

V Parte: 10 Dicembre 2015

SEDE DEL CORSO

CTS.CENTRODARI

PRESSO LA SCUOLA MEDIA STATALE "PACINOTTI"

via C. De Cristoforis, 2

VII Istituto Comprensivo – PADOVA

I MECCANISMI ATTENZIONALI NEI DSA: DALLE NEUROSCIENZE ALLA SCUOLA

10 Dicembre 2015
ore 16:30 – 19:30

DALLE NEUROSCIENZE DEI DSA ALLA SCUOLA

Relatore: **Andrea Facchetti**

Assistant Professor - Department of General Psychology - University of Padova

SEGRETERIA (PROGETTAZIONE, ORGANIZZAZIONE E GESTIONE)

AURELIO MICELLI

CENTRO TERRITORIALE DI SUPPORTO PER LE TECNOLOGIE E LA DISABILITÀ

Referente CTS.centroDARI di Padova

Tel.: 049.8073100

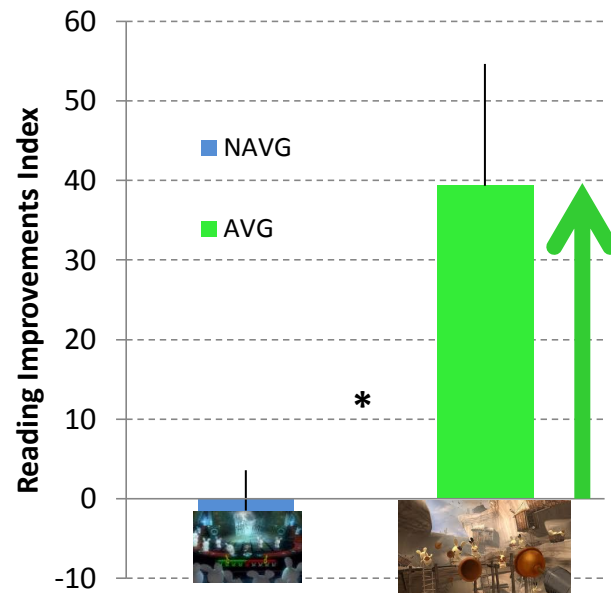
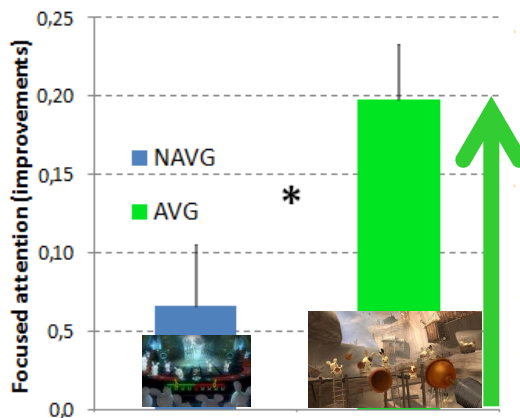
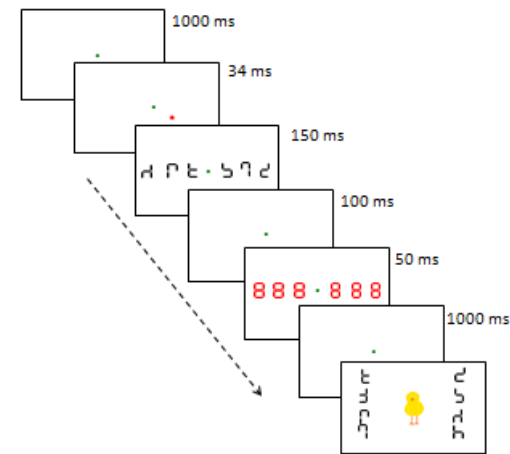
Email: cts.padova@gmail.com

(i) IMPROVING reading in children with dyslexia by REDUCING their visuo-attentional deficits

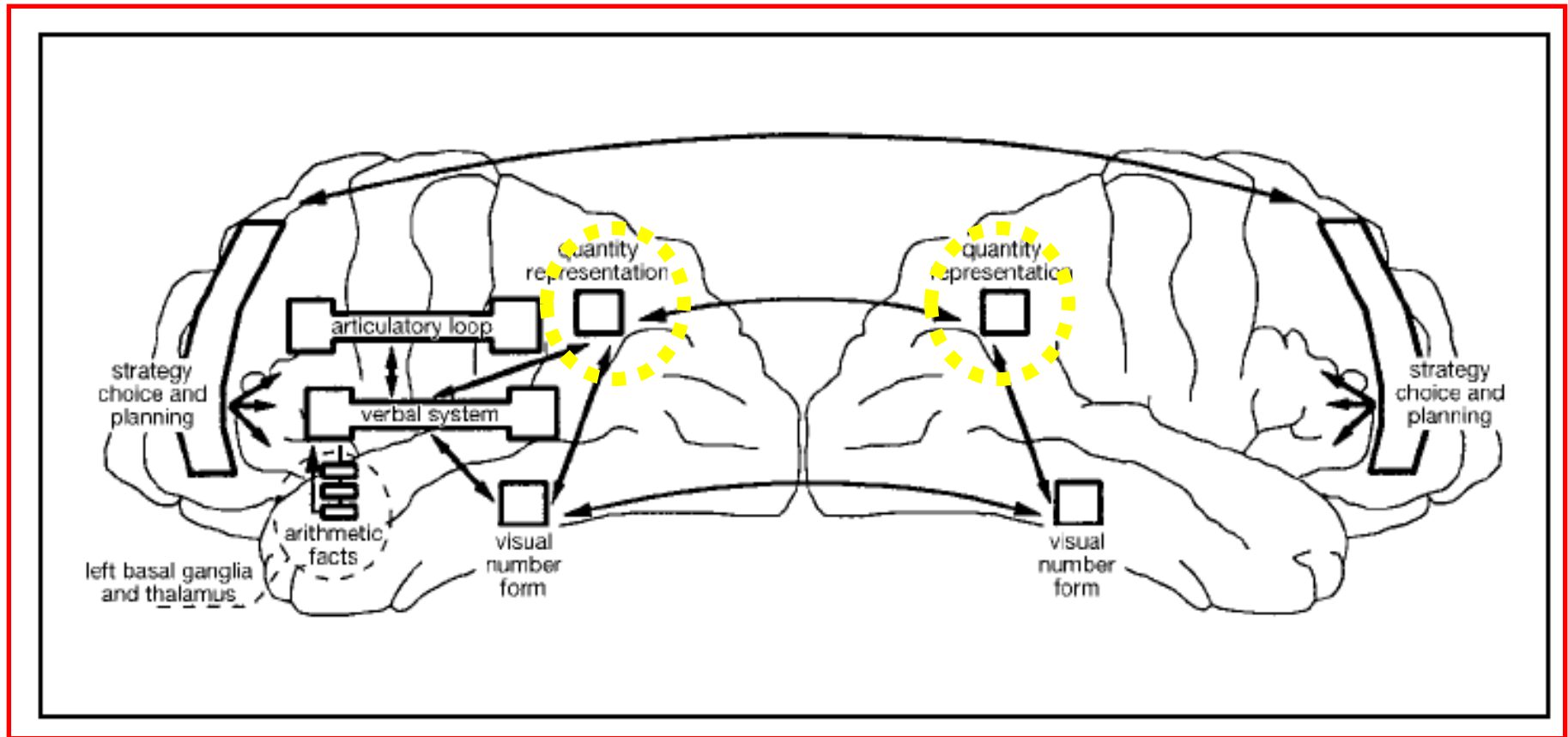
Current Biology 23, 462–466, March 18, 2013 ©2013 Elsevier Ltd All rights reserved <http://dx.doi.org/10.1016/j.cub.2013.01.044>

Report

Action Video Games Make Dyslexic Children Read Better

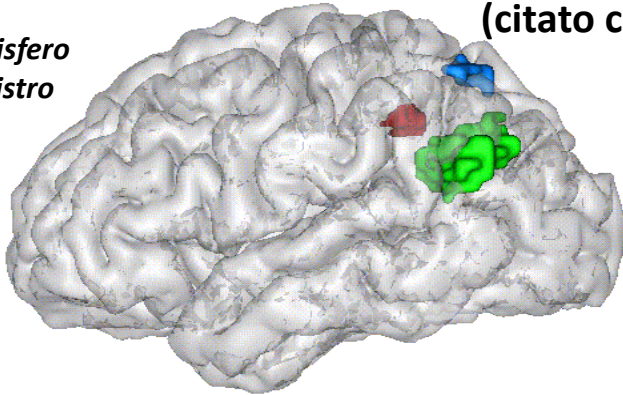


Numero e Aritmetica nel Cervello



I 3 Circuiti Parietali dell'Elaborazione dei Numeri

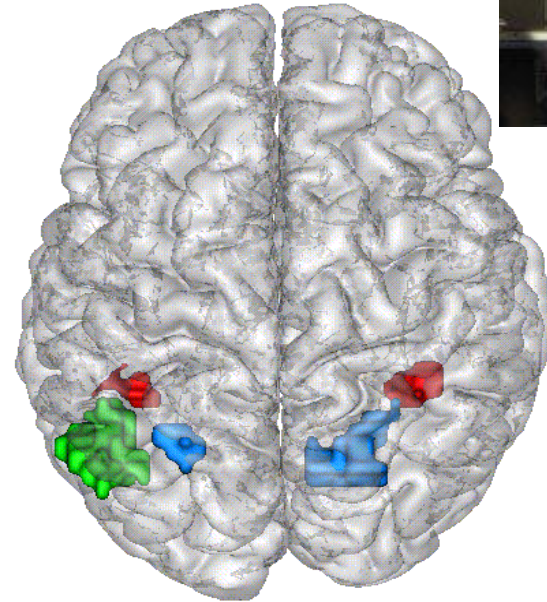
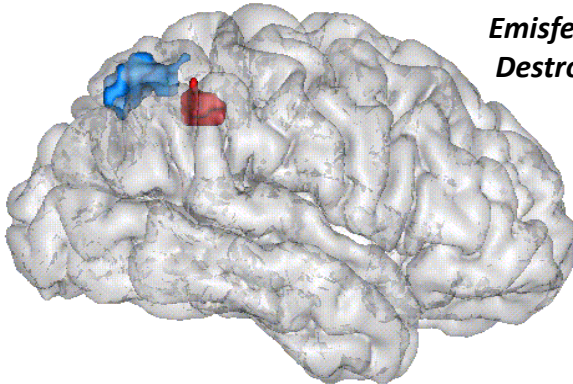
*Emisfero
Sinistro*



(citato circa 1628 volte!!! 1 Dic 2015)

Dall'alto

*Emisfero
Destro*



Solco IntraParietale (SIP) Bilaterale: Codice Analogico di Grandezza (LNM)

Giro Angolare Sinistro (GAS): Transcodifica verbale dei numeri

Corteccia Parietale Posteriore (CPP) bilaterale: Orientamento dell'Attenzione Visiva

Aims of studies

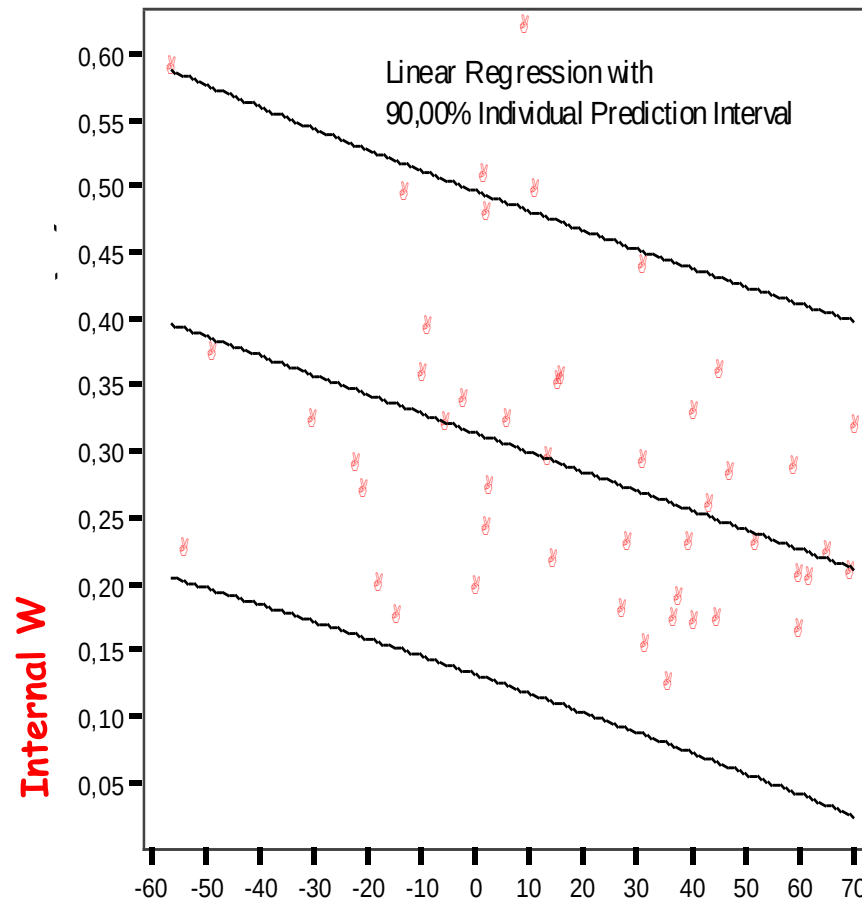
Methods

- Participants
- Procedure and stimuli

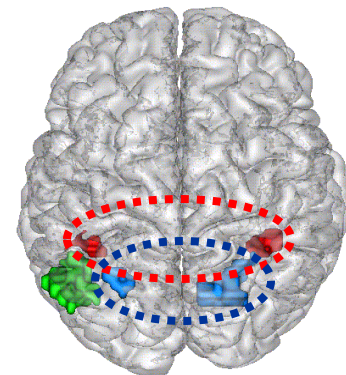
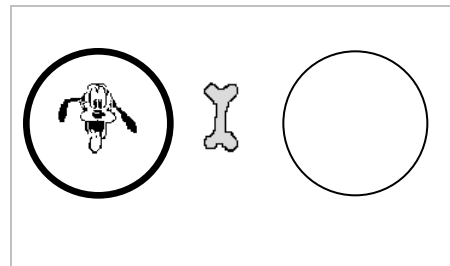
Results and discussion

