Repeated Reading Effect on Reading Fluency and Reading Comprehension in Monolingual and Bilingual EFL learners

eTale 2022

This study aims to investigate how repeated reading (RR) can affect reading fluency and comprehension among monolingual and bilingual English as a foreign language (EFL) students. An 8-week quasi-experimental RR study was conducted. Results suggested that the experimental group (n = 10 monolingual, n = 10 bilingual) in general gained in reading fluency and comprehended significantly more than the control group (n = 20). Bilingual comprehension performance was significantly different and higher than for monolingual students.

Author: Maryam Tafaroji Yeganeh

Source: Yeganeh, M.T. (2013). Repeated reading effect on reading fluency and reading comprehension in monolingual and bilingual EFL learners. *Procedia – Social and Behavioral Sciences, 70*, 1778–1786.

This study aims to investigate how repeated reading (RR) can affect reading fluency and comprehension among monolingual and bilingual English as a foreign language (EFL) students. An 8-week quasi-experimental RR study was conducted. Results suggested that the experimental group (n = 10 monolingual, n =

10 bilingual) in general gained in reading fluency and comprehended significantly more than the control group (n = 20). Bilingual comprehension performance was significantly different and higher than for monolingual students.

- Reading is an important skill in L1, L2, and foreign language (FL) settings and includes a laborious process.
- Many FL/L2 readers demonstrate a slow and effortful reading process, which is a result of underdeveloped word recognition skill of FL/L2.
- In L2/FL reading research, fluency has received scant attention.
- Fluency is defined as the ability to decode and to comprehend the text at the same time.
- Accuracy, speed, and appropriate expression in reading text (silently or orally) are main characteristics accompanied with fluency.
- RR is a means of developing fluency.
- This method has learners re-reading a short passage three or more times until they are able to read at criteria word per minute (wpm) level.

Study

This study aims to investigate how RR can affect reading fluency and comprehension among monolingual and bilingual EFL students.

Participants were 10 Persian monolingual and 10 Kurdish-Persian bilingual students. There were also 20 Iranian university students in the control group. A closed test was used to check pre-treatment equivalence of the experimental and control groups. The RR treatment text included 2 short

stories segmented into 18 texts. Participants took pre- and post-tests, where they read the text five times and answered questions about the text after first and fifth reading.

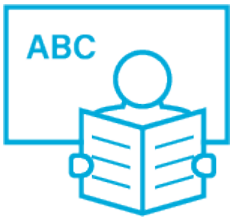
Procedure

- The project was conducted over 8 weeks.
- The RR treatment applied the following procedure for the 18 treatment sessions:
- Students read each segment of a short story timing their own reading of a passage with a stopwatch.
- Students read the previous passage to remember what they had read in the last session.
- Students read the passage twice while listening to the exact audiotaped version with headphones.
- Participants finally read the text silently a fourth and fifth time and timed each of their readings with a stopwatch, marking each time on their time log sheet.
- Students wrote a short report about what they had read in the story passage.

Findings

- The results show that reading fluency for both monolingual and bilingual experimental group participants increased during the 8 weeks RR treatment.
- Reading fluency (on average) increased by 49 wpm for monolinguals and by 55 wpm for bilinguals on the first reading between the first and last RR session.
- On average, participants' reading fluency on the fifth reading increased by 109 wpm for monolinguals and 110 wpm for bilinguals from first to last RR session.

- Participants reading fluency within RR sessions also increased.
- On the short answer first reading pre-test, the experimental group did not differ from the control group; however, by the fifth reading the control group read slower than the experimental group.
- On the first reading post-test, the experimental group read the test slightly faster than the control group, although this was not statistically significant, but by the fifth reading the experimental participants read faster than control group and the differences were statistically significant.
- The bilingual experimental group comprehended more than the monolingual and control groups.



Conclusions and implications

RR in general was effective in increasing reading fluency and comprehension among the experimental group compared with the control group. Bilingual students gained better comprehension ability than monolingual students. However, concerning fluency, no specific differences were found between monolingual and bilingual student performances. Thus, it can be concluded that in an FL setting, RR is an effective method to help readers (especially bilingual learners) to become independent.

A Meta-Analysis of Non-Repetitive Reading Fluency Interventions for Students with Reading Difficulties

eTale 2022

This meta-analytic review investigated non-repetitive reading fluency interventions for K-12 students with reading difficulties. Results indicated that non-repetitive reading fluency instruction may be a feasible approach for students with reading difficulties.

Authors: Leah M. Zimmermann, Deborah K. Reed, & Ariel M. Aloe

Source: Zimmermann, L.M., Reed, D.K., & Aloe, A.M. (2019). A meta-analysis of non-repetitive reading fluency interventions for students with reading difficulties. *Remedial and Special Education*, 1–16. DOI: 10.1177/0741932519855058

This meta-analytic review investigated non-repetitive reading fluency interventions for K-12 students with reading difficulties. Eight studies met the inclusion criteria. The overall multivariate weighted average standardised mean difference with robust variance yielded an improvement of less than 0.2 SD (d = 0.176) for non-repetitive reading fluency

interventions. However, results were positive and statistically significant. The moderator analysis revealed that the effect on comprehension outcomes (d = 0.239) was slightly larger than fluency outcomes (d = 0.105). Studies comparing repeated reading and non-repetitive reading fluency interventions produced reading outcomes similar in magnitude. Results indicated that non-repetitive reading fluency instruction may be a feasible approach for student with reading difficulties.

- Oral reading fluency (defined as the ability to read with appropriate accuracy, speed, and prosody) is a critical component for the development of skilled reading.
- Fluent, effortless reading allows for attending to the meaning of texts, rather than focusing on word recognition.
- Students with reading difficulties are more likely to struggle with fluent oral reading than their typically achieving peers.
- Reading fluency difficulties often negatively affect other reading skills, such as reading comprehension and vocabulary acquisition.

Repeated reading

- Repeated reading involves students reading a grade-level text multiple times in succession to complete a prescribed number of readings or to reach a certain fluency criterion.
- As students reread an assigned text, they not only are exposed to new words and uses of words in a variety of sentences but they also experience multiple exposures to those words and sentences that allow for rehearsal and refinement of skills.
- This is particularly true in the presence of error correction in which an interventionist provides correct pronunciations for any words a student reads

incorrectly.

Non-repetitive reading

- Interventions in which students read one or more texts without engaging in additional readings of those texts are referred here to collectively as non-repetitive reading.
- When actively processing a series of passages, students are exposed to more new words than when they reread a single passage.
- The variation in syntax and semantics across non-repetitive readings may also require students to attend closely to the individual words in the text.
- The combination of having a greater variety of reading experiences and needing to attend to the new words and arrangement of words may facilitate transferring acquired fluency skills to unpractised texts.
- Non-repetitive reading interventions can be divided into two broad categories: wide reading and independent reading.

Study

This study sought to address the existing gap in the literature by contributing information on the effectiveness of non-repetitive reading fluency interventions.

