Номер на договора: 2011 - ERA - IP - 3

Education and Culture DG
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ЦЕНТЪР ЗА РАЗВИТИЕ НА ЧОВЕШКИТЕ РЕСУРСИ

New Bulgarian University

INTENSIVE PROGRAMME: SPECIAL ABILITIES AND TALENTS - PATTERNS OF COGNITIVE PROCESSES IN PEOPLE WITH DISABILITIES

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Effect of Distractors and Crowding on Attention Modulation in Adults with Dyslexia (AwDys)

Mr. Rizan Cassim
Dr. Liz Moores
Prof .Joel Talcott

Outline

- Introduction to Visual Attention
  - Processes involved
  - Previous Research
    - Inconsistency
    - Conflating factors
    - Questions of Interest
- My Research Work
    - 2010 Previously completed (article in Press)
    - 2011 On going…
- Overall Conclusions

"*What information consumes is rather obvious: it consumes the attention of its recipients. Hence, a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it*"

– Herbert Simon –

Introduction to Visual Attention (VA)

Processes involved

Signal Enhancement	**Noise Exclusion**
- early/late decisional level	- late decisional level
- amplifies the signal stimulus	- filtering mechanism
- low noise (‘distractions’)	- significant noise

Disruption to visual VA processes in C/AwDys have played an immense role in dyslexia.

Favouring Signal Enhancement (2002)

Journal of Vision (2002) 2, 467-479 http://journalofvision.org/2/6/4/ 467

Covert attention increases spatial resolution with or without masks: Support for signal enhancement

Marisa Carrasco Psychology & Center for Neural Science, New York University, New York, NY, USA

Patrick E. Williams Center for Neural Science, New York University, New York, NY, USA

Yaffa Yeshurun Psychology, University of Haifa, Haifa, Israel

Favouring Noise Exclusion (2005)

Deficits in perceptual noise exclusion in developmental dyslexia

Anne J Sperling[1], Zhong-Lin Lu[2], Franklin R Manis[2] & Mark S Seidenberg[3]

VOLUME 8 | NUMBER 7 | JULY 2005 NATURE NEUROSCIENCE

Favouring Noise Exclusion (2007)

doi:10.1093/brain/awl353 *Brain* (2007), 1 of 15

Impaired filtering of behaviourally irrelevant visual information in dyslexia

Neil W. Roach[1,2] and John H. Hogben[2]

[1]Visual Neuroscience Group, School of Psychology, The University of Nottingham, Nottingham, UK and [2]School of Psychology, The University of Western Australia, Perth, Australia

Correspondence to: N. W. Roach, Visual Neuroscience Group, School of Psychology, The University of Nottingham, University Park, Nottingham NG7 2RD, UK
E-mail: nwr@psychology.nottingham.ac.uk

Favouring Noise Exclusion (2008)

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect
Vision Research 48 (2008) 193–207

Vision Research
www.elsevier.com/locate/visres

Spatial cueing deficits in dyslexia reflect generalised difficulties with attentional selection

Neil W. Roach [a,b,*], John H. Hogben [b]

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Received 25 May 2007; received in revised form 18 October 2007

Against Noise Exclusion (2011)

Magnocellular Deficits in Dyslexia Provide Evidence Against Noise Exclusion Hypothesis

Teri Lawton [1] and
Garrison Cottrell [2]

Current Issue
Volume 11, Number 12, 2011

Well well well?!?!?!

Deficits in Dyslexia: Barking up the Wrong Tree?

Elisabeth Moores*

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Are there any conflating factors?

- Roach and Hogben (2004, 2007 and 2008)
- Psychophysical study - Tilt discrimination threshold (TDT) of a target stimulus in a visual search paradigm.
- They used: (a) pre-cues to infer attention (i.e. early SE & late NE).

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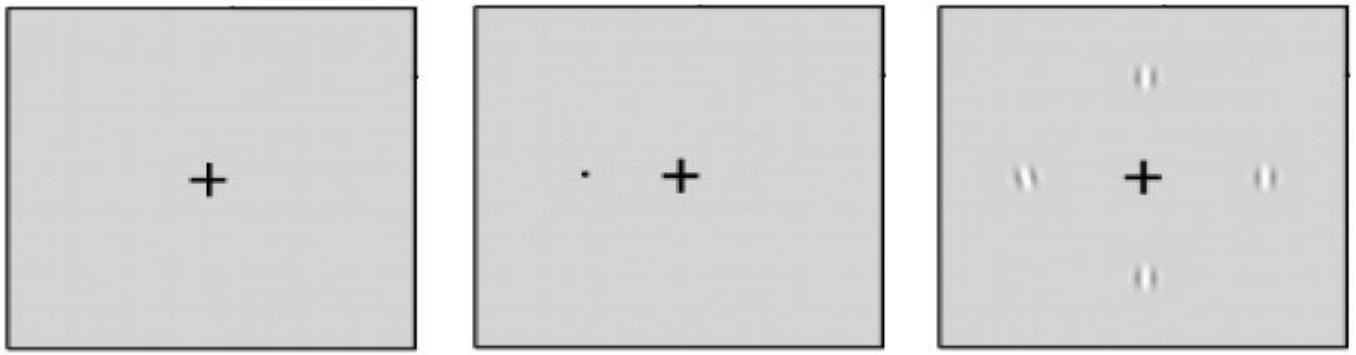
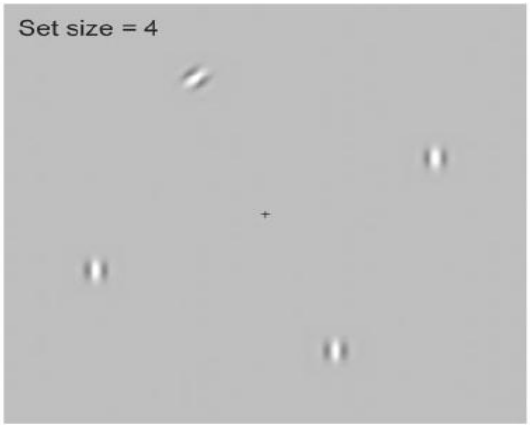
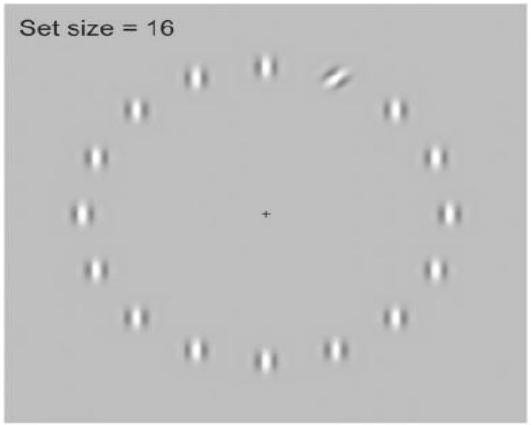


Are there any conflating factors?

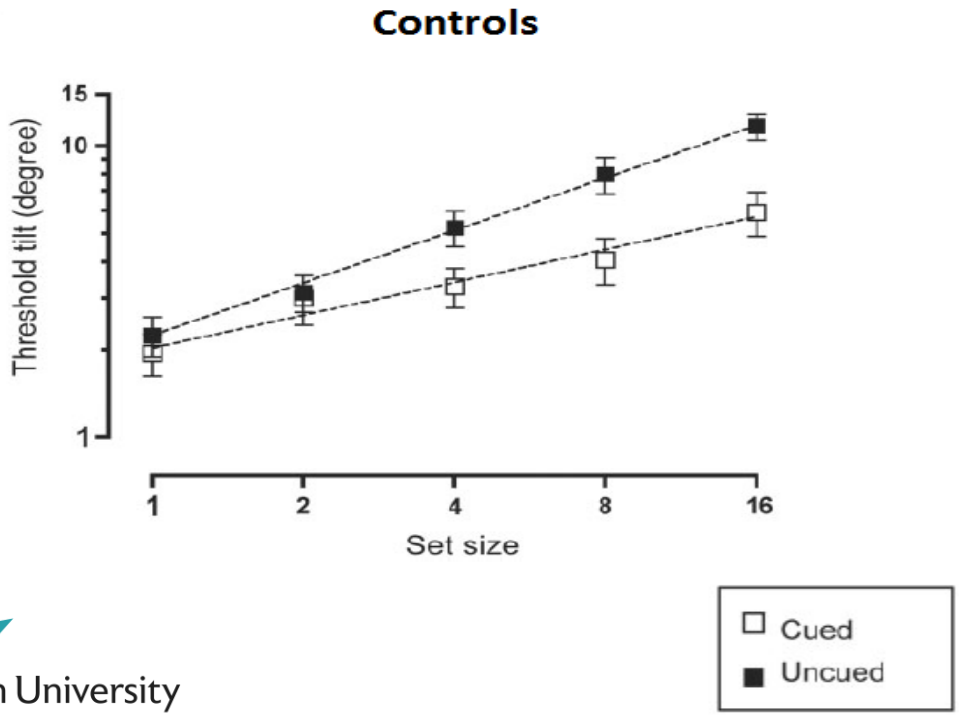
- Roach and Hogben (2004, 2007 and 2008)
- Psychophysical study - Tilt discrimination threshold (TDT) of a target stimulus in a visual search cueing paradigm.
- They used: (a) pre-cues to infer attention (i.e. early SE & late NE).
  (b) different set sizes (0,1,2,4,8 and 16)