Conclusion

(i) Children with Developmental Dyscalculia



Visuo-spatial attention efficiency (i.e., cueing effect at 100ms SOA) predicts **internal W (16%) when age and IQ are controlled for.**



Aims of studies

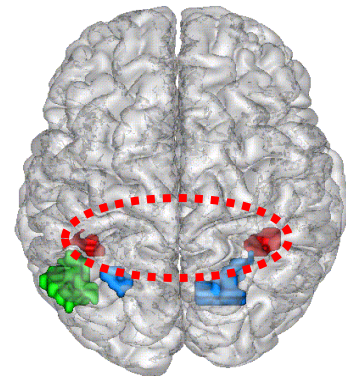
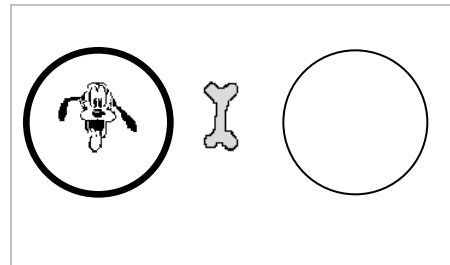
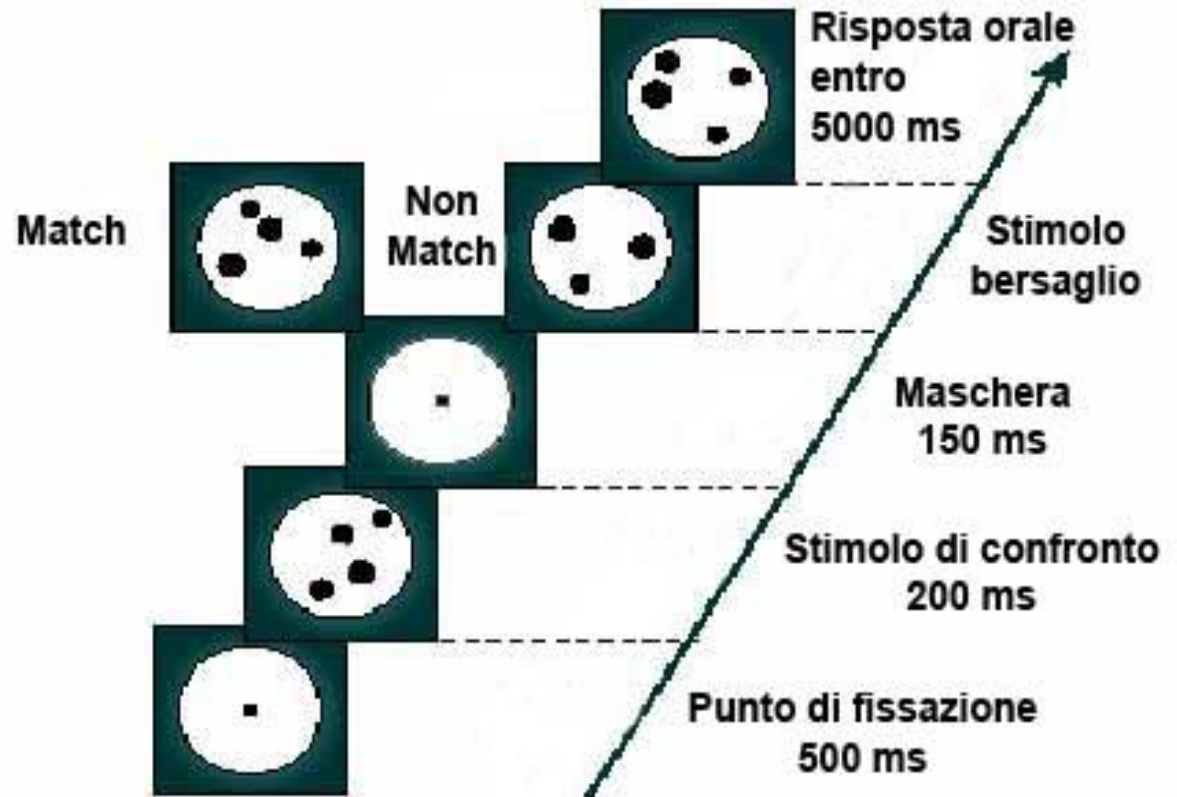
(ii) Small numerosity estimation

Methods

- Participants
- Procedure and stimuli

Results and discussion

Conclusion



Aims of studies

Methods

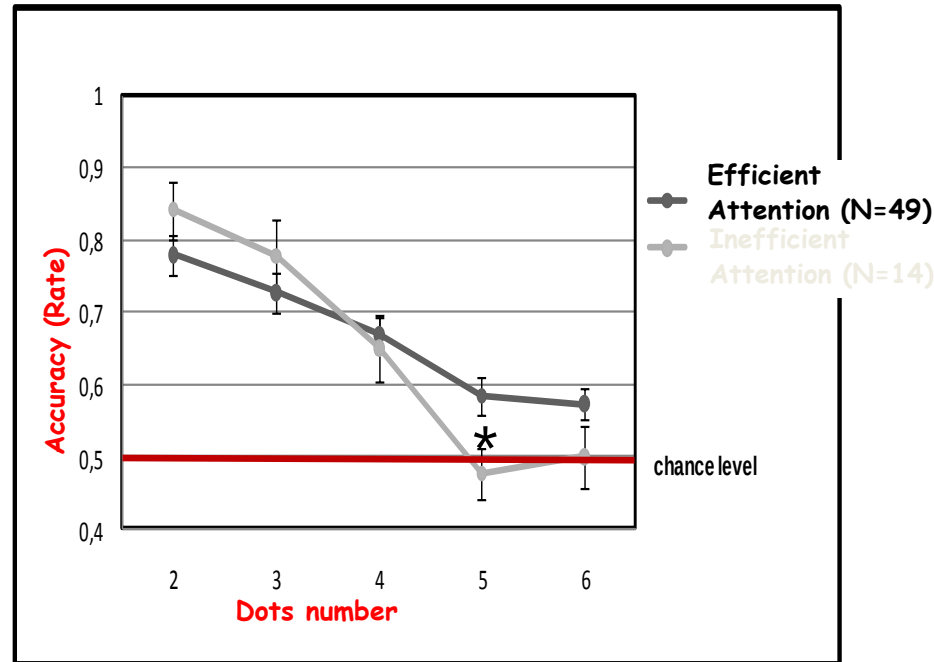
- Participants
- Procedure and stimuli

Results and discussion

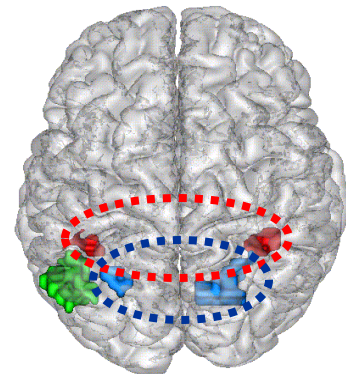
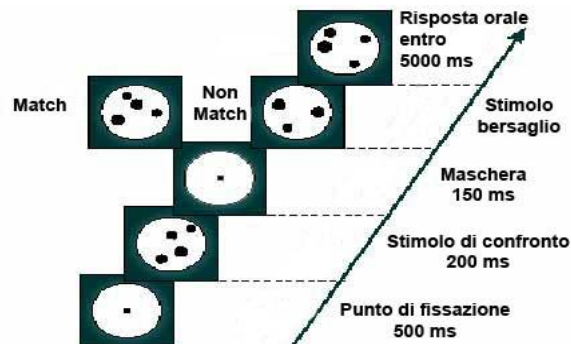
Conclusion

(ii) Pre-arithmetic children

The efficiency of **visuo-spatial attention** of 63 pre-arithmetic (5-6 years old) children was measured in T1. The efficiency of **numerosity estimation** was measured one year after in T2.



Pre-arithmetic children (T1) with inefficient visuo-spatial attention will show an impaired **numerosity estimation** (T2).



Aims of studies

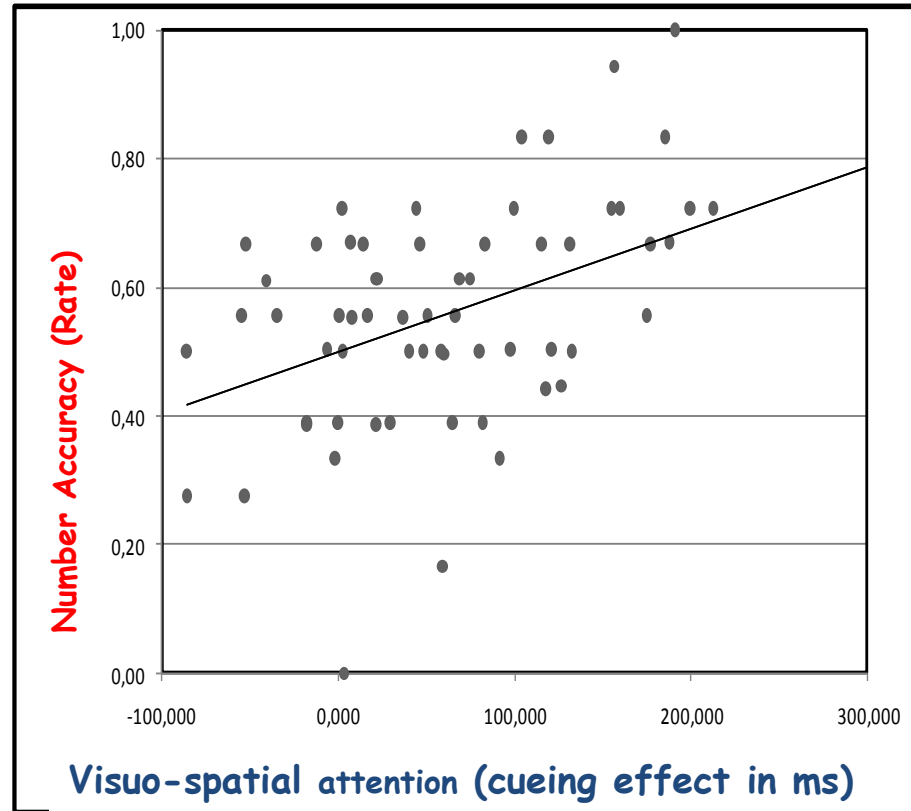
Methods

- Participants
- Procedure and stimuli

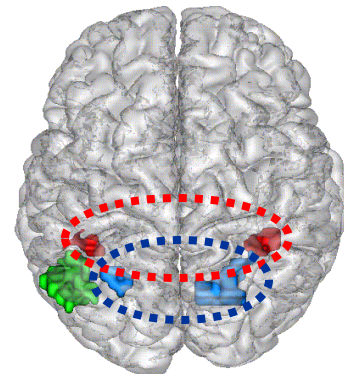
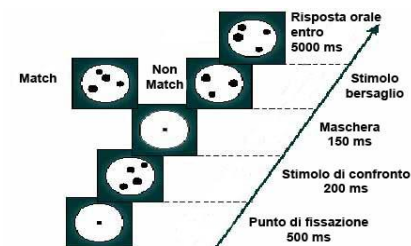
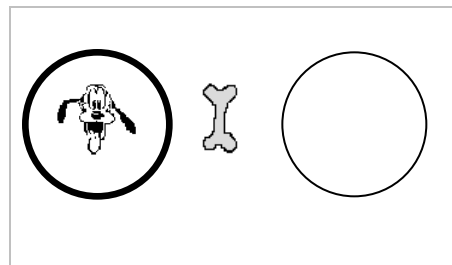
Results and discussion

Conclusion

(ii) Pre-arithmetic children



Visuo-spatial attention efficiency (i.e., cueing effect at 100ms SOA) predicts **small numerosity estimation** (16%) when age and IQ are controlled for.



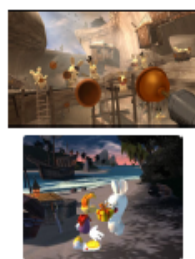
Dyscalculia Remediation by Action Video Games

Simone Gori, Monja Tait, Sandro Franceschini, Elisa Casagrande, Carlo Robino, Claudio de'Sperati & Andrea Facoetti

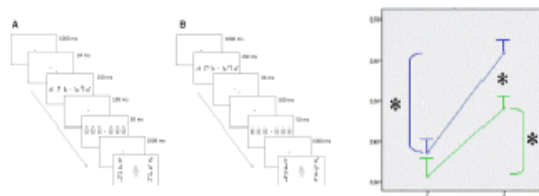
De.Co.Ne Lab, University of Padua, Scientific Institute E. Medea, Bosisio Parini (LC) Italy & Laboratory of Action, Perception and Cognition, Università Vita-Salute San Raffaele

Numerical cognition is impaired in about 5% of children; they are affected by a neurodevelopmental disorder called dyscalculia. The neurocognitive causes of dyscalculia are debated, and dyscalculia remediation is far from being achieved.

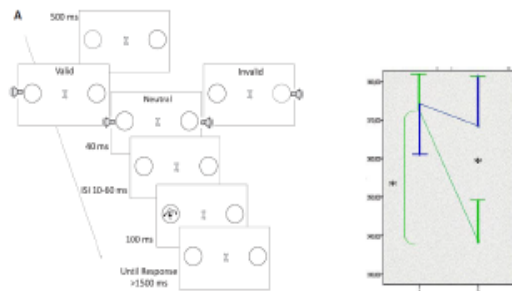
Children with Dyscalculia = "Action" training (n=14).
Children with Dyscalculia = "Non Action" training (n=14).