Research questions:

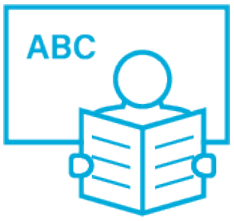
1. *What are the common components of non-repetitive reading fluency interventions?*
2. *What is the overall effect of non-repetitive reading on the oral reading fluency of students with reading difficulties?*

Findings

- Total sample sizes across the studies varied from 17 to 155 (median = 35), with 4 of the 8 studies having fewer than 30 participants.
- The duration of interventions ranged from 6 to 20 weeks.
- Most studies implemented brief but frequent sessions of 15 to 20 min, 3 times per week.
- Seven of the eight studies were categorised as wide reading.
- Continuously reading for a set amount of time was included in four studies.
- Reading the assigned texts to conclusion was the intervention in three studies.
- Only one study implemented independent reading intervention.
- Four of the studies paired students with a trained adult tutor for one-on-one instruction.
- Two studies paired students within the intervention to alternate roles as either reader or tutor.
- One study employed small-group instruction with groups of six.
- The most common fluency skills assessed were accuracy and rate of students' oral reading; however, silent reading fluency also was assessed in two studies.
- Although all studies found at least some positive

effects of the non-repetitive reading interventions on student fluency (g = 0.01–2.05), these were accompanied by wide confidence intervals (CIs).

- Of the seven studies that reported at least one comprehension outcome, at least some positive effects (g = 0.04–3.13) were found for six wide reading interventions, although they had wide CIs.
- The 8 studies included provided 56 standardised mean differences.
- The overall multivariate weighted average estimation yielded an effect of d = 0.176. This suggests a less than 0.2 SD of improvement, but results were positive and statistically significant.
- The multivariate weighted average standardised mean differences with robust variance estimation for fluency was 0.105.
- The multivariate weighted average standardised mean difference with robust variance estimation for comprehension was 0.239.



Conclusions and implications

Seven of the eight studies in the corpus implemented a form of wide reading, and four of these had students read continuously for a set amount of time, while three had students read assigned texts to completion. Most of the interventions held 15 min sessions and 3 sessions per week. The intervention length varied from 6 to 20 weeks, and it may be that interventions of longer durations might be necessary to evaluate treatment effectiveness more effectively. Students

who received the unstructured sustained silent reading intervention were outperformed by their peers who did not participate in the fluency intervention. This was one of the few effect sizes that was found with a CI not crossing a 0 value. Thus, simply providing more time to read may not be a reliable way to improve students' fluency. Non-repetitive reading has a small effect on student outcomes. Based on the results of this review, non-repetitive fluency interventions seem to be an equally plausible means of intervening with students experiencing reading difficulties.

The Effects of Reading Fluency Interventions on the Reading Fluency and Reading Comprehension Performance of Elementary Students with Learning Disabilities: A Synthesis of the Research from 2001 to 2014

eTale 2022

This synthesis covers 19 studies examining reading fluency and comprehension outcomes of reading fluency interventions for students with learning disabilities (LD) from kindergarten to 5th grade. Repeated reading (RR), multicomponent interventions, and assisted reading with audiobooks produced gains in reading fluency and comprehension. RR remains the most effective intervention for improving reading fluency.

Authors: Elizabeth A. Stevens, Melodee A. Walker, & Sharon Vaughn

Source: Stevens, E.A., Walker, M.A., & Vaughn, S. (2017). The effects of reading fluency interventions on the reading fluency and reading comprehension performance of elementary students with learning disabilities: A synthesis of the research from 2001 to 2014. *Journal of Learning Disabilities, 50*(5), 576–590. DOI: 10.1177/0022219416638028

Fluent word reading is hypothesised to facilitate reading comprehension by improving automatic word reading. This synthesis covers 19 studies examining reading fluency and comprehension outcomes of reading fluency interventions for students with learning disabilities (LD) from kindergarten to 5th grade. Repeated reading (RR), multicomponent interventions, and assisted reading with audiobooks produced gains in reading fluency and comprehension. RR remains the most effective intervention for improving reading fluency.

- Fast and accurate word reading is hypothesised to facilitate reading comprehension because it releases a reader’s cognitive resources to focus on meaning.

- Students with LD struggle to develop reading fluency.
- Reading can become a frustrating experience, which leads to an aversion to reading tasks.
- When students with LD spend less time with texts, this negatively affects vocabulary acquisition and comprehension development.
- Guided oral RR with teacher or peer feedback has been identified as an effective method for improving reading fluency and comprehension.
- Previous research has shown that RR with a model (teacher, computer, audio recording) is more effective than RR without a model, and modelling of fluent reading improves comprehension.

Study

The purpose of this systematic review is to synthesise fluency intervention studies of elementary students with LD published since 2001.

Research question:

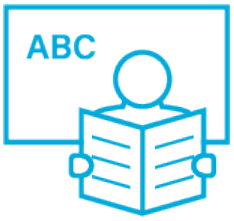
1. *What fluency interventions are associated with positive outcomes in reading fluency and comprehension for students with LD from kindergarten to* 5^{th} *grade?*

Method

A systematic review of literature was conducted. In total, 19 studies were included, which were organised into four tables based on features of the intervention (RR with or without a model, RR with multiple features, and interventions other than RR).

Findings

- Five studies examined the effects of repeatedly reading text (ranging 2-4 times) without modelling by a more proficient reader.
- Results showed medium-to-large effects in favour of RR compared to the no-treatment comparison on standardised measures of reading fluency, and RR outperformed continuous reading with small-to-medium effects in reading fluency and comprehension.
- Nine studies examined RR with a model: of these, four incorporated adult modelling of fluent reading.
- Three of these four studies found that adult modelling combined with RR improved reading rates.
- Three studies examined modelling by a more proficient peer, which yielded favourable results for improving reading rate and comprehension (although this was ineffective for improving accuracy).



Conclusions and implications

In general, the results of this synthesis show that RR is associated with positive outcomes for reading rate, accuracy, and comprehension. One method for improving the effectiveness of RR is to provide a model of fluent reading prior to practice. If adult modelling is unavailable (due to limited

resources or time constraints) a more proficient peer could provide a model prior to RR practice. Improving RR rate may also become disadvantageous as it may negatively affect reading comprehension due to an increased error rate. While results suggest RR as the most effective method for improving reading fluency and comprehension, assisted reading using audiobooks and multicomponent interventions also show promise for improving reading fluency and comprehension outcomes. Sustained silent reading is widely implemented as a mechanism for increasing reading fluency; however, it is not supported as an effective method for improving oral reading fluency. Teachers may consider using an easier level text and require students to read to a performance criterion to promote gains in fluency. Teacher modelling might be the best example of fluent reading. If this is not possible, practitioners might consider implementing peer RR routines. Students may also benefit from multicomponent interventions that combine RR with vocabulary or comprehension instruction.

How Children Read Words

eTale 2022

Reading phonologically means that children read words by converting letters into sounds. They could use grapheme–phoneme relations or intra-syllabic units, onset, and

rime. There is little direct evidence that children who are learning to read rely on letter-sound relationships to help them read words. There is a great deal of evidence that they adopt a global strategy.

Authors: Usha Goswami & Peter Bryant

Source: Goswami, U. & Bryant, P. (2016). How children read words. Chapter 2 in a book Phonological Skills and Learning to Read. ISBN: 978-1-315-69506-8 (ebk).

This book chapter considers how children read words. Do they read words phonological or in some other way? Reading phonologically means that children read words by converting letters into sounds. They could use grapheme–phoneme relations or intra-syllabic units, onset, and rime. There is very little direct evidence that children who are learning to read do rely on letter-sound relationships to help them read words. There is a great deal of evidence that they adopt a global strategy.

