

Treatment of dyslexics' reading fluency problems: New directions

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Reading Process

- Visual-information processing
- Activation of Phonological codes
- Activation of Orthographic codes
- Activation of Semantic codes

Reading Process

- Efficient processing within and across systems -> lexical access and reading performance (Seidenberg, 1990)

Cross-linguistic aspects

- Deep Orthography (English): inconsistent grapheme-phoneme correspondences
e.g. /pint/ vs. /hint/
 /throughu/ vs. /toughu/
• Shallow Orthography (Dutch/Hebrew vowelized)

Hypotheses on Reading Problems

English:

- Ineffective phonological processing (Lyon & Moats, 1997)/Phonemic awareness
E.g. phoneme deletion
- Difficulties in grapheme to phoneme decoding (Liberman & Shankweiler, 1991)

Hypotheses on Reading Problems

Dutch:

- Automatic decoding deficit (Yap & Van der leij, 1993; Van den Bosch et al., 1995; Van der leij & Van Daal, 1999). Slow rate of identification of unfamiliar words.

E.g. scores on One-Minute-Test (Brus & Voeten, 1973): errors low (Rutjens (2000))

Dyslexics and Reading Speed

- Dyslexics show slow reading speed in relatively transparent languages like Dutch and German (de Jong & Van der Leij, 1999; Wimmer *et al.*, 1998).
- Dyslexics are less efficient in activating letter and phonemic information (Booth *et al.*, 1999).

Intervention studies

- Focus on phonological deficit
- Effective in increasing reading accuracy
- Less effective in increasing reading fluency or comprehension (Torgesen *et al.*, 2001; Wolf & Katzir-Cohen, 2001)
- Compensated dyslexic adults: no accuracy problems but still fluency problems (Breznitz & Berman, 2003)

Intervention studies Hebrew adults

- Acceleration phenomenon: Fast-paced reading (10%-20%) increased decoding accuracy and comprehension (Breznitz, 1997a)

Research questions

- Can reading fluency be enhanced in a shallow language for young dyslexic readers?
- Does increased reading fluency positively influence reading comprehension (the Acceleration phenomenon)?

Design

- Pretest/Posttest:
 - Self-paced test
 - Fast-paced test
 - Three-Minute-Test
 - Oral Reading Time
- Training: Accelerated training (Dysl + Regular)
Unaccelerated training (Dysl + Regular)

No overlearning or repeated reading: sentences change.

Participants

- Dutch children: $n = 59$, Grade 4
(Age 10;2, $SD=0;5$)
- Dyslexic readers:
 - 15 Accelerated
 - 9 Unaccelerated
- Regular readers:
 - 22 Accelerated
 - 13 Unaccelerated

Scores on Three-Minute-Test (Matched on Non-verbal IQ and Passive vocabulary)

Test	Dyslexic Readers				Regular Readers				p-value ¹
	Accelerated N = 15		Unaccelerated N = 9		Accelerated N = 22		Unaccelerated N = 13		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
TMT	49	14.20	54	12.45	89	7.51	87	9.32	.00

Reading acceleration training (1)

- Children in accelerated group read a sentence in accelerated mode and answer a MC question.

For example: [He closes the door behind him]

Hij trekt de deur achter zich dicht.

ij trekt de deur achter zich dicht.

trekt de deur achter zich dicht.

Reading acceleration training (2)

Hij trekt de deur achter zich dicht. [He closes the door behind him.]



Wat trekt hij achter zich dicht? [What did he close behind him?]

- 1. het hek [the fence]
- 2. het raam [the window]
- 3. de poort [the gate]
- 4. de deur [the door]
- 5. ben niet klaar met lezen [didn't finish reading]

Reading acceleration training (3)

- First 5 examples and then 12 sentences at routine Own-pace
- Fastest speed on these 12 sentences (with correct answer) is initial speed training
- 4 or 5 correct answers in a row: linear increase in speed (2 ms, see Breznitz, 1997)
- In case of errors: speed decreased.

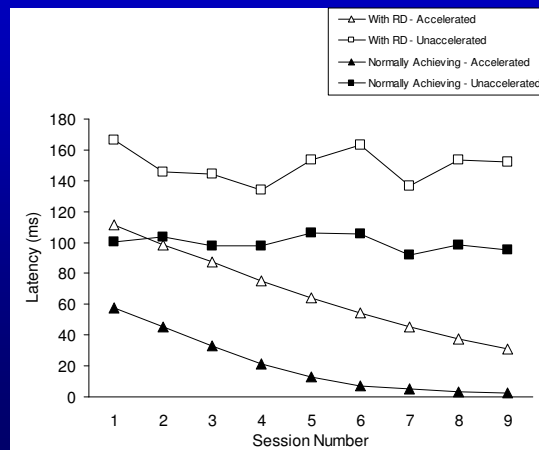
Reading acceleration training (4)

- Each session first 5 examples and then start out with the speed reached in the previous training session
- 9 training sessions of approximately 20 minutes (32 items and 288 in total).

