Title	An examination of subtypes of developmental dyslexia and intervention effects
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An examination of subtypes of developmental dyslexia and intervention effects

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Developmental Dyslexia

- a specific learning disability
- biological in origin
- characterized by difficulties with accurate and/or fluent word recognition
- and by poor spelling and decoding abilities.

Word Recognition

Double-Deficit Hypothesis

No Deficits

Intact Phonological Decoding
Intact Naming
Average Reading

Phonological Deficit

Impaired Phonological Decoding
Intact Naming Speed
Impaired Comprehension

Naming Speed Deficit

Intact Phonological Decoding
Impaired Rate of Naming
Impaired Comprehension

Double-Deficit

Impaired Phonological Decoding
Impaired Rate of Naming
Severe Comprehension Deficit

(Wolf & Bowers, 1999)

Evidence for Independent Deficits

Naming Speed:

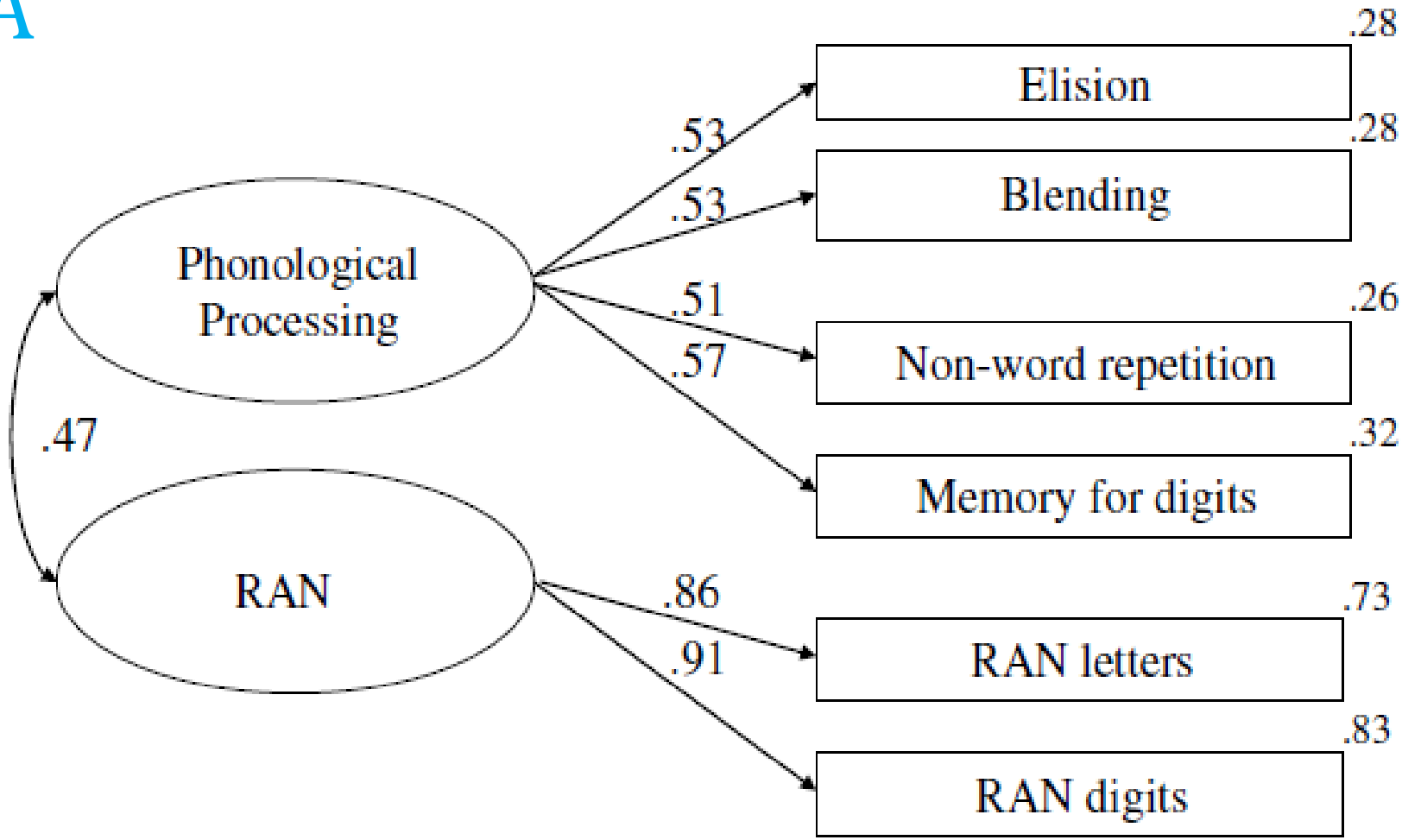
I differs between children with dyslexia versus average peers and garden variety poor readers (Wolf & Obregon, 1999)

II statistically independent contribution to reading fluency and comprehension (Bowers, 1995; Pennington et al., 2001; Schatschneider et al., 2004)

III better predictor of reading in transparent languages with shallow orthographies or non-alphabetic orthographies (e.g., Dutch-Yap & van der Leij, 1993; German -Wimmer, Mayringer, & Landerl, 2000; Chinese - Ho, Chan, Tsang, & Lee, 2002; Japanese - Kobayashi, et al., 2005)

IV involves activation of different brain structures than phonemic tasks (Misra, et al., 2004; Eckert et al., 2003; Deutsch et al., 2005)