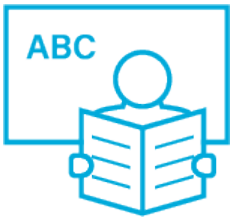
Different ways to read words

- Children may read words phonologically or in some other way.
- Reading phonologically means that children read words by converting letters into sounds: using grapheme–phoneme relations or intra-syllabic units, or onset and rime.
- Although many English words could be read with the help of letter-sound relationships, not all can be read this way, because the English script is too unpredictable.
- Thus, there needs to be another way of reading.
- One approach is often called the visual (or global) strategy.
- It is possible to recognise particular familiar words as visual patterns.
- To read words as wholes without paying attention to the individual letters is to read in the same way as the Japanese read kanji characters.

- Children might initially learn to read words based on letter-sound relationships, and then much later they might come to recognise them as familiar wholes.
- Research has shown that beginning readers can read words without the help of phonology.
- Thus, even beginning readers can read whole words without analysing the grapheme–phoneme relations in those words; rather, it is possible to take quite easily to reading words as logograms.

Comparison between reading strategies

- It seems that better readers use more the grapheme–phoneme relations but weaker readers have problems with reading based on letter-sound relationships.



Conclusions

- There is little direct evidence that children who are learning to read rely on letter-sound relationships to help them read words.
- There is a great deal of evidence that these young children take easily and naturally to reading words in other ways: they adopt a global strategy, which means that they either recognise the word as a pattern or remember it as a sequence of letters.
- However, children depend heavily on letter-sound relations when they write words.

Phonological awareness and reading

eTale 2022

The authors review research about whether phonological awareness precedes or follows learning to read. They conclude that children become aware of phonemes as a result of learning to read. However, children are aware of syllables and detect rhymes and alliterations before they start to read.

Authors: Usha Goswami & Peter Bryant

Source: Goswami, U. & Bryant, P. (2016). Phonological awareness and reading. Chapter 1 in a book Phonological Skills and Learning to Read. ISBN: 978-1-315-69506-8 (ebk).

This book chapter is about phonological awareness and its relationship to reading. The authors review research about whether phonological awareness precedes or follows learning to read. They conclude that children become aware of phonemes as a result of learning to read. However, children are aware of syllables and detect rhymes and alliterations before they start to read.

What is phonological awareness?

- Virtually any 3 or 4 year old child understands a simple, spoken word like ‘cat’; however, if you ask them

about the sounds in that word, they will find it difficult to answer the question.

- However, after approximately a year or so, these children have to learn to read and write words as well as to speak them, and that may mean the component sounds in these words take on a new significance.
- Alphabetic letters represent sounds, and strings of letters by representing a sequence of sounds can signify spoken words.
- However, we cannot assume that children's awareness of sounds (or 'phonological awareness') plays an important part when they learn to read and write.

Relationship between phonological awareness and reading

There are two possibilities:

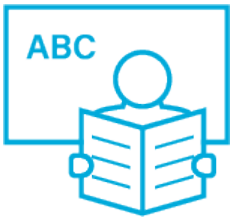
1. Children learn how to divide words up into their constituent sounds because they are taught to do so when they learn to read.
2. Before children learn to read, they may build up phonological skills that then affect how well they learn to read.

Phonemes and other speech units

- The first and perhaps the most obvious approach is to break a word up into its syllables.
- The second approach involves much smaller phonological segments; this divides words into phonemes.
- A phoneme is the smallest unit of sound that can change the meaning of a word.
- The importance to the child of learning how to use the relationships between single letters and single phonemes ('grapheme–phoneme correspondences') has been widely recognised.
- The third approach is to divide words up into units that are larger than the single phoneme (units that

themselves consist of two or more phonemes) but smaller than the syllable.

- It is usually possible to divide a syllable into two parts: an opening (or the onset) and an end (or the rime section).
- These are sometimes called intra-syllabic units.
- Words rhyme when they share common rimes.
- To know that there are categories of words that end with the same sound is a form of phonological awareness.
- Some studies show evidence that children become aware of phonemes as a result of being taught an alphabet.
- However, there are also other ways of becoming aware of phonemes.
- Young children stumble surprisingly badly when they have to make phonological judgements that depend on an explicit awareness of phonemes.
- However, there is evidence that children can delete a single phoneme in a word provided that this phoneme is the onset of the word.
- It has been found to be easier for young children to tap out the syllables rather than the phonemes of words.
- Overall, these results support the general idea that explicit knowledge about syllables precedes reading while an awareness of phonemes follows it.
- This evidence seems to support the notion that reading causes phonological awareness rather than the other way around.
- There is also evidence that children can detect rhyme and alliteration before they begin to read.



Conclusions and implications

Children’s progress in learning to read is probably the most important cause of awareness of phonemes. Children can easily judge whether words have the same onset and whether they have the same rime, and these are judgements that they can make some time before they learn to read. It is likely that the awareness of intra-syllabic units (which comes before learning to read) plays a causal role in children’s success in reading.

Naming Speed and Reading: From Prediction to Instruction

eTale 2022

The effects of naming speed across languages and the nature of its relationship to reading are examined. The double-deficit hypothesis is also considered, in which students with both slow naming speed and low phonological awareness are hypothesised to be most at-risk of reading disability. Finally, the instructional literature regarding attempts to improve naming speed and use of naming speed as a predictor of response to intervention is reviewed.

Authors: John R. Kirby, George K. Georgiou, Rhonda Martinussen, & Rauno Parrila

Source: Kirby, J.R., Georgiou, G.K., Martinussen, R., & Parrila, R. (2010). Naming speed and reading: From prediction to instruction. *Reading Research Quarterly, 45*(3), 341–362, dx.doi.org/10.1598/RRQ.45.3.4

Current theoretical interpretations of naming speed and the research literature on its relation to reading are reviewed in this article. The effects of naming speed across languages and the nature of its relationship to reading are examined. The double-deficit hypothesis is also considered. This suggests that students with both slow naming speed and low phonological awareness are most at-risk of reading disability. Finally, the instructional literature regarding attempts to improve naming speed and use of naming speed as a predictor of response to intervention is reviewed. Naming speed is uniquely associated with a range of reading tasks across orthographies, and early identification would be improved by the inclusion of naming speed measures.

- Reading is complex, and it is not surprising that the factors contributing to reading success or failure are multiple.
- One of these factors is naming speed (or rapid automatised naming [RAN]), which refers to how quickly an individual can pronounce the names of a set of familiar stimuli.
- For example, a student may be shown a page of 50 colour patches presented in a semi-random order and asked to name them as quickly as possible.
- The four types of stimuli that have been used most often are colours, objects, digits, and letters.
- There is considerable evidence that naming speed is related to reading development (even after controlling other key variables) and slow naming speed is a characteristic of poor readers or those with dyslexia.
- Naming speed is one of many cognitive processes underlying skilled word recognition, which is extremely

important for reading comprehension.
- The other key processes underlying skilled word reading include phonological awareness, phonetic decoding, orthographic processing, morphological processing, and vocabulary.

What is naming speed?

- This refer to the ability to name quickly a number of highly familiar visual stimuli (such as digits, letters, objects, and colours) presented on one page.
- The stimuli are presented in group form (not one by one) and are highly familiar.
- Speed should really be expressed as the number of correct responses per unit of time; however, many researchers measure only naming time, either ignoring errors or only counting responses when few errors are committed.

Why is naming speed related to reading?

- Naming speed and reading have so many common features that RAN has been characterised as a microcosm of reading. For example, both require eyes to move sequentially across the page, that the stimulus in fixation be encoded and can access its mental representation, and that the associated instructions for naming the stimulus be activated.
- Their differences are that reading does not always involve articulation (but naming speed does) and that reading usually involves the extraction or construction of meaning (but naming speed does not).
- One theory (e.g. Torgesen et al. 1994), hypothesises that naming speed tasks are related to reading through the more general construct of phonological processing because they measure the rate of access to stored phonological information in the long-term memory.

