

Suppression doesn't just go away, but treatment might change a VOstar - Case Series Retrospectives

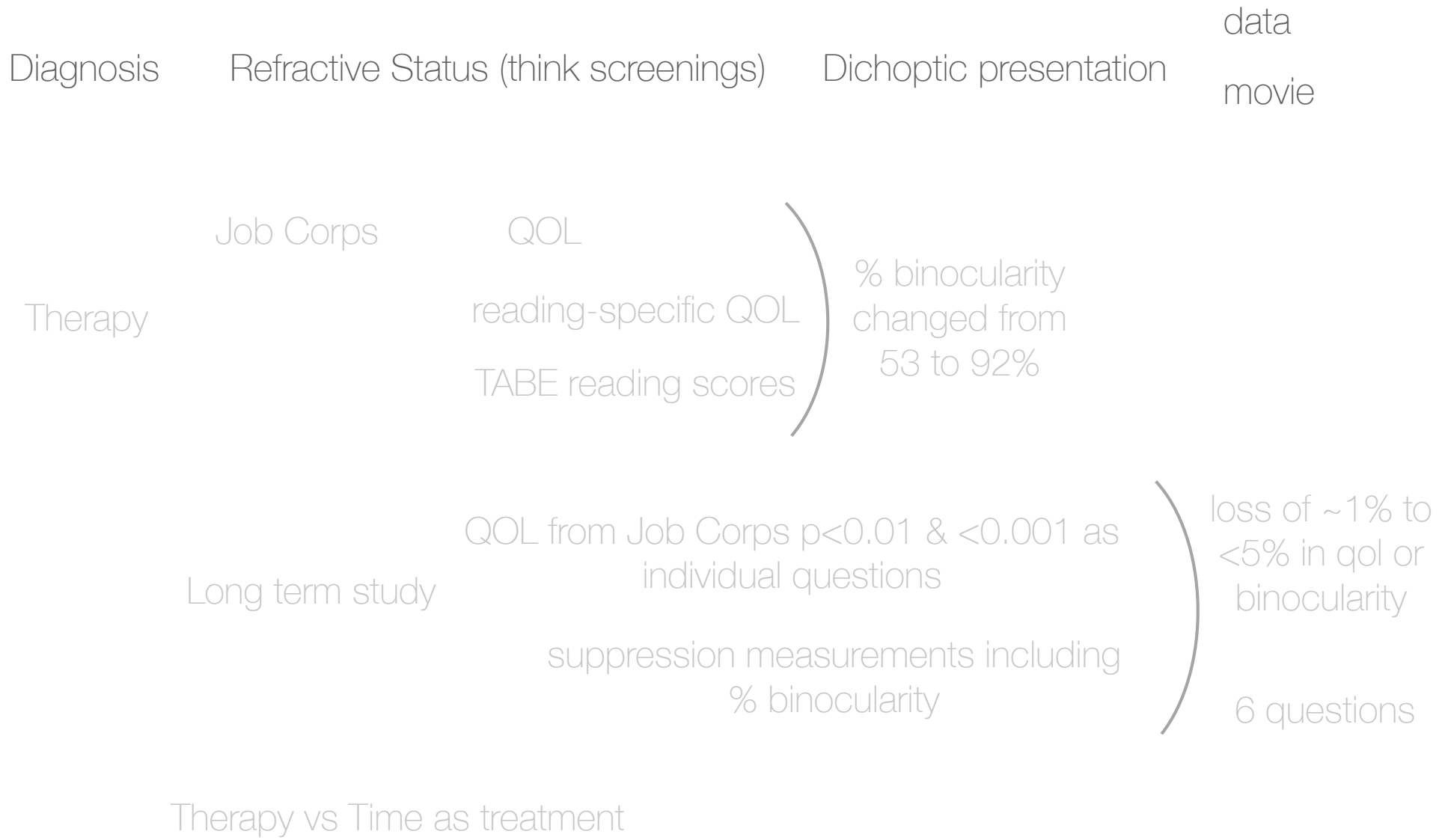
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Non-strabismic, non-amblyopic intermittent central suppression

In review at "Optometry and Visual Performance" - READ THE JOURNAL!

What I think we know



A word about refractive status...

Distance Refractive Error (spherical equivalent)

n=120 eyes

25%

Subjective Refractive Error

20%

Refractive Error	Eyes	%
pl to +1.00 DS cyl \leq -1.00 DC	84	70

15%

-0.25 to -1.00 DS cyl $<$ -1.00 DC	22	18
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Sphere or Cylinder $>\pm 1.00$ D	14	12
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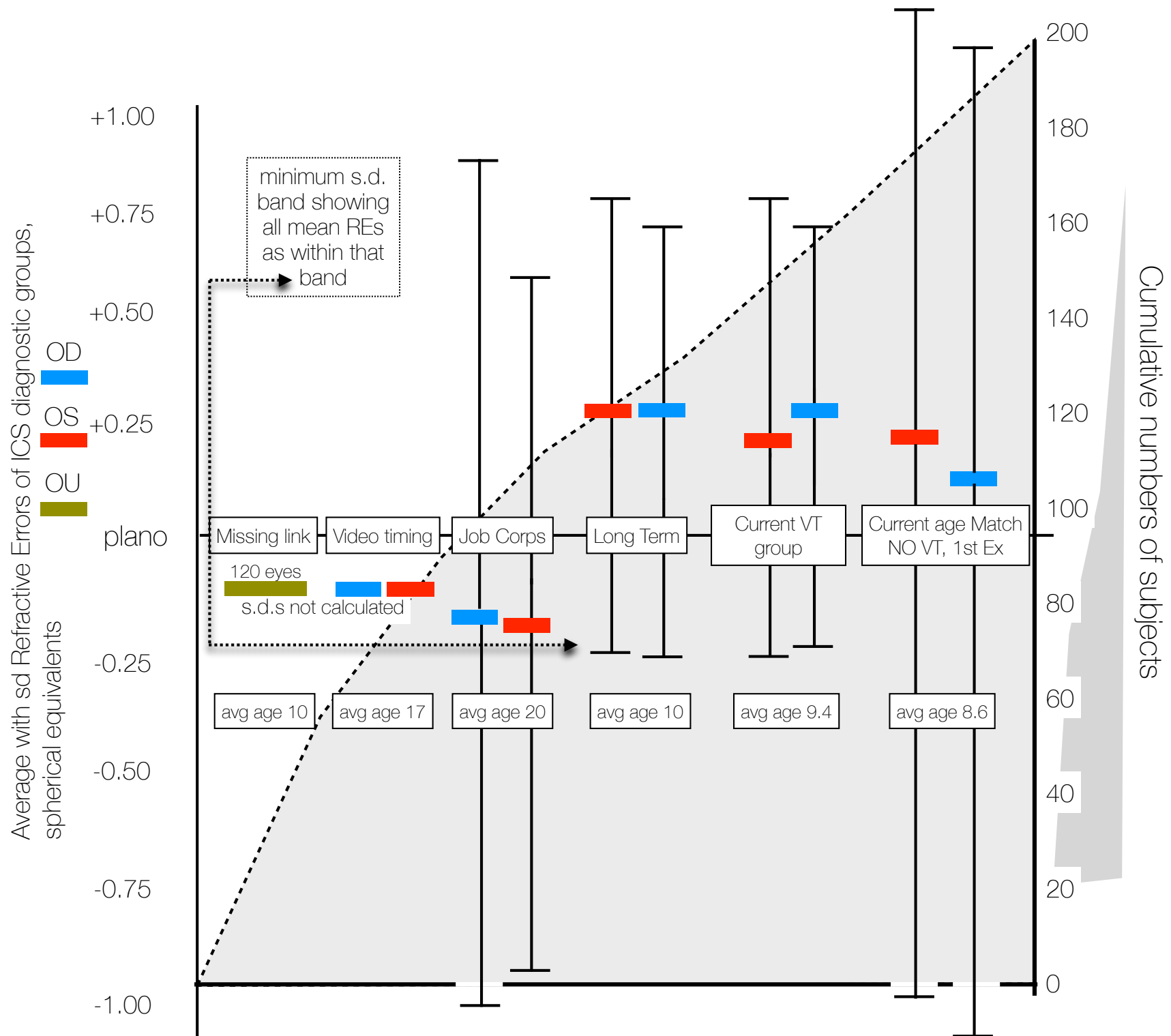
10%

90% 20/25 or better, no
amblyopia or strabismus

5%

Helveston et al,
1985

Refractive Error	Eyes	%
pl to +1.00 DS cyl \leq -1.00 DC	84	70
-0.25 to -1.00 DS cyl $<$ -1.00 DC	22	18
Sphere or Cylinder $>\pm 1.00$ D	14	12



Routine.