CFA



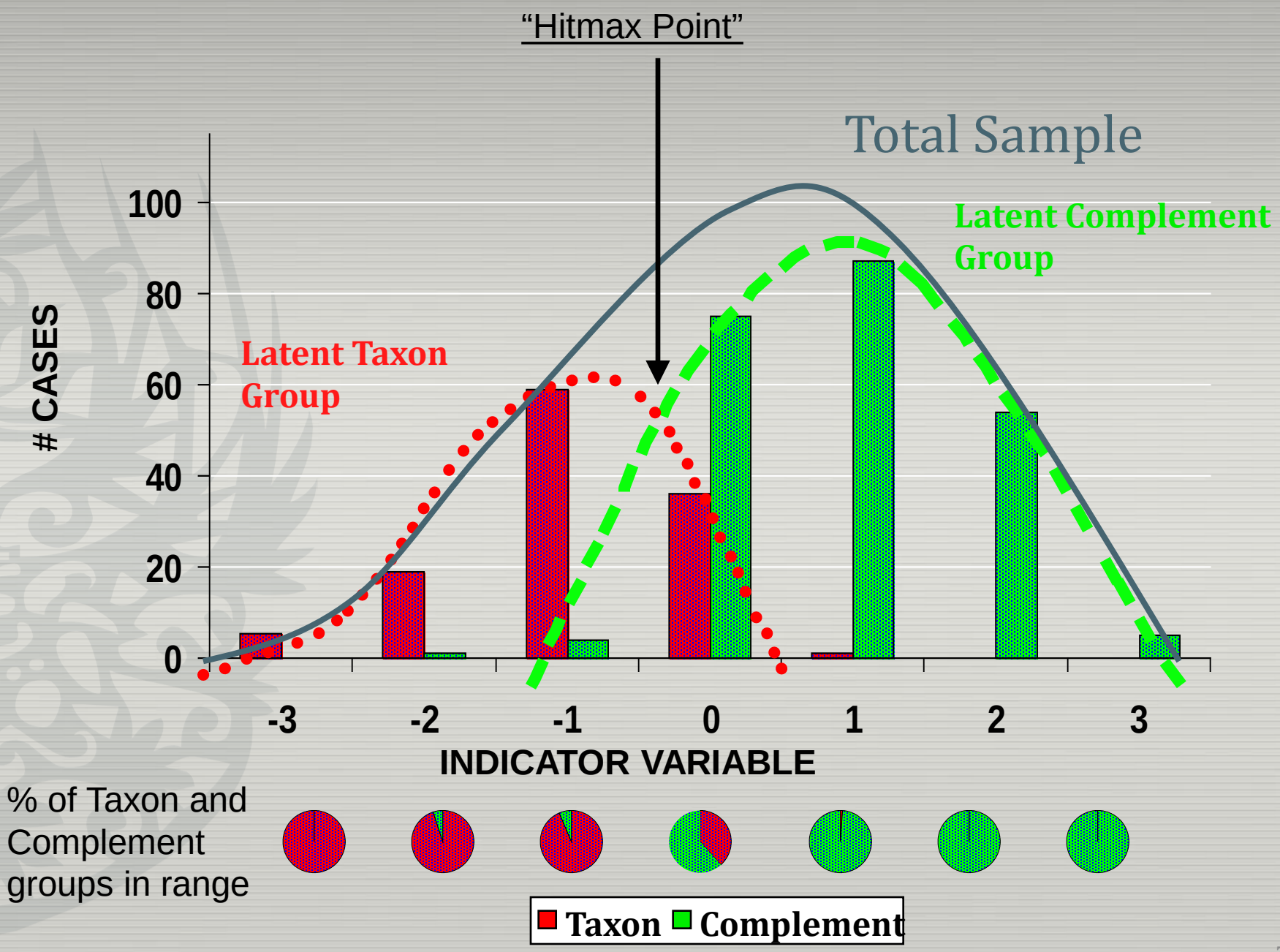
RMSEA value of .083, CFI > .95

Powell, Stainthorp, Stuart, Garwood & Quinlan (2007)

Do Double Deficit Hypothesis subtypes of dyslexia represent different classes of individuals?

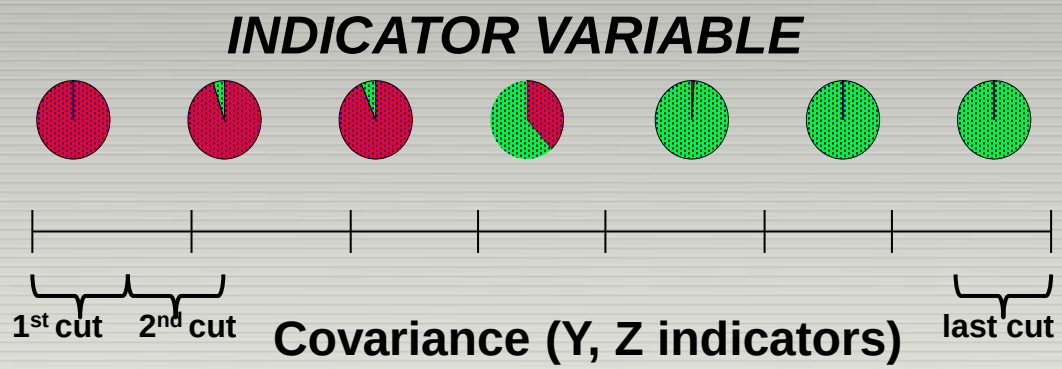
Are phonological-deficit and naming-speed-deficit subtypes different in kind or degree?

O'Brien, B.A., Wolf, M., & Lovett, M.W. (2012). A taxometric investigation of developmental dyslexia subtypes. *Dyslexia*, *18*, 16-39.