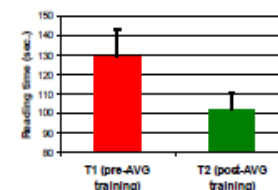
Focused and Distributed Spatial Attention



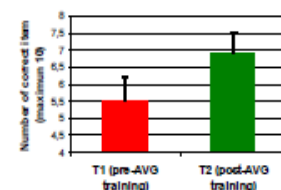
Cross-modal Temporal Attention



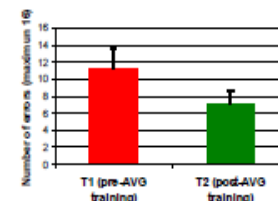
Numbers reading



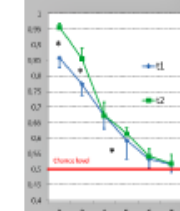
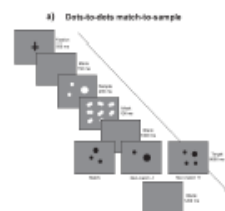
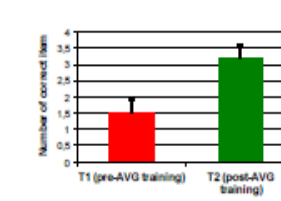
Mental calculation



Backward counting



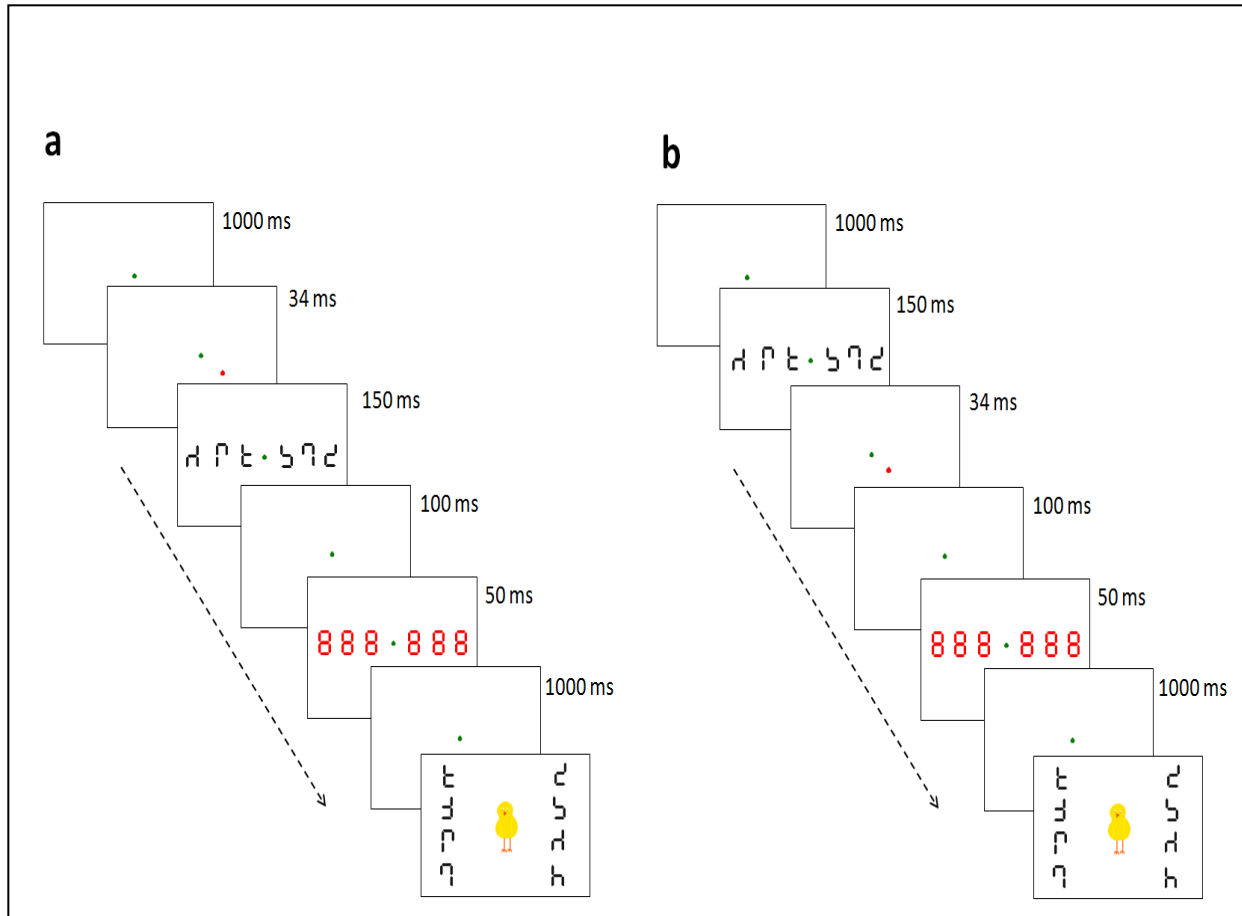
Tables



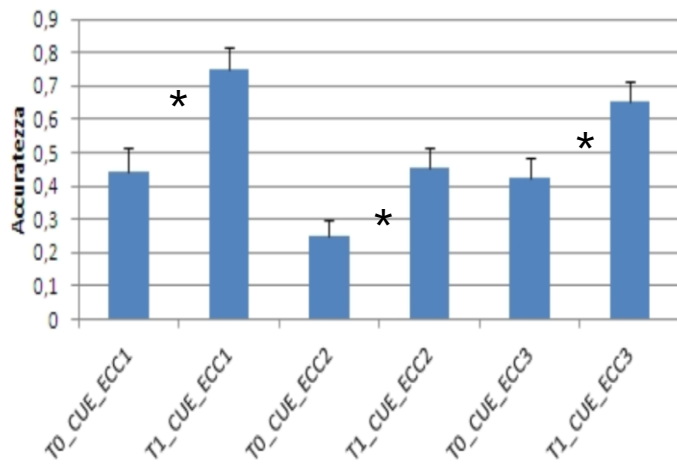
It has been demonstrated that action video games efficiently improve attention (Green & Bavelier, 2003, 2012) and reading abilities in children with dyslexia (Franceschini et al., 2013). We found that playing action video games improved children's number sense and arithmetic skills. Visuo-spatial and cross-modal temporal attentional skills also improved after action video game training, without however translating into any evident modification of oculo-motor exploratory activity. Our results suggest that attention improvements can impact positively on mathematical skills, and that action videogames could provide a fun remediation of dyscalculia and help unveiling the causal role of visuo-spatial attention in numerical cognition.

Attenzione visuospaziale

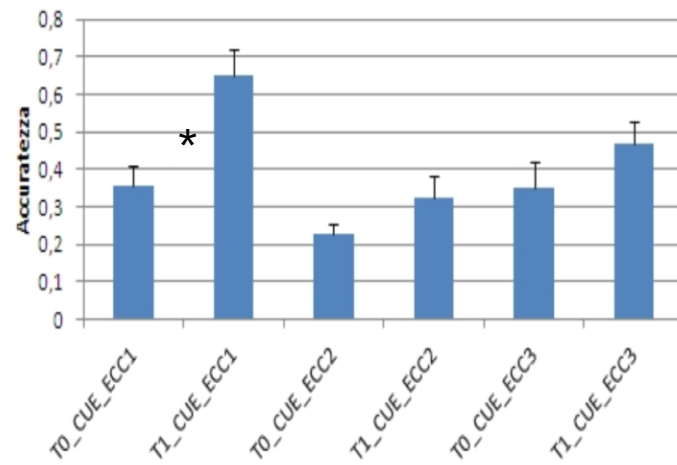
*Rappresentazione dei due compiti Focused spatial attention
(Pannello a)
e del Distributed spatial attention (Pannello b)*



VAST: Attenzione Focalizzata (cue)



VAST: Attenzione Distribuita (probe)



Test T per campioni appaiati – Cue condition

	Differenze a coppie		t	df	Sign. (1-coda)
	M	ds			
ecc1 (t0) – ecc1 (t1)	-,275	,156	-4,983	7	,001**
ecc2 (t0) – ecc2 (t1)	-,141	,140	-2,851	7	,012*
ecc3 (t0) – ecc3 (t1)	-,148	,138	-3,033	7	,009

**p<0,01, *p<0,05

Test T per campioni appaiati – Probe condition

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
ecc1 (t0) – ecc1 (t1)	-,226	,172	-3,711	7	,004**
ecc2 (t0) – ecc2 (t1)	-,022	,180	-,345	7	,370
ecc3 (t0) – ecc3 (t1)	-,0475	,177	-,760	7	,236

**p<0,01

Prova numero e calcolo:

Lettura di numeri

Ricerca "Disc e videogames"
17 Giugno 2013

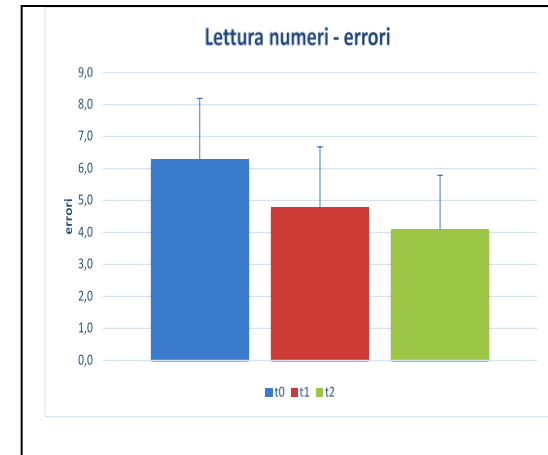
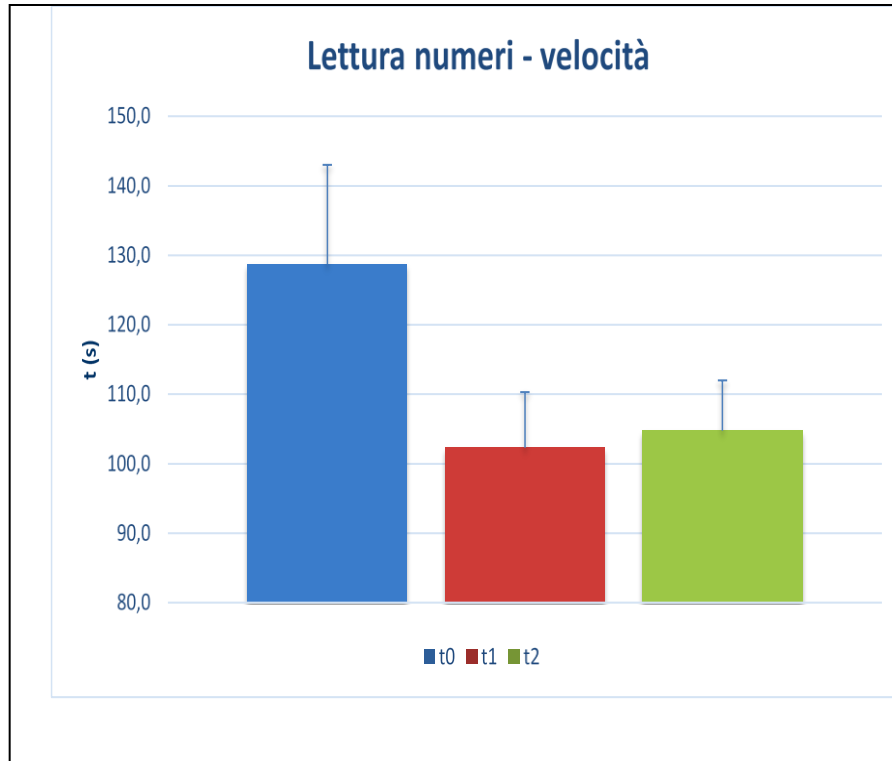
T1

Lettura di numeri

CL 1 ^a classe	DATA 17/6/13
NOME Denise	COGNOME

156	1254	23980	130345
102	1978	14943	129438
259	2023	33459	103894
137	4356	43209	430879
689	9675	26768	756121
767	5612	87124	676345
134	5098	43586	985453
561	2603	20964	150000
11,0	25,6 1e.	24,7	177,4 4e.