- Another theory (e.g. Bowers, 1995) suggests that naming speed is related to reading and is distinct from phonological awareness because it underlies or leads to orthographic processing. Orthographic processing occurs when groups of letters or entire words are processed as single units rather than as a sequence of grapheme–phoneme correspondences.
- Yet another view (e.g. Kail & Hall, 1994) states that naming speed is just one manifestation of general processing speed.
- These theoretical explanations are not mutually exclusive, and each may provide a part of the explanation for the close relationship between naming speed and reading.

Naming speed predicts performance on a variety of reading tasks

- Correlations between naming speed and word reading speed (or fluency) are generally higher than with word reading accuracy.
- The similarity of correlations of naming speed with real word and pseudoword challenges the orthographic interpretation of naming speed. By definition, pseudowords are not familiar words that could be recognised as orthographic units and should correlate less with RAN than words if orthographic interpretation applied.
- Timed measures of word or text reading are more strongly correlated with RAN than untimed reading measures (for example, reading accuracy and reading comprehension).
- Naming speed has survived many controls. It has been a significant predictor of reading after controlling statistically for verbal and nonverbal IQ, prior reading ability, attention deficit disorder, socioeconomic status, articulation rate, speed of processing, phonological short-term memory, phonological awareness,

morphological awareness, and orthographic processing.
- The effect of naming speed is at least partly distinct from the effects of phonological awareness, orthographic processing, and processing speed, that affects the theoretical basis of RAN.
- The relationship between naming speed and reading may be curvilinear, stronger at lower levels and weaker at higher levels of reading ability.

Naming speed in different languages/orthographies

- Naming speed has been shown to be a strong concurrent and longitudinal predictor of reading ability in a wide array of languages/orthographies.
- It has been argued that naming speed is a stronger predictor of reading in orthographically consistent languages than in orthographically inconsistent languages. This may be because reading in consistent orthographies has been described in terms of reading speed measures (as opposed to reading accuracy measures in inconsistent orthographies). This gives an advantage to naming speed as a speeded measure itself, while consistent orthographies place less stress on phonological awareness and phonetic knowledge leaving more variance to be accounted for by naming speed.

The double-deficit hypothesis

- This hypothesis states that reading deficits are more severe in individuals with weaknesses in both phonological awareness and naming speed than in individuals with deficits in only one of these cognitive processing skills.
- Many empirical studies have verified the hypothesis by demonstrating that students in the double-deficit group experience the most severe reading difficulties followed by the students in either one of the single-deficit groups.

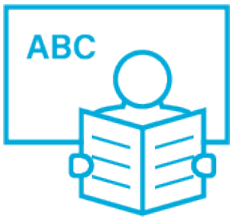
- However, a number of studies have challenged the predictions of the double-deficit hypothesis by challenging a) the independence of RAN and phonological awareness for predicting reading, b) the distinction of double-deficit and single-deficit groups, and c) the stability of group composition. There are many reasons for contradictory findings, for example, related to orthographies and methodologies used.

Can naming speed be improved?

- In one study (Fugate, 1997), 1st grade students in a letter-training (or comparison) group were compared. In the letter-training condition, each student received individual training and was provided with practice in letter naming (drill tasks in naming individual letters on flashcards). The letter-training group exhibited higher letter naming speed and oral reading fluency immediately post-test relative to the comparison group; however, there were no significant differences at follow-up.
- In another study (Conrad & Levy, 2011), Grade 1 or Grade 2 students were assigned to one of three groups: orthographic pattern training followed by letter naming training, letter naming training followed by orthographic training, or control (mathematics instruction). Letter naming speed improved only when the letter naming training followed the orthographic training; thus, promoting students' orthographic awareness may help them to develop more efficient letter naming skills.
- The positive effect of an early literacy intervention programme on English-speaking kindergarten students' phonemic awareness, letter naming speed, and word level reading skills has been identified (Nelson et al, 2005). The intervention programme comprised 25 lessons and

targeted letter knowledge, phonemic awareness skills, understanding sentences, and rapid naming. Thus, a broad-based intervention that addresses emergent literacy skills (including naming speed training) can improve letter naming speed and reading skills in young at-risk students.

- Overall, studies suggest that naming speed is difficult to improve, and that students can improve in reading skills without accompanying improvements in naming speed.
- There is no evidence that improvement in phonological awareness improves naming speed.
- Several studies (e.g. Nelson et al, 2003) have demonstrated that slow naming speed is associated with a less positive response to reading instruction, independent of other characteristics such as behaviour and phonemic awareness.
- Students with slow naming speed may require more extensive instruction in word reading.
- Action video games can improve processing speed.



Implications

- Naming speed measures help to identify students with (or at risk of developing) serious reading difficulties or disabilities.
- It is important to be able to diagnose the source of the problems so that instruction can be tailored to address the specific difficulties.
- Naming speed is phonological, but it is also related to orthographic processing. In addition, it is related to

general processing speed, but continues to predict reading after the latter is controlled. Other factors (such as working memory and other executive functions) may be involved.

- Current research indicates that students with slow naming speed are less likely to respond well to regular classroom and remedial instruction.
- It is not yet clear what form of remedial instruction students with slow naming speed require, although preliminary evidence suggests that multicomponent interventions are successful.

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

eTale 2022

This review examines both rapid automatised naming (RAN) and reading fluency and how each has shaped our understanding of reading disabilities. The way automaticity that supports RAN

affects reading across development, reading abilities, and languages is explored together with the biological bases of these processes. The contribution of collective studies of RAN and reading fluency to our goals of creating optimal assessments and interventions to help every child become a fluent, comprehending reader is also examined.

Authors: Elizabeth S. Norton & Maryanne Wolf

Source: Norton, E.S. & Wolf, M. (2012). Rapid automatised naming (RAN) and reading fluency: Implications for understanding and treatment of reading disabilities. *Annual Review of Psychology, 63*, 427–452, doi: 10.1146/annurev-psych-120710-100431

Fluent reading depends on a complex set of cognitive processes that need to work perfectly together. Rapid automatised naming (RAN) tasks provide insight into this system, acting as a microcosm of the processes involved in reading. This review examines both RAN and reading fluency and how each has shaped our understanding of reading disabilities. The way the automaticity that supports RAN affects reading across development, reading abilities, and languages is explored together with the biological bases of these processes. The contribution of collective studies of RAN and reading fluency to our goals of creating optimal assessments and interventions that help every child become a fluent, comprehending reader is also explored.

- To be a successful reader, it is necessary to rapidly integrate a vast circuit of brain areas with great accuracy and remarkable speed.
- This ‘reading circuit’ is composed of neural systems that support every level of language: phonology, morphology, syntax, and semantics – as well as visual and orthographic processes, working memory, attention, motor movements, and higher-level comprehension and cognition.

- When each of these components work smoothly with accuracy and speed, the reader develops what is called automaticity.
- As a cognitive process becomes automatic, it demands less conscious effort.
- The development of automaticity at all the lower levels of reading represents the great apex of development that provides us with the bridge to true reading with its capacity to direct cognitive resources to the deepest levels of thought and comprehension.
- It is imperative to comprehend the meaning of a text in order to go beyond what is on the page; in other words, to make connections to existing knowledge, to analyse the writer's argument, and predict the next twist in the story.

What is reading fluency?