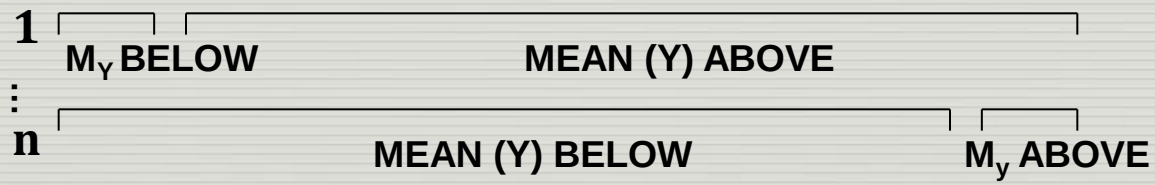

"Hitmax Point"
Total Sample
Latent Complement Group
Latent Taxon Group
CASES
100
80
60
40
20
0
-3
-2
-1
0
1
2
3
INDICATOR VARIABLE
% of Taxon and Complement groups in range
Taxon
Complement

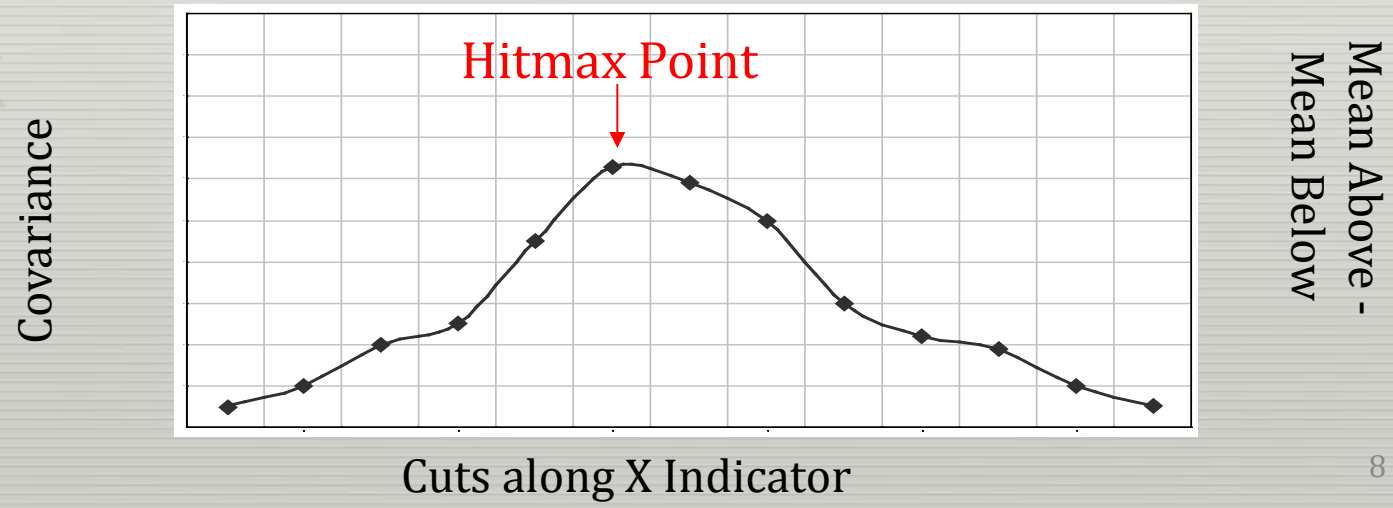
Taxometric Analysis Procedures

MAXCOV



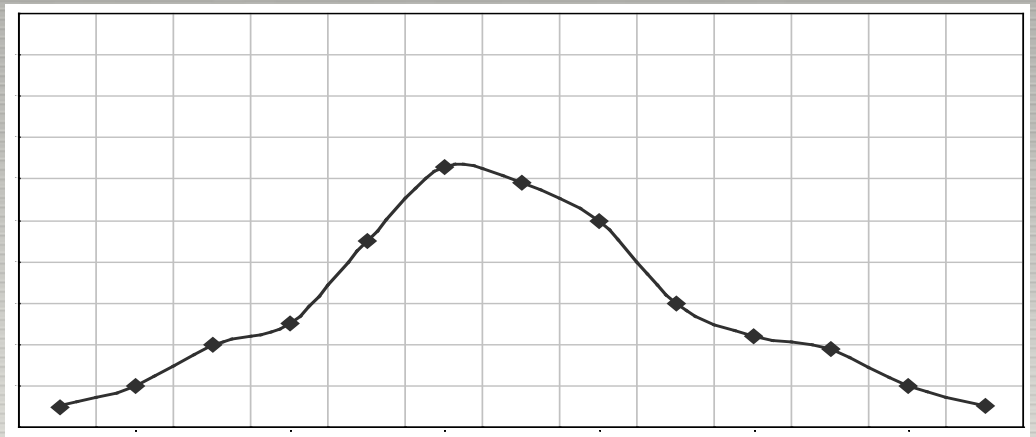
MAMBAC



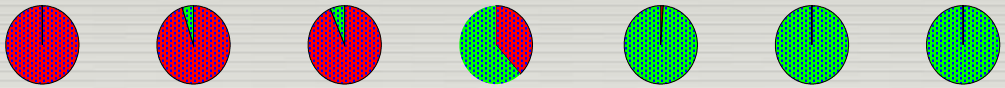


Taxonic

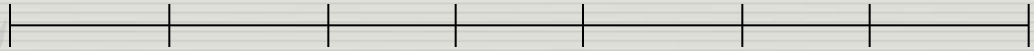
Covariance



Mean Above -
Mean Below

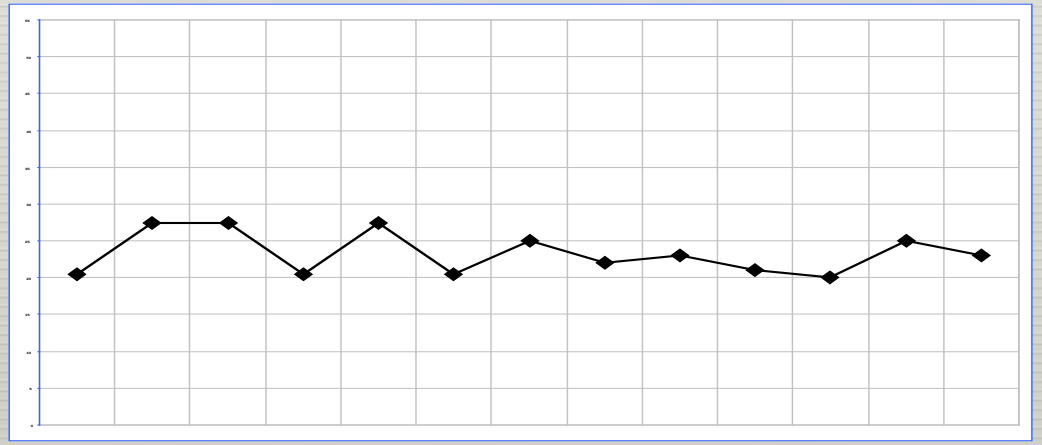


INDICATOR VARIABLE

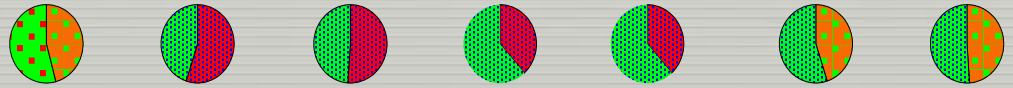


Nontaxonic

Covariance



