

Reading Fluency: How does it develop and how can we improve it in children with reading disabilities?

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The topics of this presentation...

1. Explain how fluent reading in third grade is dependent on early development of phonemic awareness and phonics skills in K, 1, and 2
2. Share results from powerful remedial interventions with older children who did not develop accurate reading skills early in elementary school
3. Discuss implications for educational policy and practice

The Broad Context.....

“One of the great mysteries to challenge researchers is how people learn to read and comprehend text rapidly and with ease. A large part of the explanation lies in how they learn to read individual words. Skilled readers are able to look at thousands of words and immediately recognize their meanings without any effort.”

Ehri, L. C. (2002). Phases of acquisition in learning to read words and implications for teaching. In R. Stainthorp and P. Tomlinson (Eds.) *Learning and teaching reading*. London: British Journal of Educational Psychology Monograph Series II.

“It is important to distinguish between reading processes that develop in learners and instructional methods that teachers use to teach these processes...my view is that by focusing on learners and the processes they acquire, we will be in a better position to decide how to teach these processes effectively and to discern whether our students are making the progress we expect.”

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Children must acquire skills and knowledge in at least these five important areas to become proficient readers by late elementary school

Phonemic Awareness

Phonics

Fluency

Vocabulary

Comprehension strategies

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graph LR; PA[Phonemic Awareness] --> A[Identifying words accurately and fluently]; P[Phonics] --> A; F[Fluency] --> A; V[Vocabulary] --> B[Constructing meaning once words are identified]; CS[Comprehension strategies] --> B;
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Identifying words accurately and fluently

Constructing meaning once words are identified

How does phonemic awareness contribute to the acquisition of reading fluency?

Phonemic awareness has its initial impact on the growth of reading skill by helping children improve the accuracy of their “first guesses” at the identity of unknown words in text.

It makes it possible to generate possibilities for words in context that are only partially “sounded out.”

In order to begin to use the alphabetic principle in reading, children must have knowledge and skill in three areas:

1. Letter-sound knowledge
2. Basic phonological awareness
3. ability to use context to help identify words once they are partially decoded phonetically.

The boy _____ the dog in the woods.

The boy ch ____ the dog in the woods

The first two ways phonemic awareness contributes to the development of reading fluency

In combination with phonics skills, and the use of context, it helps children make accurate guesses about the identify of words the first time they encounter them in print.

It allows children to become independent readers early on because they have a strong strategy for identifying words they haven't seen before in text.

A common definition of reading fluency:

“Fluency is the ability to read text quickly, accurately, and with proper expression”

National Reading Panel

The most common method of measuring reading fluency in the early elementary grades

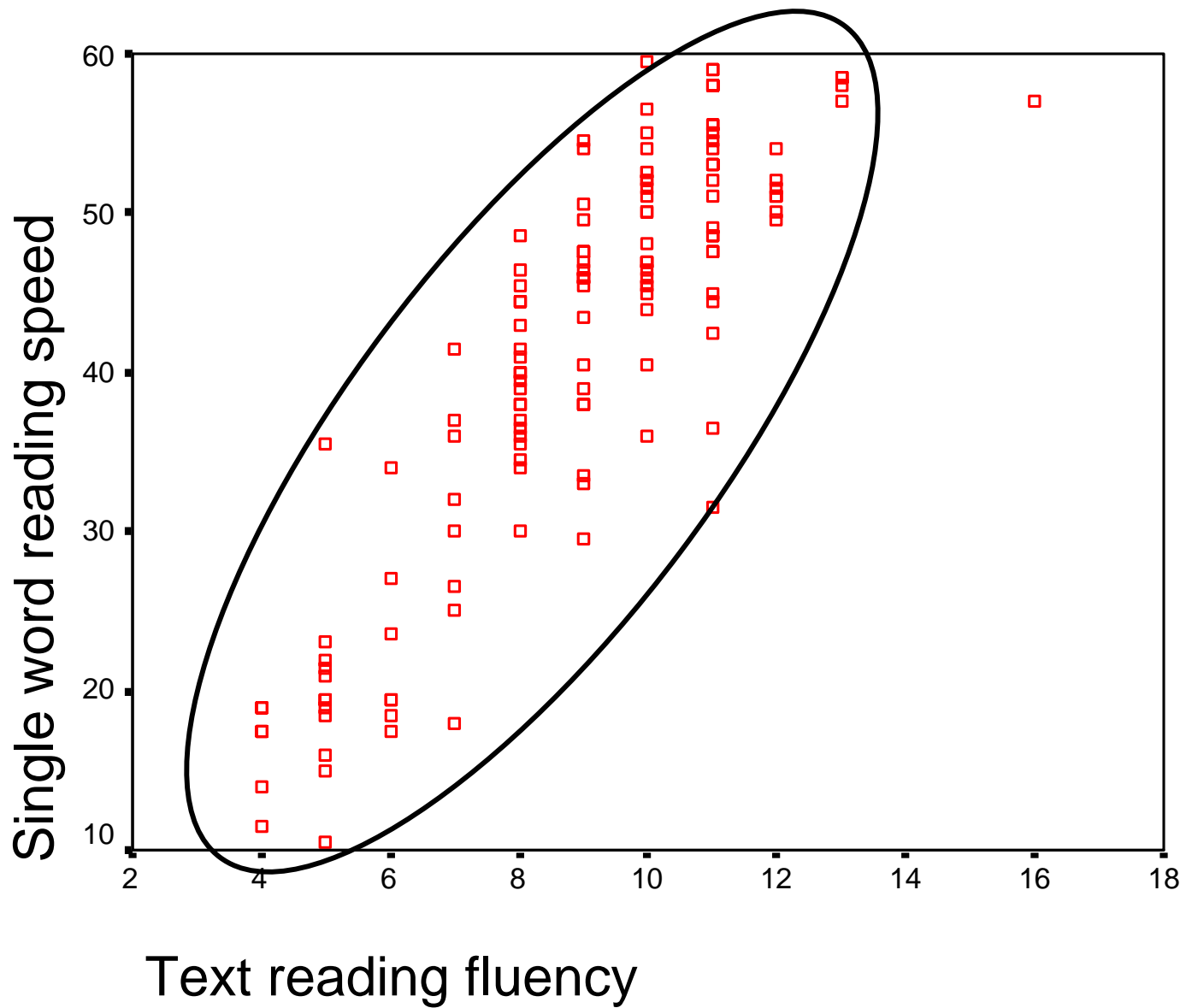
Measuring the number of accurate words per minute a child can read orally

Factors that might potentially influence oral reading rate

1. Proportion of words in text that are recognized as “sight words.”
2. Speed with which sight words are processed - affected by practice or individual differences in basic processing speed.
3. Speed of processes used to identify novel or unknown words -- phonetic decoding, analogy, context.
4. Speed with which word meanings are identified.
5. Speed at which overall meaning is constructed
6. Individual choices about the trade-off between speed and accuracy

A Model of Oral Reading Fluency: Factors that may limit oral reading rate:

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TOWRE

Sight Word

Efficiency

go	shop	chance	mountain
dog	meat	instead	project
in	best	farmer	factories
at	then	spring	straighten
am	spell	present	clarify
it	come	strong	frequent
so	start	huge	mediate
big	green	believe	threshold
be	want	office	modulate
do	better	question	prudent
box	learn	contact	exercise
one	black	history	protect
look	train	invent	desperate
if	even	invoice	quantity
not	went	complete	wonderful
car	thing	custom	initiate
hot	other	inquire	spurious
this	fruit	natural	particular
have	wrong	purchase	emergency
some	watch	vacant	selection
now	truck	everyone	verbatim
need	stars	swollen	awkward
give	winter	fireplace	wilderness
sat	begin	together	grandiose
good	forest	horizon	ornament
here	street	embassy	penitent

These are iNTirEStinG and cHallinGinG times for anyone whose pRoFEshuNle responsibilities are rEelaTed in any way to liTiRucY outcomes among school children. For, in spite of all our new NaWLEGe about reading and reading iNstRukshun, there is a wide-spread concern that public EdgUkAshuN is not as eFfEktlve as it shoold be in tEechHiNg all children to read.