Pretests and posttests

- Self-paced test: 5 example sentences, then 12 sentences at self-paced routine reading speed: record speed and comprehension.
- Fast-paced test: Fastest speed on these 12 sentences (with correct answer) is speed fast-paced test; 5 example sentences then 24 sentences at fast-paced reading speed: record speed and comprehension.

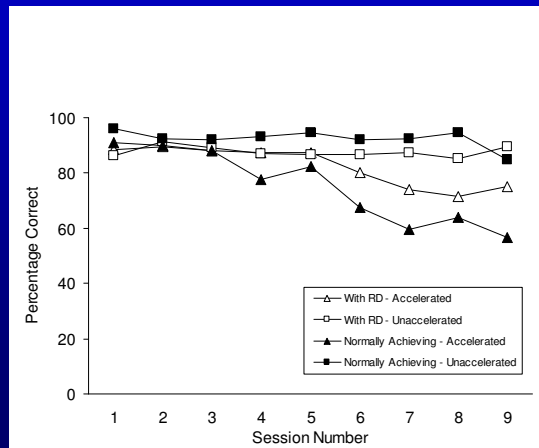
Fluency Development during Training (ms per letter)



Results Fluency development (Session 1 vs. 5)

- Reading new sentences: Only accelerated training improved reading fluency, $F(1, 55) = 49.92, p < .001, \eta^2 = .48$.
- Accelerated Dyslexics become faster than Unaccelerated Regular readers.

Comprehension Development during Training



Results Comprehension development

- Similar comprehension between Accelerated and Unaccelerated training
- From session 6, when speed becomes too high, comprehension declines.
- Session 3-5: Dyslexics have high comprehension yet faster than unaccelerated average readers

Results Pre-Posttest Speed- Selfpaced

- Match on single word reading
- Sentences: Unaccelerated children were faster, $F(1, 55) = 20.11, p < .001, \eta^2 = .27$
- All children improved reading rate, $F(1, 55) = 69.71, p < .001, \eta^2 = .56$
- Accelerated and Unaccelerated training equally effective

Results Pre-Posttest Speed- Fastpaced

- Match on single word reading
- Sentences: Unaccelerated children were faster, $F(1, 55) = 4.41, p < .05, \eta^2 = .07$
- All children improved reading rate, $F(1, 55) = 46.76, p < .001, \eta^2 = .46$
- Accelerated and Unaccelerated training equally effective

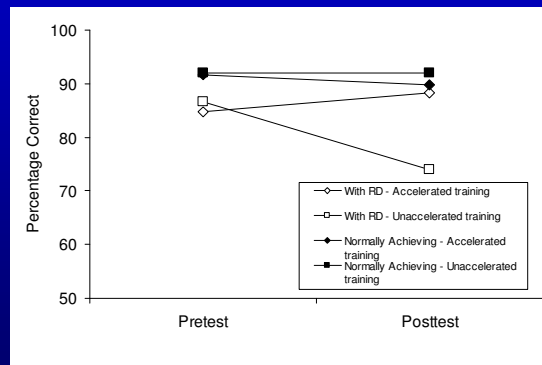
Results Pre-Posttest Comprehension- Selfpaced

- Dyslexics lower comprehension than normally achieving, $F(1, 55) = 5.60, p < .05, \eta^2 = .09$
- Slight decrease after training, yet still around 90%

Results Pre-Posttest Comprehension- Fastpaced

- Dyslexics lower comprehension than normally achieving, $F(1, 55) = 13.37, p < .01, \eta^2 = .20$
- 3-way interaction Time x Reading Group x Training Condition, $F(1, 55) = 6.15, p < .05, \eta^2 = .10$

Results Pre-Posttest Comprehension-Fastpaced



Results Pre-Posttest Comprehension- Fastpaced

- NA children stayed constant
- Accelerated dyslexics improved a little
- Unaccelerated Dyslexics: drop in comprehension at fast paced reading

Results Pre-Posttest Comprehension- Self vs Fastpaced

- Comprehension was higher on self-paced test than on fast-paced test
- No replication of acceleration phenomenon

Results Pre-Posttest Three Minutes Test and Fluency of Oral Sentence Reading

- All children improved on the TMT, regardless of type of training.
- All participants improved on Fluency of Oral Sentence reading,

Conclusions

- Can reading rate be enhanced for young dyslexics in a transparent language?

Yes, during training accelerated training helped dyslexics to become faster readers. Moreover, generalised training effects. Previous studies word-specific effects (Berends & Reitsma, 2006).

Faster than regular readers and Comprehension stayed high

Conclusions

- Do the effects of accelerated training transfer to Self-paced reading?

Sofar, effects on Self-paced routine reading were not larger than those found for unaccelerated dyslexics. Duration training?

Effects on TMT and Fluency of sentence reading were not larger either. Oral reading vs. silent reading?

Conclusions

- Do the effects of accelerated training transfer to Fast-paced reading?

Accelerated training enabled dyslexics to maintain high comprehension levels while reading at high speeds.