Lettura di numeri



Test T per campioni appaiati – Lettura di numeri (velocità)

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
t0-t1	26,4333	43,7328	2,094	11	,030**
t1-t2	-1,46357	44,72594	-,122	13	,1452

**p<0,05

Test T per campioni appaiati – Lettura di numeri (errori)

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
t0-t1	1,5	1,506	3,726	13	,003**
t1-t2	,71	5,123	,758	13	,463

**p<0,01

Ricerca "Disc e videogames"
17 Giugno 2013

T1

10 SEGNA CON UNA CROCETTA IL NUMERO PIÙ GRANDE
ES:

12
X 34
26

X 8 X 9 12 23
4 8 X 14 21
3 7 11 X 33

36 87 X 124 X 942
X 76 79 117 454
67 X 91 109 390

676 834 X 323 689
766 438 232 X 699
X 767 X 891 322 609

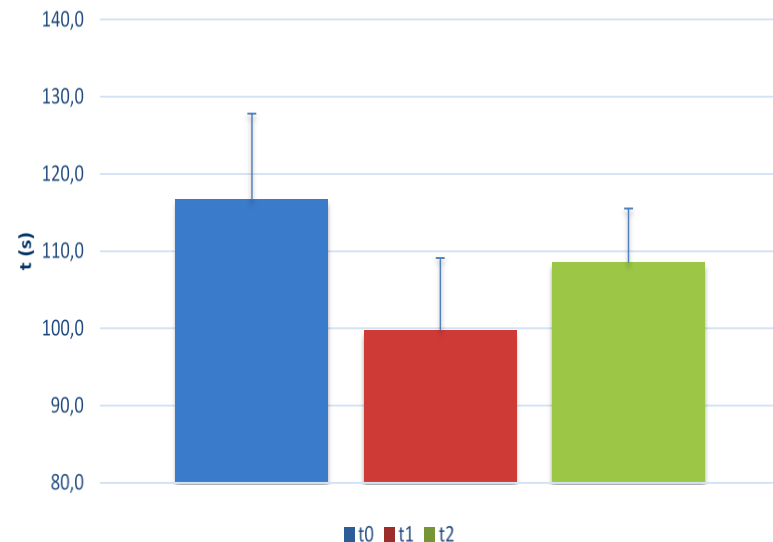
8209 7564 2781 4621
8290 X 7465 X 2791 X 4499
X 9208 7561 2709 4620

X 13243 X 26354 88987 35980
13241 26345 X 89890 X 35890
13234 27435 89988 35390

Tempo 62,1 Punteggio/12 15/20

Triplette

Triplette - velocità



Test T per campioni appaiati – Triplette (velocità)

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
t0-t1	17	21,736	2,926	13	,006**
t1-t2	-10,12	39,97887	-,913	12	,379

**p<0,05

Conteggio regressivo

Ricerca "Disc e videogames"
17 Giugno 2013

T1

PROVA di ABILITÀ NUMERO-CALCOLO
INDIVIDUALE ORALE
FOGLIO ESAMINATORE

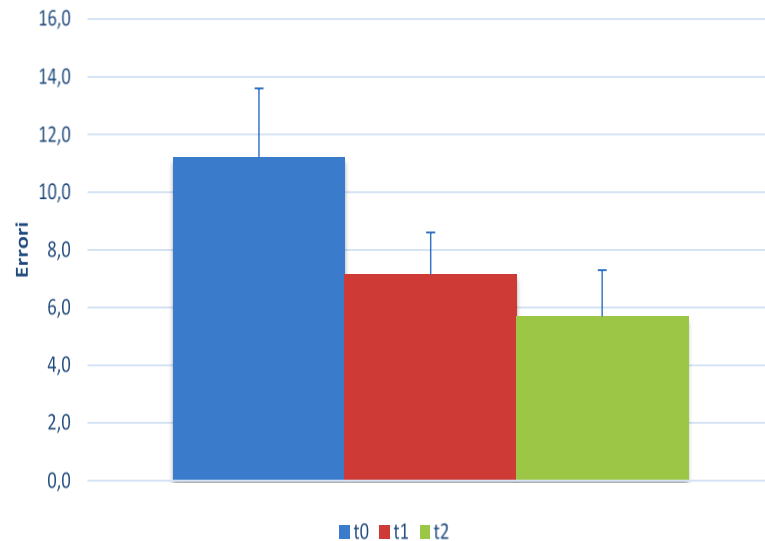
CL. 1 ^a media	DATA 14/6/13
NOME Denise	COGNOME

1) PROVA DI CONTEGGIO REGRESSIVO

100 99 98 97 96 95 94 93 92 91
~~90~~ 89 88 87 86 85 84 83 82 81
~~80~~ 79 78 ~~77~~ 76 75 74 73 72 71
~~70~~ 69 ~~68~~ 67 66 65 64 63 62 61
~~60~~ 59 58 57 ~~56~~ 55 54 53 52 51
~~50~~ 49 48 47 46 45 44 43 42 41
~~40~~ 39 38 37 36 35 34 33 32 ~~31~~
~~30~~ ~~29~~ ~~28~~ ~~27~~ 26 ~~25~~ 24 23 22 21
~~20~~ ~~19~~ ~~18~~ ~~17~~ ~~16~~ ~~15~~ ~~14~~ ~~13~~ ~~12~~ ~~11~~
 10 9 8 7 6 5 4 3 2 1

TEMPO 2.19 min 139 s. ERRORI 26

Conteggio regressivo - errori



Test T per campioni appaiati –Conteggio regressivo (errori)

	Differenze a coppie		t	df	Sign. (1-code)
	M	Ds			
t0-t1	4,0721	8,004	,947	13	,039**
t1-t2	1,769	6,735	1,274	12	,362

**p<0,05

Calcolo mentale oltre il 10

Ricerca "Disc e videogames"
17 Giugno 2013

T1

3) CALCOLO A MENTE (15 sec)

Addizioni

9+6 + (15) 18+4 + (22) 32+7 36 (39)
14+19 32 (33) 15+12 + (27) 18+23 40 (41)
13+8 + (21) 24+12 + (36) 26+7 + (33)
60+30 + (90)

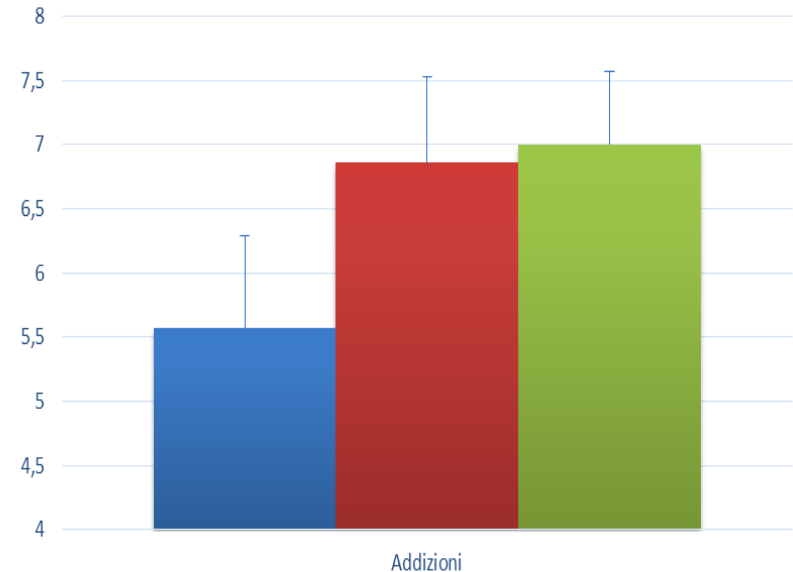
Punteggio: 7/10

SOTTRAZIONI

23-5 / (18) 16-4 + (12) 37-8 28 (29)
26-15 / (11) 37-16 / (11) 32-5 + (27)
41-18 / (23) 30-11 / (19) 44-8 / (36)
70-40 + (30)

Punteggio: 3/10

Calcolo mentale oltre il 10 - accuratezza



Test T per campioni appaiati – Calcolo mentale complesso oltre la decina

		Differenze a coppie		t	df	Sign. (1-coda)
		M	Ds			
ADDIZIONI OLTRE LA DECINA	t0-t1	-1,286	2,164	-2,223	13	,023**
	t1-t2	-,143	3,110	-,172	13	,433

**p<0,05

Tabelline saltate

Ricerca "Disc e videogames"
17 Giugno 2013

T1

2) FATTI ARITMETICI

2a) TABELLINA DEL 3 (2 sec)

$$\begin{array}{r} 3 \\ + \\ \hline 18 \end{array} \quad \begin{array}{r} 6 \\ + \\ \hline 21 \end{array} \quad \begin{array}{r} 9 \\ + \\ \hline 24 \end{array} \quad \begin{array}{r} 12 \\ + \\ \hline 27 \end{array} \quad \begin{array}{r} 15 \\ + \\ \hline 30 \end{array}$$

Punteggio 6 /10

2b) TABELLINA DELL'8 (2 sec)

$$\begin{array}{r} 8 \\ + \\ \hline 48 \end{array} \quad \begin{array}{r} 16 \\ + \\ \hline 56 \end{array} \quad \begin{array}{r} 24 \\ + \\ \hline 64 \end{array} \quad \begin{array}{r} 32 \\ + \\ \hline 72 \end{array} \quad \begin{array}{r} 40 \\ + \\ \hline 80 \end{array}$$

Punteggio 1 /10

2c) TABELLINE SALTATE (2 sec)

$$\begin{array}{r} 6 \times 5 \\ \hline \end{array} (30) \quad \begin{array}{r} 4 \times 9 \\ \hline \end{array} (36) \quad \begin{array}{r} 3 \times 8 \\ \hline \end{array} (24) \\ \begin{array}{r} 7 \times 9 \\ \hline \end{array} (63) \quad \begin{array}{r} 6 \times 3 \\ \hline \end{array} (18) \quad \begin{array}{r} 2 \times 7 \\ \hline \end{array} (14)$$

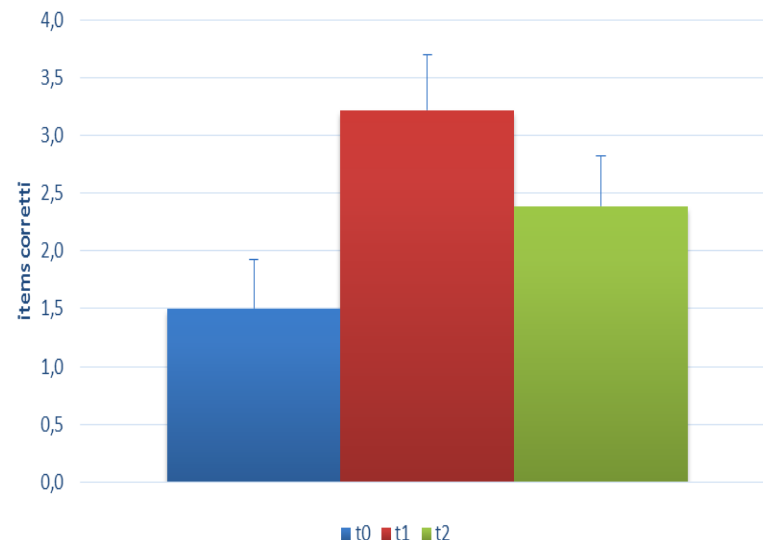
Punteggio: 2 /6

2d) ADDIZIONI E SOTTRAZIONI VELOCI (2 sec)

$$\begin{array}{r} 4+2 \\ \hline \end{array} (6) \quad \begin{array}{r} 5+3 \\ \hline \end{array} (8) \quad \begin{array}{r} 2+3 \\ \hline \end{array} (5) \\ \begin{array}{r} 7+2 \\ \hline \end{array} (9) \quad \begin{array}{r} 1+5 \\ \hline \end{array} (6) \quad \begin{array}{r} 8-3 \\ \hline \end{array} (5) \\ \begin{array}{r} 5-2 \\ \hline \end{array} (3) \quad \begin{array}{r} 7-5 \\ \hline \end{array} (2) \quad \begin{array}{r} 3-2 \\ \hline \end{array} (1) \\ \begin{array}{r} 9-1 \\ \hline \end{array} (8) \quad \begin{array}{r} 6-4 \\ \hline \end{array} (2) \quad \begin{array}{r} \\ \hline \end{array} \end{array}$$

Punteggio: 5 /12

Tabelline saltate - accuratezza



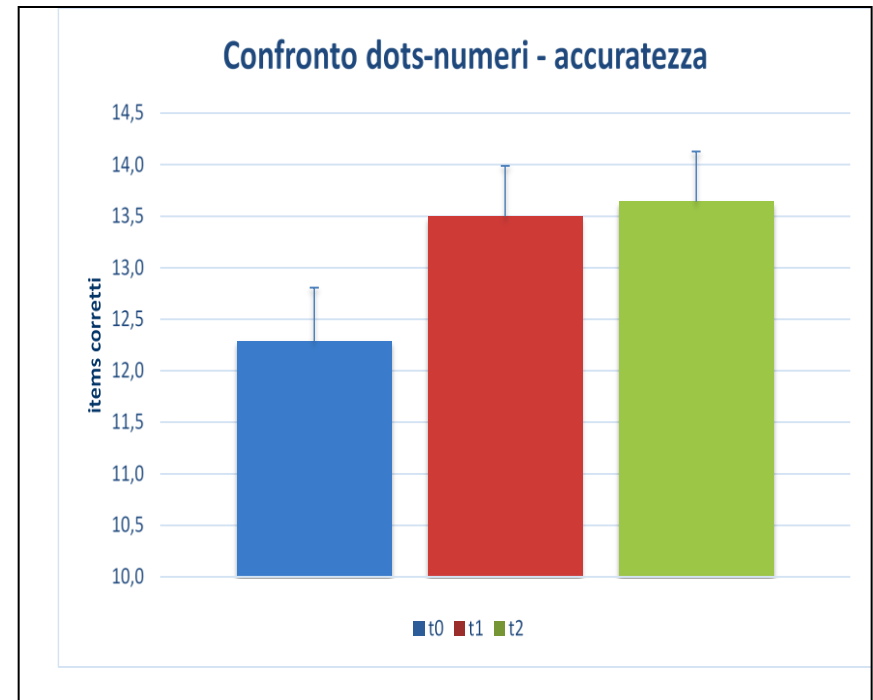
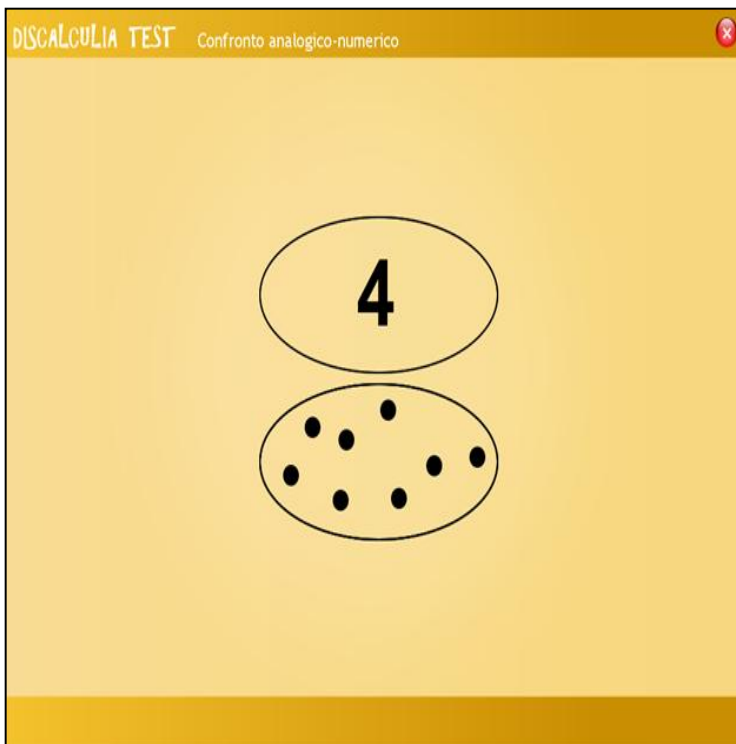
Test T per campioni appaiati – Tabelline saltate (accuratezza)