The report of the National Research Council pointed out that these concerns about literacy derive not from declining levels of literacy in our schools but rather from recognition that the demands for high levels of literacy are rapidly accelerating in our society.

What is a “sight word”?

“Sight words are words that readers have read accurately on earlier occasions. They read the words by remembering how they read them previously. The term sight indicates that sight of the word activates that word in memory, including information about its spelling, pronunciation, typical role in sentences, and meaning” (Ehri, 1998)

“ Sight of the word activates its pronunciation and meaning in memory immediately without any sounding out or blending required. Sight words are read as whole units with no pauses between sounds” (Ehri, 2002))

“Sight words include any word that readers have practised reading sufficiently often to be read from memory” (Ehri, 2002))

According to the model of fluent reading we are considering, a significant part of understanding how children become fluent readers by 3rd or 4th grade involves understanding how they learn to recognize many thousands of words at a single glance.

something decide money then said

The most complete current theory of how children form sight word representations has been developed by Linnea Ehri (Ehri, 1998, 2002)

The theory begins with the statement that “the process at the heart of sight word learning is a connection-forming process. Connections are formed that link individual written words to their pronunciations and meanings in memory

The distinctive contribution of the theory is that it describes what kinds of connections are most likely used to remember sight words.

What are some potential connections that might serve?

Associations between the visual features of words and their meanings.

Shape -- on ate tent

But what about -- stick, sting, sling, string, sink, stink, stick

Sight word reading must involve remembering the letters in the words; these are the distinctive features that make one word different from another.

What are some potential connections that might serve?

However, if these letter sequences were linked arbitrarily to meaning, it would be a very difficult memorization task.

recognize something excitement

“A mnemonically powerful system is needed to explain learning as rapid as occurs for sight words.”

Further, if letters were connected arbitrarily to meaning, we would expect many more synonymous substitutions in reading.

Reading student for pupil

Instead--puppet for pupil

mad for angry

angel for angry

recover for found

fund for found

Instead of arbitrary connections between visual features and meaning, Ehri's theory proposes:

“..that pronunciations of words are the anchors for written words in memory. Readers learn sight words by forming connections between letters seen in spellings of words and sounds detected in their pronunciations already present in memory.”

“When readers learn sight words, they look at the spelling, pronounce the word, and analyse how the graphemes match up to phonemes in that word. Reading the word a few times secures its connections in memory.”

For a reader with well developed phonemic awareness, the phonological structure of a word, which is already known, serves as a mnemonic for remembering the letters in its spelling.

S T O P



B I R D



G I G G L E



B R I G H T



S W* O R D



I S* L A N D



“...readers learn to process written words as phonemic maps that lay out elements of the pronunciation visually. Beginners become skilled at computing these mapping relations spontaneously when they read new words. This is the critical event for sight word learning. Grapho-phonemic connections provide a powerful mnemonic system that bonds written words to their pronunciations in memory along with meanings. Once the alphabetic mapping system is known, readers can build a vocabulary of sight words easily. “

Relating the growth of phonemic decoding skills to the quality of orthographic representations required for recognizing words at a single glance

Phases in development of word reading influence the quality of sight word representations

Pre-alphabetic phase -- children do not use letter-sound connections to read words. They remember selected visual features.

Look dog spiderman

Partial alphabetic phase -- children form connections between some of the letters and sounds in words

Jail -- JL

house -- HS

clap CP

Two kinds of weaknesses in word reading

1. Inability to completely segment sounds in words
2. Incomplete knowledge of sound-letter relations-- particularly vowels

Alphabetic phase -- children form connections between all of the letters and sounds in words. Representations are more complete, and reading is more accurate

As children's increasingly developed phonemic skills lead to more detailed analysis of the internal structure of words in print, they begin to acquire increasingly explicit and more fully specified orthographic representations. *However, if their phonetic skills do not develop, their orthographic representations are likely to remain incompletely specified, and they will be inaccurate readers and poor spellers.*

Which is the real word?

smoak

smoke

circus

cercus

wagon

wagun

first

ferst

traid

trade

Putting it all together:the development of reading fluency

To be a fluent reader, a child must be able to recognize most of the words in a passage “by sight”

Children must correctly pronounce words 5-10 times before they become “sight words”

Children must make accurate first guesses when they encounter new words, or the growth of their “sight word vocabulary” will be delayed—they will not become fluent readers

Facts about reading from scientific research:

The most efficient way to make an “accurate first guess” of the identity of a new word is:

First, do phonemic analysis and try an approximate pronunciation

Then, close in on the exact right word by selecting a word with the right sounds in it, that also makes sense in the passage

Words likely
to be
encountered
for the first
time in first
grade

animal

faster

happy

never

time

sleep

rabbit

Words likely
to be
encountered
for the first
time in
second grade

amaze

beach

comfortable

example

interesting

grease

stiff

sweep

3rd Grade FCAT passage

_____ the middle _____, it was the
_____ for a _____ to wear his full
set of _____ whenever he
_____ in _____ - even in times
of _____! When a _____ believed
he was _____ friends, he would
_____ his _____. This _____
of _____ showed that the
_____ felt _____ and safe.

3rd Grade FCAT passage

During the middle ages, it was the custom for a knight to wear his full set of armor whenever he appeared in public - even in times of peace!

When a knight believed he was among friends, he would remove his helmet.

This symbol of friendship showed that the knight felt welcome and safe.

Summary of the connection between reading fluency and phonemic awareness

1. Phonemic awareness contributes to the development of sight words in three ways:
 - A. It helps children to make more accurate “first guesses” when they encounter a word for the first time.
 - B. It allows children to become independent readers early in development.
 - C. It helps them use the phonemic structure of words as a mnemonic for remembering the letters in a word’s spelling. Thus, it is directly helpful in forming fully developed sight word representations in memory.
2. A major factor that determines reading fluency is the proportion of words in a passage that can be recognized as sight words.

Implications for instruction

1. Phonemic awareness should be stimulated early in development as one key to accurate reading of words when they are first encountered in print
2. The growth of phonemic awareness should be monitored to insure that it attains the full phonemic level
3. Letter representations of all 44 phonemes should be taught
4. Young children should be encouraged and supported to do lots of reading-- there should be lots of opportunities for guided oral reading (reading with feedback).
5. Text that is specifically written to provide extra practice opportunities for high-utility “core vocabulary” words may be particularly efficient for building fluency through early acquisition of high frequency words in sight vocabularies

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Book **1**

Elfrieda H. Hiebert, Ph.D.

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Why is repeated reading effective for improving fluency?

It provides repeated opportunities to read new words in relatively close temporal proximity...

This facilitates the creation of memory representations for previously unknown words

Just to be sure I'm not misunderstood....

We've been focusing on the development of fluent word level reading skills, but that's not the most important goal of reading instruction

It's an important intermediate goal, but the real goal is to help children acquire all the skills they need to fluently construct the meaning of what they read. And, we also want them to value and enjoy reading.

What skills,
knowledge, and
attitudes are
required for good
reading
comprehension?



What we know about the factors that affect reading comprehension

Proficient comprehension of text is influenced by:

Accurate and fluent word reading skills

Oral language skills (vocabulary, linguistic comprehension)

Extent of conceptual and factual knowledge

Knowledge and skill in use of cognitive strategies to improve comprehension or repair it when it breaks down.