Mean Above -
Mean Below



Sample Participants

671 Grade 1-3 Children

identified with reading disability:

Low Achievement Criterion
(below 15th percentile)

&/or

Discrepancy Criterion
(1SD difference from predicted)

English speaking (monolingual)
No primary sensory or neurological conditions

(Morris, Lovett & Wolf, NICHD #HD30970)

Hypotheses Tested:

I. Taxon with phonological deficits

Indicator variables:

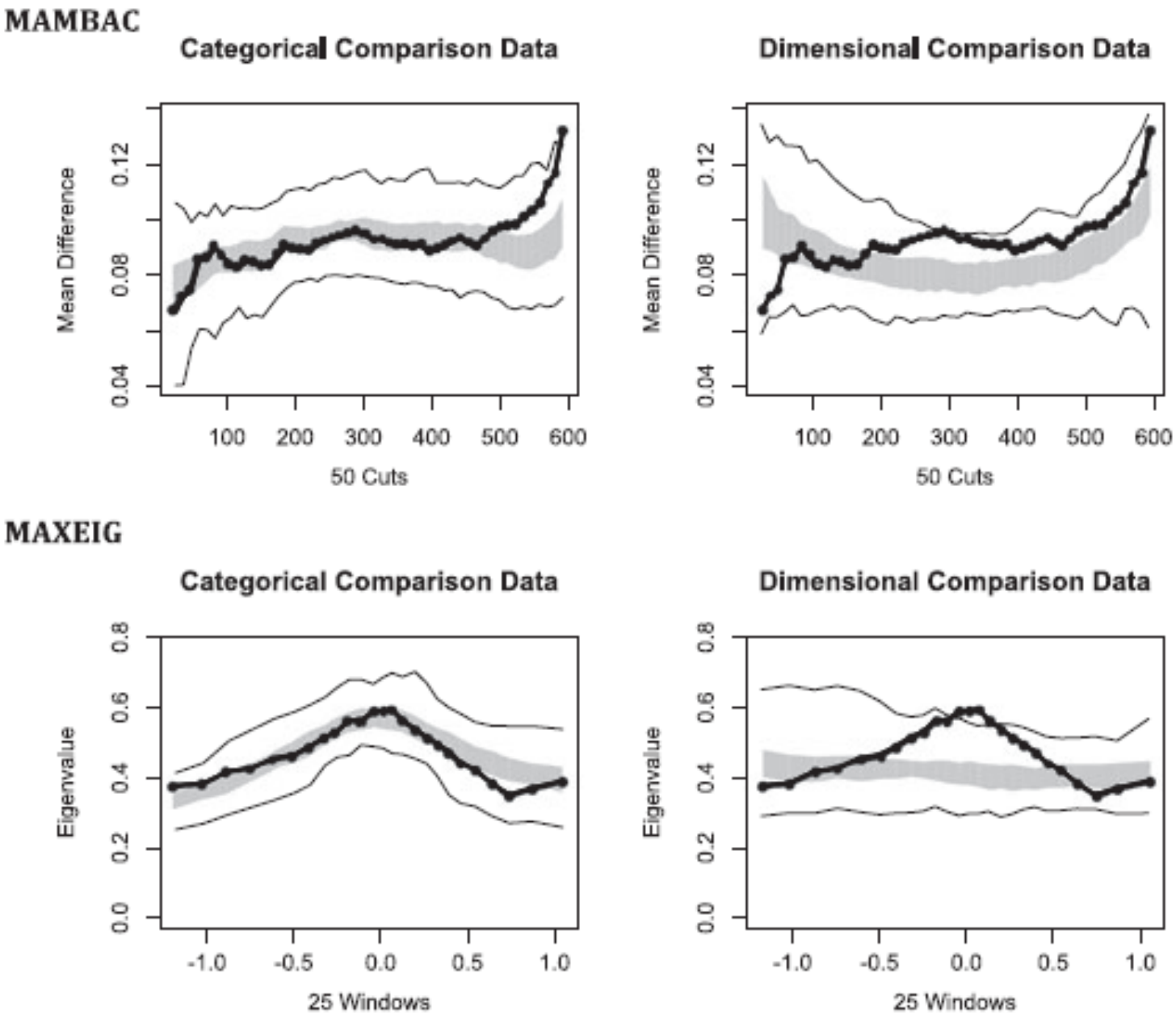
- CTOPP Elision (Wagner, Torgesen, Rashotte,1999)
- CTOPP nonword repetition
- Sound Symbol conversion (Lovett, et al., 1994)
- Decoding (TOWRE, Torgesen et al., 1999)