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
t0-t1	-1,714	1,204	-5,326	13	,000**
t1-t2	,830	2,438	1,274	13	,113

**p<0,001

Discalculia test

Confronto dots-numeri

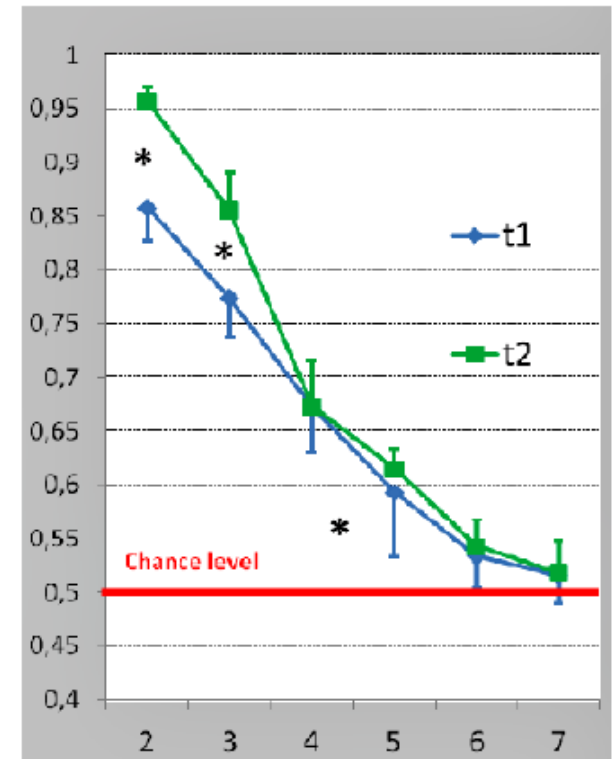
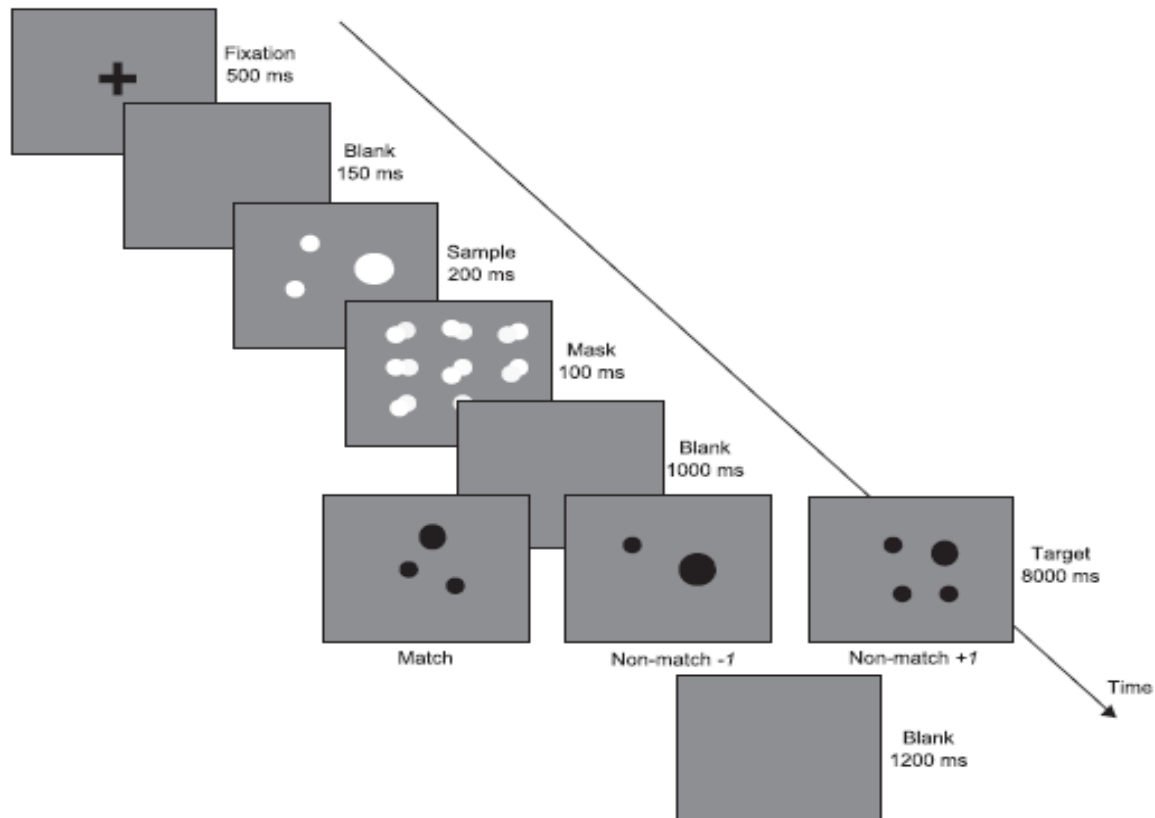


Test T per campioni appaiati – Confronto tra grandezze dots - numeri (accuratezza)

	Differenze a coppie		t	df	Sign. (1-coda)
	M	Ds			
t0-t1	-1,214	2,190	-2,075	13	,029**
t1-t2	-,143	1,791	-,298	13	,385

**p<0,05

a) Dots-to-dots match-to-sample



**Nessun conflitto d'interesse:
Finanziamento dalle compagnie degli
“action video games ” = 0 (ZERO)
;-)**



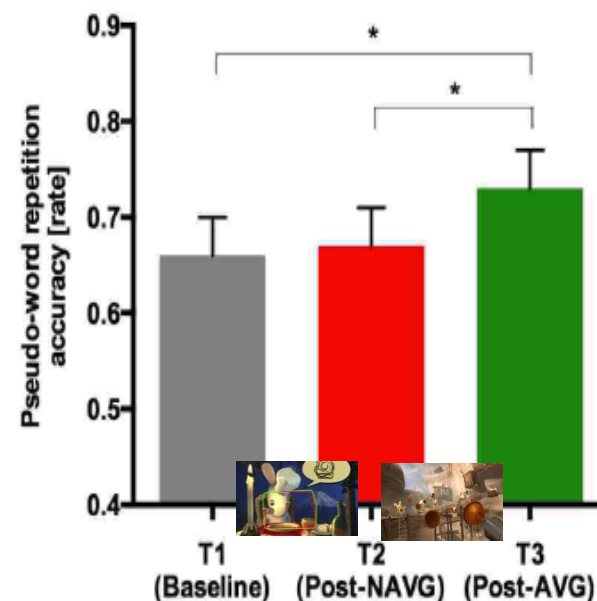
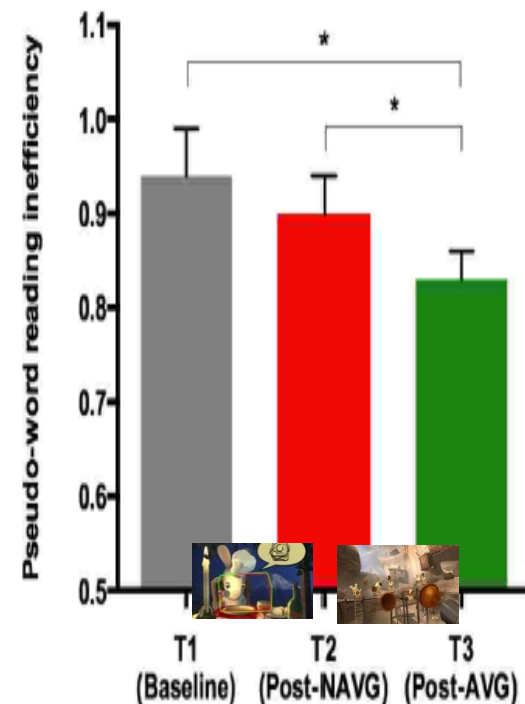
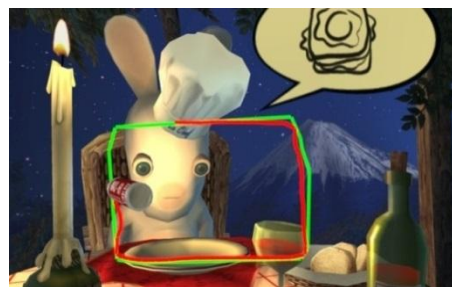
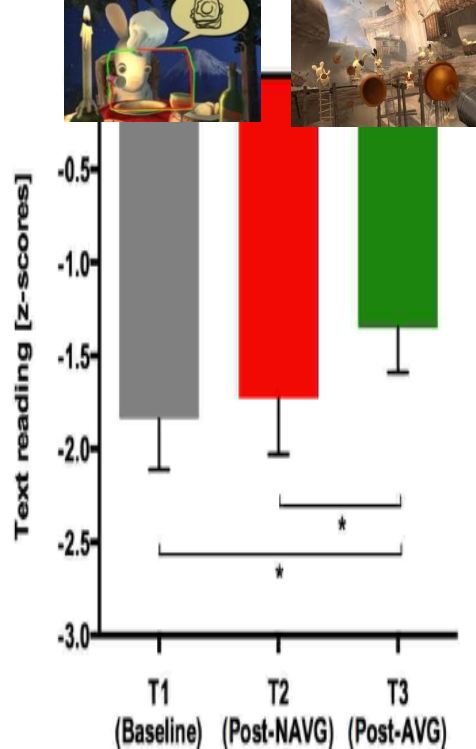
Ecco una delle prime “simpatiche” reazioni al nostro paper sugli action!!!



E' chiaro... giocare con gli action non è come leggere ;-)

Una replica dello studio con disegno “within subjects”:

Gli stessi bambini con dislessia (n=11), prima NAVG e poi AVG training



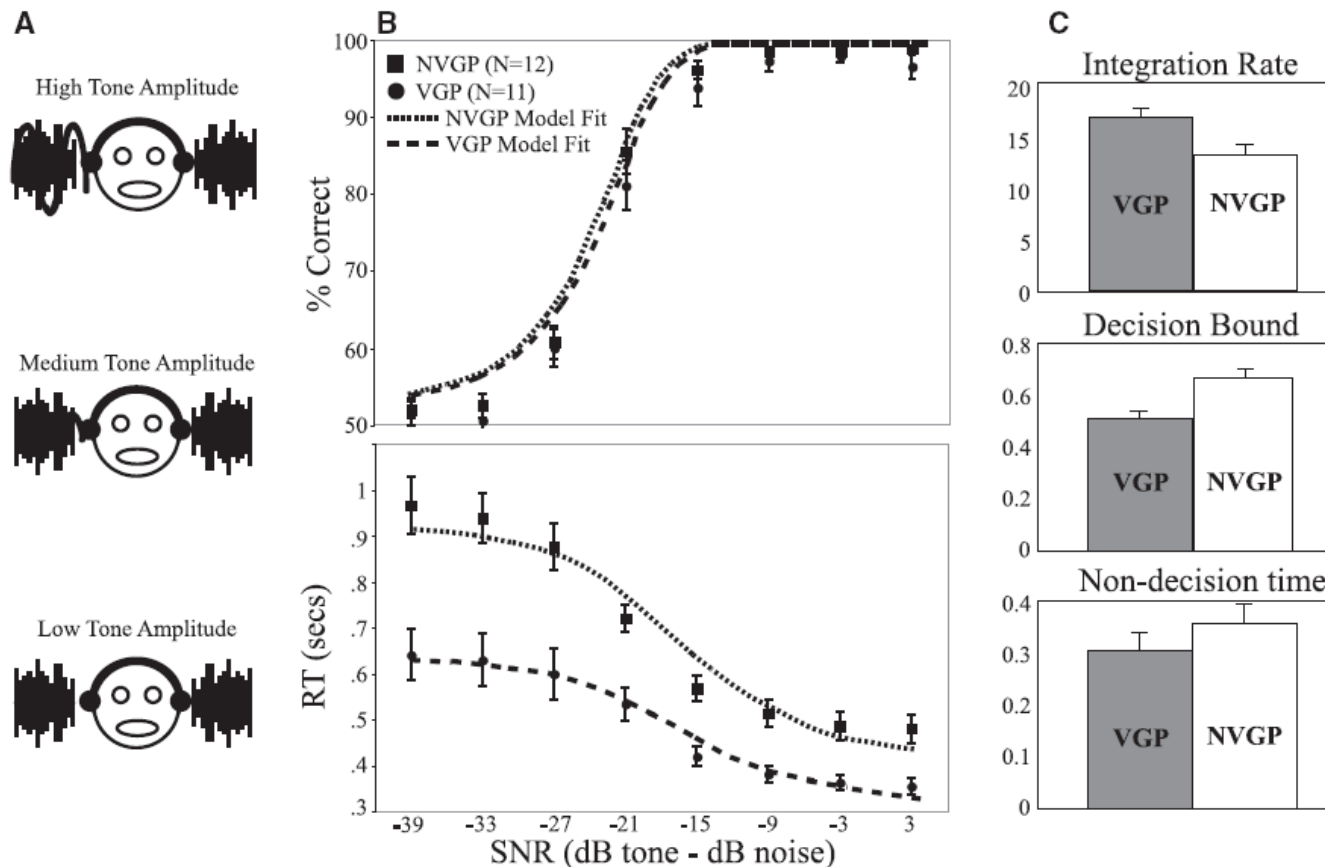
Report

Improved Probabilistic Inference as a General Learning Mechanism with Action Video Games