Reasoning and inferential skills

Motivation to understand and interest in task and materials

Word reading fluency and accuracy

X

Knowledge and Strategies for Linguistic
comprehension

X

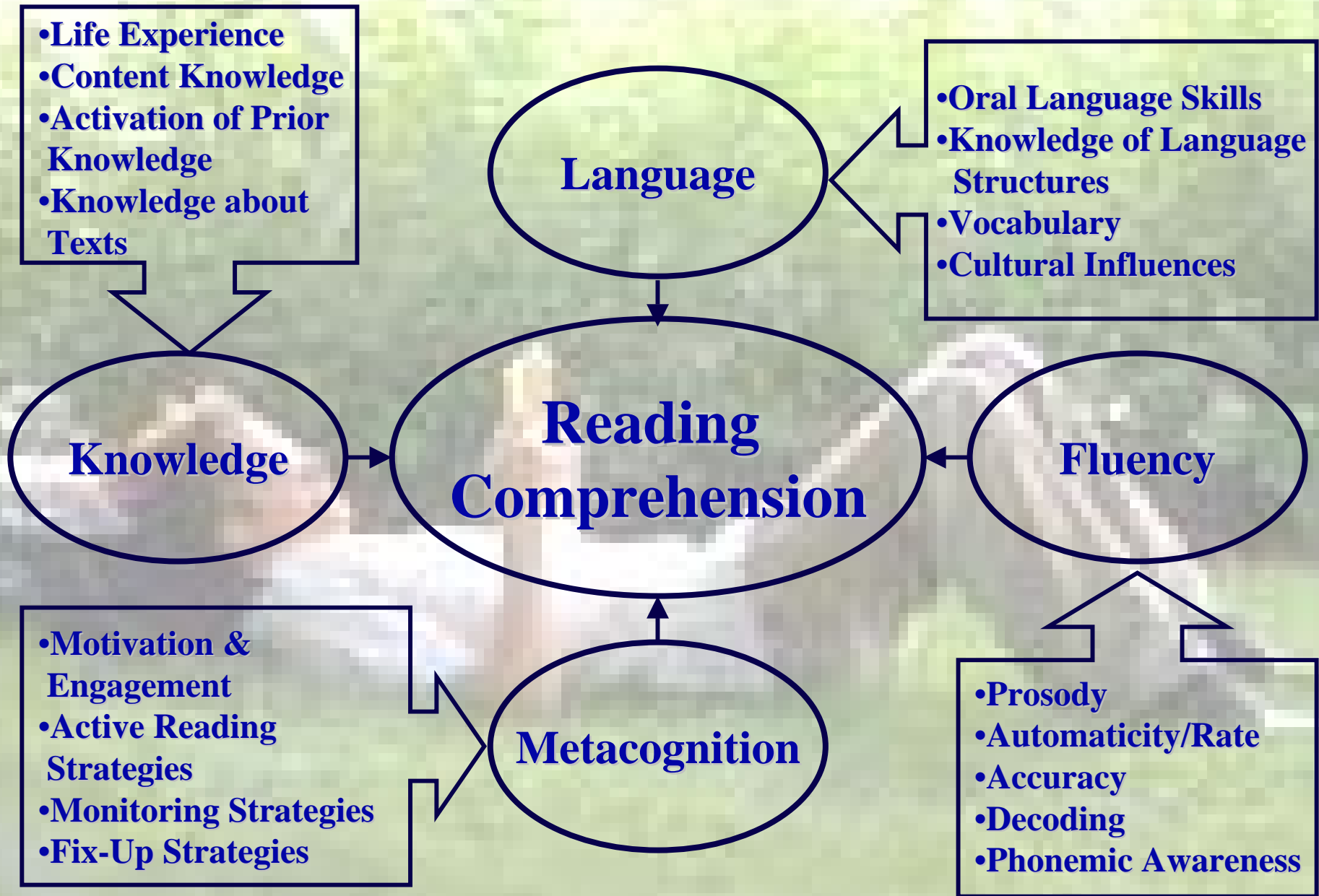
Motivation and interest

=

Reading Comprehension

“In fact, the automaticity with which skillful readers recognize words is the key to the whole system...The reader’s attention can be focused on the meaning and message of a text only to the extent that it’s free from fussing with the words and letters.”

Marilyn Adams



The development of proficient reading skill: the ideal developmental path

K 1 2 3 4 5 6 7 8 9 10 11 12



Alphabetic
Principle
and other
word
reading
strategies



Acquisition of
Fluency



Development of Vocabulary, Knowledge and Thinking Skills

Development of attitudes—-----motivation, interest, curiosity

Now, for a small shift in focus....

How does this information about the development of reading fluency help us to understand the difficulties in “closing the gap” in reading fluency for children who have struggled in learning to read for several years?.

Examine outcomes from 5 clinical or experimental studies of remedial interventions with children from 10-12 years of age experiencing reading difficulties

Three samples of severely disabled children with beginning word level skills around the 2nd percentile

One sample of moderately disabled children with beginning word level skills around the 10th percentile

One sample of mildly impaired children with beginning word level skills around the 30th percentile.

Instructional Effectiveness Measured by Outcomes in Four Areas

Phonemic Decoding Accuracy -- skill at using sound-letter relationships to decode novel words

Text reading accuracy -- Accuracy with which individual words are identified in text

Text reading fluency -- speed of oral reading of connected text

Reading Comprehension -- accuracy with which meaning is constructed during reading

Outcomes measured in standard scores. An improvement in standard score means that a child is improving his/her reading skills compared to average readers. On all the measures used here, 100 is average.

A study of intensive, highly skilled intervention with 60 children who had severe reading disabilities

Children were between 8 and 10 years of age

Had been receiving special education services for an average of 16 months

Nominated as worst readers: at least 1.5 S.D's below grade level

Average Word Attack=69, Word Identification=69, Verbal IQ=93

Randomly assigned to two instructional conditions that both taught “phonics” explicitly, but used different procedures with different emphasis

Children in both conditions received 67.5 hours of one-on-one instruction, 2 hours a day for 8 weeks

Children were followed for two years after the intervention was completed

Time x Activity Analyses for an approach with very strong emphasis on phonemic awareness and phonemic decoding(LIPS)