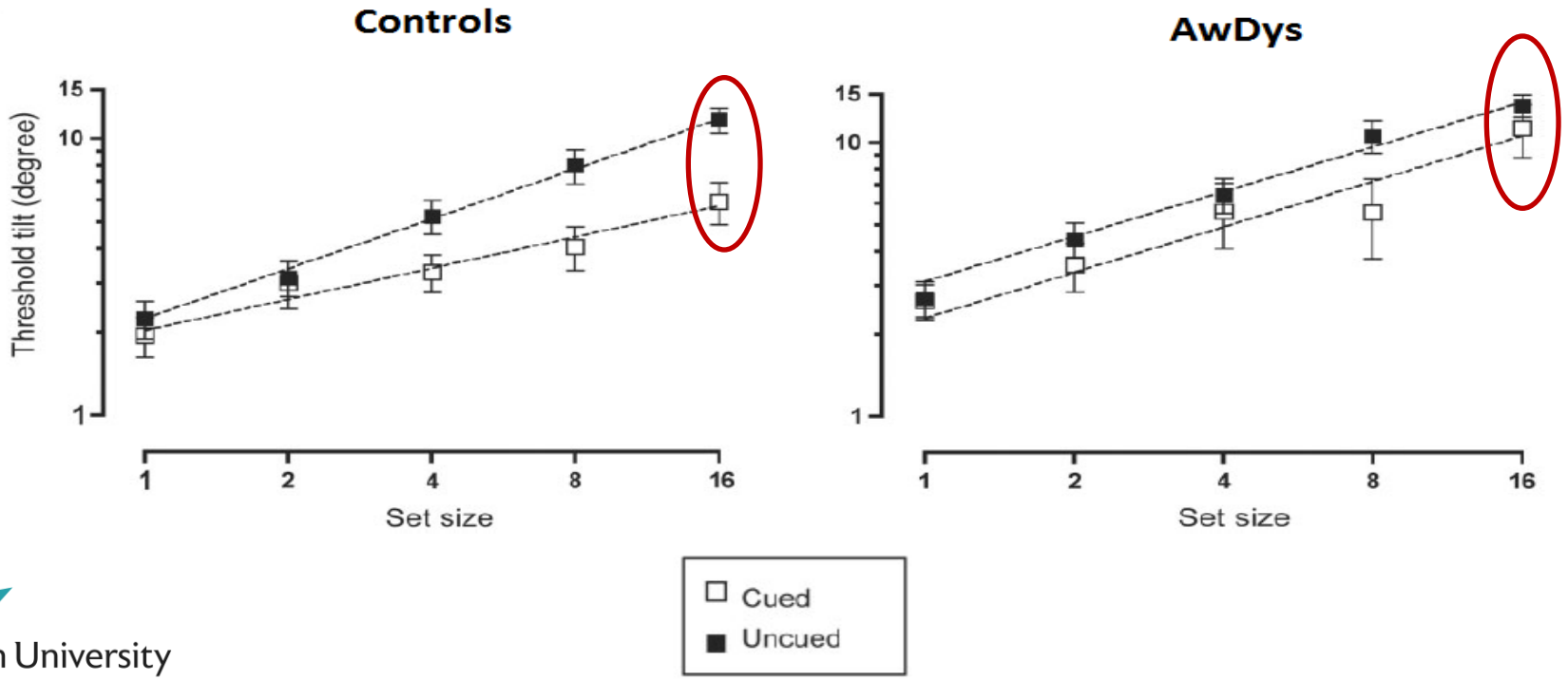
Are there any conflating factors?...contd

- They found:
  (a) In **controls**, when un-cued, TDT increased sharply as more distractors were added. Cueing the location of the target dramatically reduced the detrimental effect of the distractors.

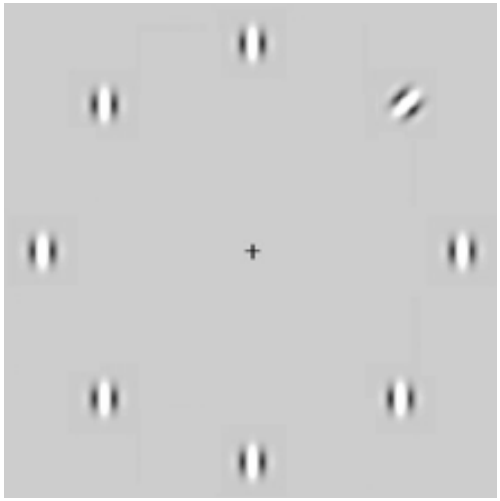


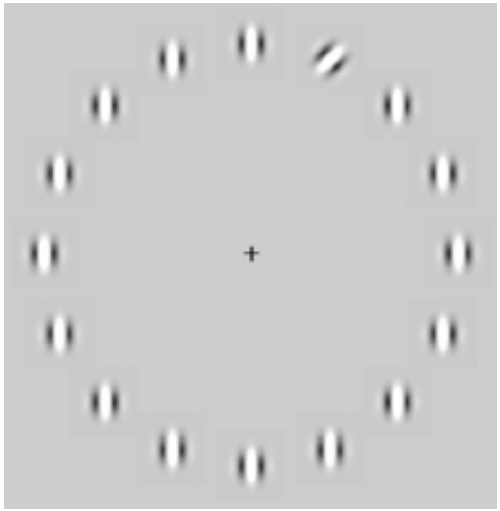
Are there any conflating factors?...contd

- They found:
  (a) In **AwDys**, when un-cued, performance was in no way different from controls. Cueing the location of the target produced no effect on performance.



Are there any conflating factors?...contd





Large Set size (16)

= largest cueing benefits (controls)
= stimuli positioned closest

= ⬆ set size = ‘crowding effect’

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Are there any conflating factors?...contd

Vision Research xxx (2011) xxx–xxx

Contents lists available at ScienceDirect

Vision Research

journal homepage: www.elsevier.com/locate/visres

Crowding in a detection task: External noise triggers change in processing strategy

Rémy Allard*, Patrick Cavanagh

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Solution: One unified test that can take into all the possibilities

Research Questions

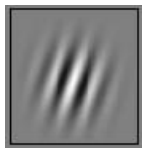
- Using simple stimuli, to study if AwDys:

1. are affected by crowding?
2. are able to successfully use cues to probe any deficit with VA processes (NE & SE)?
3. are able to allocate sufficient attention to overcome a set size effect (with crowding effects intact)?
4. and the above effects of crowding, cue use & set size effects correlate with measures of literacy?