- The term 'fluency' has been used to describe the speed and quality of oral reading (often emphasising prosody); however, this definition does not encompass all the goals of reading or reflect the fact that most of our reading is done silently rather than aloud.
- Here, reading fluency is examined in terms of what has been called 'fluent comprehension': a manner of reading in which all sub-lexical units, words, and connected text and all the perceptual, linguistic, and cognitive processes involved in each level are processed accurately and automatically so that sufficient time and resources can be allocated to comprehension and deeper thought.

What is rapid automatised naming?

- The seemingly simple task of naming a series of familiar items as quickly as possible appears to invoke a microcosm of the later developing, more elaborated

reading circuit.

- RAN tasks are considered one of the best, perhaps universal, predictors of reading fluency across all known orthographies.
- RAN tasks and reading are considered to require many of the same processes (eye saccades, working memory, and the connecting of orthographic and phonological representations).
- RAN tasks depend on automaticity within and across each individual component in the naming circuit.
- RAN has been referred as one of the universal processes that predict the young child's later ability to connect and automatise whole sequences of letters and words with their linguistic information, regardless of the writing system.
- RAN tasks have proven to have great potential because children can perform RAN tasks (such as naming familiar objects or colours) well before they are able to read and because RAN is correlated with reading ability in kindergarten and beyond.

History of research on reading disabilities

- Reading difficulties can be classified into two main types: developmental and acquired.
- The effects of developmental dyslexia begin in childhood and makes learning to read and developing reading skills difficult.
- Acquired reading difficulties (usually called alexia) often result from a brain trauma, such as an injury or stroke.
- In the late 1800s, physicians including Jules Dejerine and Adolf Kussmaul described patients who suffered brain injury with subsequent reading difficulty (despite intact language and vision) using the term 'word-blindness'.
- John Hinshelwood and W. Pringle Morgan were among the

first to describe ‘congenital word blindness’; that is, reading difficulty beginning in childhood that is not due to injury.

- Neurologist Samuel Orton developed a theory that inappropriate cerebral dominance accounted for the reversed letters and words sometimes observed in children with reading difficulties.
- He noted that many struggling readers he observed had average or above-average intellectual abilities, that perhaps as many as 10% of children might suffer from reading difficulties, and that reading difficulties were not likely due to a single brain abnormality.

History of RAN tasks

- In the 1960s, neurologist Norman Geschwind conceptualised the core deficit in alexia as a disconnection between the visual and verbal processes in the brain.
- He emphasised the importance of connectivity among brain regions (particularly association areas such as the angular gyrus) that act as a switchboard or relay station for different brain regions.
- The first RAN measure was based on an array of 50 coloured squares arranged in a grid with five rows, where each of five familiar colours was repeated in a random order.
- Geschwind did not believe that colour naming was an aspect of reading; rather, the neural processes supporting rapid serial colour naming might be similar to those involved in reading.
- Neurologist Martha Denckla (1972) discovered five boys who had dyslexia and were particularly slow and inconsistent in serial colour naming for their age, despite typical intelligence and colour vision.
- Together with Rita Rudel, Denckla created three other versions of the speeded serial naming test using

objects, letters, and numbers as stimuli.

- They coined the term ‘rapid automatised naming’ to describe these tasks that were designed to measure the speed of naming familiar items.
- They found that RAN latencies were not related to how early certain stimuli were learned, but how ‘automatised’ the naming process was.
- Performance on RAN tasks differentiated children with reading difficulties from typical readers of the same age and from children with other, nonlanguage-based learning disabilities.

Toward a multi-componential view of reading and reading disability

- LaBerge and Samuels’ (1974) model of reading was one of the first to emphasise what we now know as ‘fluency’; the idea that successful reading depends on not only accuracy but automaticity of multiple cognitive and linguistic processes, requiring minimal conscious effort.
- Another possible core deficit associated with dyslexia is difficulty with phonological awareness (PA), which involves the explicit ability to identify and manipulate the sound units that comprise words.
- Isabelle Liberman (1971) promoted the idea that reading development depends on explicit awareness of the sounds of language and that possibly the greatest challenge facing young readers is learning to match the phonemes of speech with the graphemes that represent them in print.
- It is now generally agreed that PA is a crucial precursor to reading acquisition in alphabetic languages, and that many (if not most) children with dyslexia have PA deficits.
- We know that the reading circuit is intrinsically complex and that a lack of accuracy or automaticity at

one of any number of levels can cause reading difficulties.

- Wolf and Bowers (1999) found that phonological awareness and RAN contributed separately to reading ability.
- They proposed the double deficit hypothesis (DDH) to demonstrate how children can be characterised in various subgroups according to their performance in each set of processes.
- According to this hypothesis, a deficit in either PA or naming speed can cause reading difficulties, with RAN deficits indicating weakness in one or more of the underlying fluency-related processes (and not simply a naming speed deficit).
- These deficits can co-occur, and children with a double deficit in PA and RAN characterise the most severely-impaired readers.
- Studies have suggested that 60% to 75% of individuals with reading or learning disabilities exhibit RAN deficits.

Defining the RAN tasks

- RAN tasks have been described in the literature using slightly different terms, such as rapid serial naming, serial visual naming, continuous rapid naming, rapid naming, and naming speed. In this review, RAN is used to mean generally any rapid automatised naming task or process.
- **RAN tasks** involve timed naming of familiar stimuli presented repeatedly in a random order, in a left-to-right serial fashion. In some uses of the RAN task, self-corrections and errors are noted for the purposes of qualitative observations; however, the key dependent variable is the total time taken to name the items. It is crucial that the items to be named (whether objects, colours, letters, or numbers) are sufficiently familiar to the examinee.

- The two most widely used **standardised tests of RAN** in the USA are the Rapid Automatised Naming-Rapid Alternating Stimulus (RAN-RAS) Tests by Wolf and Denckla, and the rapid naming subtests of the Comprehensive Test of Phonological Processing (CTOPP) by Wagner and colleagues. The CTOPP uses a shorter format that is considered by its authors to measure phonological retrieval. Both these measures are standardised and normed on large samples. A child's raw score on these tests can be used to derive a standard score and percentile rank, which provides information about how the child performed relative to others of the same age or grade level.
- **RAN-RAS Tests** include the four classic subtests of RAN measures: objects, colours, numbers, and letters, as well as two RAS subtests. Each of the subtests has 50 items arranged in 5 rows of 10 items each. The five different token items for each subtest are pseudorandomised with no item appearing consecutively on the same line. The RAS was first developed in the 1980s by Wolf to incorporate processes involved in switching and disengaging attention to rapid-naming tests. The RAN-RAS tests include a 2-set RAS composed of alternating letters and numbers and a 3-set RAS with alternating letters, numbers, and colours. Norms are available for individuals aged 5–18.
- **The CTOPP** conceptualises rapid naming as one of three subcomponents of phonological processing, along with phonological awareness and phonological memory. The rapid naming subtests measure rapid object, colour, digit, and letter naming. For each subtest, there are six token items, and the task is divided into two parts, with the items arranged in two arrays on separate pages. Each of the 2 arrays include 4 rows of 9 items, for a total of 72 items. The test is normed for individuals aged 5–24.
- The RAN-RAS tests treat rapid naming as a cognitive

ability that includes phonology but also other linguistic and visual processes. In contrast, the CTOPP was designed based on a model of overall phonological processing that includes phonological awareness, phonological memory, and rapid naming as related subcomponents.