Phonemic Awareness and
Phonemic Decoding

85%

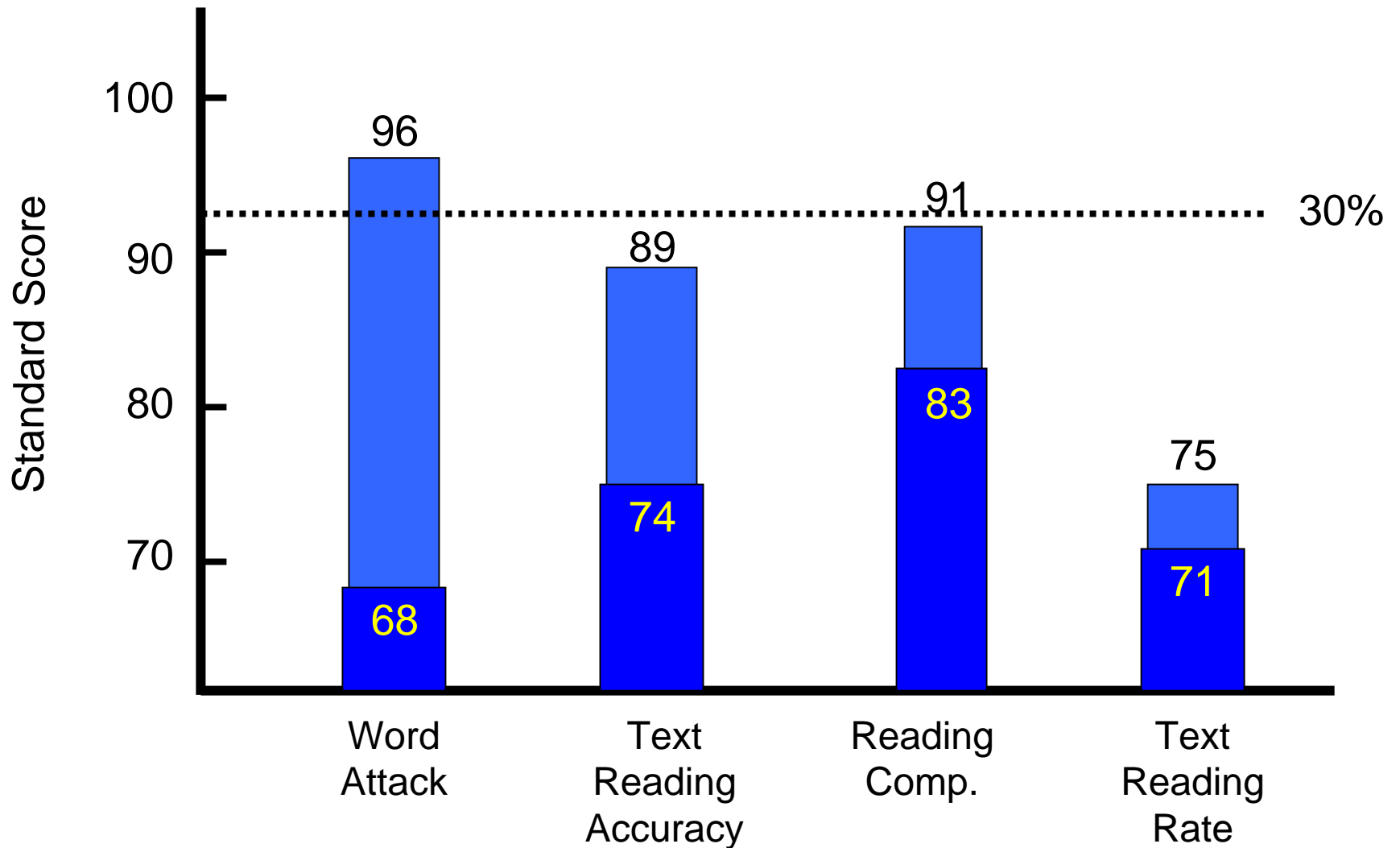
Sight Word Instruction

10%

Reading or writing
connected text

5%

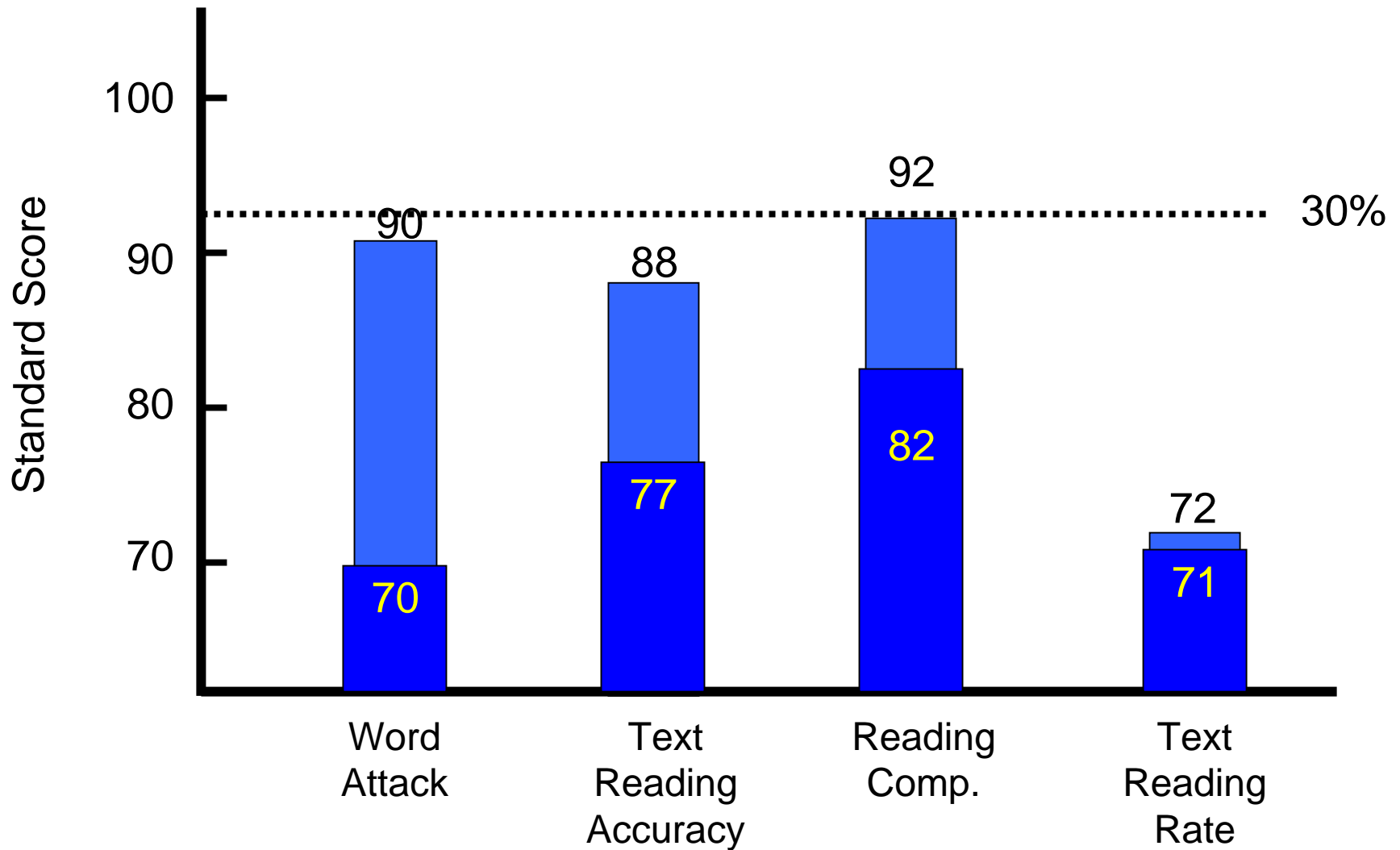
Outcomes from 67.5 Hours of Intensive LIPS Intervention



Time x Activity Analyses for an approach that emphasized guided reading of text with online correction and feedback (EP)

	<u>LIPS</u>	<u>EP</u>
Phonemic Awareness and Phonemic Decoding	85%	20%
Sight Word Instruction	10%	30%
Reading or writing connected text	5%	50%

Outcomes from 67.5 Hours of Intensive Intervention-EP



Oral Reading Fluency was much improved on passages for which level of difficulty remained constant

Absolute change in rate from pretest to posttest.