II. Taxon with naming speed deficits

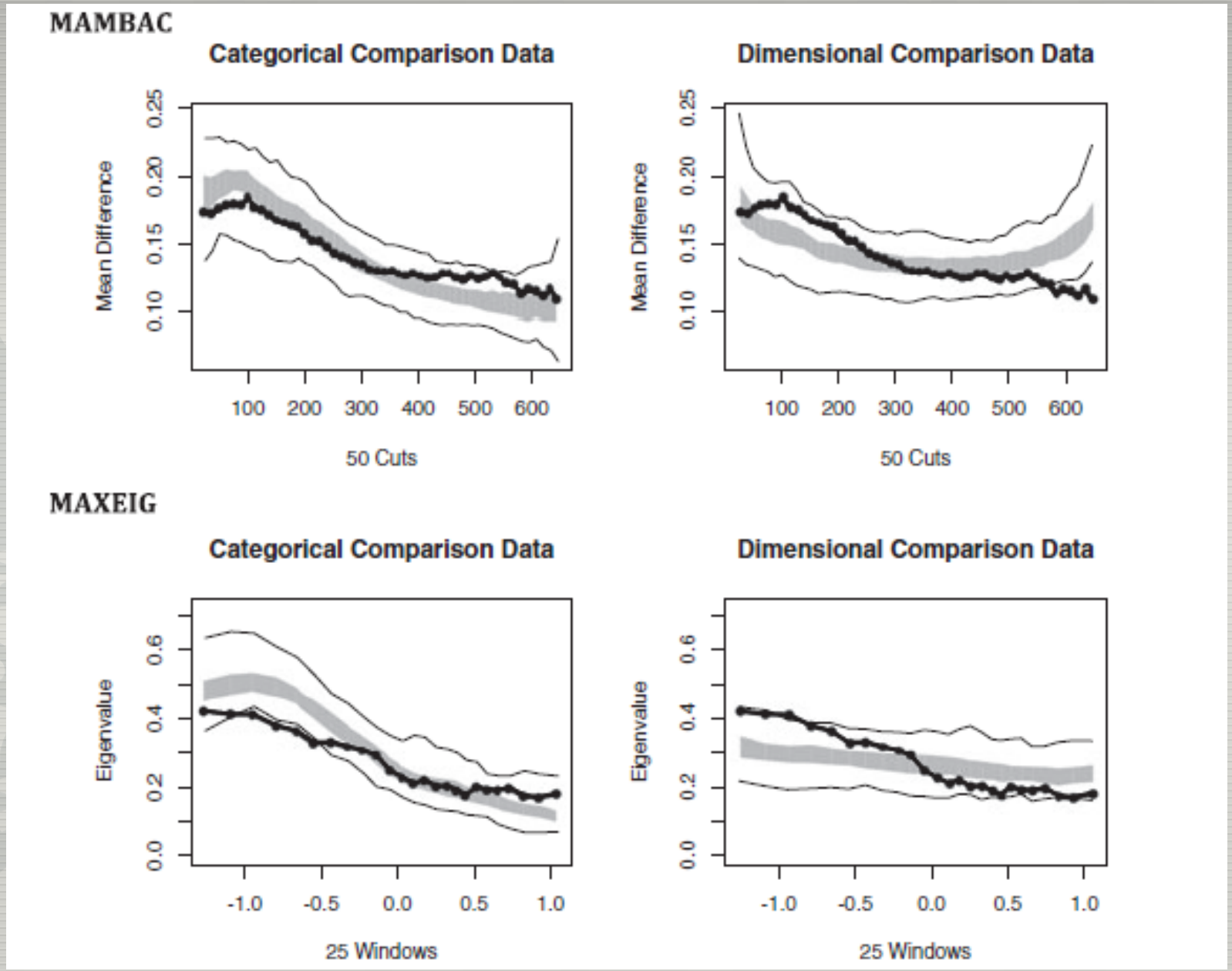
Indicator variables:

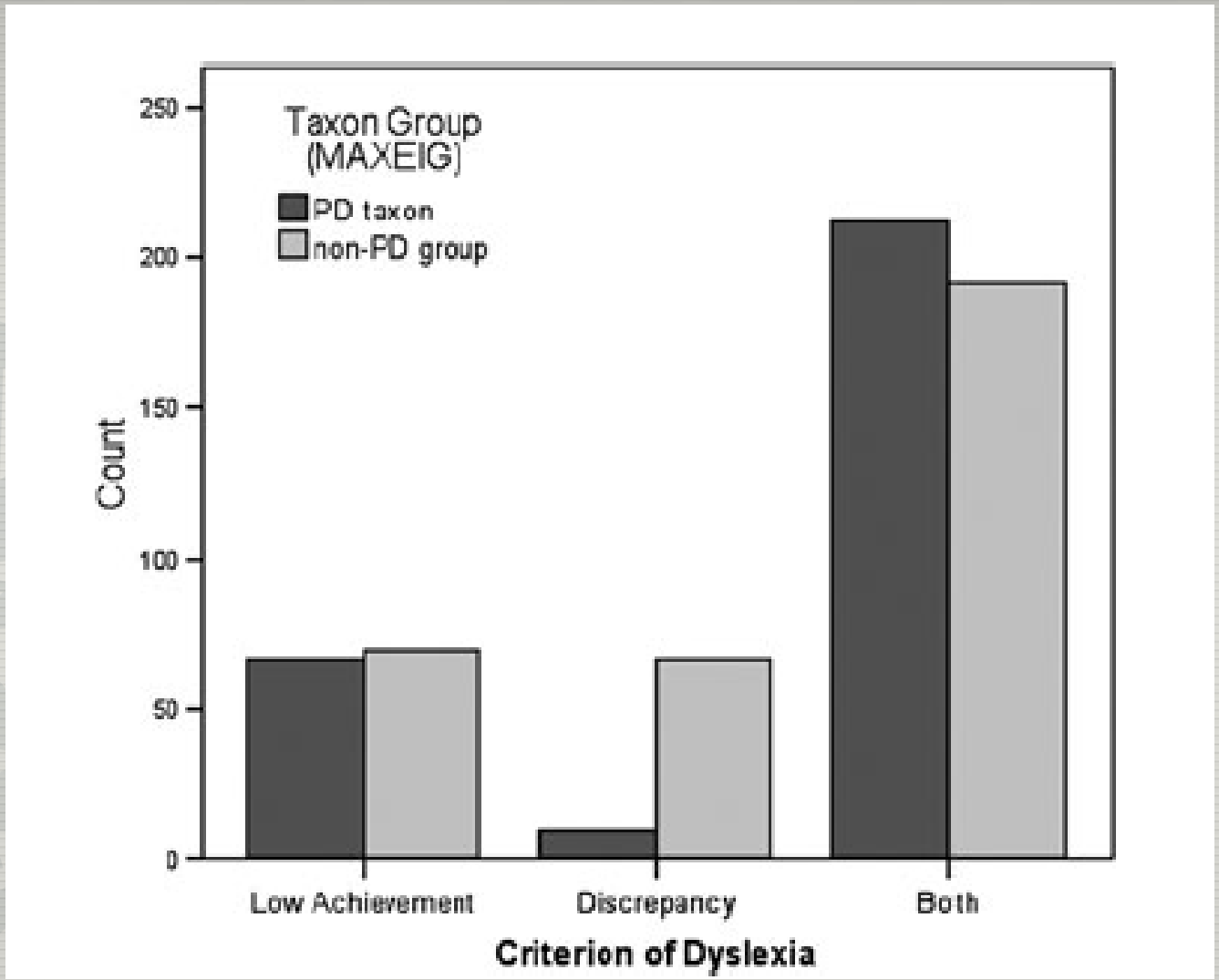
- RAN Letters
- RAN Objects (Denkla & Rudel, 1976)
- WISC-III Coding (Wechsler, 1991)

Hypothesis 1
PD TAXON



Hypothesis 2
NSD TAXON




Taxon Group
(MAXEIG)
PD taxon
non-PD group
Count
250
200
150
100
50
0
Low Achievement
Discrepancy
Both
Criterion of Dyslexia

Implications

- Both Taxometric procedures indicate the presence of a phonological-deficit taxon **and** a taxon without phonological deficits
- Children with and without phonological processing deficits are different in kind (e.g., in neurobiological, or genetic constitution)
- Results imply multiple neurobiological pathways for reading failure

Implications for Diagnosis and Intervention

Phonological Core Deficit

Focus on phonological processing

Double-Deficit Theory

Explicitly address automaticity and fluency as well as phonology

NICHD Intervention study
(Morris, Lovett, Wolf, 2010)

- direct instruction program
- training letter-sound correspondences, sound segmentation and blending
- practice with rhyming, decoding, and word analysis

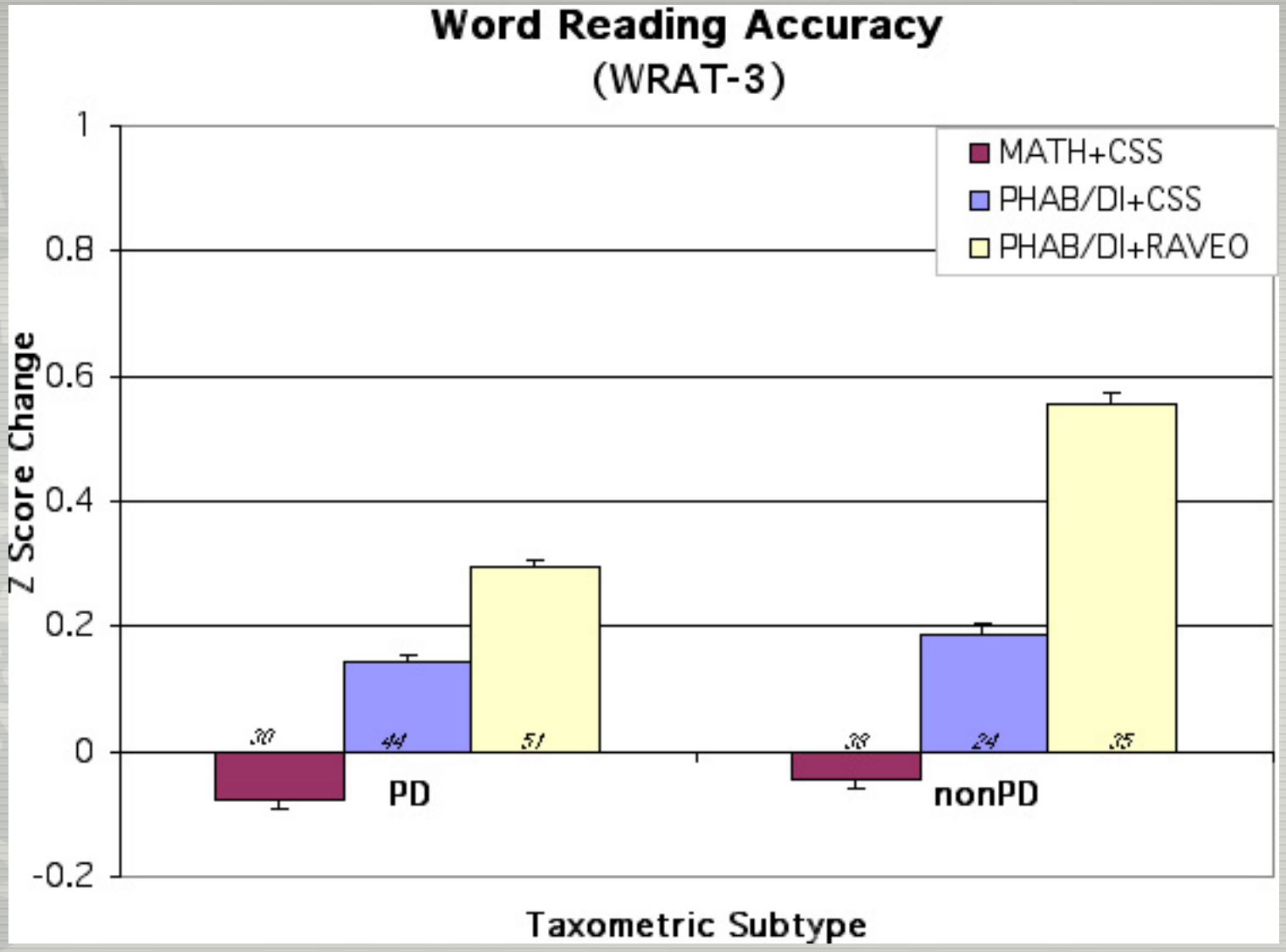
- integrated fluency program training quality representation and rapid rate of retrieval in:
- phonological, orthographic, semantic, syntactic, and morphological component processes, and their interconnections
- Practice at sublexical, lexical, and connected text levels