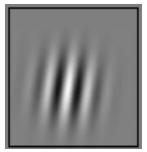
Design: 2010 study

Trial sequence:

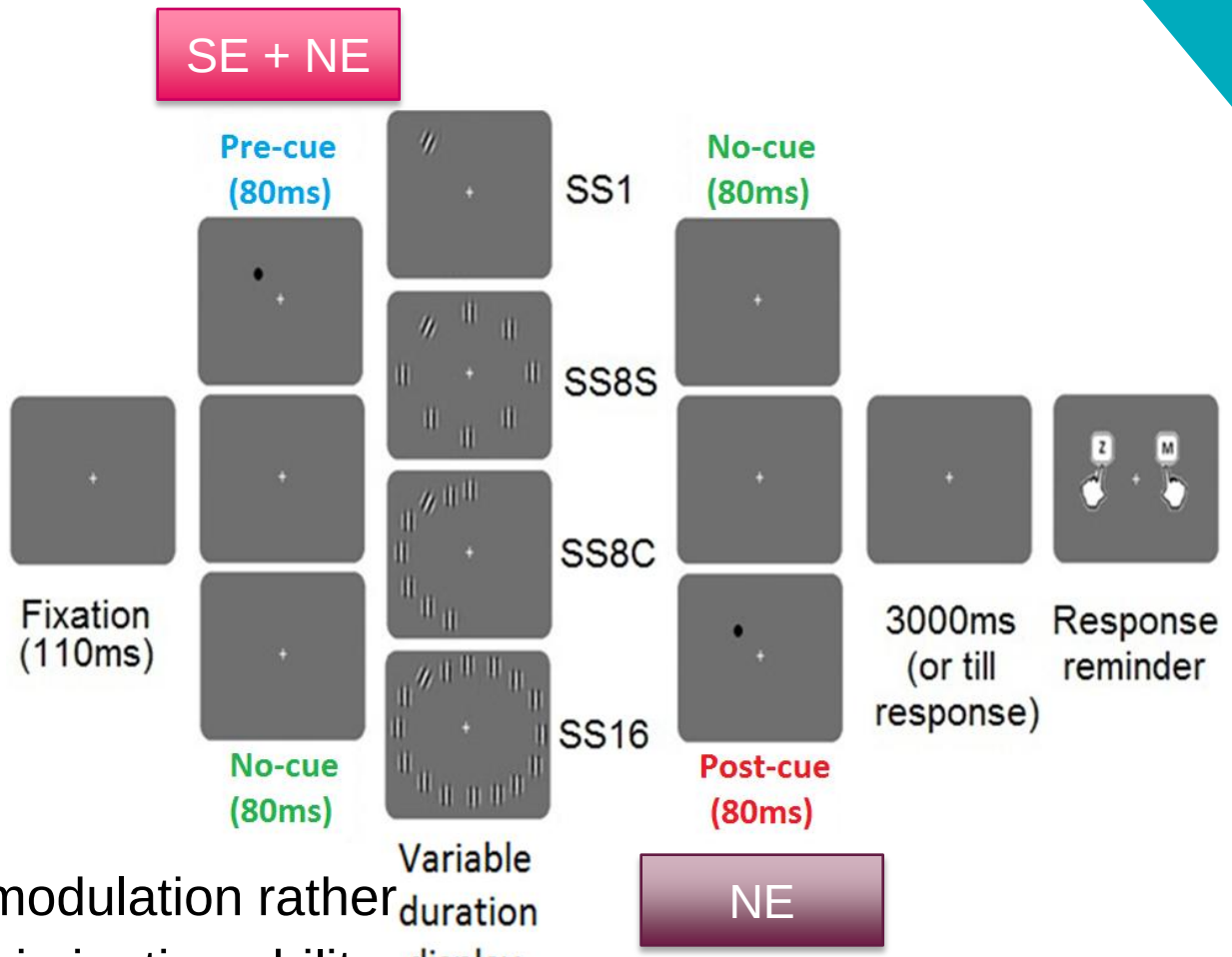
- 4 set sizes
- 3 cue types
- 2 difficulty levels



Easy (5°)

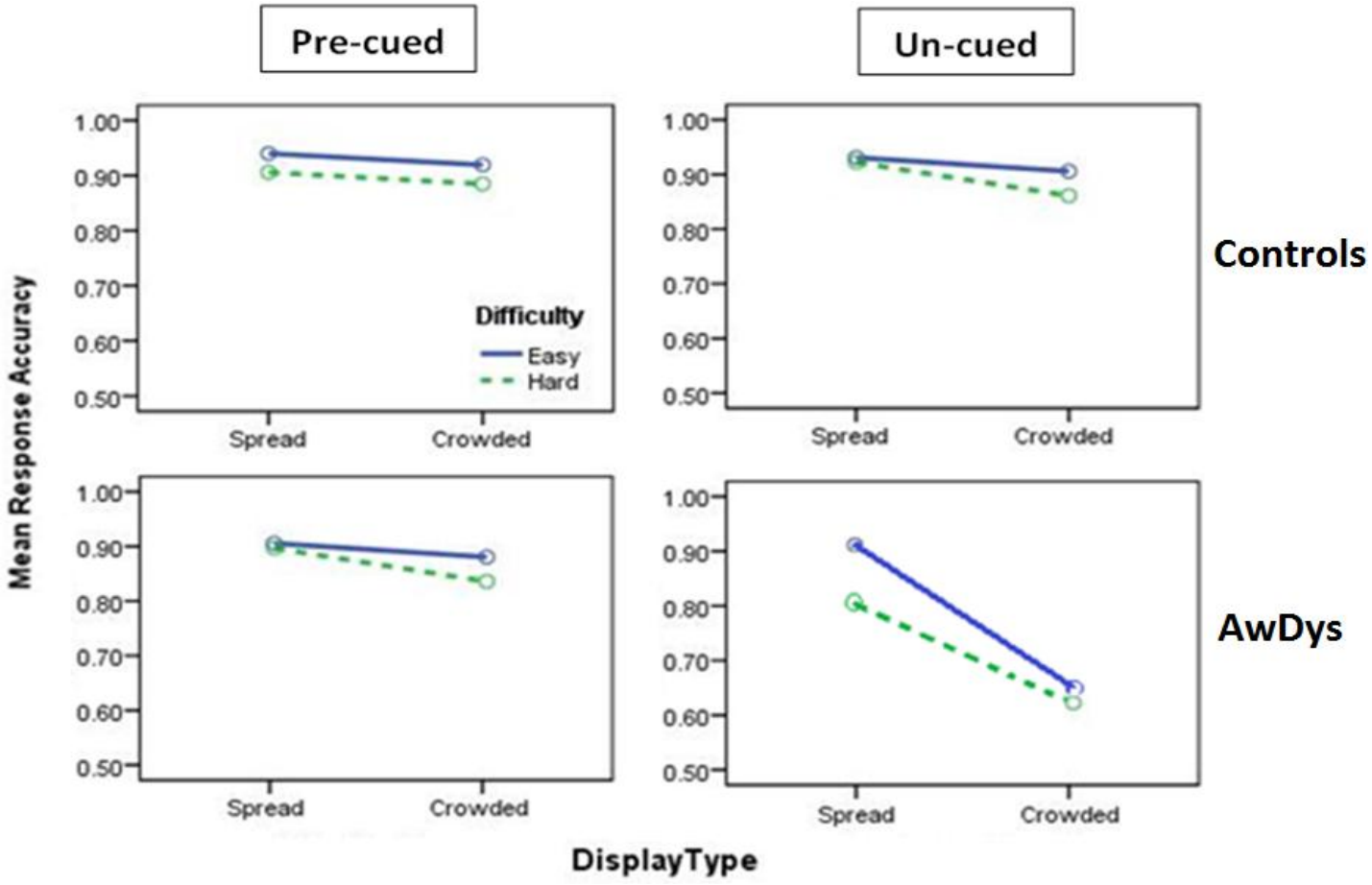


Hard (2°)



*Attention modulation rather than discrimination ability.

Outcome 1. Crowding effects



AwDys showed strong effects of crowding which were eliminated by pre-cueing.

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Outcome 1. Crowding effects (Support)

Journal of Vision (2010) 10(10):16, 1–12 http://www.journalofvision.org/content/10/10/16