Most difficult
passage

Pretest -- 38 WPM, 10 errors

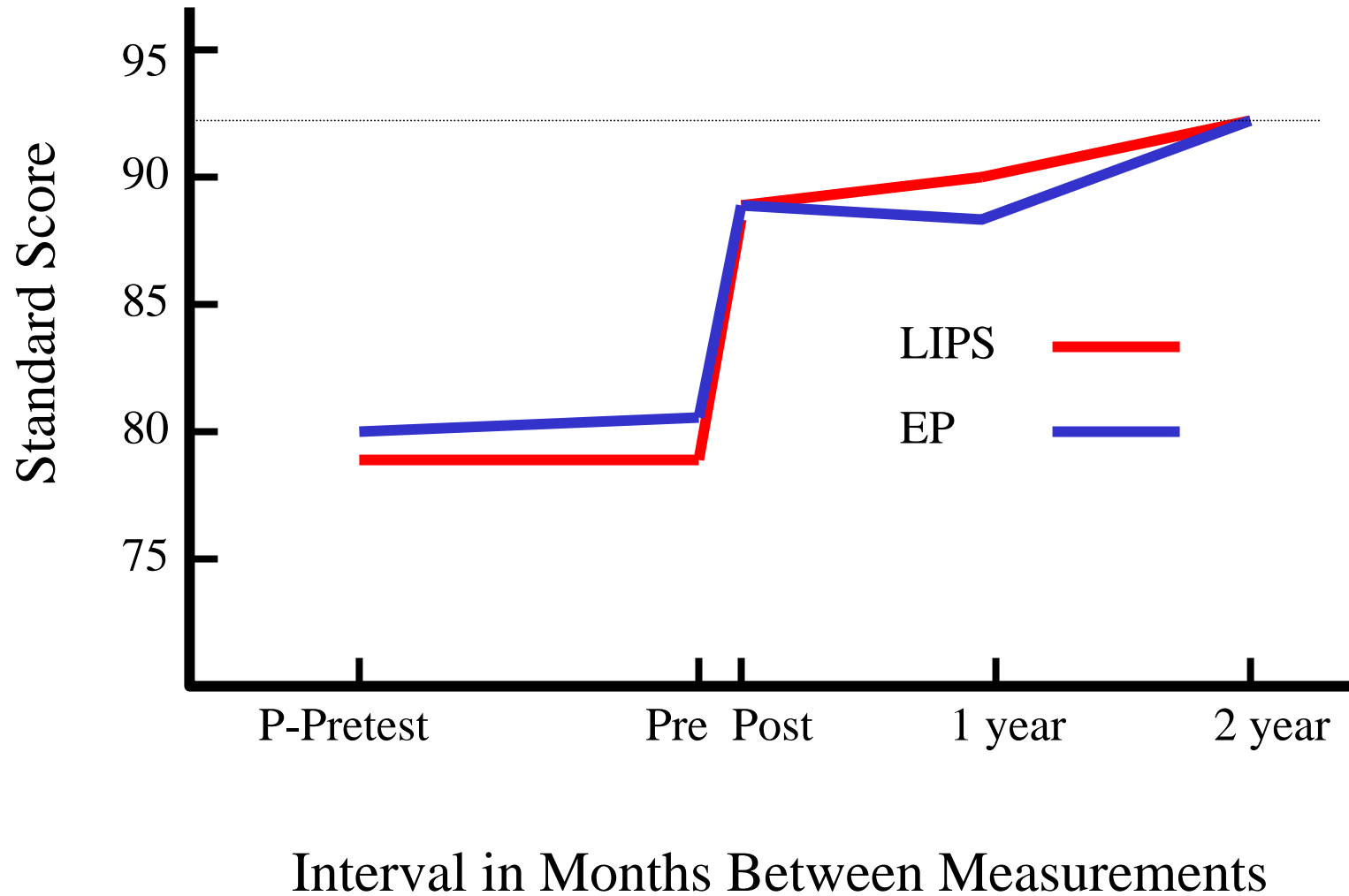
Posttest -- 101 WPM, 2 errors

Next most difficult
passage

Pretest -- 42 WPM, 6 errors

Posttest -- 104 WPM, 1 error

Growth in Total Reading Skill Before, During, and Following Intensive Intervention



Follow-up study of intensive intervention with 60 children who have severe reading disabilities - preliminary results

Children were between 8 and 10 years of age

All are currently receiving or were identified for special education services

Nominated as worst readers: at least 1.5 S.D's below grade level

Average Word Attack= 72, Word Identification= 72, Verbal IQ=87

Randomly assigned to two instructional conditions that both taught “phonics” explicitly, but contained different emphasis on fluency oriented practice

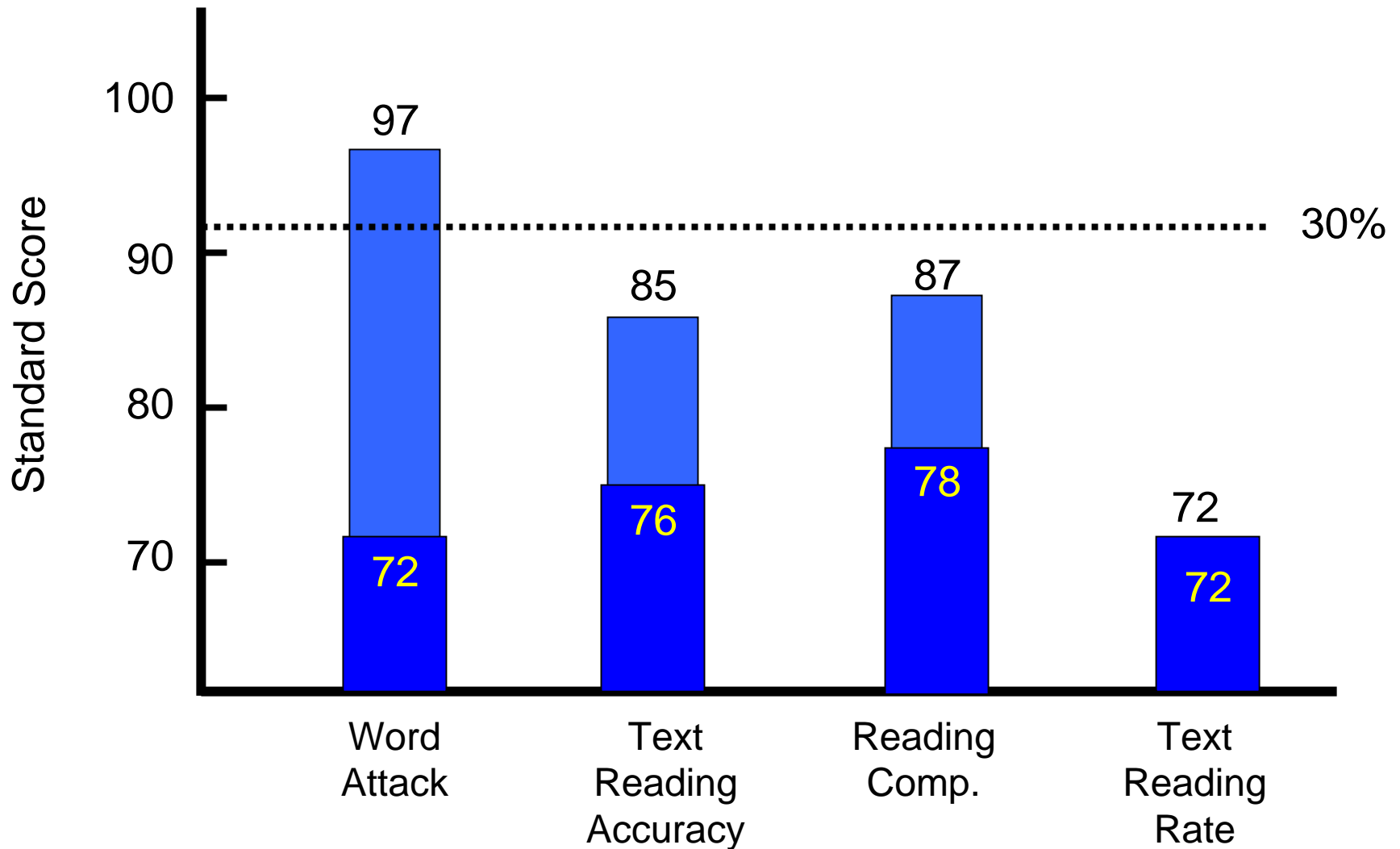
Children in both conditions received 83 hours of one-on-one and 50 hours of small group instruction, 2 hours a day for 16 week 133 hours total

Preliminary results for 45 children in both conditions combined

Major differences between Accuracy and Accuracy + Fluency Groups

	<u>Accuracy</u>	<u>Accuracy + Fluency</u>
<u>First 33 Hrs. 1:1</u>	LIPS	LIPS
<u>Next 50 Hrs. 1:1</u>	LIPS	70% LIPS, 30% Fluency
<u>Next 50 Hrs. Sm. Grp.</u>	Extended LIPS Comprehension V V Accuracy Oriented Text practice	Comprehension--V V Repeated reading practice with text and word drills