- Wolf and colleagues enumerated seven related **processes that are involved in rapid naming**: a) attentional processes to the stimulus; b) bi-hemispheric visual processes responsible for initial feature detection, visual discrimination, and pattern identification; c) integration of visual features and pattern information with stored orthographic representations; d) integration of visual and orthographic information with stored phonological representations; e) access and retrieval of phonological labels; f) activation and integration of semantic and conceptual information with all other input; and g) motoric activation leading to articulation.
- There are several reasons **why RAN should be considered independent from phonological processing**: 1) RAN and PA are only moderately correlated and load on separate factors; 2) regression and structural equation models consistently report that RAN and PA account for unique variance in reading ability; and 3) genetic and neuroimaging studies find different biological bases for RAN and PA abilities. Functional brain imaging studies of the two tasks show some shared regions, as would be expected with their similar task demands, yet also separate areas of processing.

Characteristics and predictive value of RAN across development

- The measures that most consistently predict future reading difficulty in English are phonological processing/awareness, letter-name knowledge, and RAN.
- RAN-reading relationships are stronger in poor than in

typical readers.

- **Prediction in kindergarteners and prereaders.** 5- and 6-year-olds often name the colour and object (nonalphanumeric) stimuli more quickly than letters and numbers (alphanumeric stimuli). With more practice and exposure, the alphanumeric stimuli become much more automatic and are named faster than nonalphanumeric stimuli. At this point, alphanumeric RAN becomes more strongly associated with reading ability. These differences underscore the importance of considering alphanumeric RAN separately from nonalphanumeric RAN stimuli.
- RAN and phonological processing tasks are valuable tools because both are excellent predictors of reading ability that can be assessed before children learn to read; thus, they can be used as easy indicators of risk for reading difficulties.
- In a large longitudinal study from kindergarten to 2nd grade, RAN objects and PA predicted later outcomes on untimed passage comprehension in a similar way. However, RAN may have a stronger impact on timed reading measures (no timed measures were used in this study).
- **Prediction in school-age and beyond.** Longitudinal studies suggest that RAN scores measured in early school grades significantly predict later reading and spelling scores, and the predictive value of RAN seems to be stronger and more stable in poor readers than in typical readers. RAN seemed to be strongly related to decoding; however, it did not predict untimed reading comprehension measures in the later grades in typical or disabled readers. Unfortunately, the outcome measures did not include any timed reading or fluency tasks.
- RAN ability differences persist between young adults with and without dyslexia.
- A Dutch study found that the developmental trajectory of alphanumeric RAN reached an asymptote after age 16 but

that RAN latencies for colours and objects continued to decrease through adolescence and adulthood.
- The correlations between alphanumeric RAN and reading are also significant through adulthood.

Cross-linguistic studies of RAN and fluency

- RAN and its relationship to reading have been studied in relation to many of the world's languages, with findings following the general pattern of what is known about RAN in English: that RAN predicts reading (both concurrently and longitudinally) in both typically developing and reading-impaired populations.
- Alphabetic languages can be considered on a continuum based on the complexity of the mapping between sounds and letters (or phonology and orthography). The orthography of English is considered very deep (or opaque) because the correspondences from phonemes to graphemes are not consistent. Many other alphabetic languages such as German and Spanish have what is called a shallow or transparent orthography, where grapheme–phoneme correspondences are highly predictable. Learning sound-to-letter correspondences and decoding is more straightforward in these orthographically shallow languages.
- PA is important in early reading acquisition but as children essentially reach a ceiling in their ability to decode words accurately, a shift occurs in which the relationship between RAN and reading becomes much stronger. Children reading more transparent languages shift away from phonology earlier in schooling.
- Orthographic complexity affects the relationship of PA and reading ability; however, the relationship of RAN and reading is essentially consistent across languages.
- Nonalphabetic languages (such as Chinese and Japanese orthographies) are composed of thousands of characters that are essentially unrelated (or much less related) to

phonemes. Phonological awareness is a weaker predictor of timed reading in Chinese. RAN is strongly correlated with reading in Chinese and accounts for additional variance after writing (orthographic) ability is controlled for.
- Overall, the differences in RAN across languages and orthographies are small in comparison with the number of similarities.

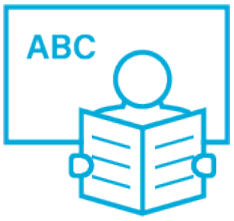
Contribution of neuroscience and genetics to understanding RAN and fluency

- Brain activation for reading-related tasks has been consistently identified in three main areas of the left hemisphere: the inferior frontal gyrus (IFG), the temporoparietal area, and the occipitotemporal area. For people with dyslexia relative to controls, the most consistent finding is an under-recruitment (hypoactivation) of the left temporoparietal and left occipitotemporal areas. Many individual studies have identified areas of the right frontal and temporal lobes that show greater activation in people with dyslexia relative to controls.
- There is some evidence that PA and RAN or fluency abilities may have separate neural substrates.
- Two studies (Misra et al., 2004; Christodoulou et al., 2011) found that for letter naming contrasted with fixation, the RAN task engaged the left inferior frontal gyrus, left posterior middle frontal gyrus, and bilateral inferior occipital areas.
- In one study (Christodoulou et al., 2011), adults with dyslexia had lower standardised RAN scores and lower in-scanner performance. The typical controls engaged several posterior areas in the occipital and parietal regions bilaterally more than the group with dyslexia, whereas the adults with dyslexia demonstrated greater activity than controls in a variety of bilateral

temporal, motor, and left supramarginal gyrus (part of the temporoparietal area).

- From EEG research, it is known that different aspects of words are processed along a timeline. For example, initial visual processing occurs within the first 50 ms after a word is presented. Word-specific orthographic processing begins around 150 ms and executive and attention processes at about 200 ms, with phonological processes between 150 and 300 ms, followed by semantic and comprehension processes.
- The mismatch negativity (MMN) ERP component (a pre-attentive response to a difference within a series of auditory stimuli) has been studied as a possible correlate of automatic language processing. The MMN response is a significant predictor of reading outcomes (even better than a combination of behavioural assessments in children) and differs among infants with and without a family history of reading disability. Recently, it has been found that the MMN response in children was significantly correlated with RAN, timed single word reading, and timed connected text reading (but not with PA or untimed reading).
- In Magnetic Resonance Imaging (MRI), children with dyslexia showed smaller volumes of the pars triangularis area of the IFG bilaterally as well as an area of the right cerebellum. These anatomical measurements were also significantly correlated with RAN scores.
- It may be the case that extreme asymmetries of the planum temporale in either direction may induce risk for dyslexia.
- In a sample (Pernet et al., 2009), 100% of adults could be accurately classified as typical or dyslexic based on the volumes of the right cerebellar declive and left lentiform nucleus (part of the basal ganglia). The concept of a U-shaped curve, in which extreme values on either the high or low end can cause a disorder, could help explain conflicting findings in asymmetry.

- Because RAN and fluency depend on the speed and integration of multiple processes throughout the brain, the extent and quality of white matter pathways may play a substantial role in enhancing understanding of the biological basis of fluency-related processes.
- Heritability estimates for dyslexia range widely, from 0.3 to 0.7 (where a trait that was 100% determined by genetics would measure 1.0).
- Several researchers have reported a set of common genetic influences that affect PA, RAN, and reading (that is, they are all affected by some common genes) but that there are also separate genetic influences on PA and RAN.
- At least nine major candidate genes for susceptibility to dyslexia have been identified located on eight different chromosomes. Most of these are related to neuronal migration and axon growth in utero.