Precueing attention to the target location diminishes crowding

Yaffa Yeshurun

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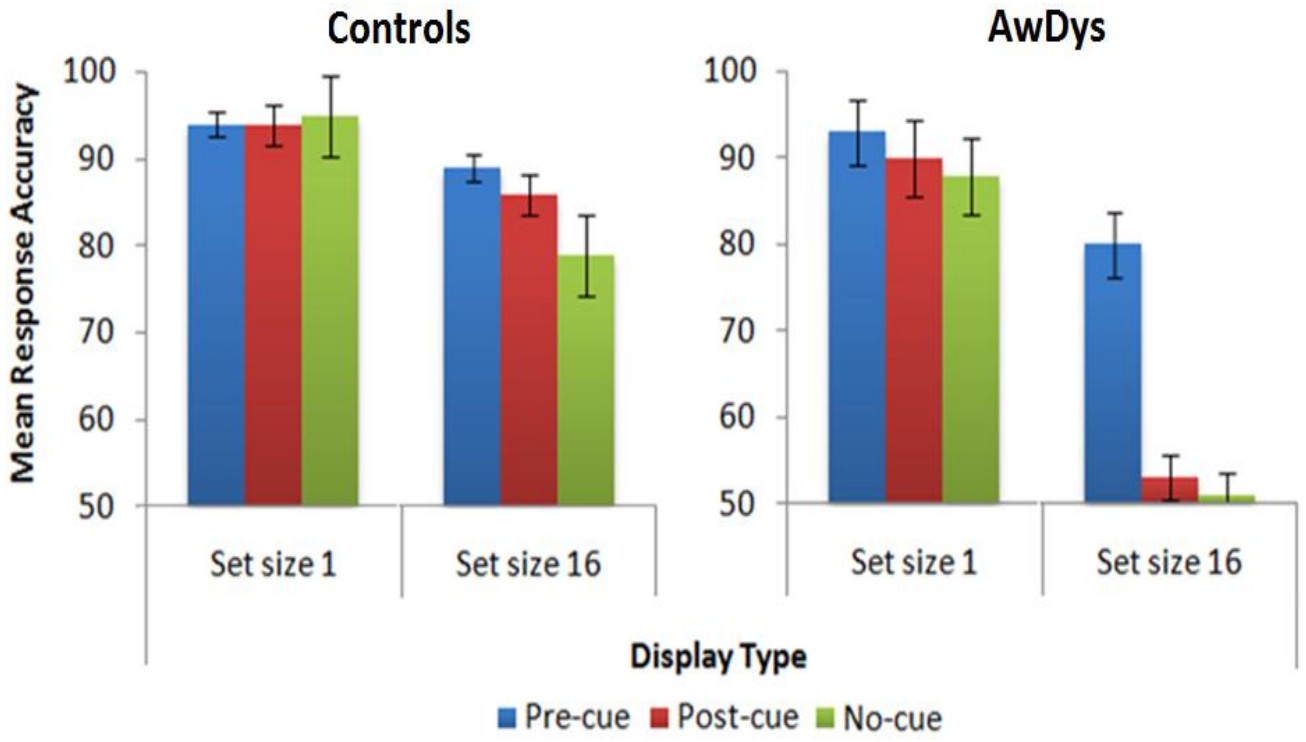
Einat Rashal

Department of Psychology and Institute of Information Processing and Decision Making, University of Haifa, Haifa, Israel

Outcome 2. Cueing effects



AwDys are able to use the pre-cues to good effect (to exclude noise & enhance the signal at an early stage) unlike post-cues (inability to exclude noise at a 'late' decisional stage).

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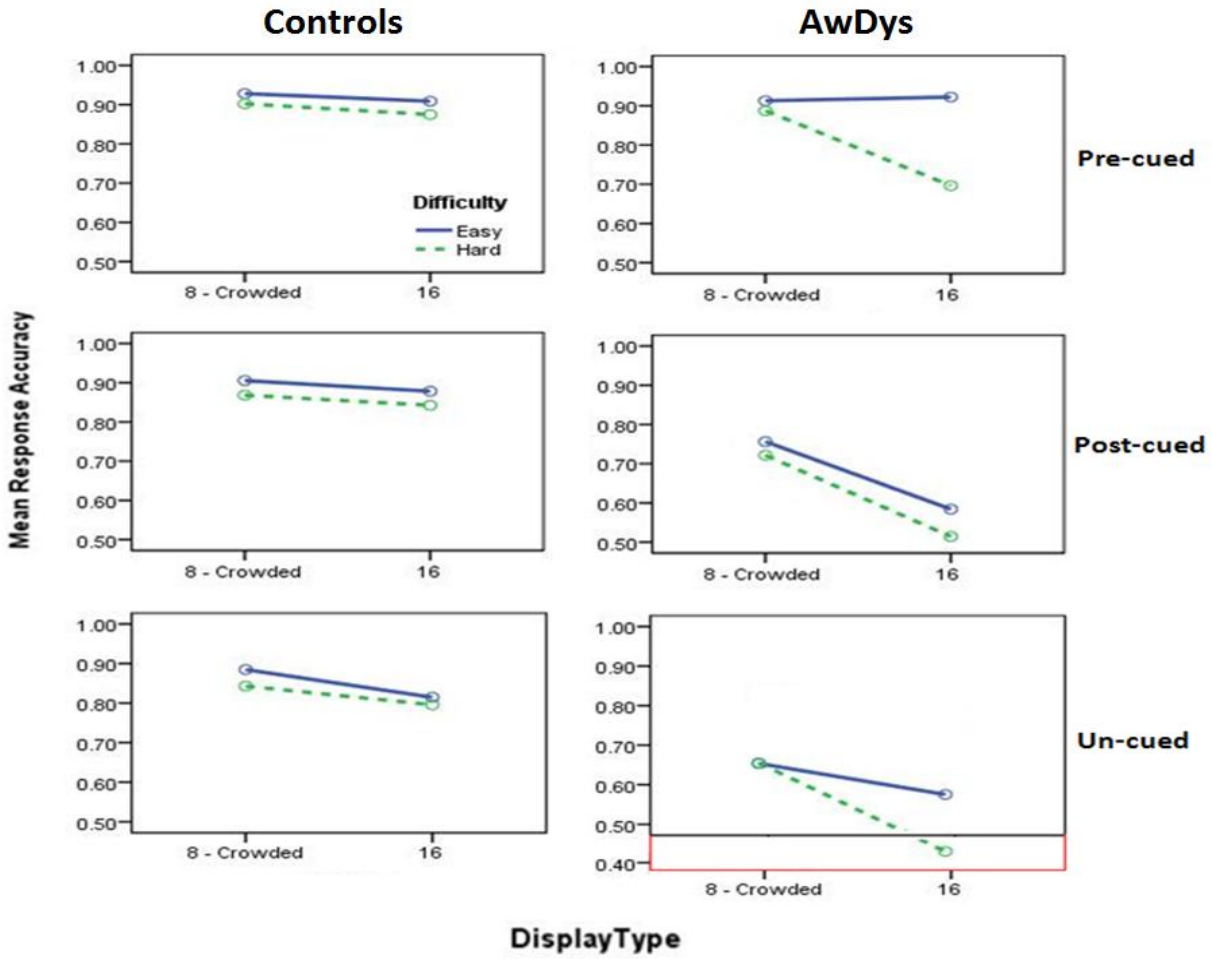
Outcome 3. Attention allocation & set size effects



AwDys did not gain the same cueing benefit that normal readers did.

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Outcome 4: Relationship of effects to literacy

Variable	Control		AwDys		Sig. (2-tailed) p - value
	Mean	SD	Mean	SD	
Age	25.8	6.6	25.8	7.4	NS
Spelling	118.3	4.3	102.3	11.3	< .001
Reading	111.7	4.4	97.7	7.6	< .001
IQ	125.0	9.3	118.5	11.2	NS

	Spelling	Reading
Spacing	– 0.64**	– 0.68**
Set size	– 0.52**	– 0.46*

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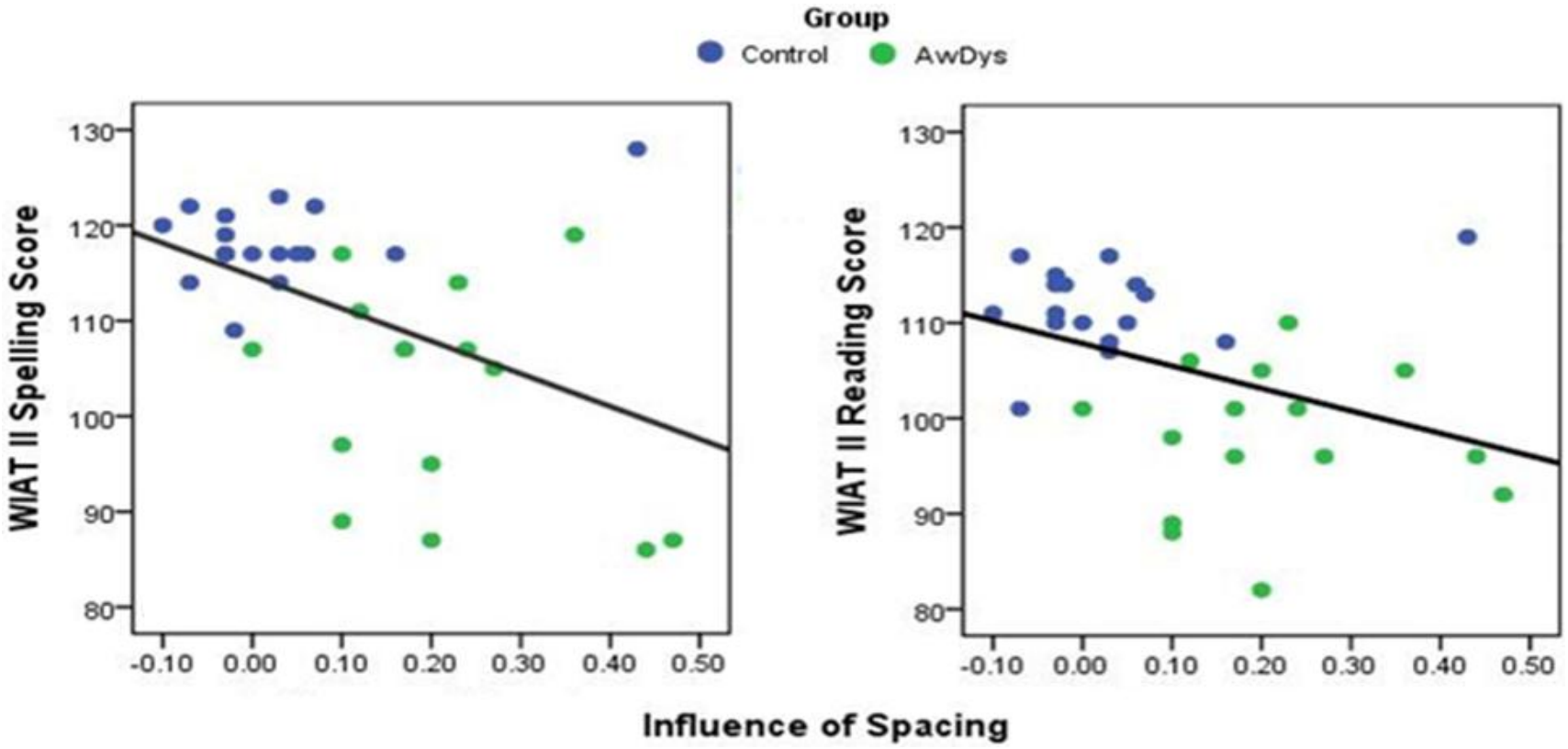
Outcome 4: Relationship of effects to literacy