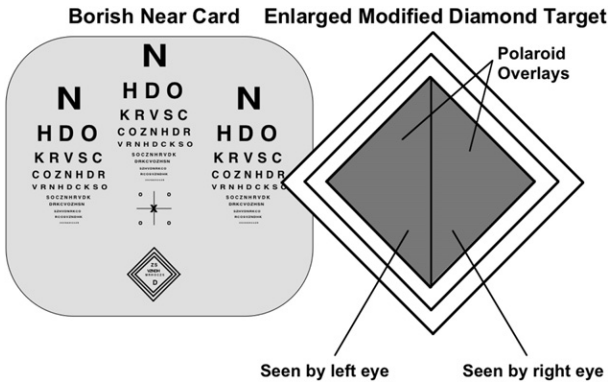
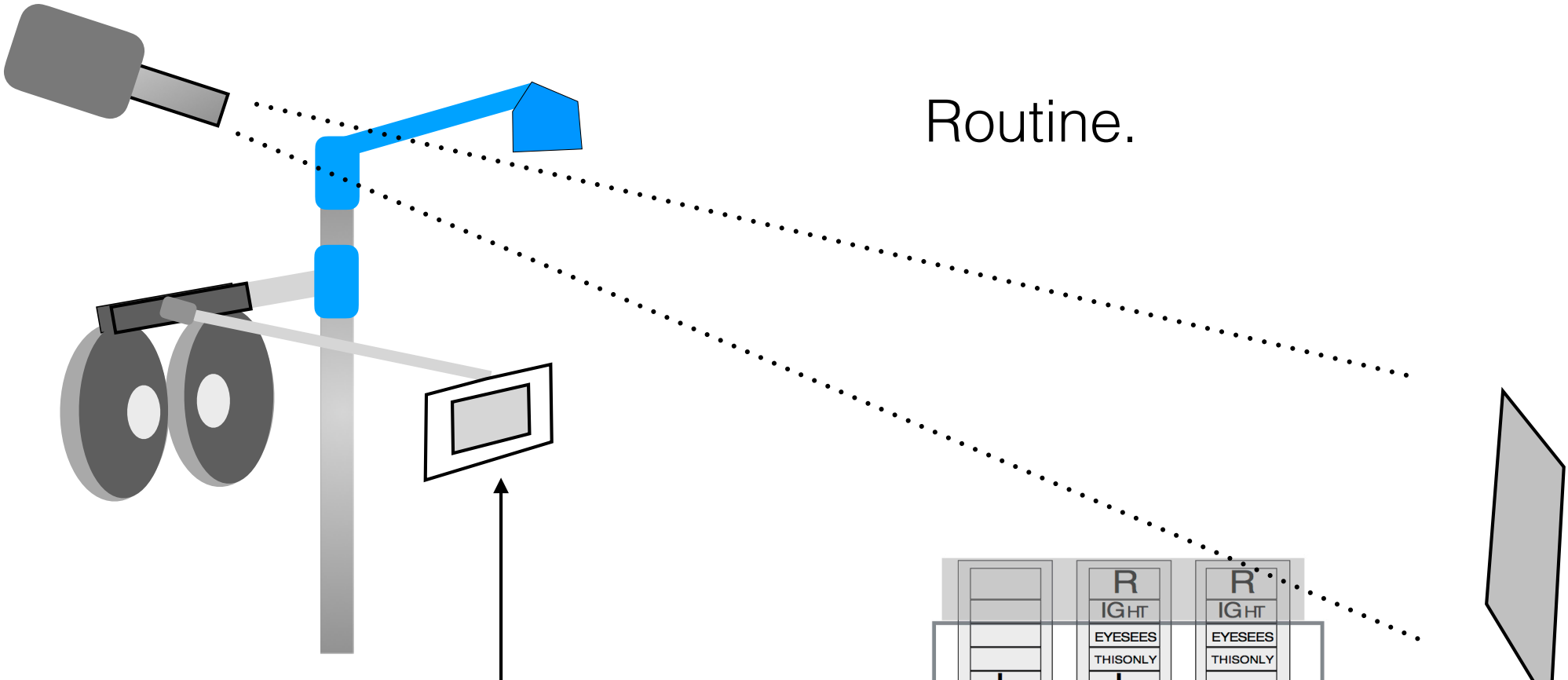
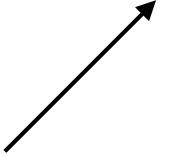
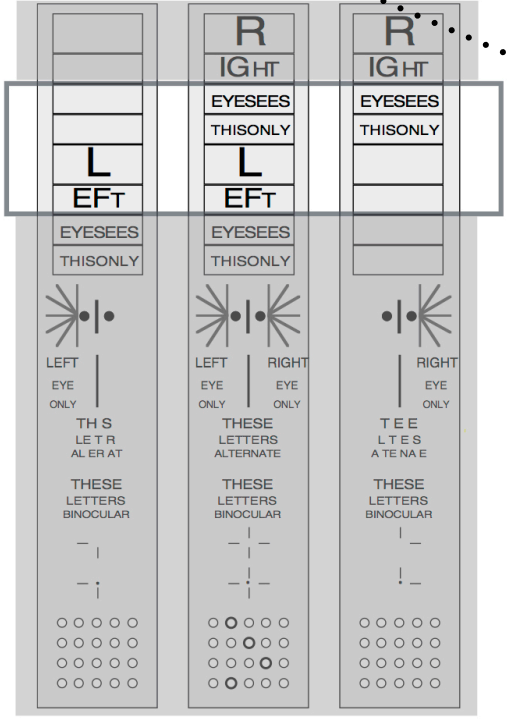
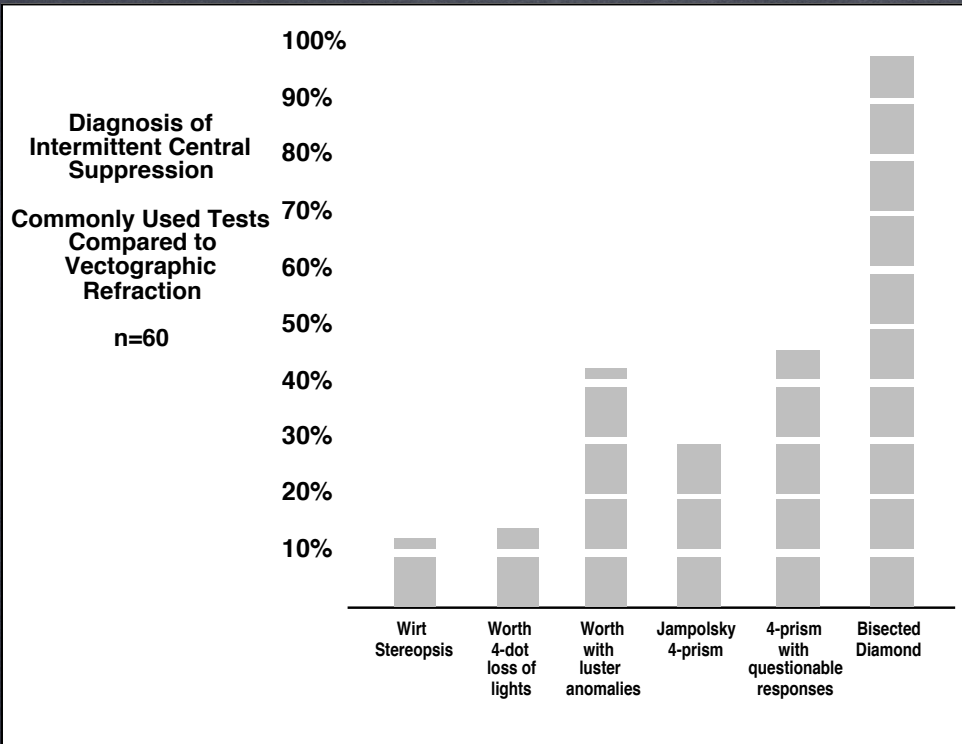


Figure 2 Schematic of modified Borish Vectographic Near Card.



And a word about testing...



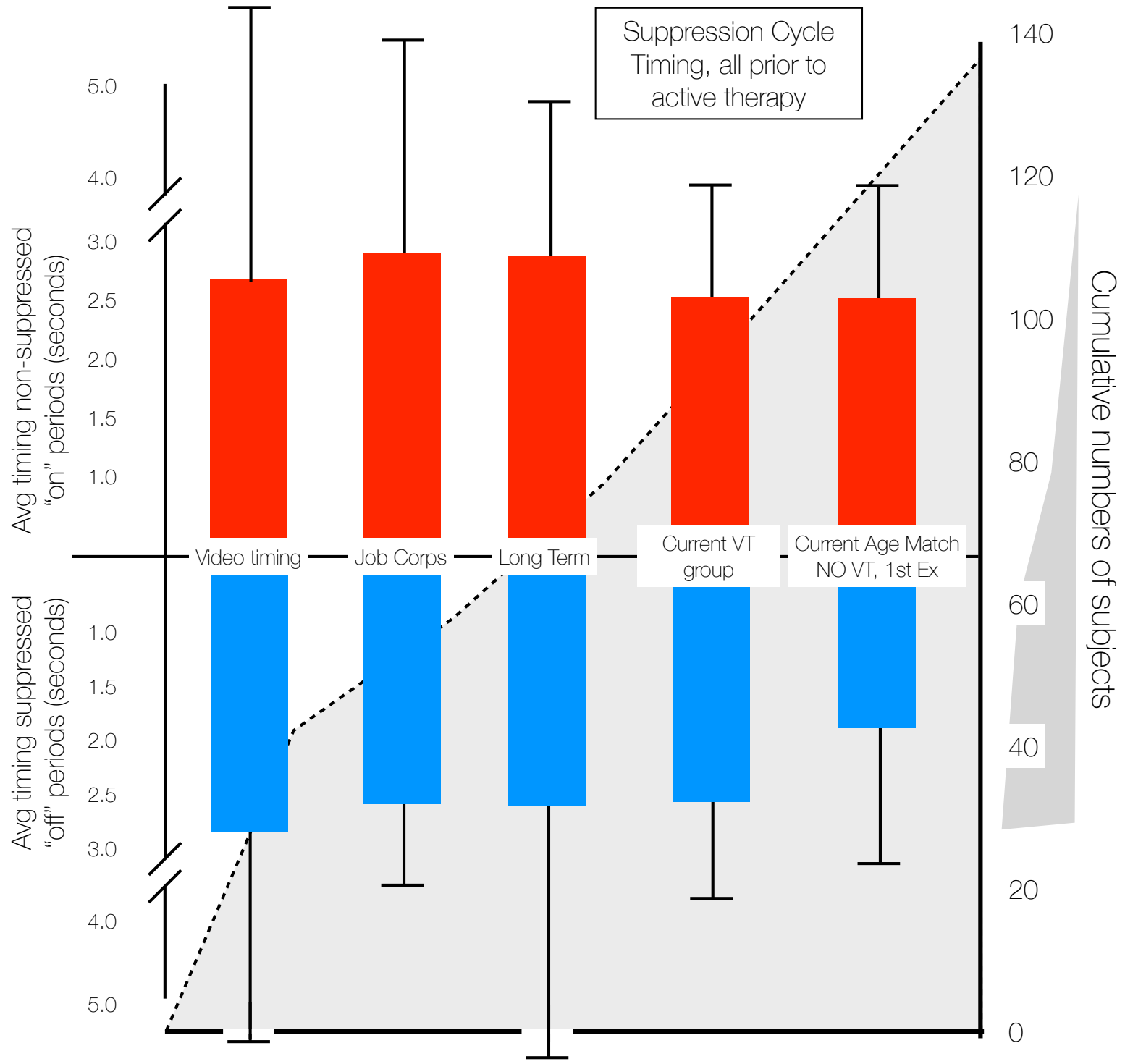
Phi Coefficients between Common Suppression Tests