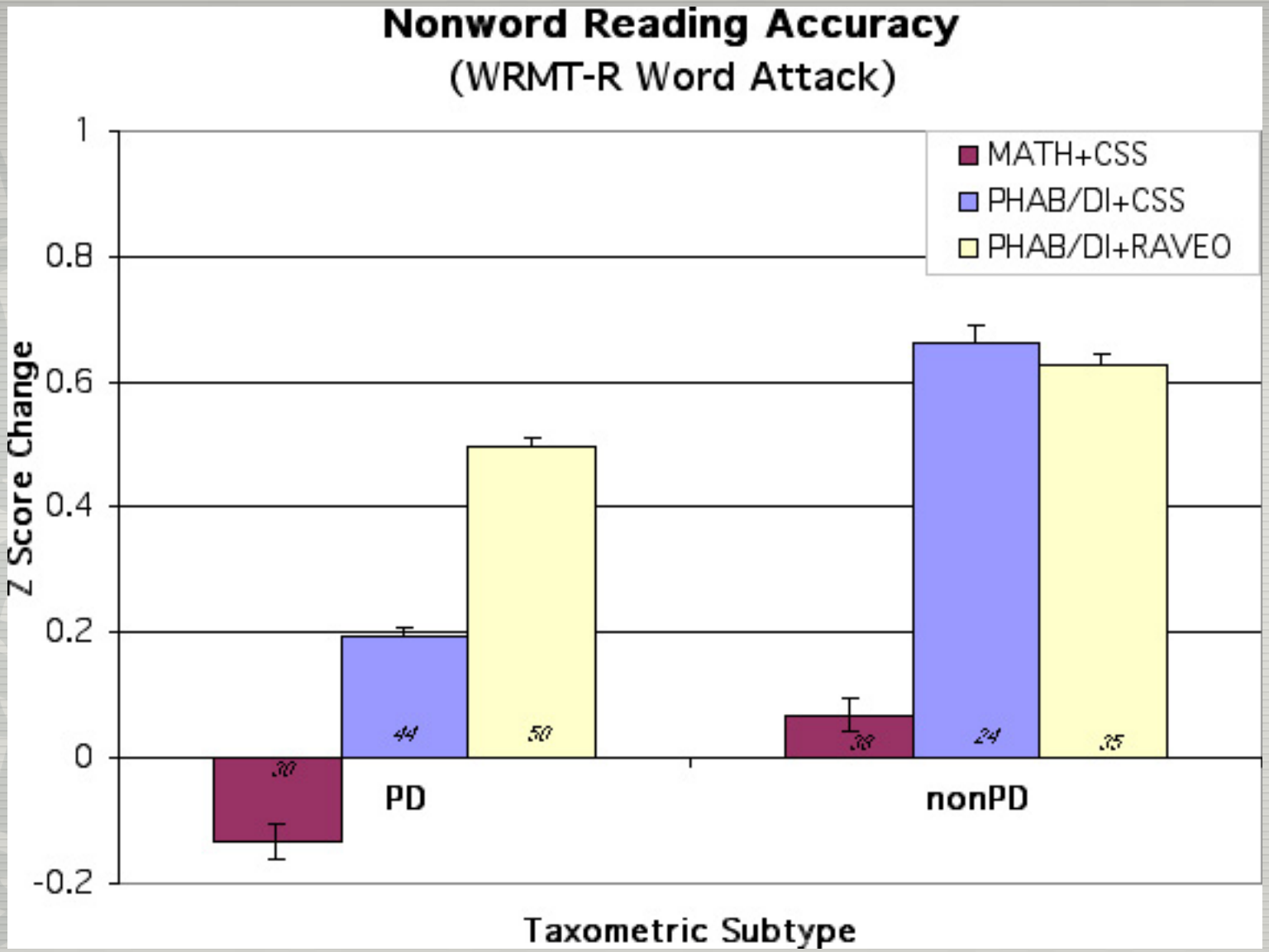
PHAB (Phonological awareness & Blending)	PHAB+ RAVEO