C. Shawn Green,^{1,2} Alexandre Pouget,¹ and Daphne Bavelier^{1,*}

¹Department of Brain and Cognitive Sciences, University of Rochester, Rochester, NY 14627, USA

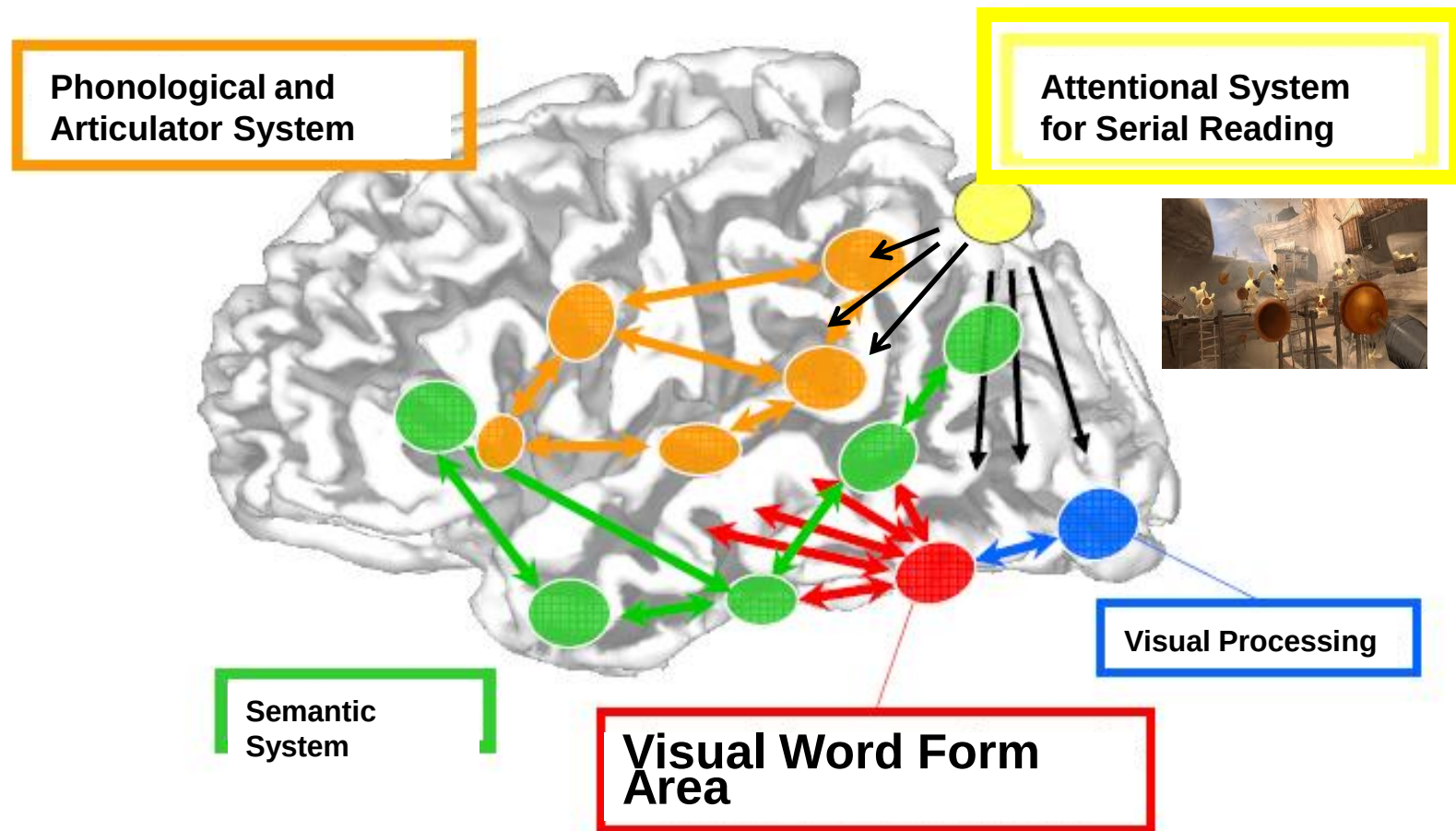
meet our standards for improved probabilistic inference. These can be defined rigorously in the task we chose by considering decision making from a probabilistic perspective. Before committing to a choice, the best a subject can do is to



4. Prevenzione della dislessia

Innovativa anatomia funzionale della lettura

Il modello modificato di Stanislas Dehaene



Opinion

Trichur R. Vidyasagar¹ and Kristen Pammer²

²Department of Psychology, The Australian National University, Canberra A.C.T., Australia



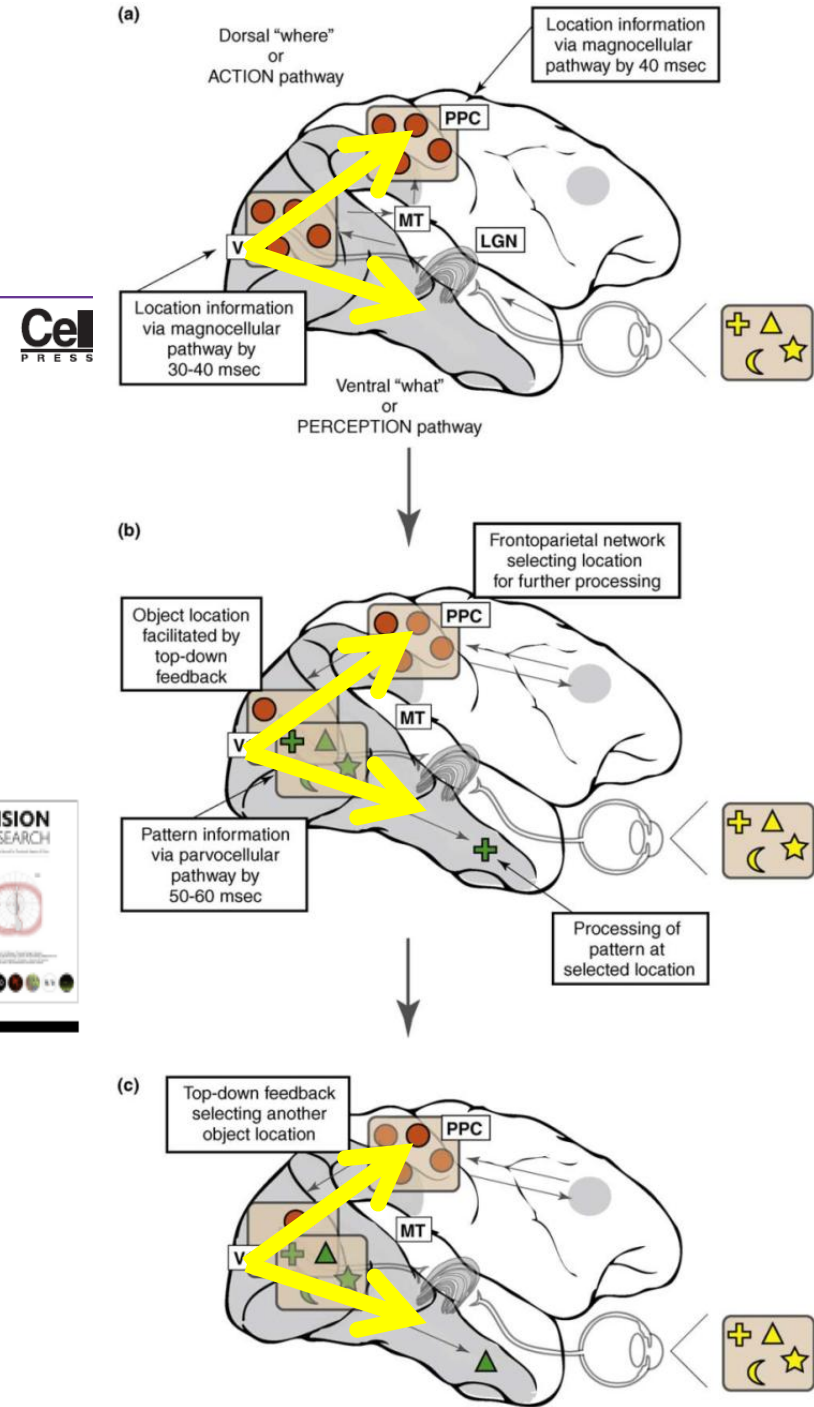
Vision Research

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



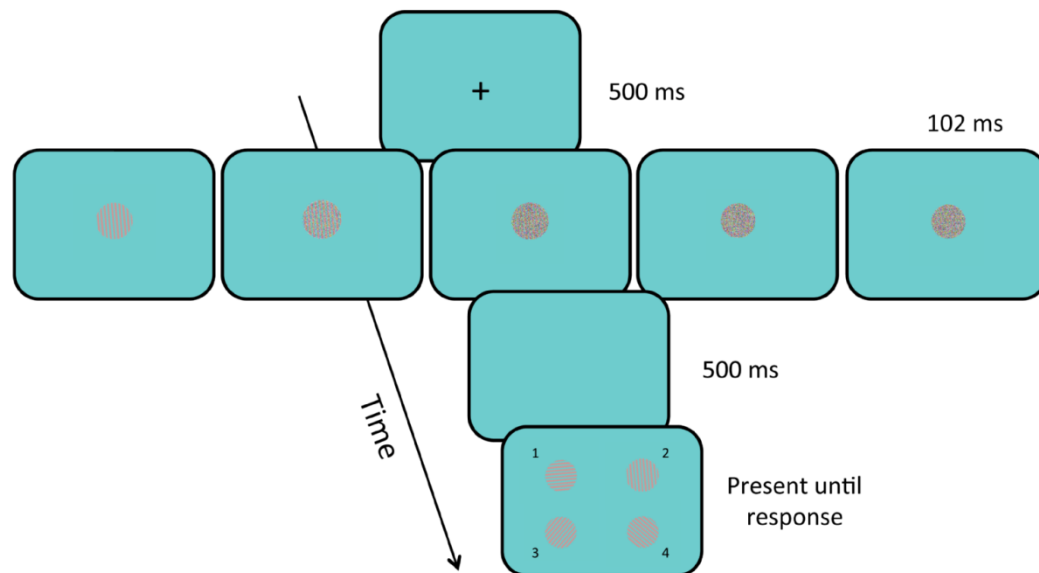
Simone Gori*, Andrea Facoetti*

Developmental and Cognitive Neuroscience Lab, Department of General Psychology, University of Padua, Padua 35131, Italy
Developmental Neuropsychology Unit, Scientific Institute "E. Medea", Bosisio Parini, Lecco 23842, Italy

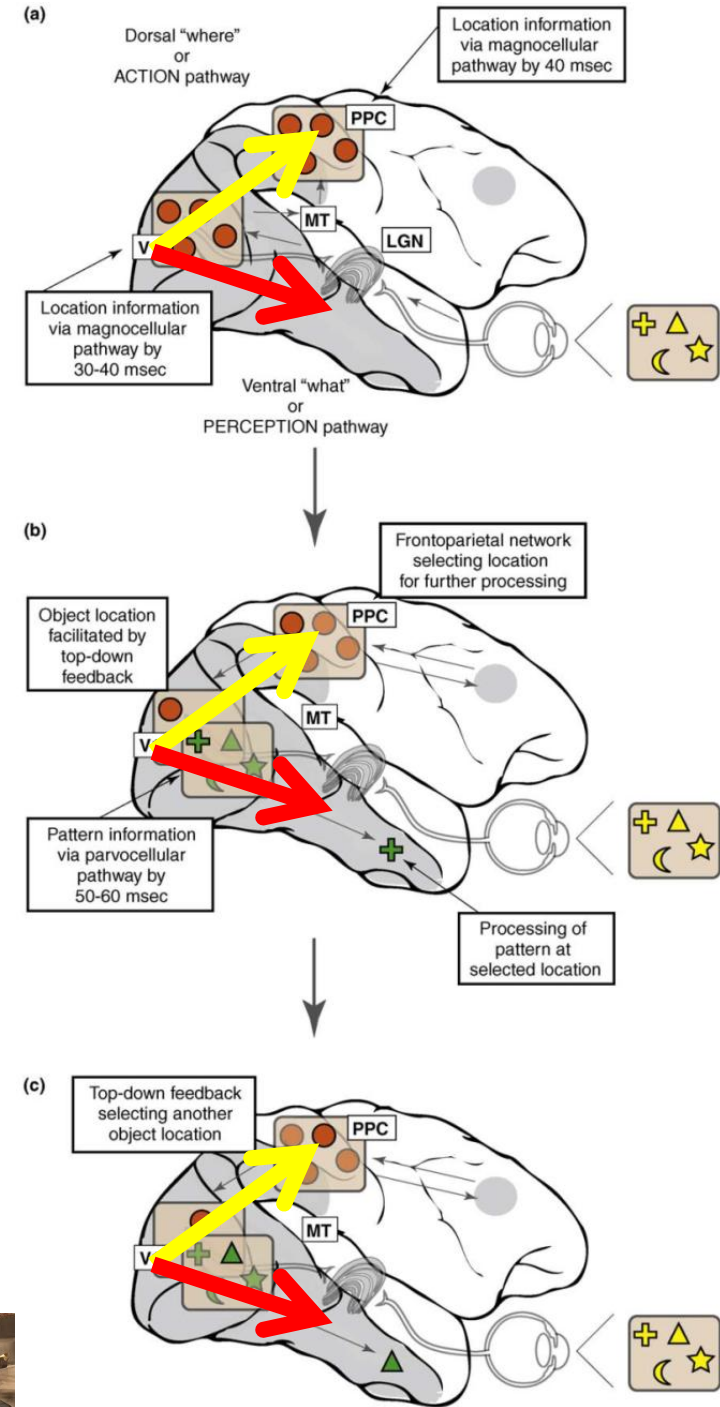


Action video games: Allenano il circuito dorsale o quello ventrale???