Diamond

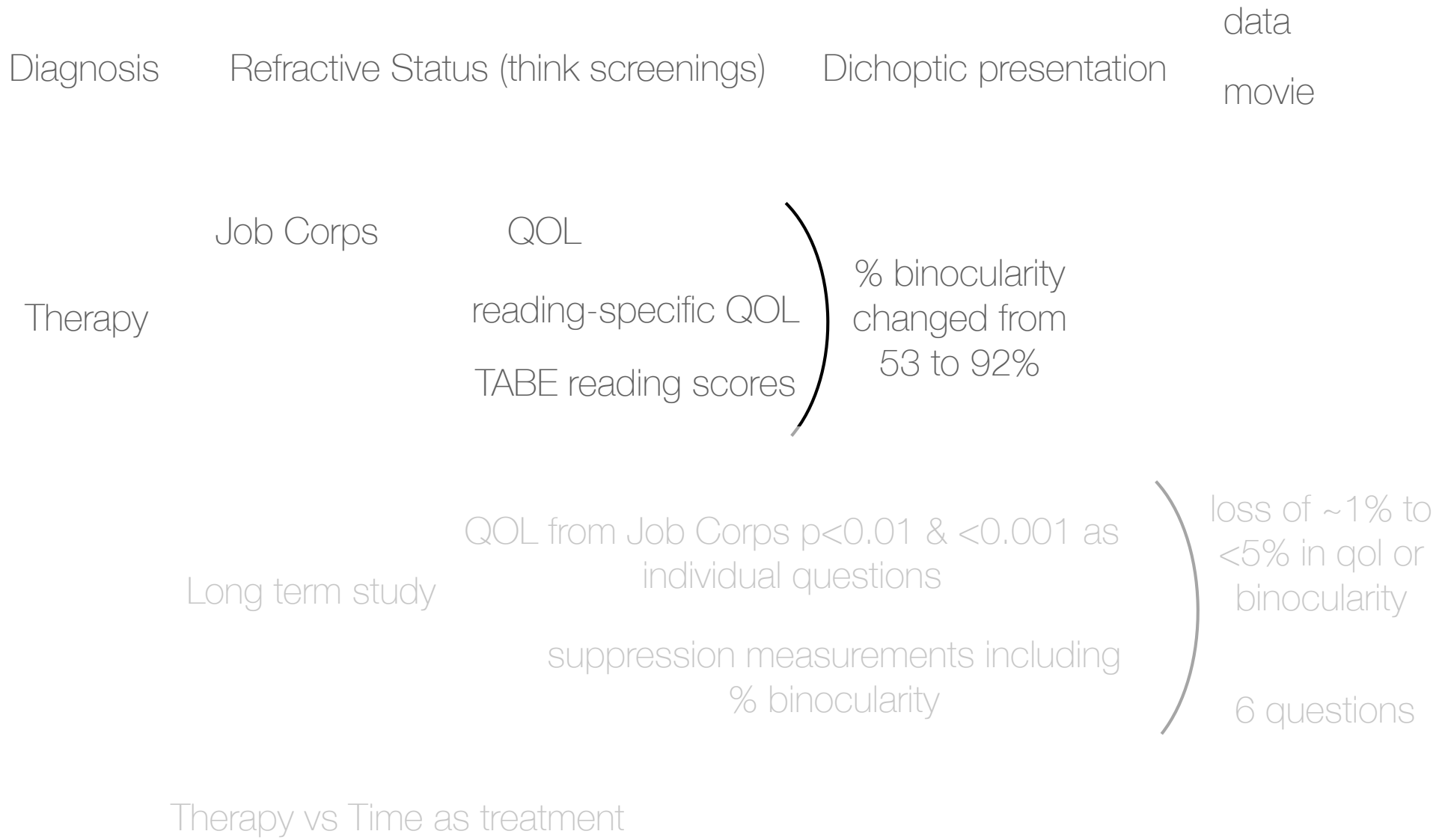
	Worth 4-dot with Luster Anomalies	Worth 4-dot loss of lights	Wirt Stereopsis <40 arcsec	4-prism with questionable responses	4-prism Strabismus response
Worth 4-dot with Luster Anomalies	-0.03	0.07	0.07	-0.02	0.12
Worth 4-dot loss of lights	0.46	0.11	0.05	-0.08	
Wirt Stereopsis <40 arcsec	0.16	-0.06	0.08		
4-prism with questionable responses	-0.12	0		0.07	
4-prism Strabismus response					

Phi { <0.30 shows weak relationship
 0.30<phi<0.60 shows moderate correlation
 >0.60 shows strong relationship

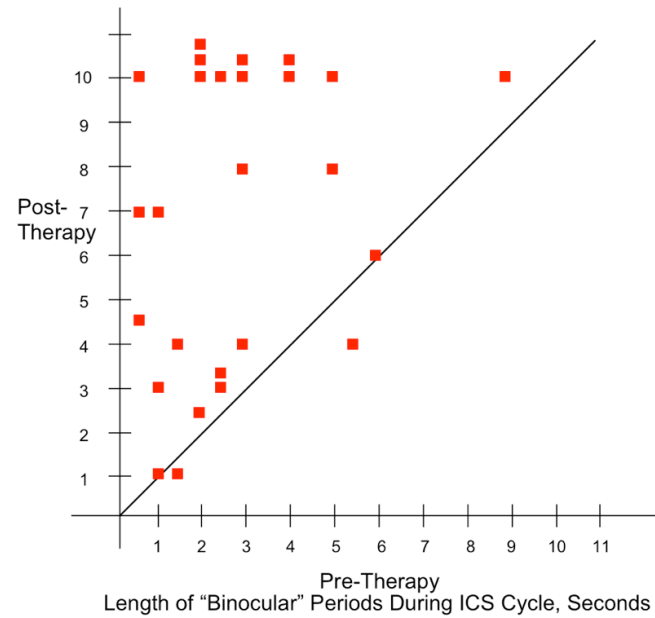
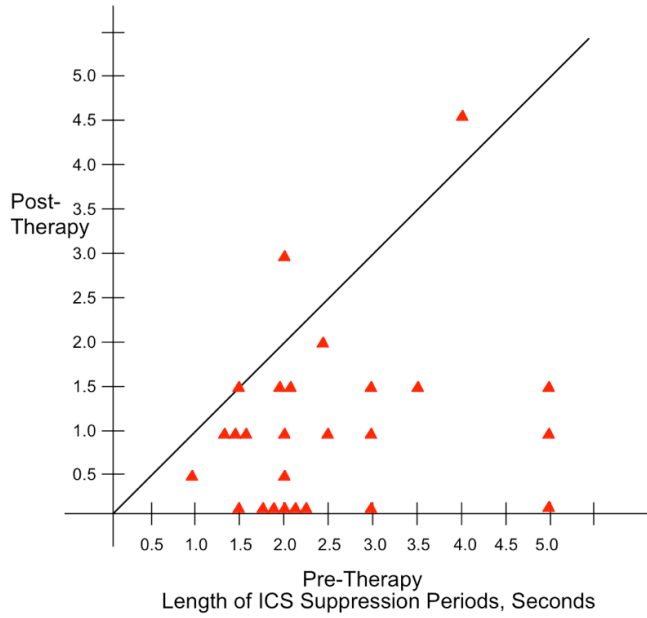




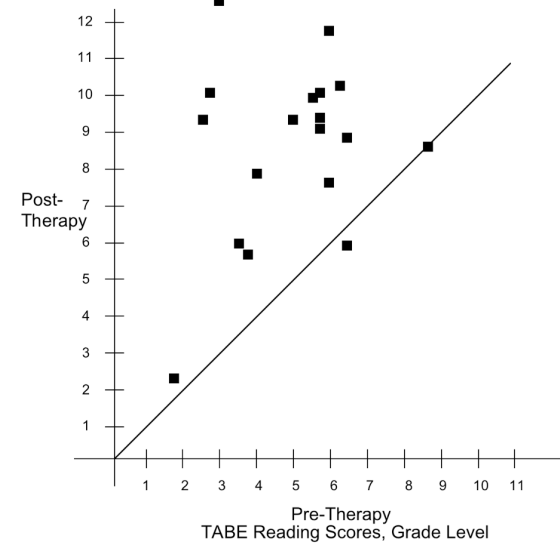
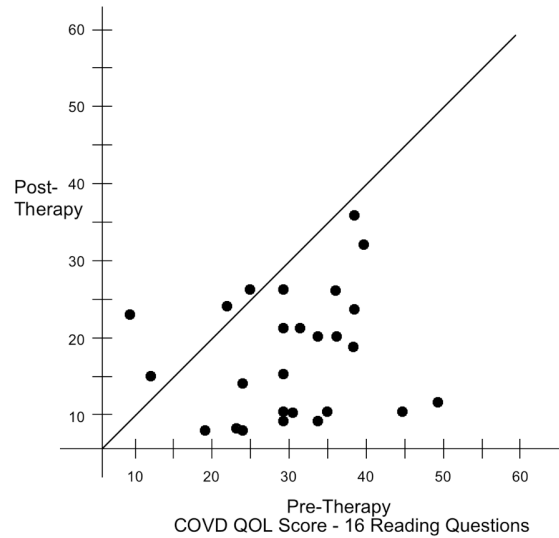
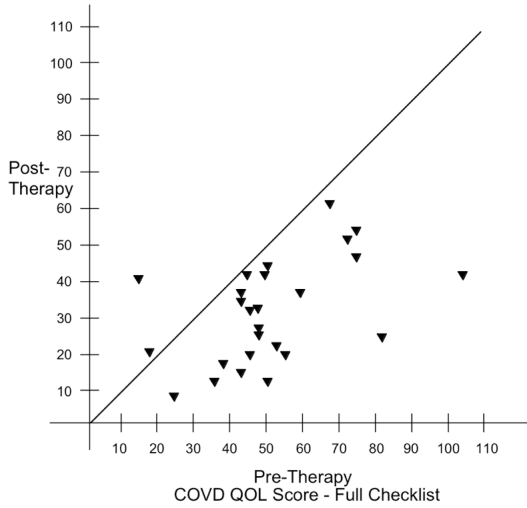
What I think we know