Outcomes from 133 Hours of Intensive LIPS + Fluency+ Comprehension Intervention



A School-based, treatment control study of 40 students

60% Free and reduced lunch

Mean Age 12 years (range 11-14)

45% White, 45% Black, 10% other

53% in special education

Received 94-108 hours (mean=100) hours of instruction

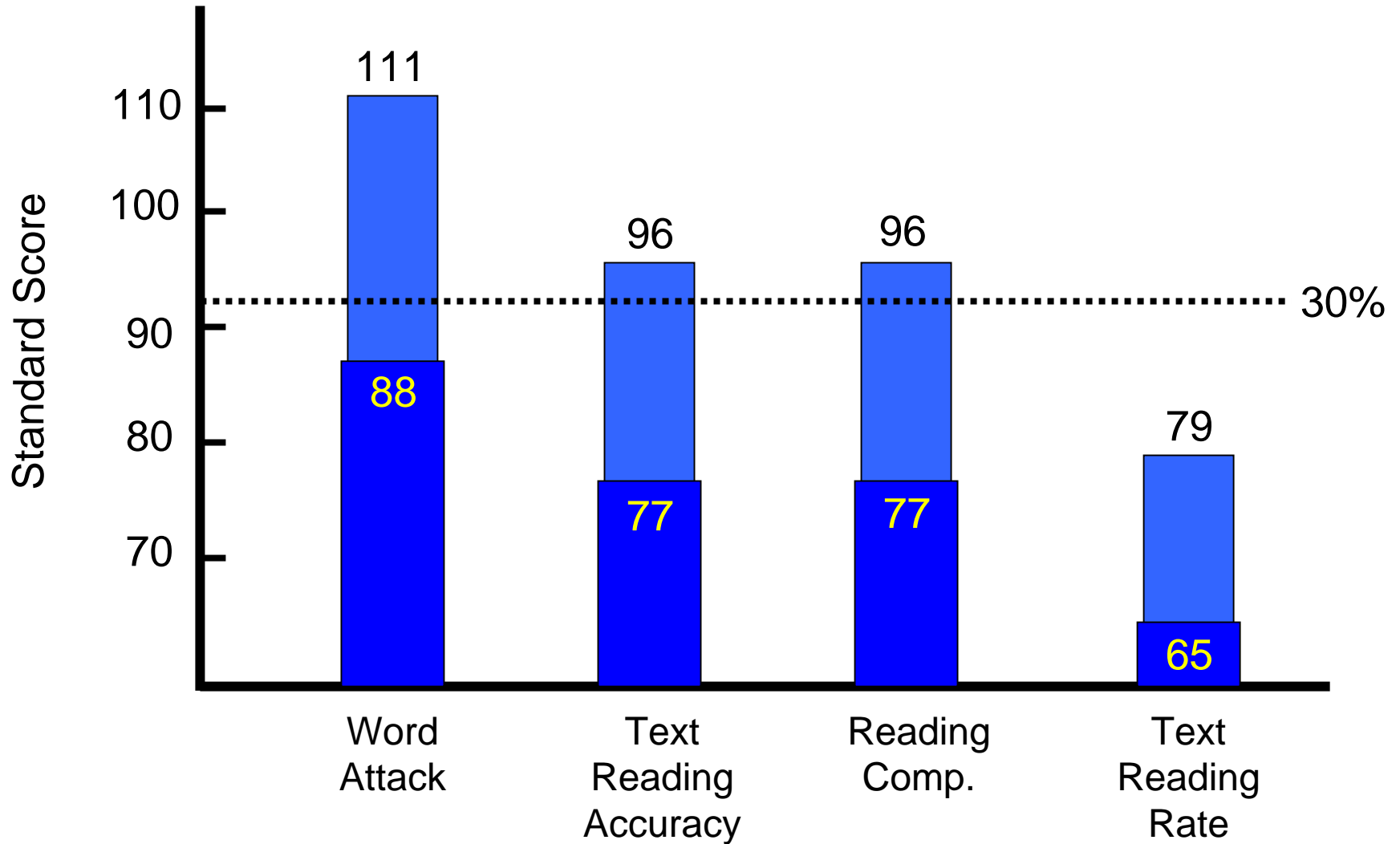
Intervention provided in groups of 4-5

Remedial Methods: Spell Read P.A.T., Soar to Success

Mean Word Identification Score = 83

Children begin with word level skills around 10th percentile

Outcomes from 100 Hours of Small Group Intervention--Spell Read



A Clinical Sample of 48 Students aged 8-16

Middle and upper-middle class students

Mean Age 11 years

79% White, 67% Male

Received 45-80 hours (mean=60) hours of instruction

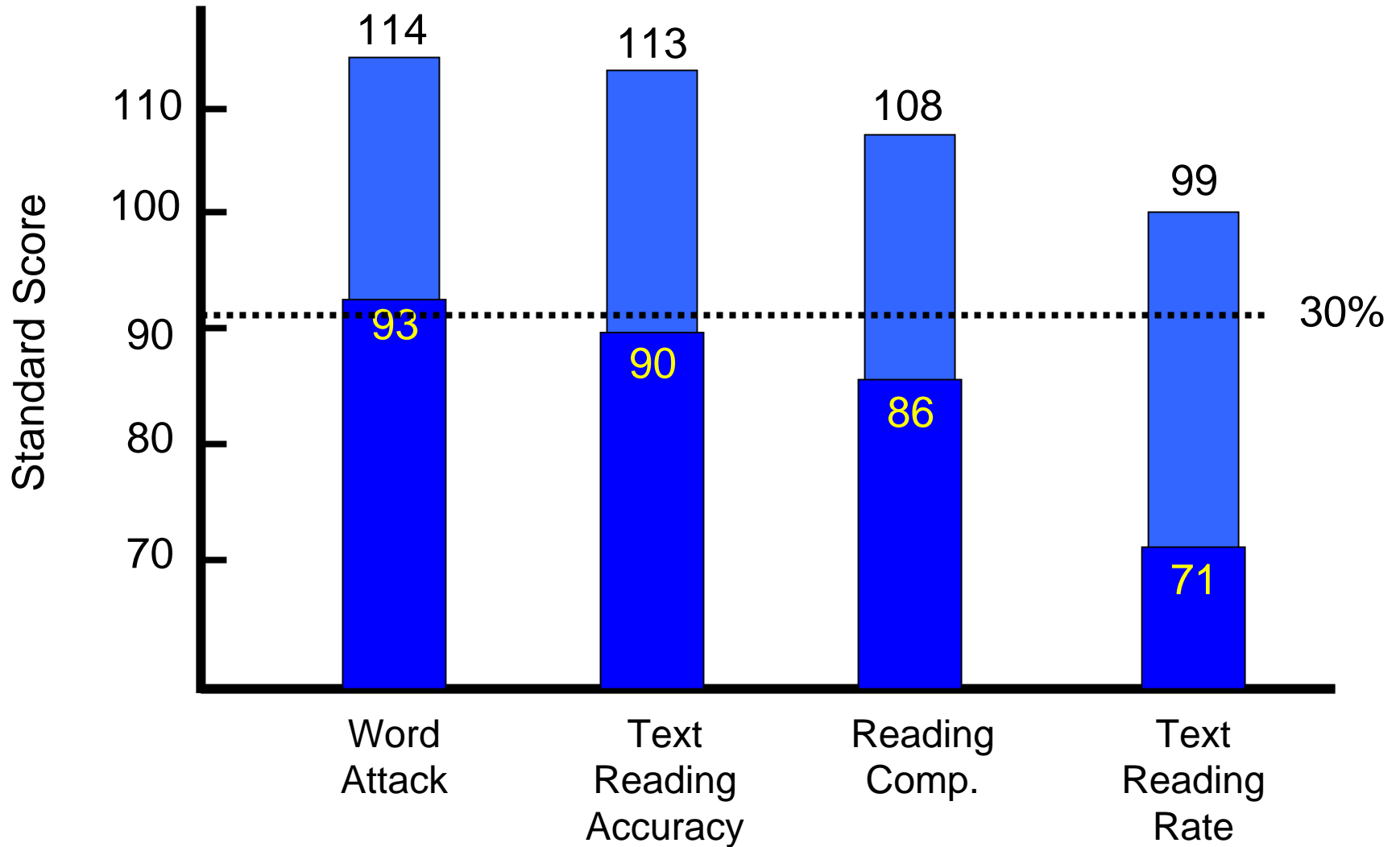
Intervention provided in groups of 2-4

Remedial Method: Spell Read P.A.T.