E.



Risultati:
Nessuna variazione nel Grating Orienting
task (NAVIG = t1 vs. t2 o AVG = t2 vs. t3).



Un semplice esempio di disfunzione della percezione del movimento



Pre-trauma cranico!

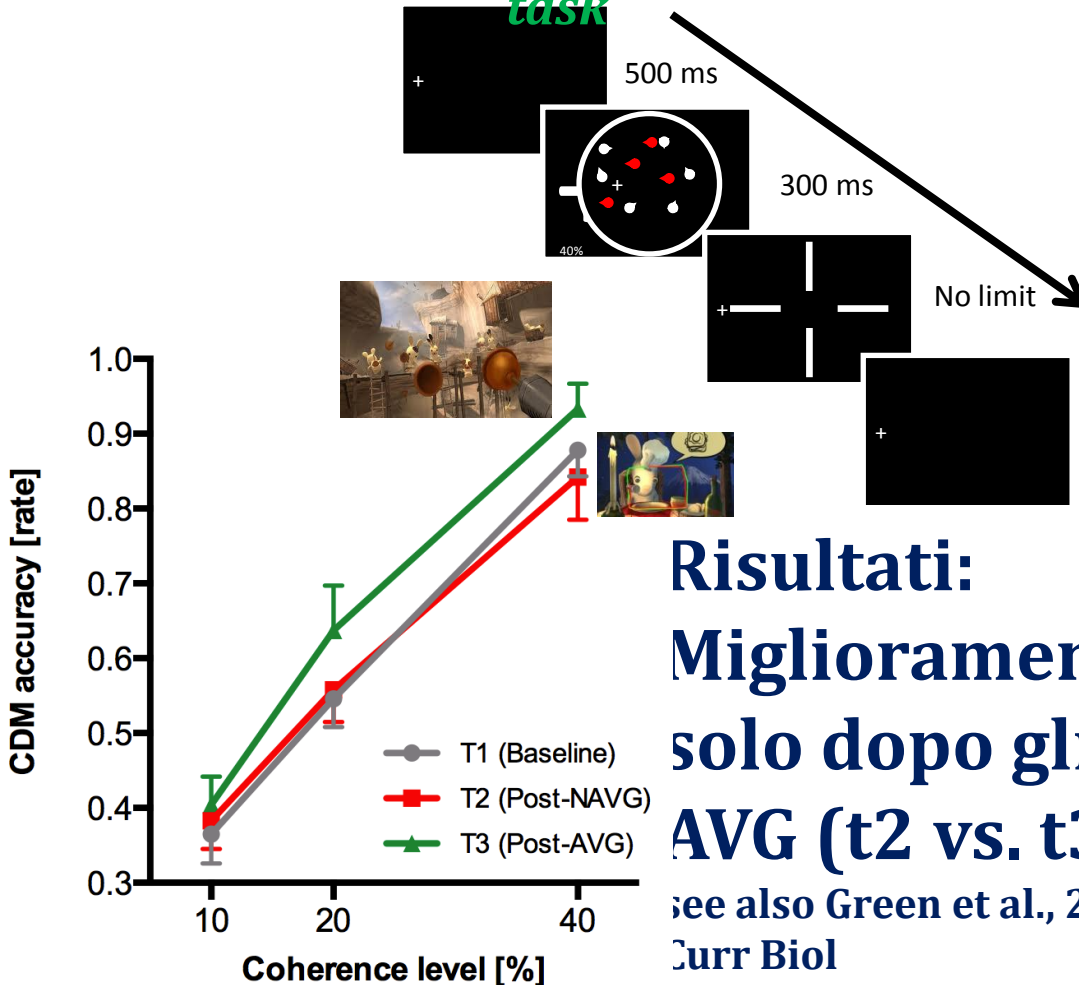
Un esempio di lento orientamento dell'attenzione



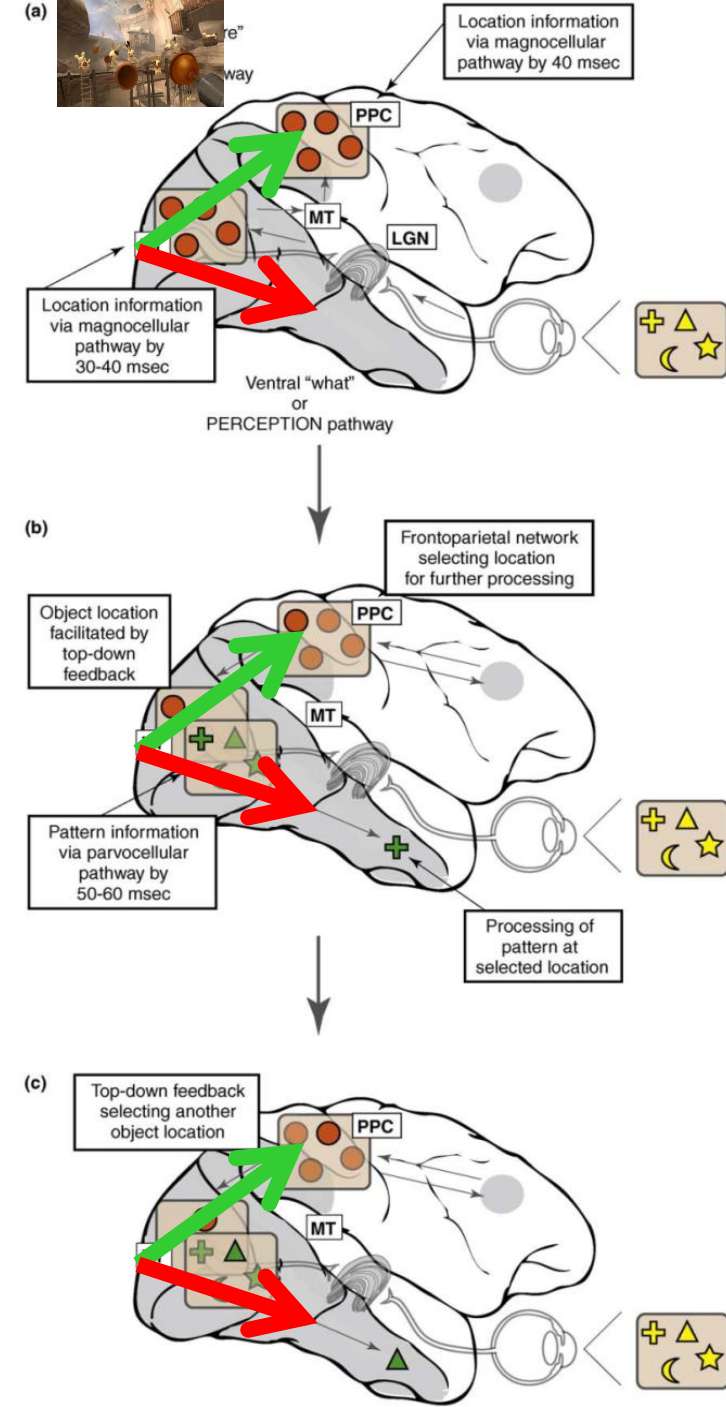
5. Perché funzionano?

3. Action video games: Allenano il circuito Dorsale?

Coherent dot motion task



Risultati:
Miglioramenti
solo dopo gli
AVG (t2 vs. t3);
see also Green et al., 2010
Curr Biol



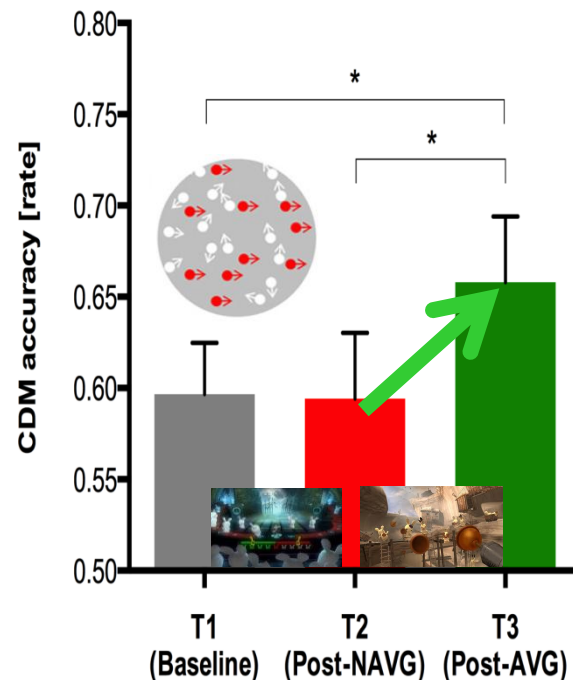
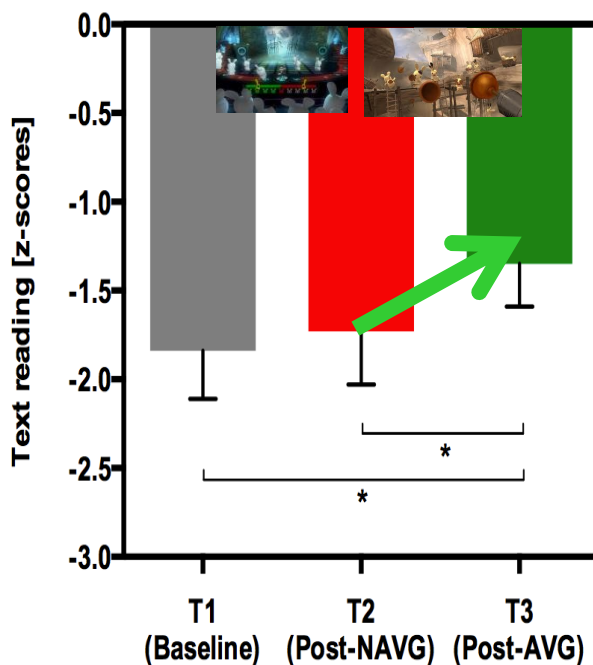
(ii) IMPROVING reading in children with dyslexia by RESTORING the dorsal-attentional network

OXFORD

ORIGINAL ARTICLE

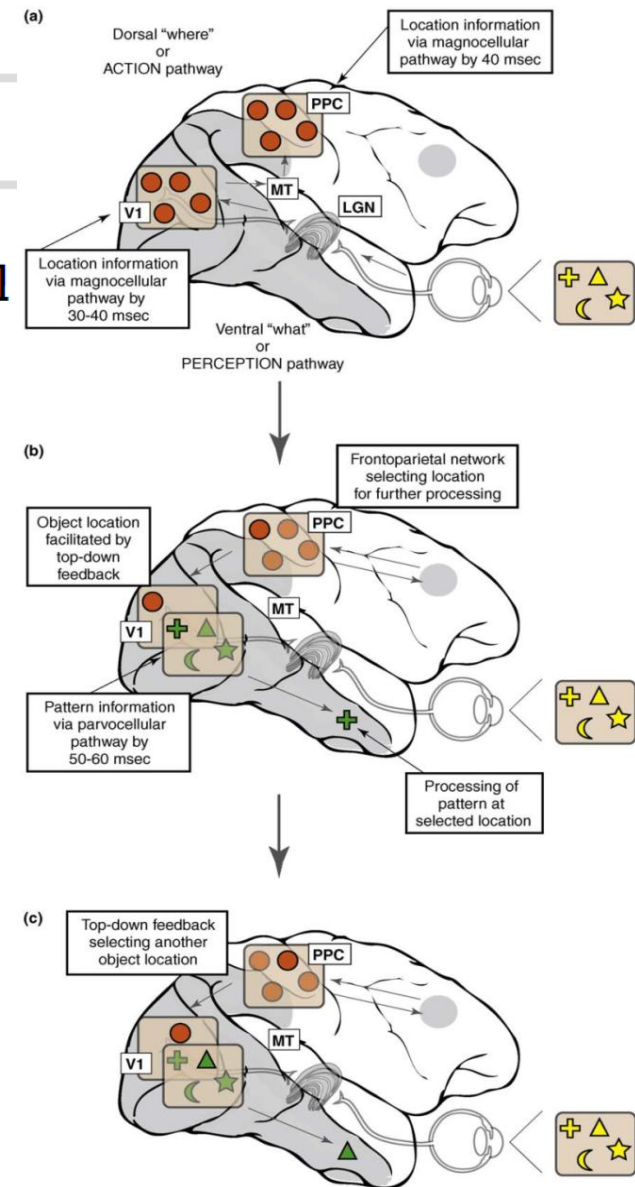
Multiple Causal Links Between Magnocellular–Dorsal Pathway Deficit and Developmental Dyslexia

Simone Gori^{1,2,†}, Aaron R. Seitz³, Luca Ronconi^{2,4}, Sandro Franceschini^{2,4} and Andrea Facoetti^{2,4,†}



Cerebral Cortex, 2015, 1–14

doi: 10.1093/cercor/bhv206
Original Article





**La lettura è cruciale
per vivere nella
società moderna**



**Per circa il 5% dei
bambini imparare
a leggere è
estremamente
difficile**



**Questi bambini
sono affetti da
dislessia che è
un complesso
disordine
neuroevolutivo**

**La più popolare spiegazione della dislessia individua nel disturbo
linguistico-fonologico l'unica causa,
MA
la dislessia è causata da una combinazione di cause.**

I tradizionali trattamenti della dislessia sono spesso lenti, lunghi, costosi e frustranti per i bambini (e i loro genitori) e spesso neppure troppo efficienti.