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Are AwDys able to actually see/identify the target efficiently when not cued?

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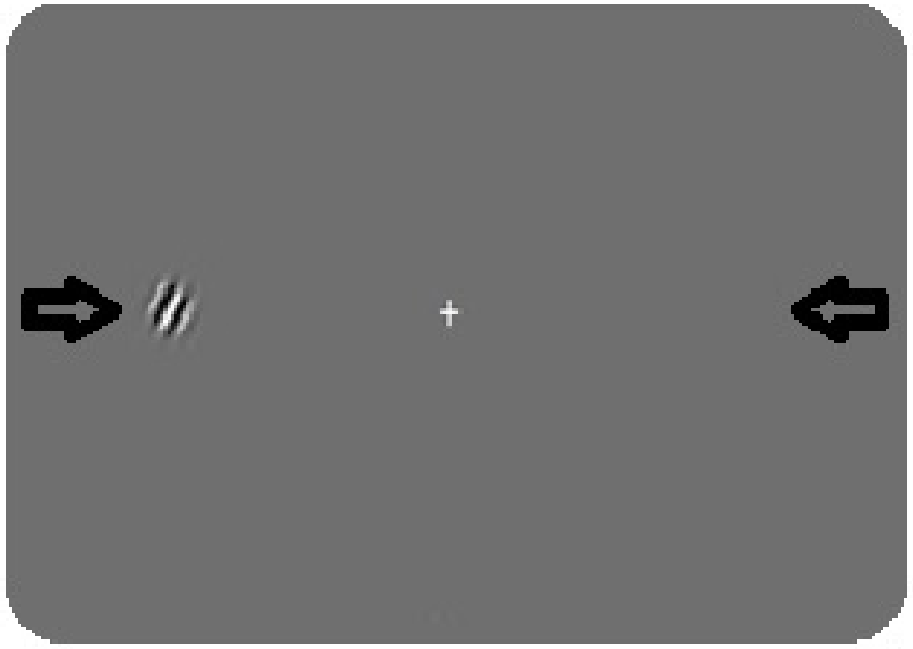
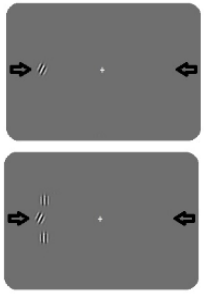
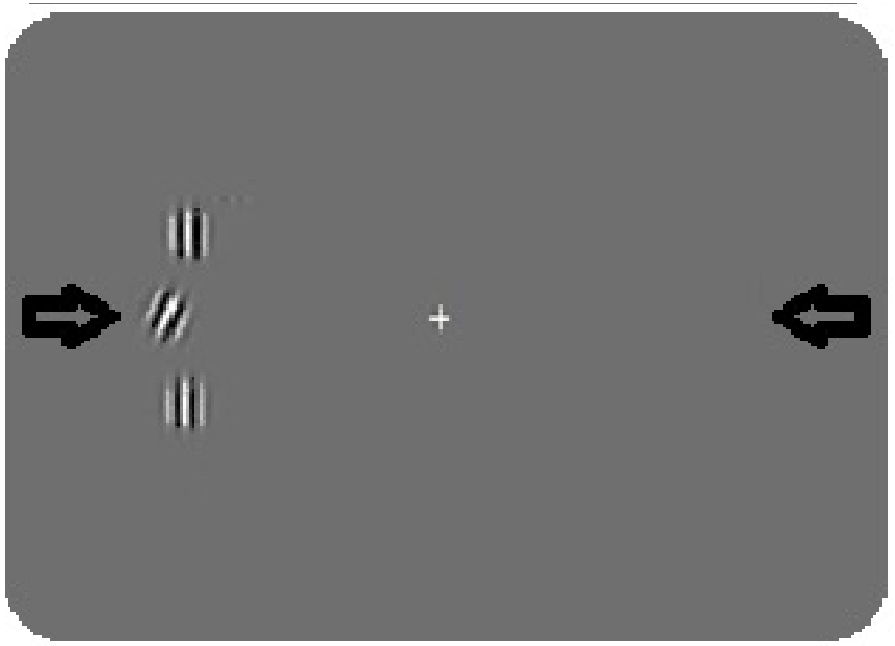
Design: 2011 study