Mean beginning Word Identification Score = 92

Children with word level skills around the 30th percentile

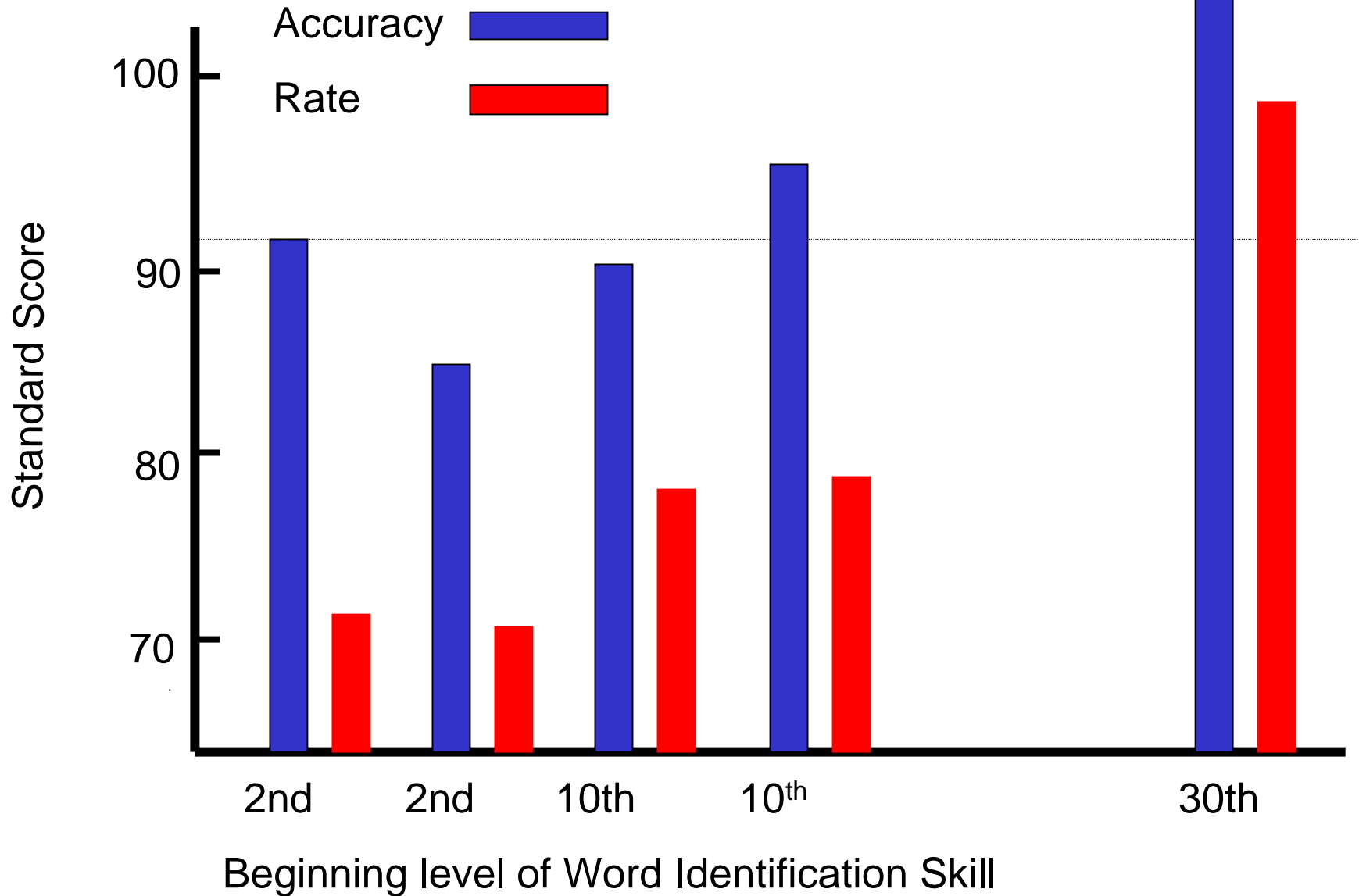
Outcomes from 60 Hours of Small Group Intervention with upper middle class students--Spell Read



Summary and Conclusions:

1. For many older children with word level reading skills around the 30th percentile, a relatively brief (60hrs) dose of appropriate small group instruction can bring their skills in phonemic decoding, text reading accuracy and fluency, and comprehension solidly into the average range.
2. For many older children with word level reading skills around the 10th percentile, a more substantial dose (100hrs) of appropriate small group instruction can bring their skills in phonemic decoding, text reading accuracy, and reading comprehension solidly into the average range. Although the gap in reading fluency can be closed somewhat, reading fluency is likely to remain substantially impaired.
3. For older children with word level reading skills around the 2nd percentile, intensive interventions can have a strong effect on phonemic decoding, text reading accuracy, and reading comprehension, but they are likely to leave the fluency gap essentially unaffected.

Disparity in outcomes for rate vs. accuracy in five remediation studies



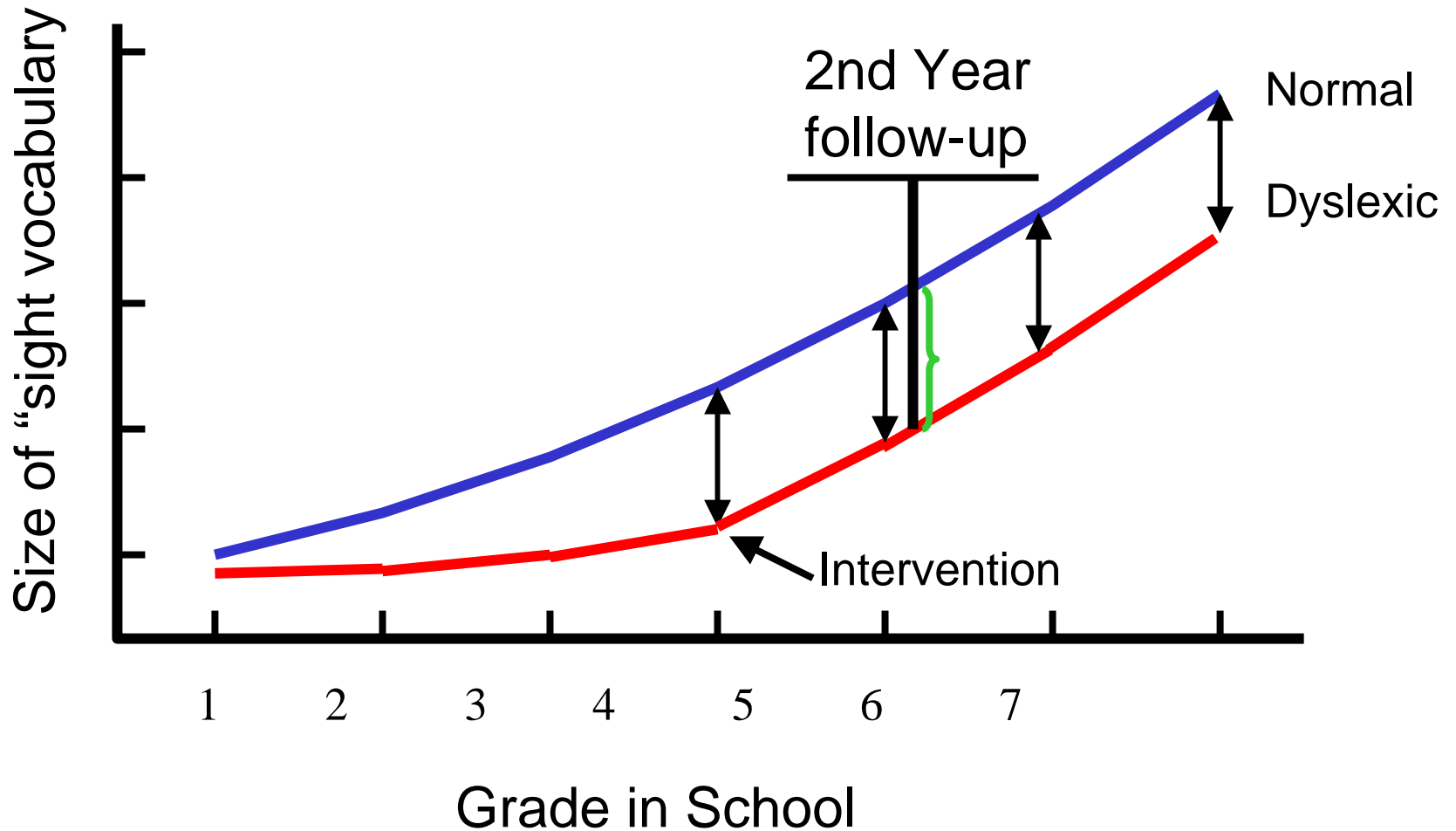
Our current hypothesis about the difficult fluency gap