Implications of RAN and fluency for identifying reading difficulties, instruction, and intervention

- RAN tasks can be best used by educators and psychologists as part of a clinical assessment to identify a risk of reading and learning difficulties and as a measure of the development and efficiency of processes related to word retrieval and reading fluency.
- RAN tasks take only a few minutes to administer and require only modest training to administer and score. Using published normed measures, examiners can determine how a child’s RAN ability compares with what is typical for a given age or grade.

- A second important reason for assessing RAN and other fluency issues is that speed and automaticity are essential components of what it means to be a good reader, yet we tend to measure reading too often only in terms of accuracy.
- Children with phonological weaknesses who receive high-quality phonological interventions tend to improve both their PA skills and decoding ability. Although our best interventions can improve most reading and language variables, the RAN changes little from pre- to post-treatment, indicating that RAN taps a more basic index of processing.
- One technique that has been widely used as purported way to improve fluency is repeated reading. However, the entire approach of repeated reading measures yield changes in speed that may not be related to improvements in our *sine qua non* of reading, fluent comprehension.
- There are numerous programmes designed to address phonological decoding skills; however, few explicitly address multiple components of language (such as orthography, morphology, syntax, and semantics) with the goal of improving fluent comprehension.
- Children who received multi-componential interventions had significantly greater growth than other intervention groups on timed and untimed word and nonword reading and passage comprehension.
- The present review of the fluency research highlights the need for multi-componential interventions, especially for students with RAN or double deficits whose weaknesses are not adequately addressed by a phonological decoding programme.
- Successful intervention for reading disabilities depends on accurate assessment of a child’s profile in terms of both accuracy and speed across all levels of reading, from the sub-word to connected text. Multi-componential intervention programs that target phonology as well as multiple levels of language show the greatest promise in

improving reading fluency.

Summary

- RAN measures act as a microcosm of the reading system providing an index of one’s abilities to integrate multiple neural processes.
- RAN and phonological awareness are both robust early predictors of reading ability, and one or both are often impaired in people with dyslexia. Longitudinal, cross-linguistic, genetic, and neuroimaging studies suggest that these two crucial reading-related processes should be considered distinct constructs rather than subcomponents of a single construct.
- It is advantageous to conceptualise fluent reading as a complex ability that depends on automaticity across all levels of cognitive and linguistic processing involved in reading, allowing time and thought to be devoted to comprehension.
- Multi-componential intervention programmes that target phonology as well as multiple levels of language show the greatest promise in improving reading fluency.

What Mechanism Underlies the Rapid Automatized Naming – Reading Relation?

The present study examined why rapid automatised naming (RAN) is related to reading by manipulating one aspect of the RAN task at a time and by inspecting changes to the RAN-reading relation. The results of regression analyses indicated that seriality, access to phonological representations, and articulation play an important role in the RAN-reading relationship.

Authors: George Georgiou & Rauno Parrila

Source: Georgiou, G. & Parrila, R. (2020). What mechanism underlies the rapid automatized naming – reading relation? *Journal of Experimental Child Psychology*, *194*, 104840. https://doi.org/10.1016/j.jecp.2020.104840

The present study examined why RAN is related to reading by manipulating one aspect of the RAN task at a time and by inspecting the changes to the RAN-reading relation. Accordingly, 136 Grade 2 English-speaking children and 121 university students were assessed on serial and discrete RAN, cancellation, yes/no naming, and oral and silent reading fluency. The results of regression analyses indicated that seriality, access to phonological representations, and articulation play an important role in the RAN-reading relationship. However, their effects were not equal for the two age groups or across the two reading outcomes.

- The ability of an individual to name as fast as possible highly familiar stimuli such as letters, digits, colours, and objects (RAN) is a strong predictor of reading.
- It has been shown that RAN continues to predict word

reading after controlling for several proposed mediators.

- Pause time in RAN is more strongly related to word reading than articulation time.
- Serial RAN (when all stimuli are presented simultaneously in an array) produces stronger correlations with reading than discrete naming; however, discrete naming is a stronger correlate of discrete word reading than serial RAN.
- Serial RAN dominates the prediction of reading fluency over discrete naming and only RAN tasks requiring overt articulation correlate with reading fluency.
- RAN is related to reading because it requires serial processing and overt articulation of items accessed in long-term memory.

Three different approaches to studying the RAN-reading relation:

- Examining the contribution of RAN to reading after controlling for the effects of the presumed mediator.
- Partitioning RAN total time into articulation time and pause time and examining how each component relates to reading.
- Manipulating different aspects of RAN tasks and examining how this affects the RAN-reading relation.

The study

The aim of the present study was to replicate and expand Georgiou et al.’s (2013) study with English-speaking second graders and university students.

Research questions:

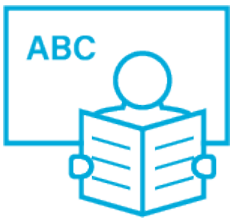
1. *Does seriality contribute to the RAN-reading relation?*
2. *Does set size contribute to the RAN-reading relation?*
3. *Does articulation contribute to the RAN-reading relation?*

The data was gathered from 137 Grade 2 children and 121 university students from Canada. Serial RAN, discrete naming, cancellation, yes/no naming, and reading fluency of the participants were tested. Three versions of RAN were used: a) 5 letters repeated 10 times (5 × 10), b) 2 letters repeated 25 times (2 × 25), c) 25 letters repeated twice (25 × 2).

Findings

- The three serial RAN tasks correlated strongly with each other (r = 0.54–0.73 in Grade 2 and r = 0.78–0.84 in adults) and with oral reading fluency (r = −0.45– −0.56 in Grade 2 and r = −0.58– −0.63 in adults).
- In the regression analysis, where serial RAN (5 × 10) and discrete naming were analysed simultaneously, both naming tasks significantly predicted the reading outcomes in Grade 2 (betas ranged from −0.230 to −0.465), but only serial RAN significantly predicted the two reading outcomes in adults (betas were −0.595 and −0.313, respectively).
- When three types of RAN tests were analysed in the same model, both RAN (5 × 10) and RAN (25 × 2) accounted for unique variance in oral reading fluency in Grade 2; however, in adults, only RAN (25 × 2) predicted significantly oral reading fluency.

- When RAN (5 × 10), cancellation, and yes/no naming were analysed in the same model, RAN (5 × 10) was the only significant predictor of oral reading fluency in both groups (betas were −0.579 in Grade 2 and −0.520 in adults), and of silent reading fluency in Grade 2 (beta = −0.442).



Implications

- While both discrete naming and serial RAN predicted reading in Grade 2, only serial RAN predicted reading for adults. This implies that in early grades, children process words in reading fluency tasks one at a time (as in discrete naming). For this reason, discrete naming predicts reading. Serial naming is important irrespective of grade level because it involves processes specific to the sequential nature of the task (such as eye-movement control) and beyond the automaticity of name retrieval (tapped by discrete naming).
- This suggests that reading fluency requires both quick word recognition and efficient processing of words that appear in sequence.
- Both RAN (5 × 10) and RAN (25 × 2) accounted for unique variance in oral reading fluency in Grade 2, which may be expected given that most words in the reading tasks would be unknown to Grade 2 children and they would need quick access to phonological representations of graphemes to facilitate decoding.
- Neither cancellation nor yes/no naming predicted reading.

- RAN and the other measures accounted for a substantially lower degree of variance in silent reading fluency than in oral reading fluency, which suggests that articulation in both RAN and reading is partly responsible for their relation.