Set size 1

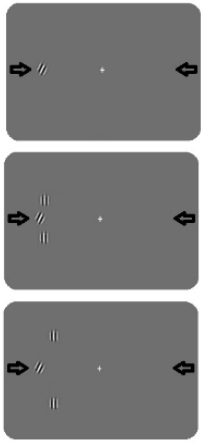
Design: 2011 study

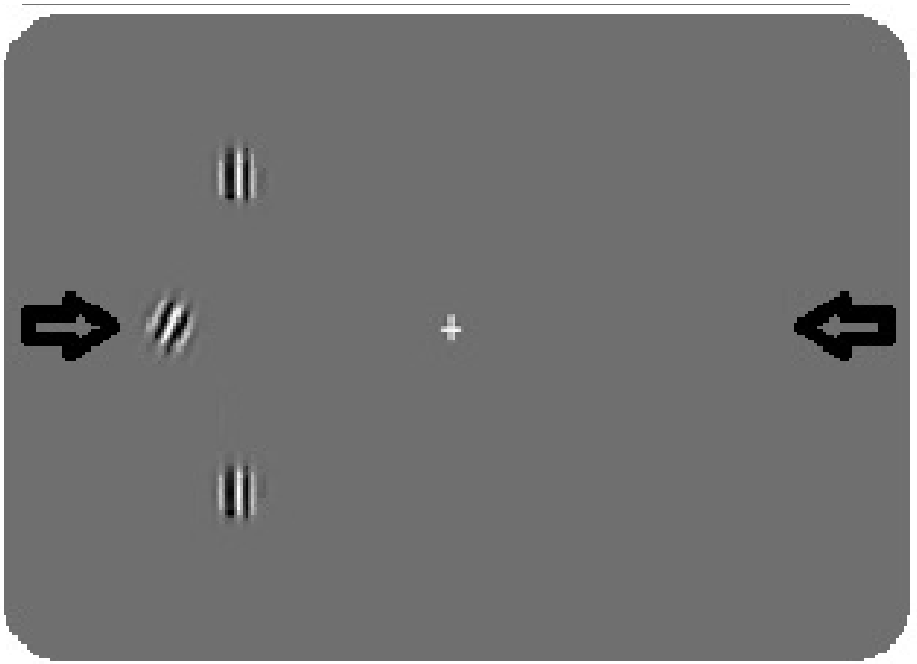




Set size 2 crowded

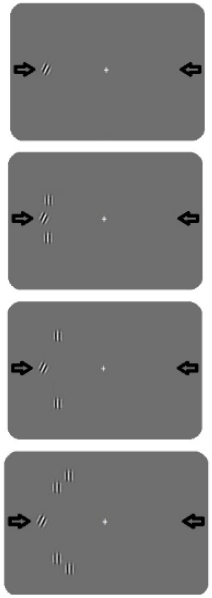
Design: 2011 study

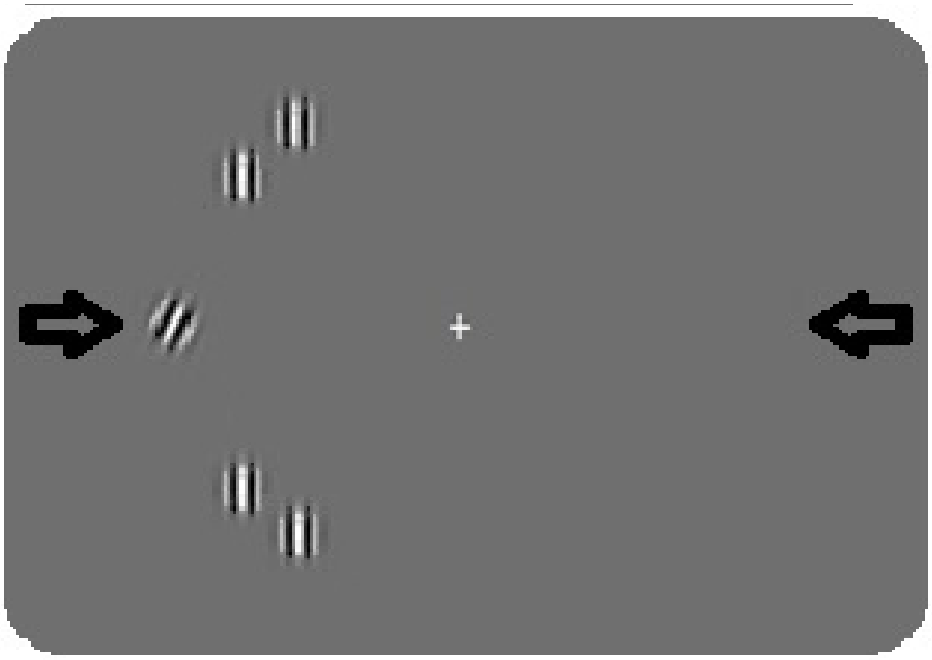




Set size 2 spread

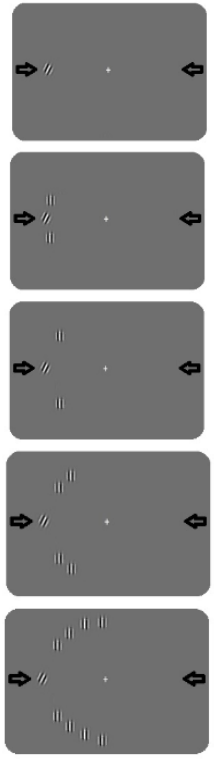
Design: 2011 study

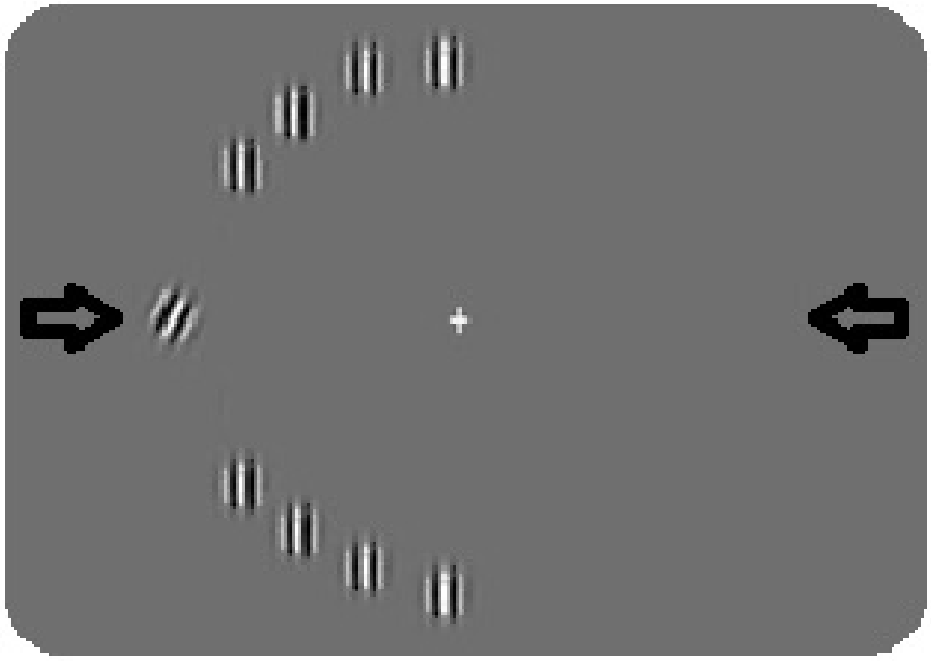




Set size 4

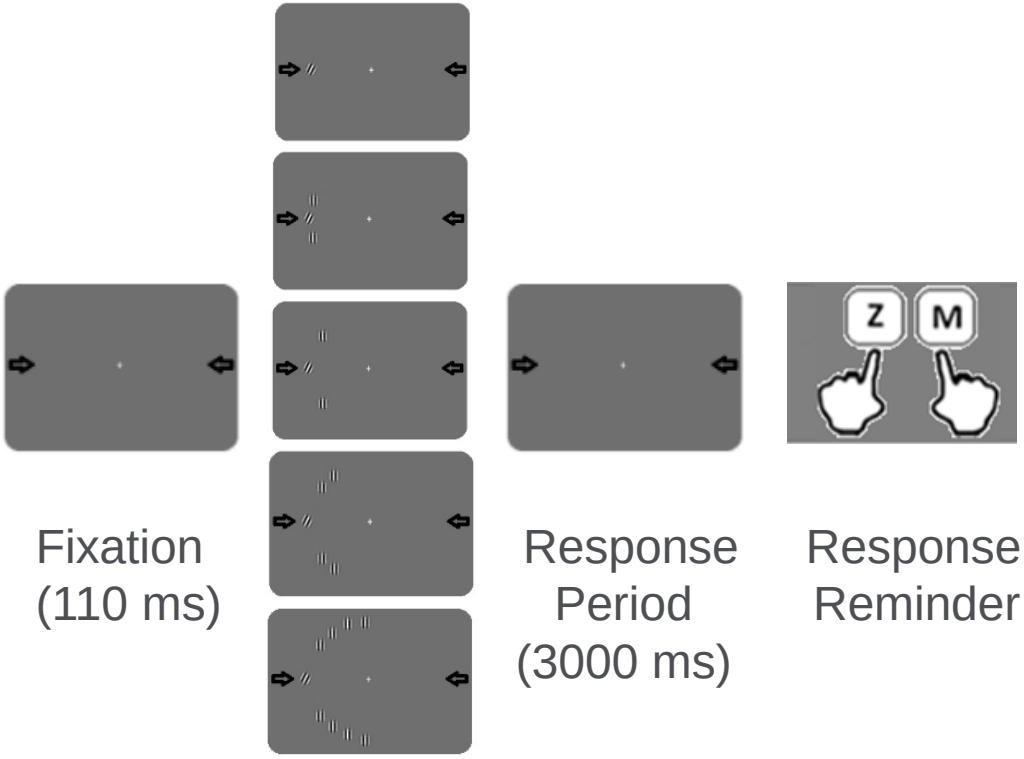
Design: 2011 study





Set size 8

Design: 2011 study



Fixation (110 ms)

Variable Duration Display

Response Period (3000 ms)