Children who struggle initially in learning to read miss out on many hundreds of thousands of opportunities to learn to recognize individual words because they read inaccurately and they don't read very much.

By the time they reach 3-4 grade, their "sight word vocabulary" is severely restricted compared to good readers of their same age

After they become more accurate readers, there is still a huge gap in the number of words they can recognize by sight. They can't catch up with their peers because 4th and 5th grade good readers are continuing to add words to their sight vocabulary at a very fast rate.

Projected growth in “sight vocabulary” of normal readers and disabled children before and after remediation



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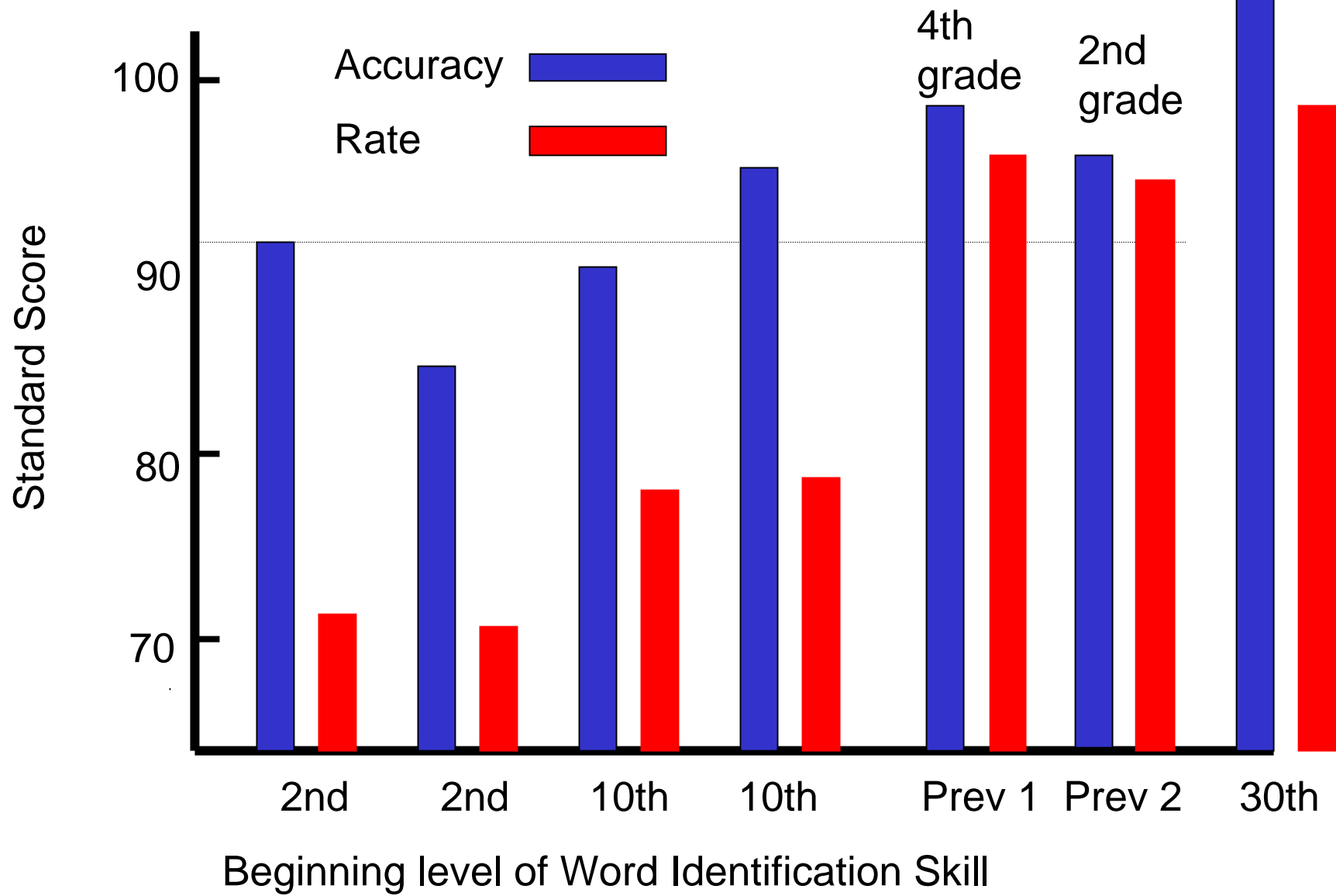
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Unless poor readers who have received strong remediation can add words to their "sight vocabulary" at a faster rate than their peers, the "fluency gap" will continue

What happens to accuracy and fluency of reading scores when children receive powerful preventive instruction?

Disparity in outcomes for rate vs. accuracy in remediation and prevention studies



Policy Implications arising from the combined outcomes of remedial and preventive studies

1. We must work preventively to eliminate the enormous reading practice deficits that result from prolonged reading failure, and that are a primary cause of difficulties in attaining fluent text reading skills.
2. We must find a way to provide interventions for older children with reading disabilities that are appropriately focused and sufficiently intensive. This type of intervention can produce dramatic improvements in older children's text reading accuracy and reading comprehension in a relatively short period of time.
3. We still need to develop appropriately engineered practice activities to help close the gap in reading fluency once accurate reading skills are established.

References

1. Ehri, L. (2002). Phases of acquisition in learning to read words and implications for teaching. In R. Stainthorp and P. Tomlinson (Eds.) *Learning and teaching reading*. London: British Journal of Educational Psychology Monograph Series II.
2. Share, D. L., & Stanovich, K. E. (1995). Cognitive processes in early reading development: A model of acquisition and individual differences. *Issues in Education: Contributions from Educational Psychology*, 1, 1-57.
3. Torgesen, J.K., Rashotte, C.A., Alexander, A. (2001). Principles of fluency instruction in reading: Relationships with established empirical outcomes. In M. Wolf (Ed.), *Dyslexia, Fluency, and the Brain*. Parkton, MD: York Press.

Thank You

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Science of Reading