Job Corps

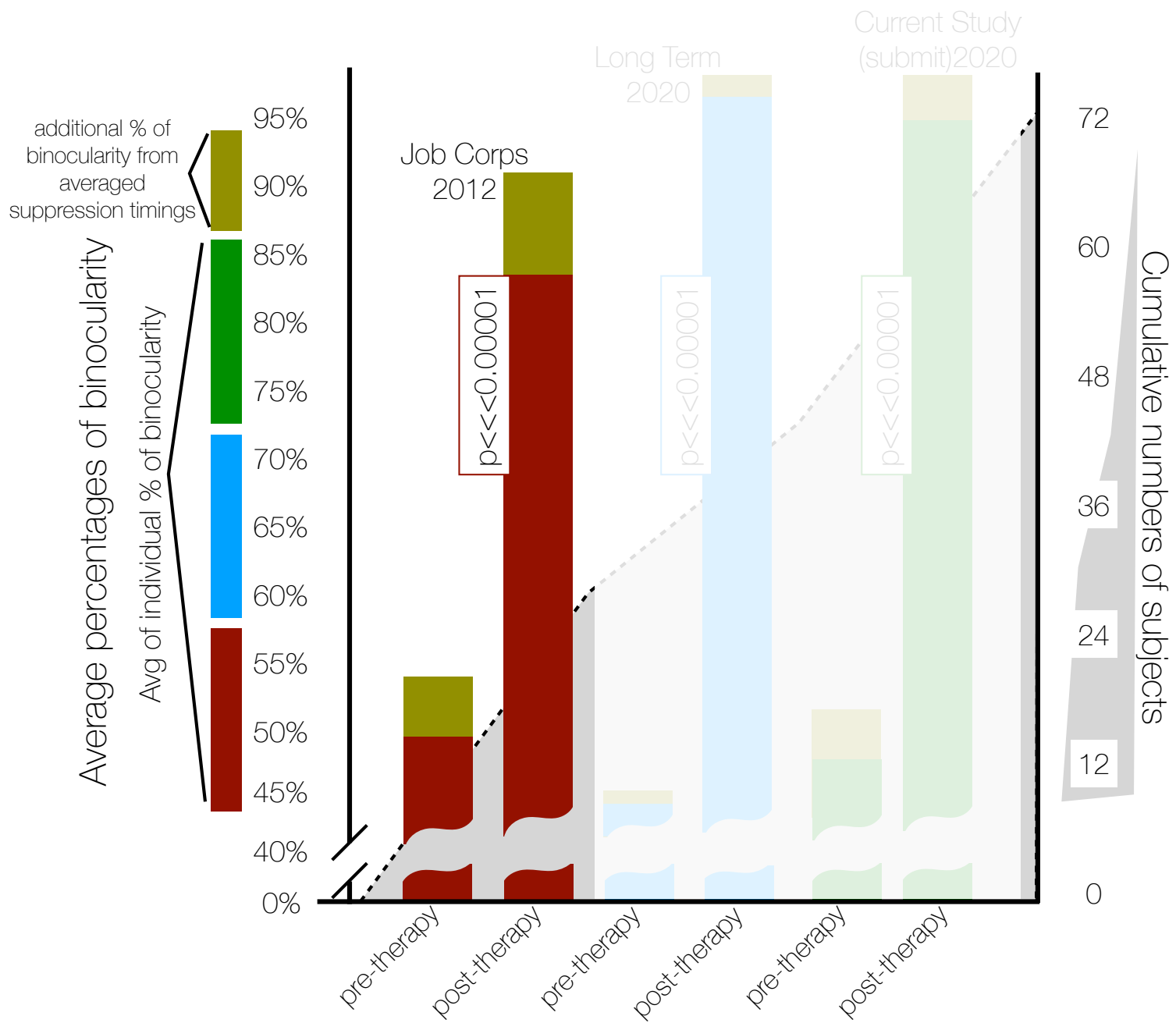


$p < 0.0001$



Percentage of Binocularity during Waking Hours

$$\left[\frac{\text{average non-suppressed seconds}}{(\text{average suppressed seconds} + \text{average non-suppressed seconds})} \right] \times 100$$



$p < 0.001$ 7 Vision worse end of day 8 skip/repeat lines reading 20 difficulty completing assignments on time

$p < 0.01$ 3 Headaches with near work 4 Words run together reading 5 Eyes burn/sting/water 6 falls asleep reading

10 tilts head/closes eye reading 13 omits words reading 14 writes uphill/downhill

16 read comprehension down over time 18 holds reading too close 19 trouble keeping attention on reading

$p < 0.05$ 1 Blur at near 2 Double Vision 12 avoids near work/reading 15 misaligns digits/columns

21 says "I can't" 24 can't estimate distances

All the rest improved, but $p > 0.05$

9 dizziness/nausea with near work

25 clumsy/knocks things over on desk/table

11 difficulty copying from board

26 difficulty with time management

17 poor sports performance

27 difficulty with money concepts/make change

22 avoids sports

28 loses papers & belongings

23 poor hand-eye/handwriting - difficulty with hand tools

29 car sickness, motion sickness

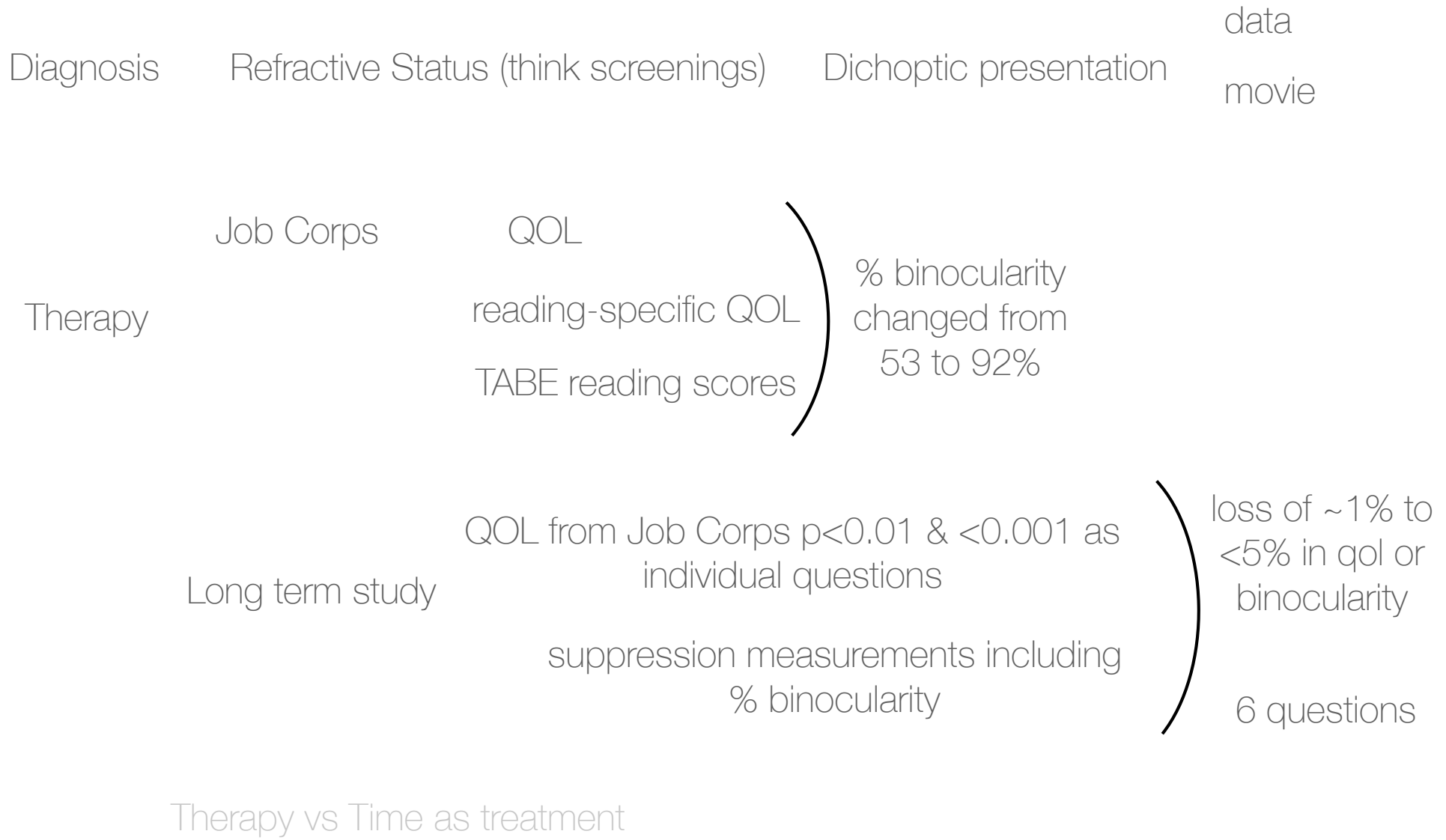
30 poor memory

	Never = 0	Seldom = 1	Occasional = 2	Frequently = 3	Always = 4
Blurred vision at near/reading			X		
Double vision			X		
Headaches with near work			X		
Words run together reading			X		
Burning, itching, watering eyes			X		
Fall asleep reading				X	
See worse end of day		X			
Skip/repeat lines when reading				X	
Dizziness/nausea with reading		X			
Head tilt/close an eye reading		X			
Avoid near work/reading			X		
Miss/omit small words reading			X		
Reading comprehension down			X		
Hold reading too close			X		
Short attention span reading				X	
Difficulty finishing assignments				X	

	Never = 0	Seldom = 1	Occasional = 2	Frequently = 3	Always = 4
Blurred vision at near/reading	X				
Double vision	X				
Headaches with near work	X				
Words run together reading	X				
Burning, itching, watering eyes	X				
Fall asleep reading		X			
See worse end of day	X				
Skip/repeat lines when reading	X				
Dizziness/nausea with reading	X				
Head tilt/close an eye reading	X				
Avoid near work/reading	X				
Miss/omit small words reading	X				
Reading comprehension down	X				
Hold reading too close	X				
Short attention span reading		X			
Difficulty finishing assignments	X				

- ◀ DL: “reading textbooks is a lot better”
- ◀ JR (1st “JR”): “words are not blurring or jumping”. Also, a teacher reported his reading score jumped from 6.2 to 8.9 in three months.
- ◀ MW: “not losing my place as much, writing skills have improved, no more double vision”. A teacher reports “his vision has really changed. He [MW] described it as seeing the written words as if they were on a piece of crumpled material that has slowly been spread out and straightened”.
- ◀ CC: “I read a whole book for the first time in my life – Stuck in Neutral.” [Stuck in Neutral is written on a Junior High reading level.]
- ◀ JR (2nd “JR”): Reading is easier. Prior to therapy his depth perception would “just go out.” That doesn’t happen now. Teachers “are amazed. I’m their miracle kid. I’m not a very fast reader, but things have really improved...oh man!” It has made a “huge difference in trade [bricklaying]. Awesome.” Note – prior to therapy this JR had trouble with aligning bricks. His instructor commented on the difference post-therapy. Had been told he was dyslexic.
- ◀ BS: Never used to read and is now reading Jack London novels. His teacher reports the therapy “changed his life”. He is now reading avidly, “devouring” books. He got a job as a welder. Note – BS was one of the students reporting side effects: headaches and achy eyes that disappeared after two months of goggle use.
- ◀ MT: Reading is “coming along greatly” and is reading faster. Comprehension is improving.
- ◀ GP: Not losing his place as much when reading.
- ◀ CS (who didn’t improve on the QOL checklist): When he arrived at Job Corps his reading level was 2.8. It improved to 8.8. During the month of April 2005 it improved from 7.7 to the current 8.8. An article on CS was published in the Job Corps Times, September 2005 (See Appendix). Again, given the positive comments here, the QOL validity must be questioned in this group.

What I think we know



What happens long term?

18 private ICS patients, 10.5 ± 6 y.o. (5.25-32 years at start of therapy) primarily treated with rapid alternation

At start of therapy average acuity 20/25+ OD,OS No ocular pathology

By definition with ICS, no strabismus or anisometropic amblyopia

	Start of therapy		End of therapy	
	OD	OS	OD	OS
Median refractive error	+0.27	+0.26	plano	-0.07
Max	+0.87 (0.25 cyl)	+1.00	+0.50	+0.50
Min	-1.25	-1.12 (0.25 cyl)	-2.75	-2.50
Mode refractive error	+0.50	+0.50	+0.50	+0.50

Refractively Normal, Acuities Near-Normal, No Ocular Pathology

Average 2.24 years since finishing therapy.