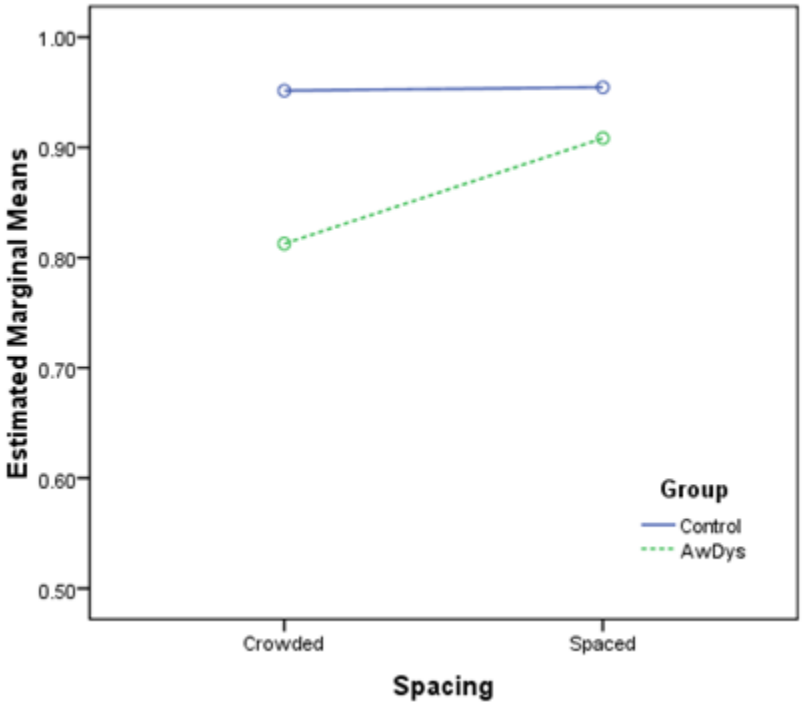
Response Reminder

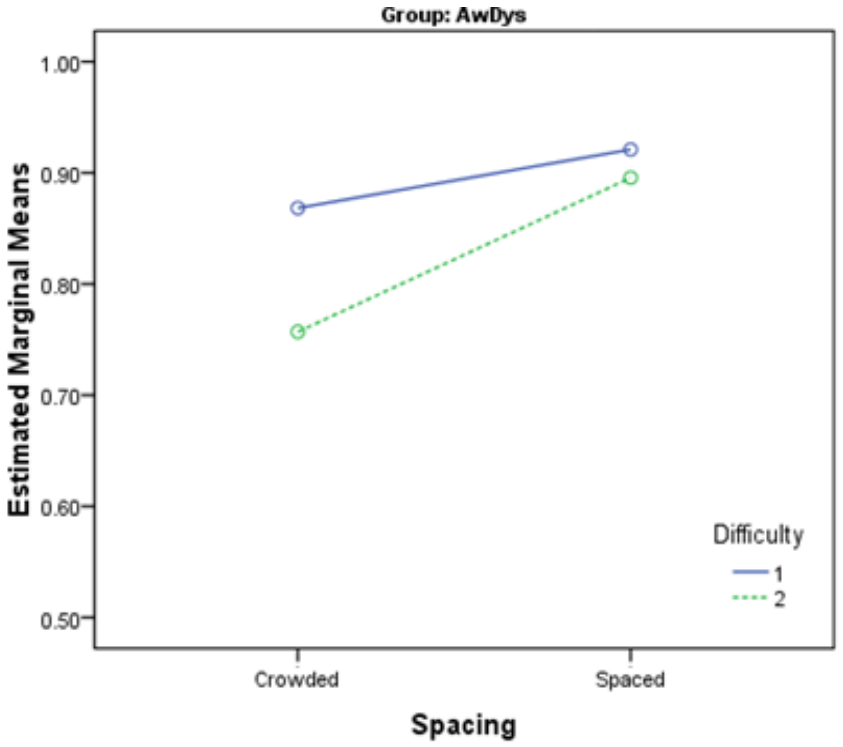
Results: 2011 study

	Control (n = 15)		AwDys (n = 15)		p-value
	Mean	SD	Mean	SD	
Age (years)	26.9	5.8	25.8	4.9	N.S
Handedness	0.8	0.4	0.8	0.4	N.S
Reading (WIAT-II)	108.9	6.6	99.5	7.1	< 0.001
Spelling (WIAT-II)	114.5	9.1	101.1	8.0	< 0.001
TOWRE (Real)	100.8	3.1	94.3	5.3	< 0.001
TOWRE (Nonsense)	61.5	1.2	53.3	1.6	< 0.001
IQ	124.6	6.5	120.3	7.5	N.S

Means and Standard Deviations of Demographic Group Characteristics. The composite standard scores (SS) predicted from IQ tests fell in range with the mean (M_{ss} = 100 and SD_{ss} = 15). N.S represents non-significant results.

Results: 2011 study - Spacing





$F(1,14) = 28.7$, $p < 0.001$ [$Eta^2 = 0.67$]

$F(1,14) = 23.9$, $p < 0.001$ [$Eta^2 = 0.63$]

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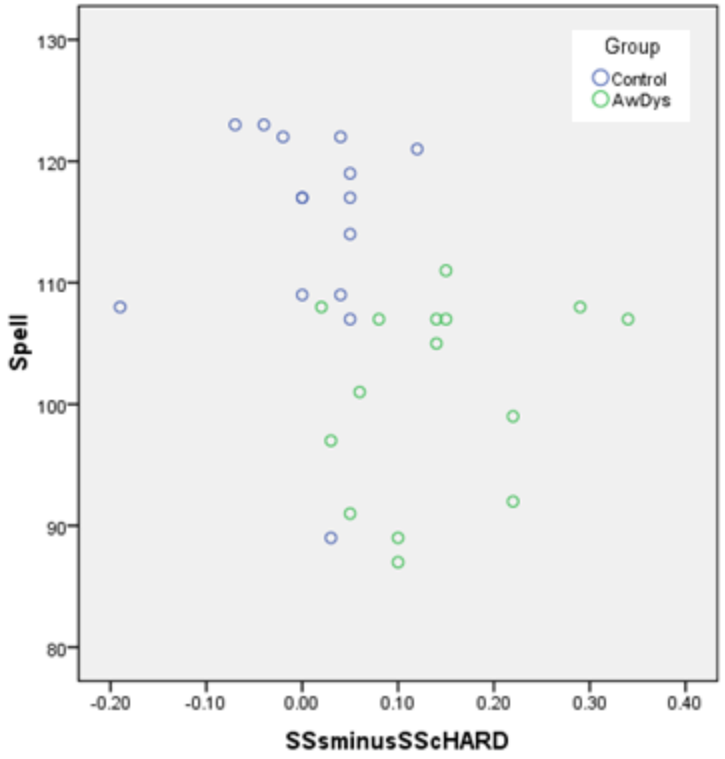
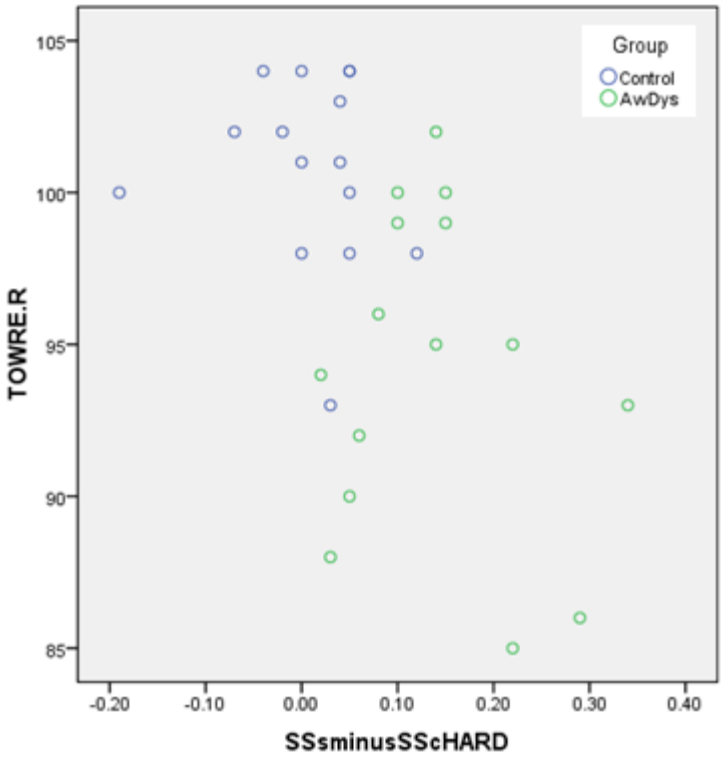
Results: 2011 study – Spacing with Literacy