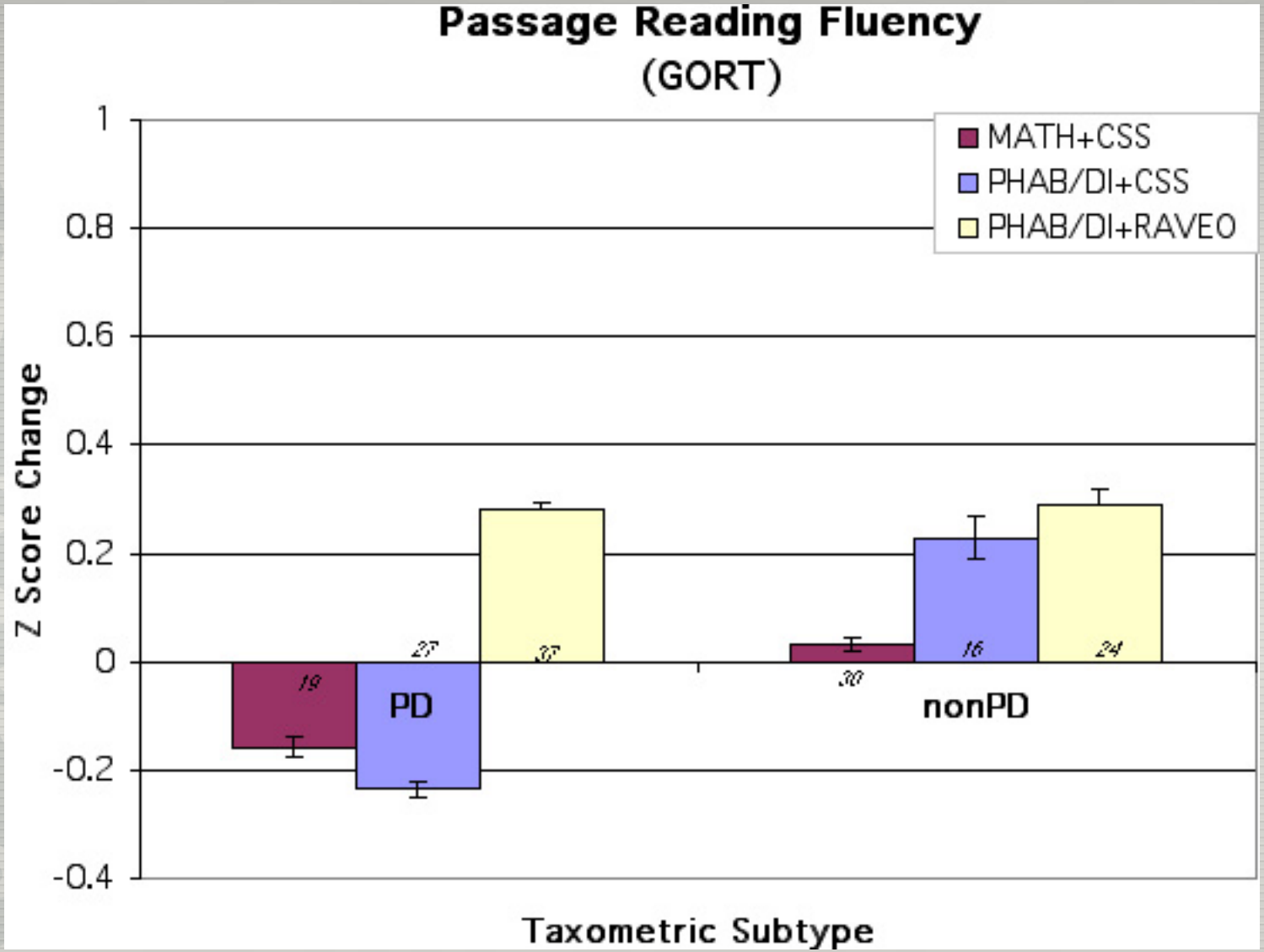
Reading Measures *across* Taxometric Subtypes

PD taxon scored below Elision HITMAX point from MAXEIG analysis

nonPD taxon scored above Elision HITMAX point from MAXEIG analysis


Word Reading Accuracy
(WRAT-3)
MATH+CSS
PHAB/DI+CSS
PHAB/DI+RAVEO
Z Score Change
1
0.8
0.6
0.4
0.2
0
-0.2
30
44
51
38
24
35
PD
nonPD
Taxometric Subtype


Nonword Reading Accuracy
(WRMT-R Word Attack)
MATH+CSS
PHAB/DI+CSS
PHAB/DI+RAVEO
Z Score Change
1
0.8
0.6
0.4
0.2
0
-0.2
.30
.44
.50
.08
.24
.25
PD
nonPD
Taxometric Subtype


Passage Reading Fluency
(GORT)
MATH+CSS
PHAB/DI+CSS
PHAB/DI+RAVEO
Z Score Change
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
19
27
37
30
16
24
PD
nonPD
Taxometric Subtype

CONCLUSIONS

1. Overall, children with dyslexia benefited more from RAVE-O fluency training in subword processing, word identification and reading fluency.

2. For Word Reading, children in the non-phonological taxon were aided the most with RAVE-O fluency training compared to phonological training alone.

3. For decoding and text fluency, children in the phonological-deficit taxon showed additional gains from RAVE-O training.

CONCLUSIONS

Diagnosis - Needs to take into account measures such as naming speed in addition to phonological processing tasks

Treatment - Should explicitly address issues of automaticity and fluency as well as phonology