The Group

average acuity post-therapy between 20/20 & 20/15 [20/19]

average use ~130 hours over an average ~8 months

average age at completion of therapy ~11 [10 without the 32 year-old]

General Results

1st and foremost: Improvements hold pretty well

Suppression periods during therapy reduced by ~3 seconds

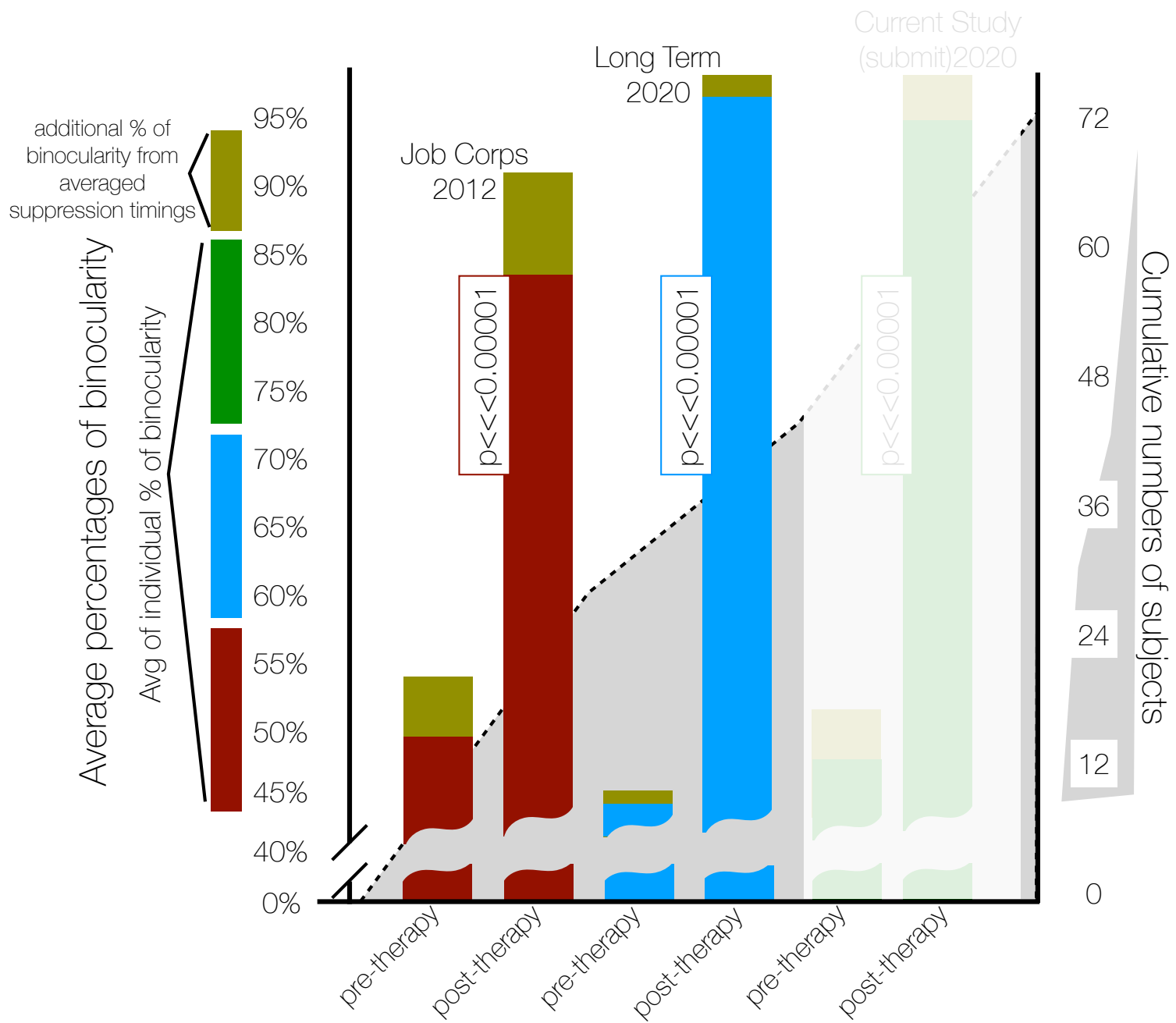
Binocular periods during therapy increased by just over 11 seconds

On average, using latest visit numbers, some small losses in improvements, <5% in performance from the improvements documented at the end of therapy

5 Question responses marked with reversal of gains

so, 13 questions, 18 respondents gave 106 change responses, with 5 “lost gains” = just less than 5%

didn't reply to the questionnaire: “Thank you so much for providing this. C**** has experienced noticeable improvement in the speed at which he is able to read. I have no doubt his treatment with you is the root of his improvement. Thanks again.”
email received 1/9/2020 - Last seen 7/28/2016



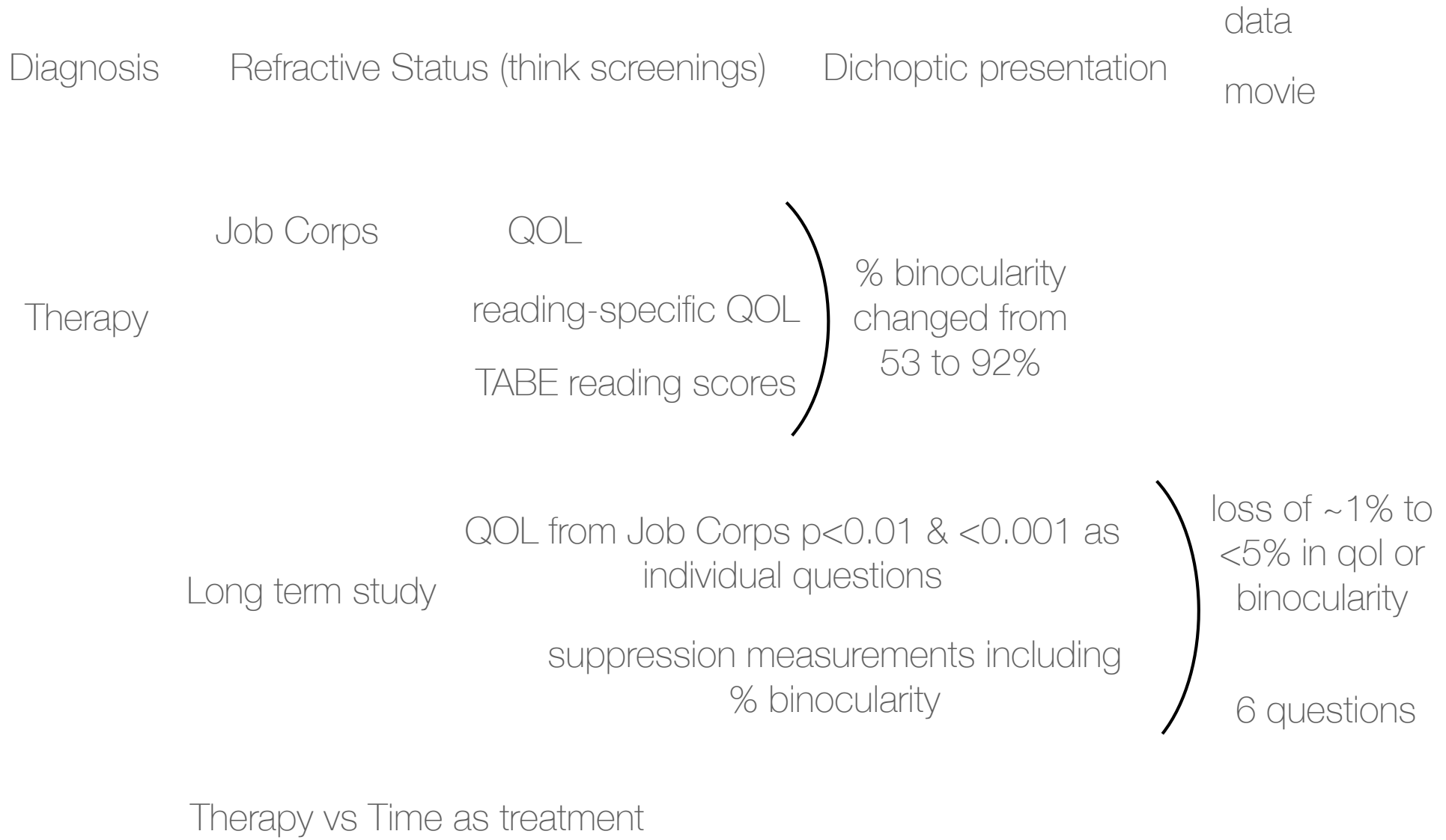
If the kid can't see, the kid can't read.

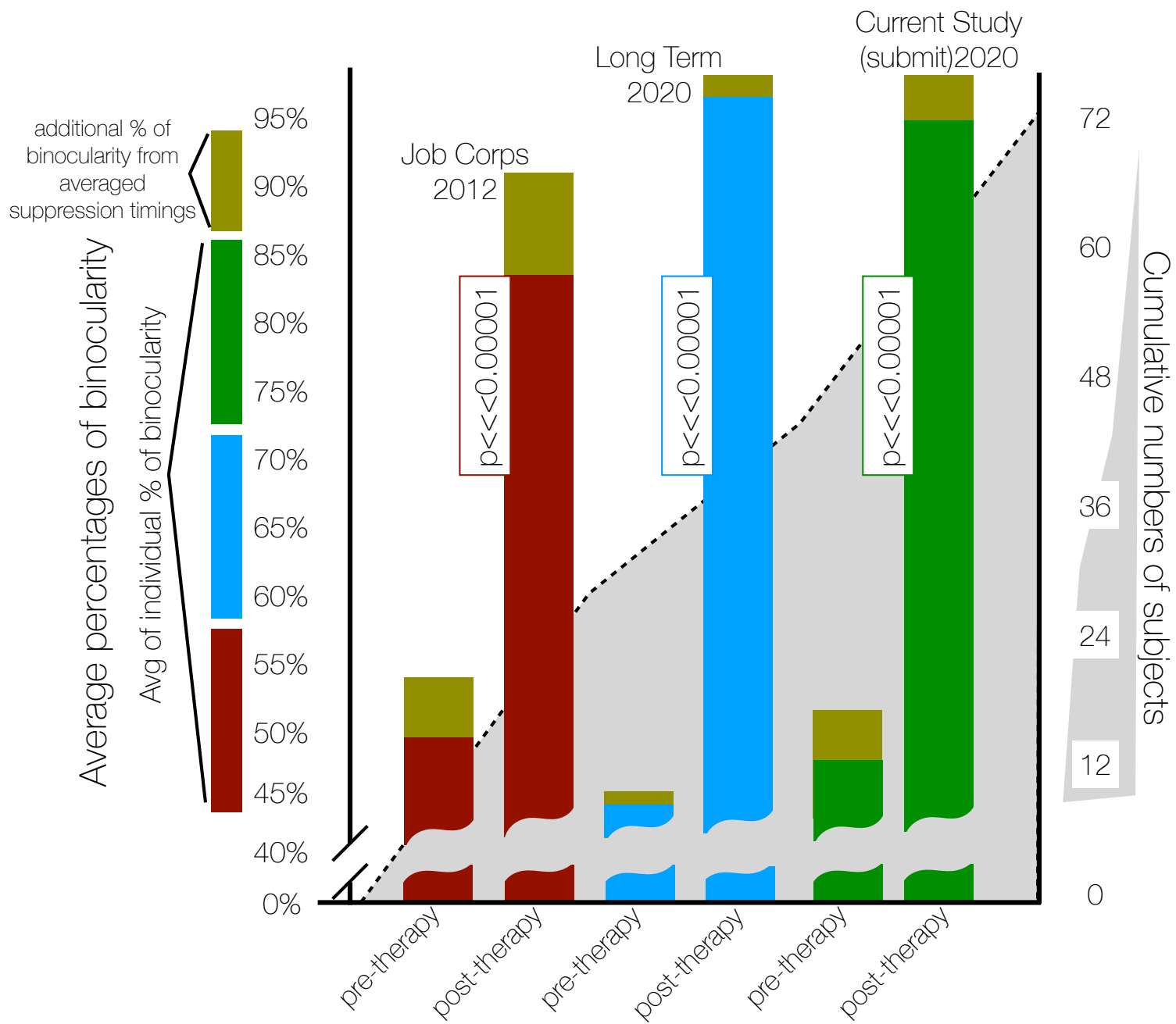
Date	Name
<input type="checkbox"/>	During reading, words run together
<input type="checkbox"/>	Skip or repeat lines when reading
<input type="checkbox"/>	Miss small words when reading
<input type="checkbox"/>	Reading comprehension is not good
<input type="checkbox"/>	Trouble keeping attention on reading
<input type="checkbox"/>	Difficulty completing assignments