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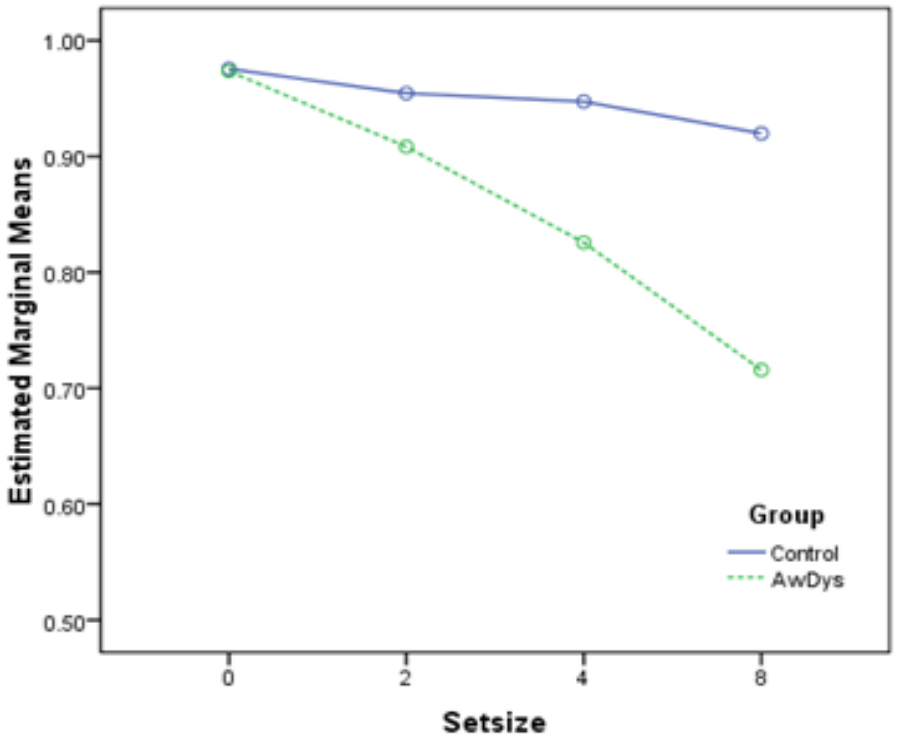
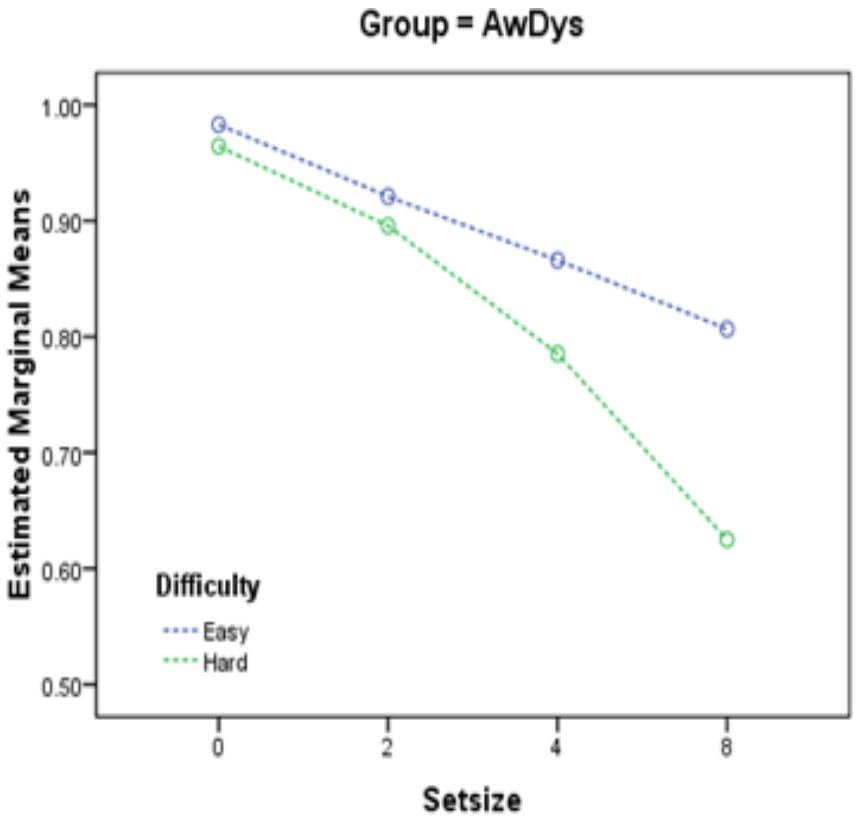
Results: 2011 study – Set size





$F(3,42) = 46.2$, $p < 0.001$ [$Eta^2 = 72$]

$F(3,42) = 14.9$, $p < 0.001$ [$Eta^2 = 50$]

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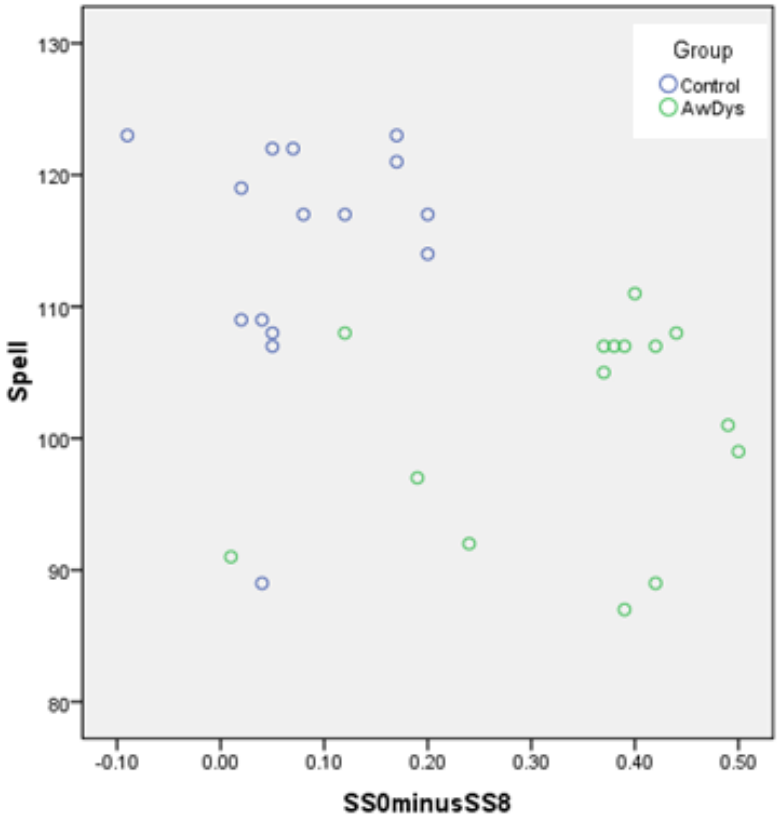
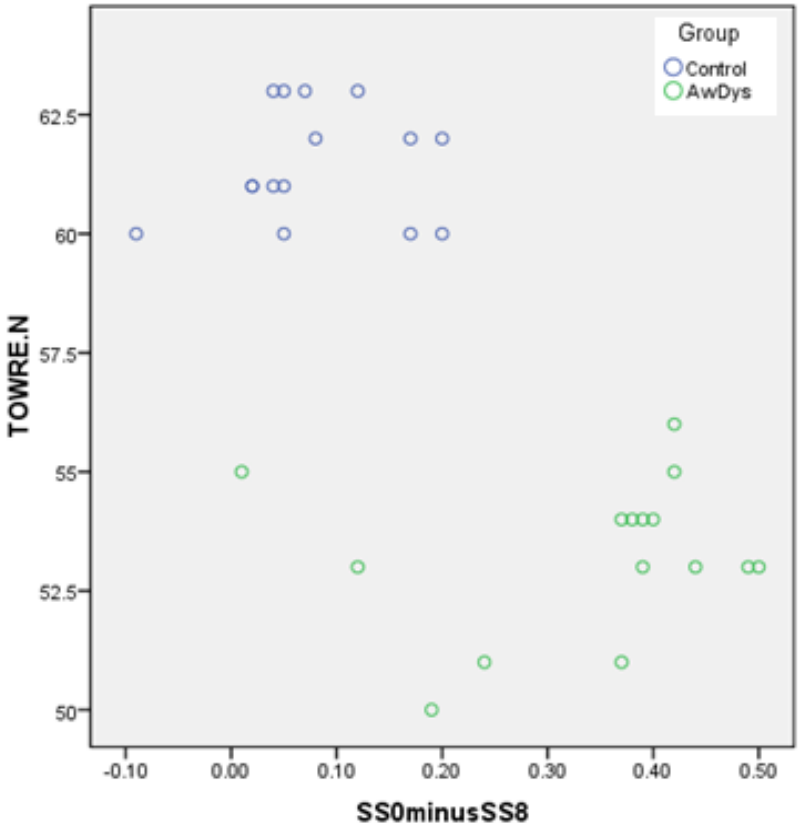
Results: 2011 study – Set size on literacy





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Conclusions

- First study to show crowding and set size effects with simple, non-linguistic visual stimuli (all correlated with literacy measures).
- Interaction of some of our effects with task difficulty highlighted a need to control for basic sensory difficulties in this area of research.
- Effects cannot be accounted for by phonological deficit since cognitive requirements were equal in all conditions.
- Visual attention play an important role in the aetiology of dyslexia

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Thank you