Working Memory, Long-Term Memory, and Language Processing: Issues and Future Direction

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In this study, different views are examined concerning the relationships between working memory, long-term memory, and language processing. Thus, working memory is considered a gateway between sensory input and long-term memory (or rather a workspace), and working memory is considered not strictly tied to any particular cognitive system; rather, as drawing on the operation and storage capacities of a subset of components involved in language processing.

Authors: Fabienne Collette, Martial Van der Linden, & Martine Poncelet

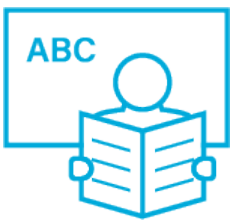
Source: Collette, F.; Van der Linden, M.; Poncelet, M. (2000). Working memory, long-term memory, and language processing: Issues and future directions. *Brain and Language, 71*, 46–51.

In this study, different views are examined concerning the relationships between working memory, long-term memory, and language processing. Thus, working memory is considered a gateway between sensory input and long-term memory (or rather a workspace), and working memory is considered not strictly tied to any particular cognitive system; rather, as drawing on the operation and storage capacities of a subset of components involved in language processing.

- Working memory refers to a limited capacity system responsible for the temporary storage and processing of information while cognitive tasks are performed.
- According to the multicomponent model, working memory consists of a modality-free controlling central executive aided by two slave systems that ensure temporary maintenance of verbal and visuospatial information: the phonological loop and the visuospatial sketchpad.
- Working memory makes significant contributions to some aspects of language processing; namely, sentence comprehension, speech production, vocabulary acquisition, and reading.
- Working memory is considered a ‘gateway’ between sensory input and long-term memory, although this gateway perspective has been questioned because there are long-term memory effects in working memory tasks.
- Baddeley et al. (1998) postulated that two separate but interrelated short- and long-term phonological stores exist.
- The visually or auditorily presented verbal information is maintained in a phonological short-term store.
- The long-term phonological representations constitute a stable pattern corresponding to phonological structures

that are frequently activated. Repeated presentations of phonological information will modify the representations in the long-term phonological system.

- Logie (1996) suggested that rather than working as a gateway between sensory input and long-term memory, working memory operates as a workspace.
- Accordingly, the storage components of working memory are not input buffers; rather, they serve as temporary buffers for the information that has yet to be processed or is about to be rehearsed overtly.
- Martin and Romani (1994) suggested that verbal working memory is not a specialised subsystem dedicated to short-term memory storage and separate from the language system. Rather, it draws on the operation and storage capacities of a subset of components involved in language processing.
- They concluded that the different levels of representation involved in memory span and language processing draw on specific resources, which may be conceptualised either as buffers specialised for particular types of representations or in terms of rate of decay that may differ for different levels of representation.
- These views clearly differ from Baddeley's conception as they consider verbal short-term memory to be an integral part of the language system. For Baddeley, the working memory components are not strictly tied to any particular cognitive system.



Conclusion

There are neuroimaging studies that agree with the existence of two separate phonological stores, as postulated by Baddeley et al. (1998).

Classroom Climate and Children's Academic and Psychological Wellbeing: A Systematic Review and Meta-Analysis

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In this study, a meta-analytic approach was used to synthesise existing research. The results showed that overall classroom climate had small-to-medium positive associations with social competence, motivation and engagement, and academic achievement and small negative association with socioemotional distress and externalising behaviours.

Authors: Ming-Te Wang, Jessica L. Degol, Jamie Amemiya, Alyssa Parr, & Jiesi Guo

Source: Wang, M.-T., Degol, J.L., Amemiya, J., Parr, A., &

Guo, J. (2020). Classroom climate and children's academic and psychological wellbeing: A systematic review and meta-analysis. *Developmental Review, 57*, 100912. https://doi.org/10.1016/j.dr.2020.100912

In this study, a meta-analytic approach was used to synthesise existing research with the goal of determining a) the extent to which classroom climate as a multidimensional construct was associated with youth's academic, behavioural, and socioemotional outcomes from kindergarten to high school; and b) whether the relations between classroom climate and youth's outcomes differed by dimensions of classroom climate, study design, and child characteristics. Analysis included 61 studies. The results showed that overall classroom climate had small-to-medium positive associations with social competence, motivation, and engagement, and academic achievement and small negative association with socioemotional distress and externalising behaviours.

- Bronfenbrenner's (1994; 2006) bioecological model posits that human development occurs within a set of interrelated contexts in which proximal processes mediate individual experiences, cognitions, emotions, and behaviours.
- It is through these proximal processes occurring between students and teachers that classroom climate provides the resources and opportunities for developing children and youth's academic, socioemotional, and behavioural competencies.
- Classroom climate incorporates a multitude of dimensions, such as the organisation and structure of the classroom environment; pedagogical, disciplinary, and curriculum practices; and interpersonal relationships among students, peers, and teachers. These form a set of proximal processes that may mediate or moderate the influence of other contexts on children's outcomes.

- There are at least three basic classroom components associated with student–teacher interactions: instructional support, socioemotional support, and classroom organisation and management.

Instructional support

- This focuses on features of instruction that provide quality feedback, use techniques to enhance critical thinking, and communicate high academic expectations for students.

Socioemotional support

- This refers to classroom characteristics that support the emotional wellbeing of students, including the warmth, safety, connectedness, and quality of interactions with teachers and peers.

Classroom organisation and management

- This denotes the practices used by teachers to establish daily classroom routines, including reinforcing classroom rules consistently, providing positive behaviour support, managing disruptive behaviour effectively and fairly, and using preventative strategies to reduce punitive events.

The study

The present study used a meta-analytical approach to investigate the extent to which classroom climate was related to children's academic, behavioural, and socioemotional outcomes. The study also examined whether the link between

classroom climate and youth outcomes varied by classroom climate dimensions, grade level, study sample racial composition, family socioeconomic status, research methods, and study design.

Hypothesis:

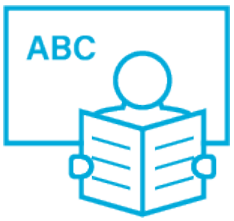
1. *Overall classroom climate is positively associated with youth's social competence, motivation and engagement, and academic achievement, and negatively associated with socioemotional distress and externalising behaviours.*

This meta-analysis consisted of 61 articles of which 34 examined instructional support, 42 socioemotional support, and 18 classroom organisation and management.

Findings

- Classroom climate had a small-to-medium positive association with social competence, motivation and engagement, and academic achievement, whereas classroom climate had small negative associations with externalising behaviour and socioemotional distress.
- All three dimensions of classroom climate (instructional, socioemotional, and organisational) appeared to be associated with youth's socioemotional development, academic achievement, and behavioural problems.
- Classroom climate was more strongly associated with youth motivation and engagement when the sample included more students from ethnic minority backgrounds.
- Student reporting and observation of classroom climate had positive associations with social competence,

whereas teacher reporting of classroom climate had a non-significant effect on social competence.
- Student and teacher reporting of classroom climate had negative associations with externalising behaviour (although observation did not).



Implications

- Findings suggest that classroom contexts are associated with a wide range of developmental outcomes.
- Teachers and peers create opportunities for youths to engage in a variety of academic and social activities through instructional methods, classroom organisation, and the provision of socioemotional support.
- Students' motivational beliefs are cultivated within the context of complex social and academic classroom networks, creating motivational orientations that either foster or undermine academic development.
- Classroom environments that meet students' psychological needs are optimised for positive youth development.