Currently, suppressors (intermittent central suppression) average score: just over 4

range about 3 - 5 1/2

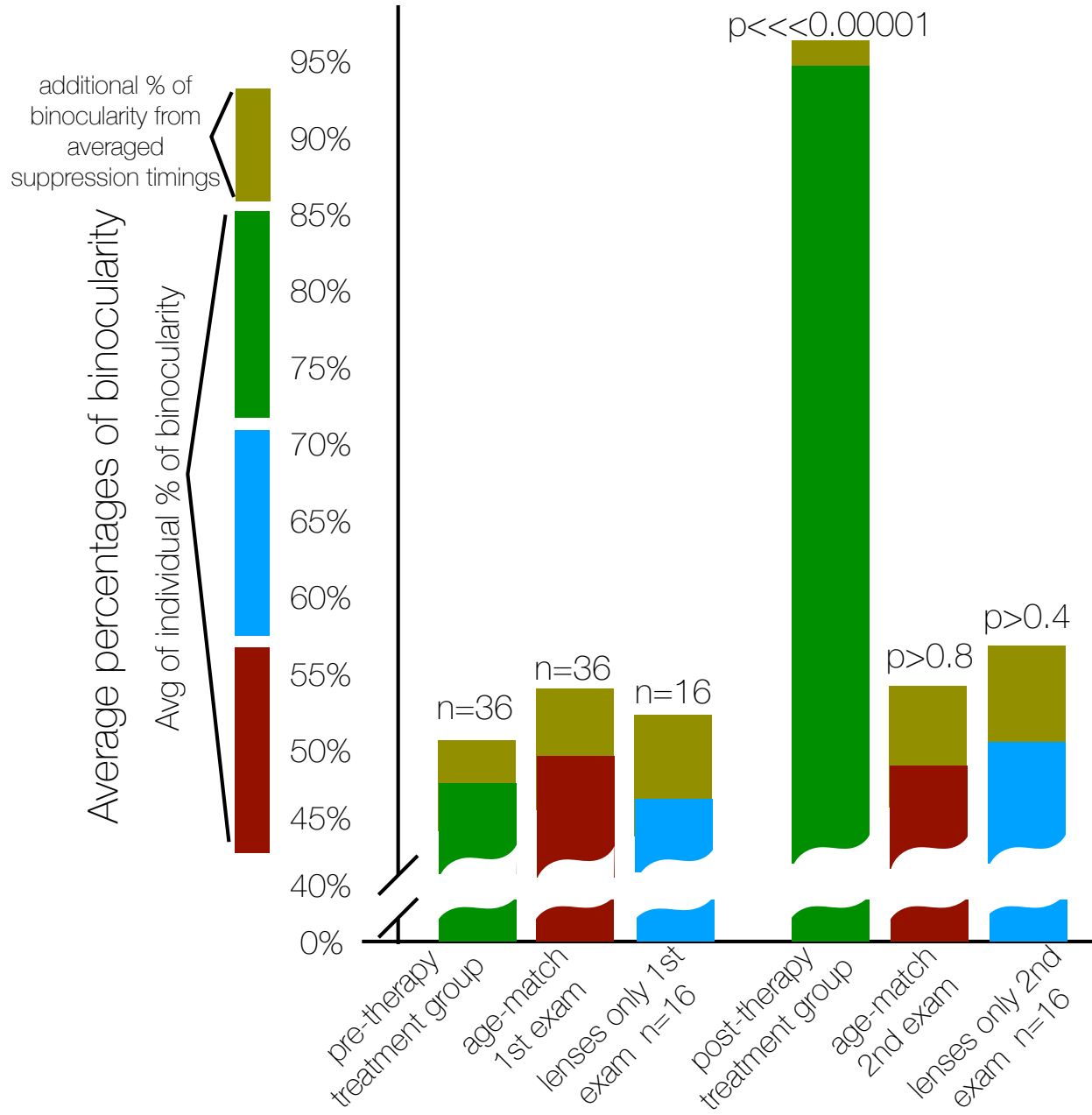
What I think we know





	Therapy Group	Non-Therapy Group
n/avg. age	36/ 9.5 ± 2.9 years	36/ 8.6 ± 2.5 years
% Binocularity 1	47.33 ± 19.5	49.16 ± 23
% Binocularity 2	94.59 ± 8.1	48.40 ± 23
Change in % Binocularity	+47.26	-0.76
change in Binocularity, paired T-test	p<<0.00001	p>0.8

	Therapy Group	Lens (No Therapy) Group
n/avg. age	36/ 9.5 ± 2.9 years	16/ 8.4 ± 3 years
% Binocularity 1	47.33 ± 19.5	46.49 ± 22
% Binocularity 2	94.59 ± 8.1	51.37 ± 22
Change in % Binocularity	+47.26	+4.88
change in Binocularity, paired T-test	p<<0.00001	p>0.45



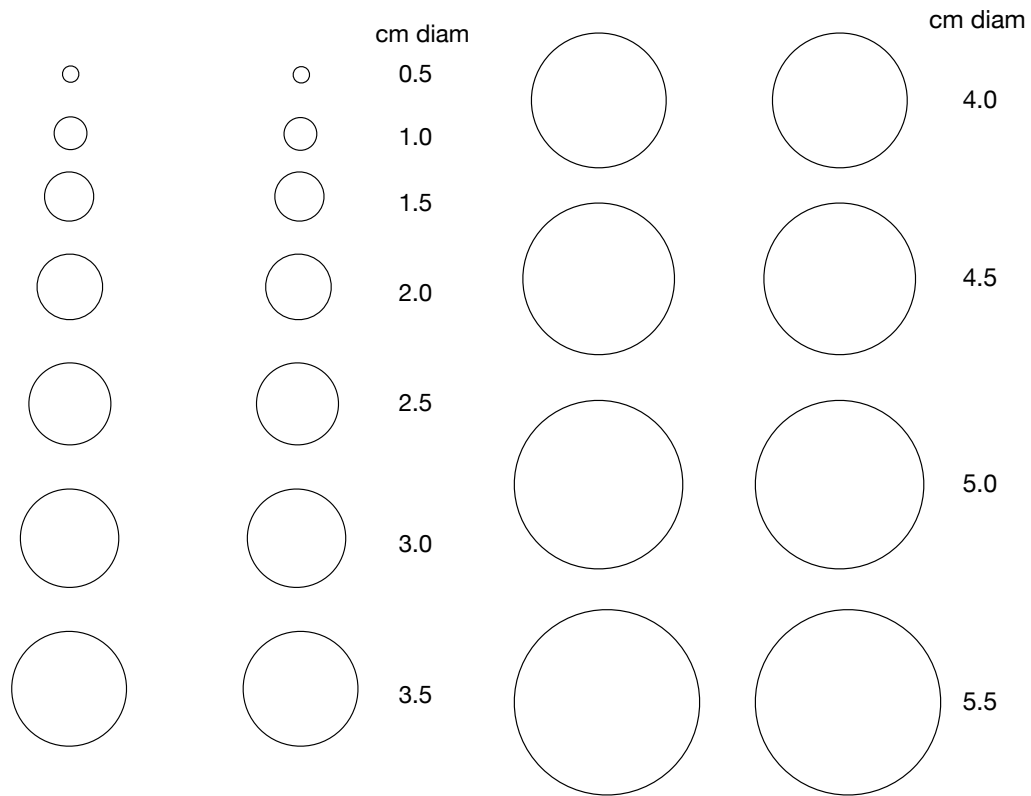
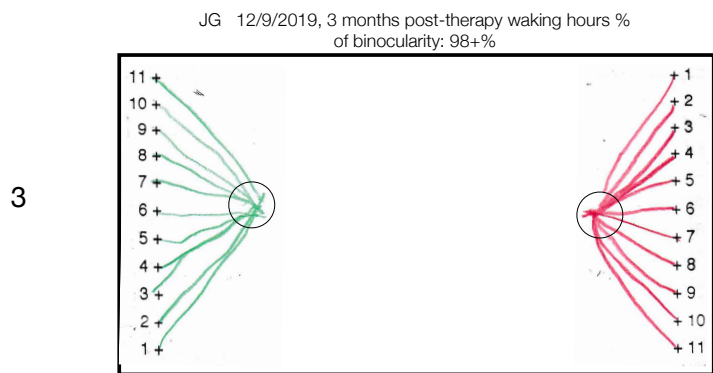
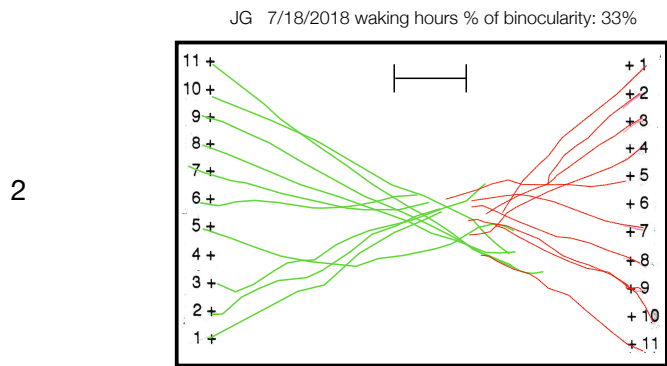
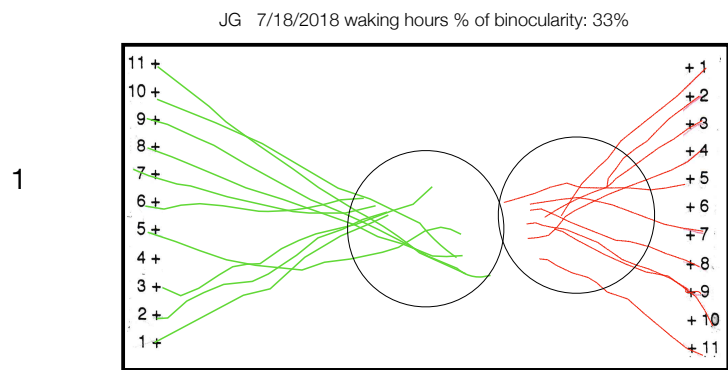
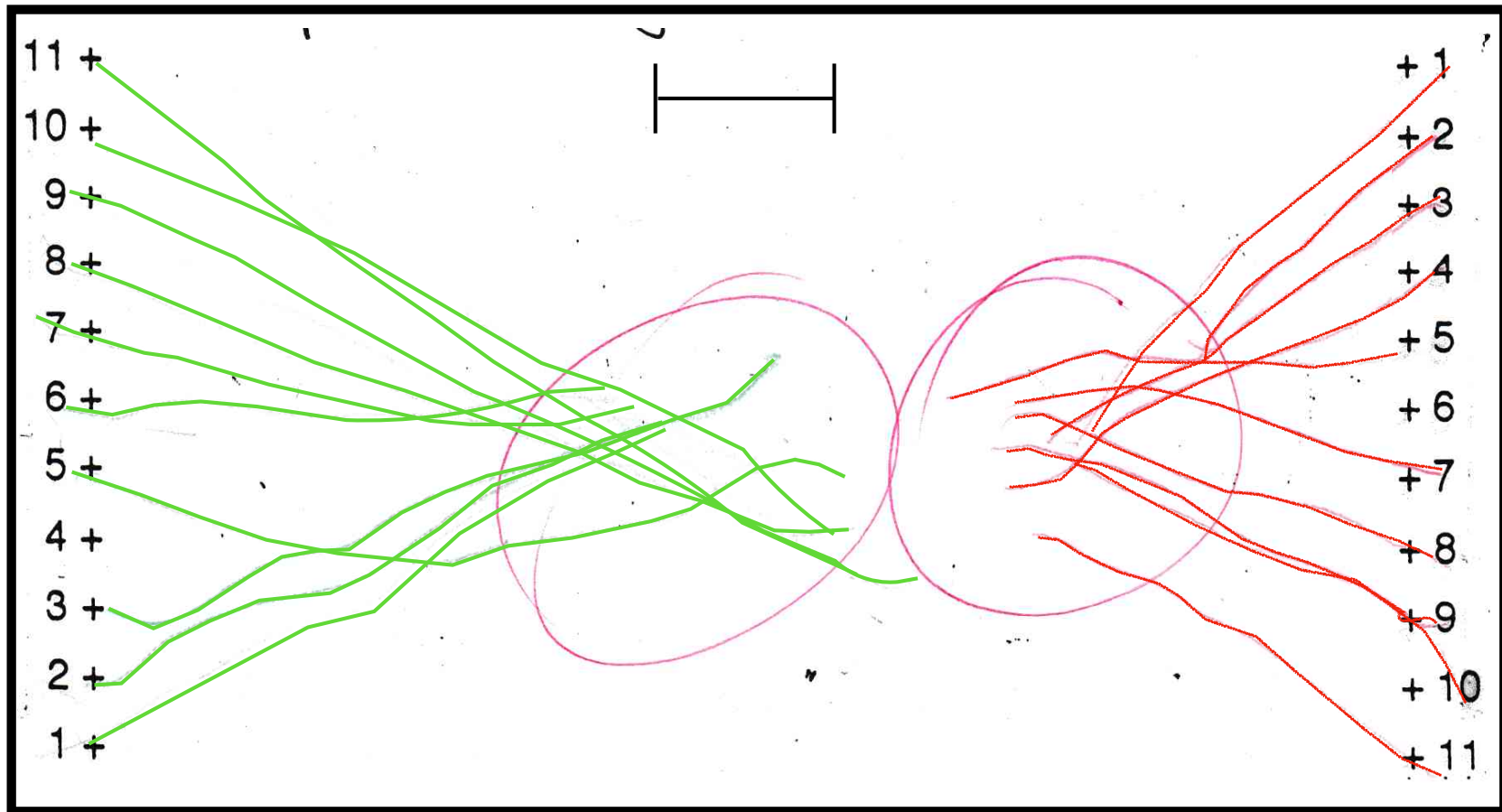
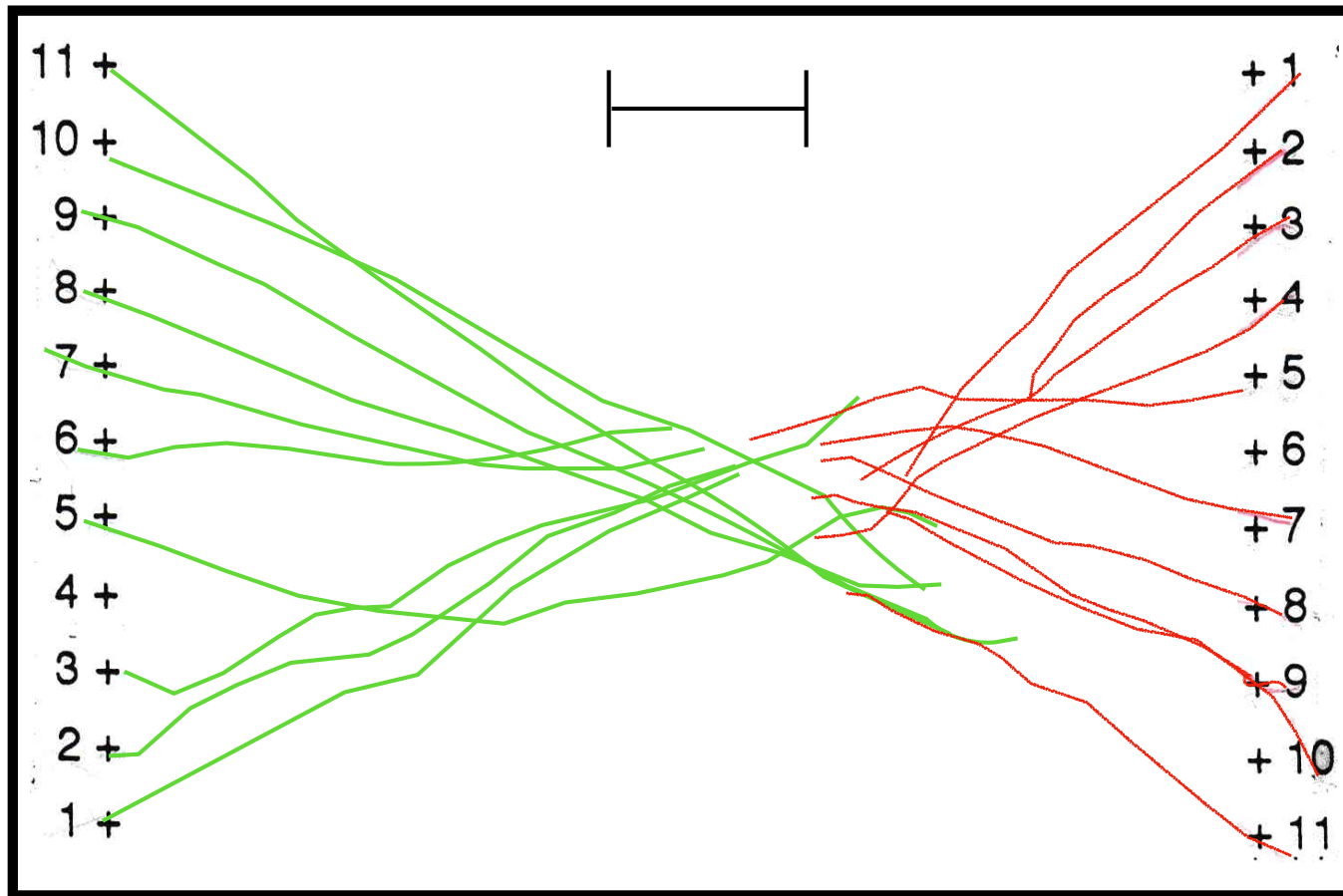


Figure 1 Circles printed on clear acetate used to measure apical scatter of VO stars

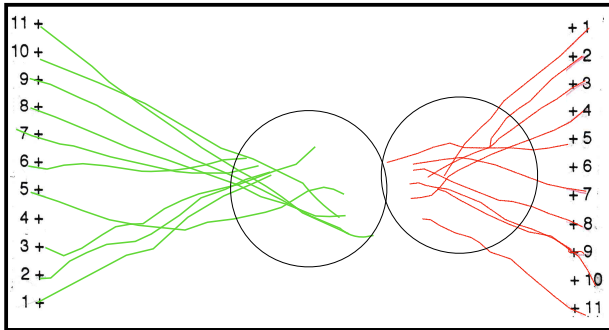
JG 7/18/2018 waking hours % of binocularity: 33%



JG 7/18/2018 waking hours % of binocularity: 33%



JG 7/18/2018 waking hours % of binocularity: 33%



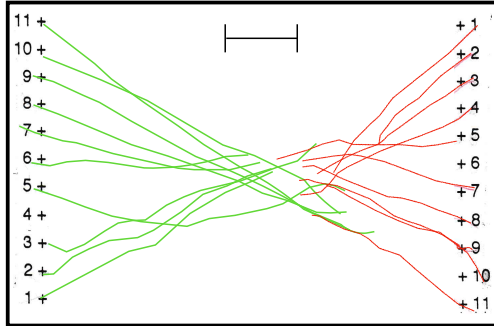
1

As binocularity increased through reduction of the ICS, both R & L spreads reduced by over a centimeter

$p \lll 0.0001$

right a little more than the left

JG 7/18/2018 waking hours % of binocularity: 33%



2

JG 12/9/2019, 3 months post-therapy waking hours % of binocularity: 98+%



3

"Em" 9 1/2 y.o.

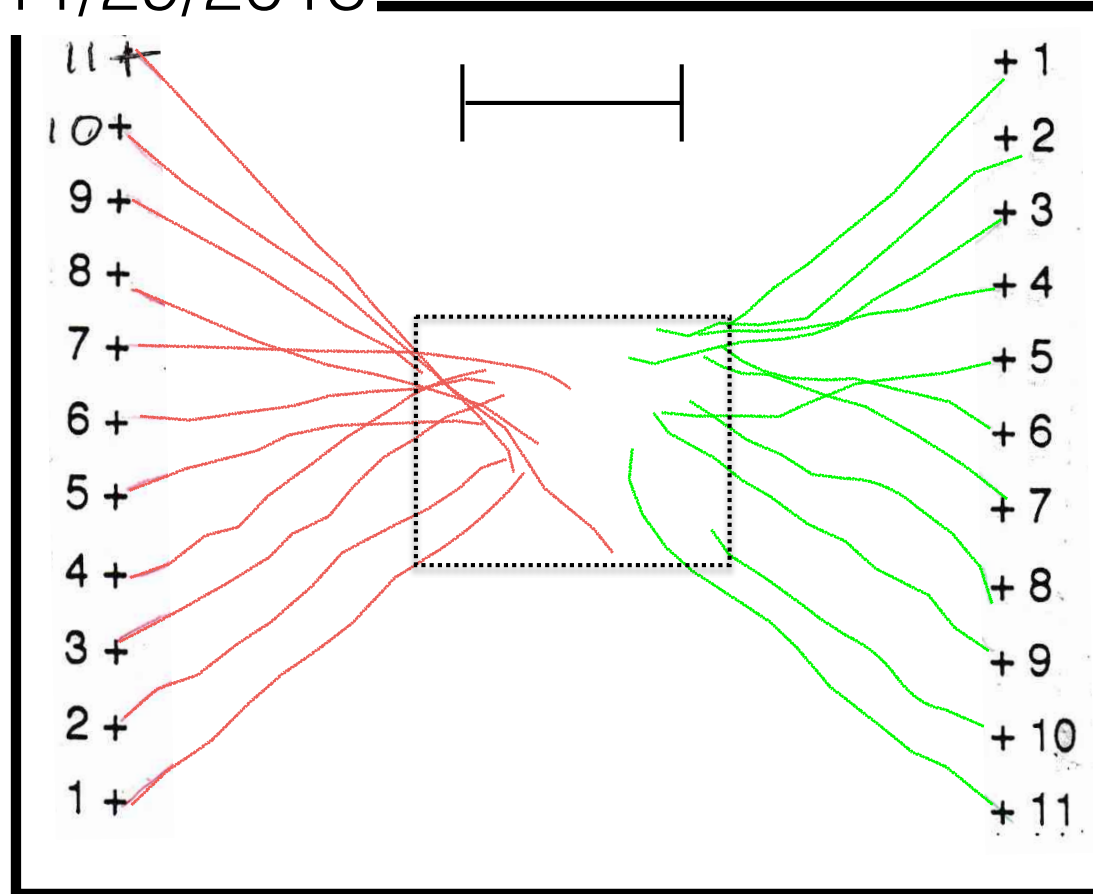
11/29/2018

L Pencil tip
disappeared



“Em” 9 1/2 y.o.

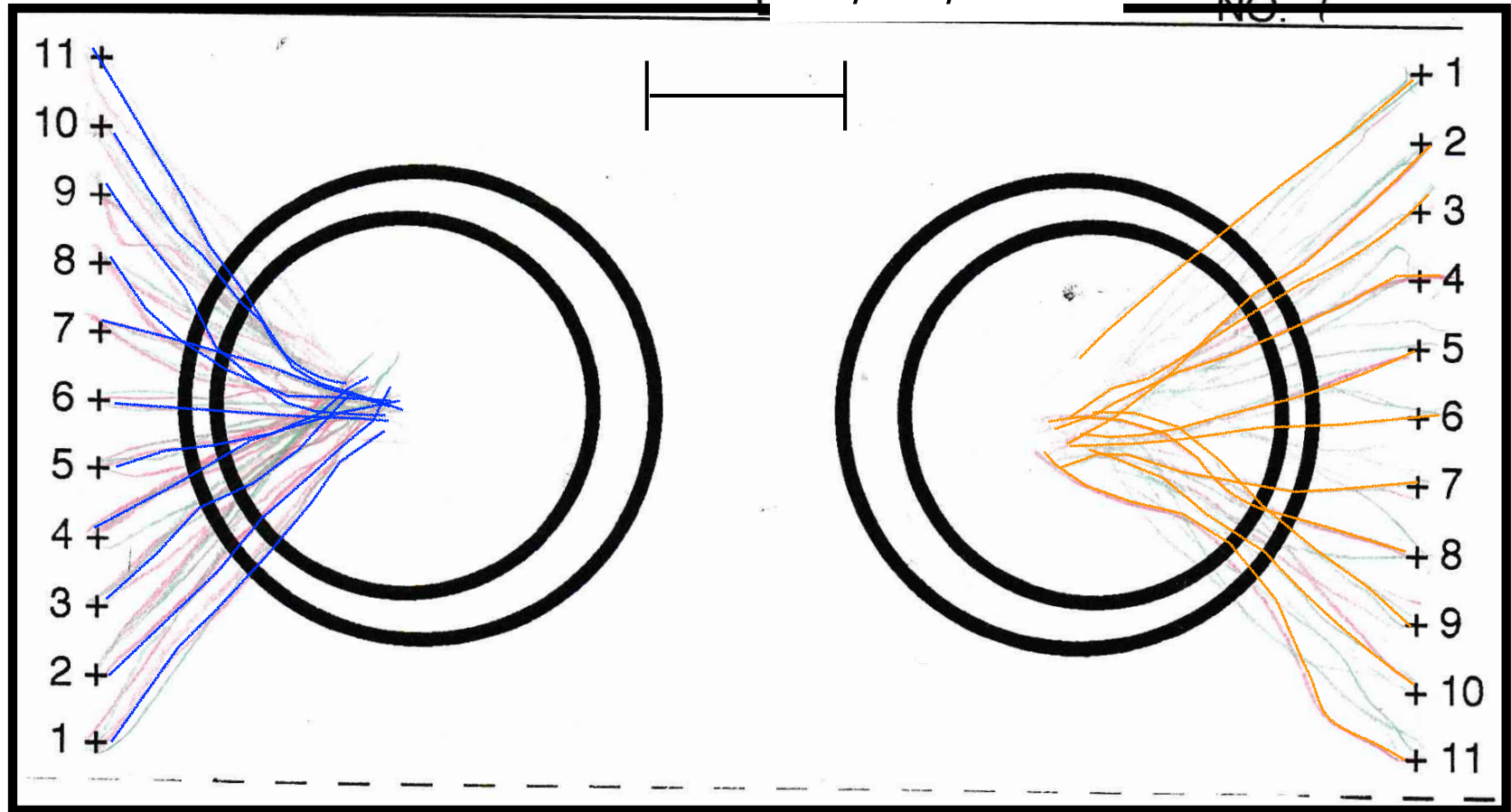
11/29/2018



“Em” 10 1/2 y.o.

10/16/2019

NO. 7



“Em” 10 1/2 y.o.

“Binocular” 89% of the time

“Em” 9 1/2 y.o.

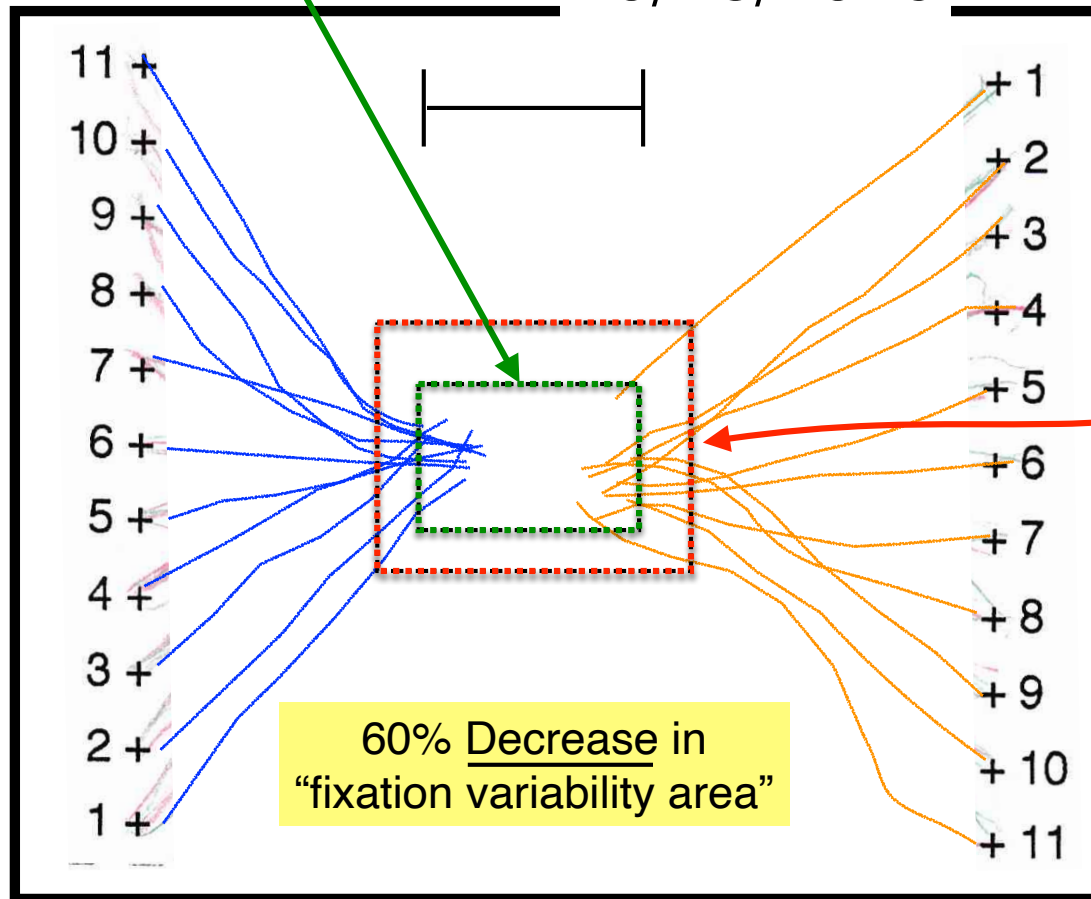
“Binocular” 25% of the time

10/16/2019

“Square Points”

152x120=18240

107x71=7597



Fixation is the necessary pause in saccadic motor activity during which visual information such as print on a page can be sent to the visual cortex.

Hussey, ES, OVP: “Who’s on First? Is it fixation that drives sensation? Or is it sensation that controls fixation?”