Il nostro approccio mira alla prevenzione, piuttosto che al trattamento della dislessia mediante un trattamento preventivo prescolare mediante video giochi



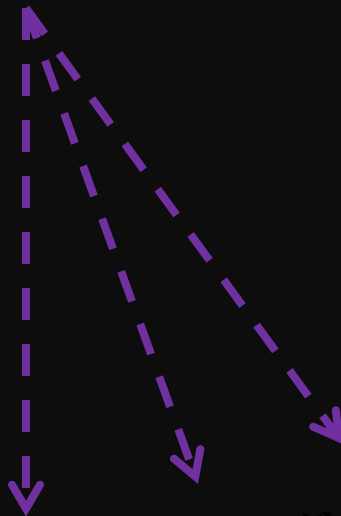
PRE-LETTURA

Scuola dell'infanzia

ACQUISIZIONE DELLA LETTURA

Primaria Secondaria Università

Prevenzione
mediante training
neurocognitivo



Sviluppo tipico della lettura

Dislessia evolutiva con prevenzione

Dislessia evolutiva

Interazioni
Geni x Ambiente

ABILITA' DI LETTURA

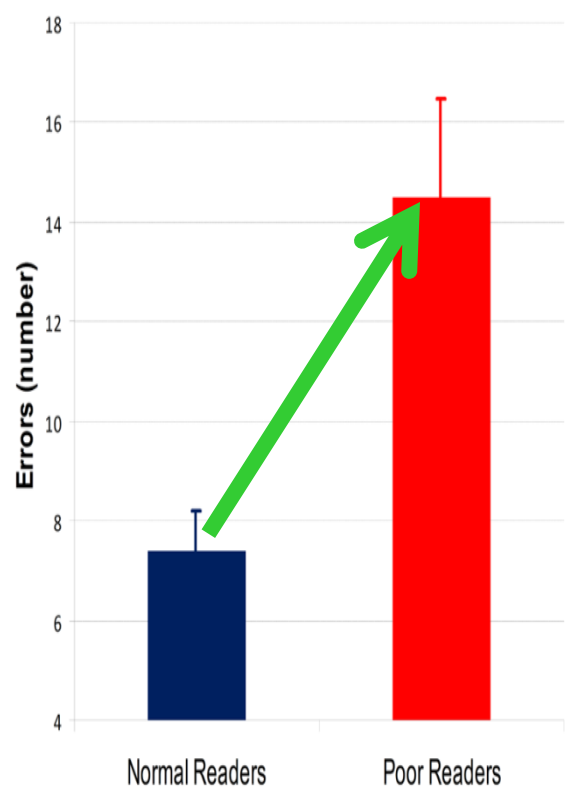
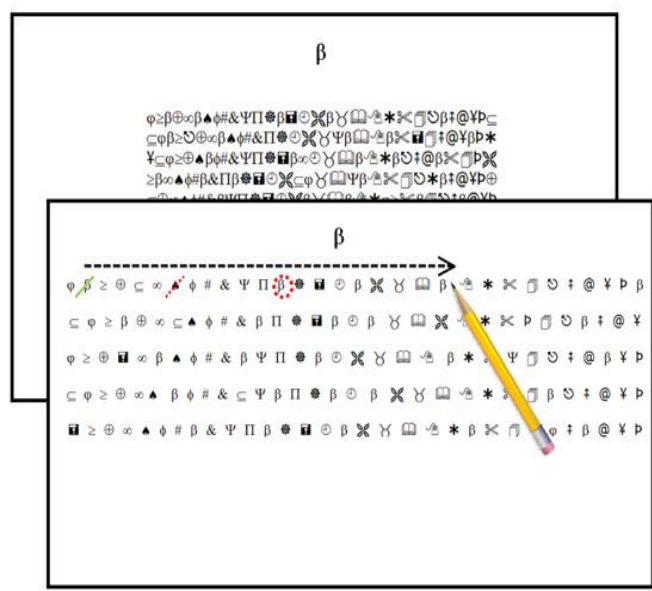
T E M P O

Denominazione rapida automatizzata
Abilità uditive-fonologiche

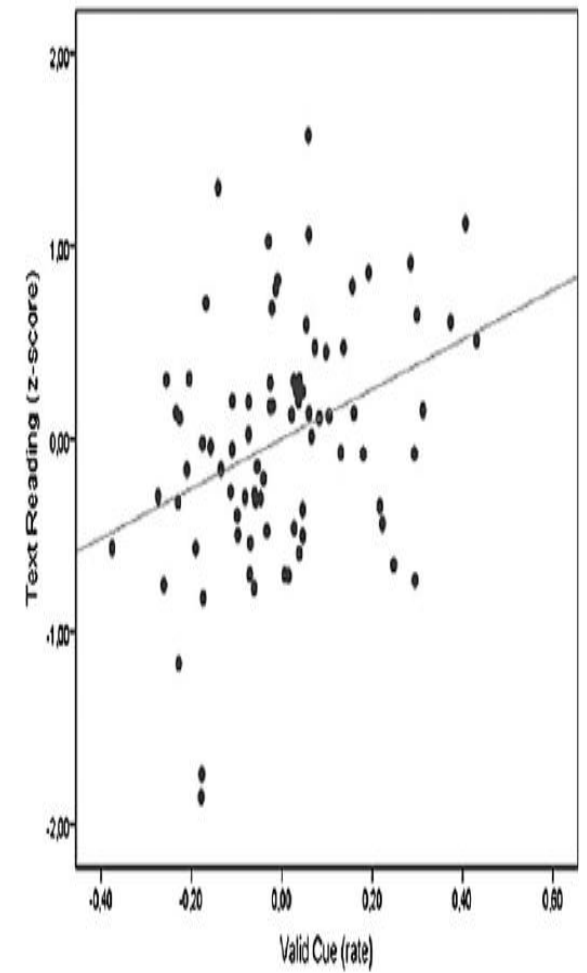
(1) PREVEDERE la dislessia nei prescolari MISURANDO il funzionamento visuo-attenzionale

Current Biology 22, 814–819, May 8, 2012

A Causal Link between Visual Spatial Attention and Reading Acquisition



Report



(2) PREVEDERE la dislessia nei prescolari MISURANDO il funzionamento del circuito dorsale

Cerebral Cortex Advance Access published October 6, 2015

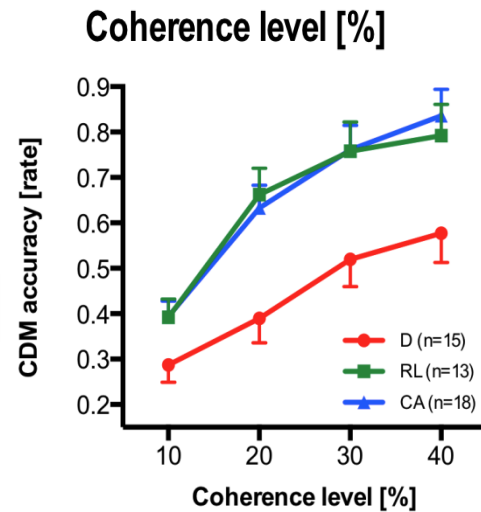
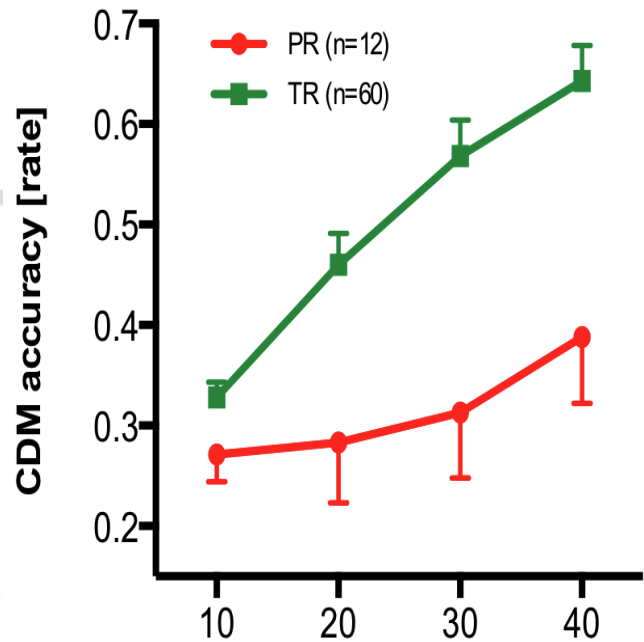
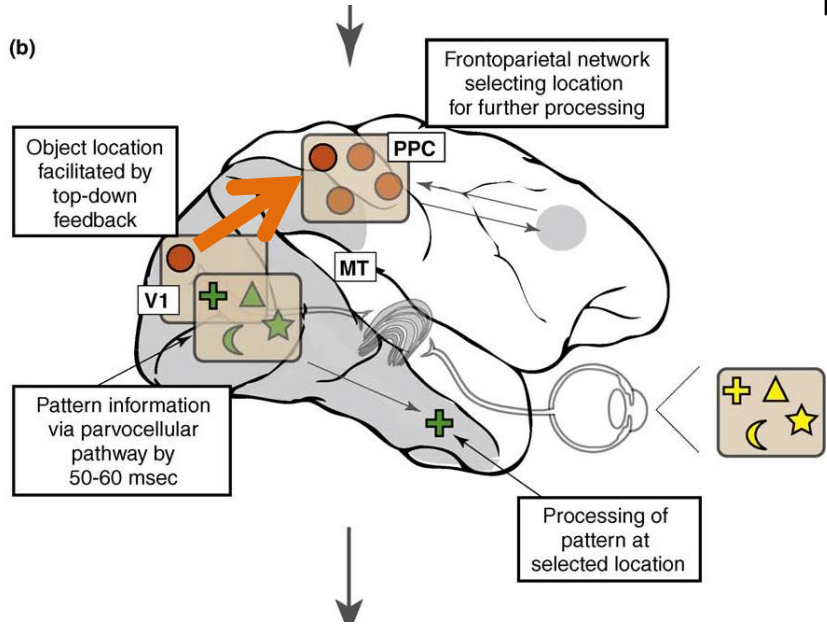
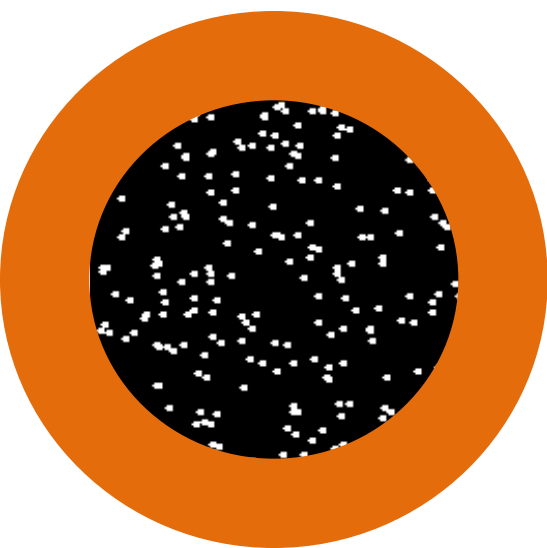


Cerebral Cortex, 2015, 1–14

doi: 10.1093/cercor/bhv206
Original Article

ORIGINAL ARTICLE

Multiple Causal Links Between Magnocellular–Dorsal Pathway Deficit and Developmental Dyslexia



PRE-LETTURA

Scuola dell'infanzia

ACQUISIZIONE DELLA LETTURA

Primaria Secondaria Università

Sviluppo tipico della lettura

Dislessia evolutiva

ABILITA' DI LETTURA

Interazioni
Geni x Ambiente

T E M P O

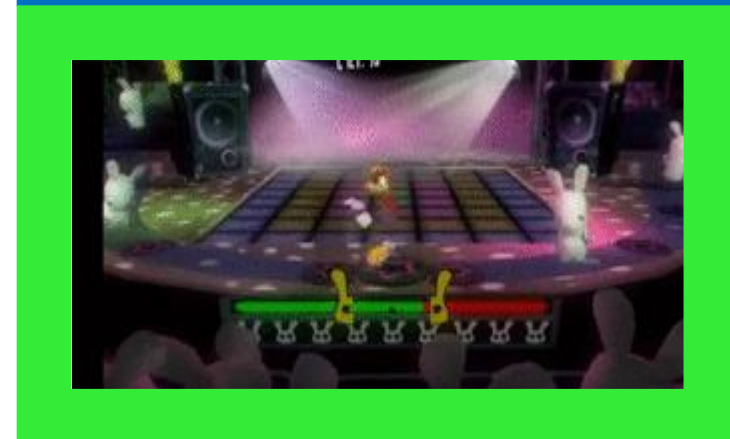
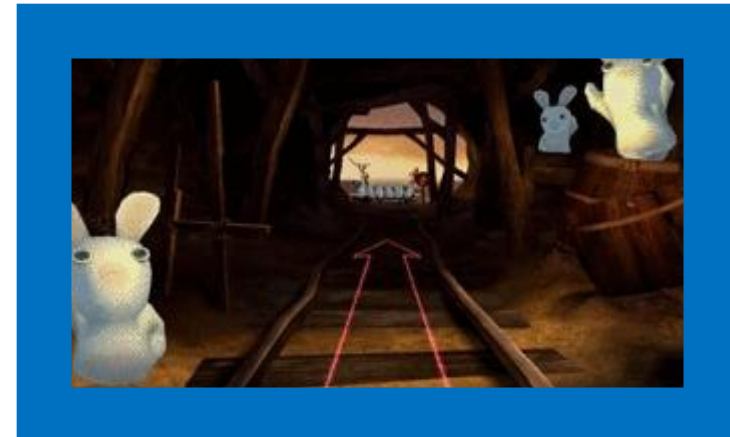
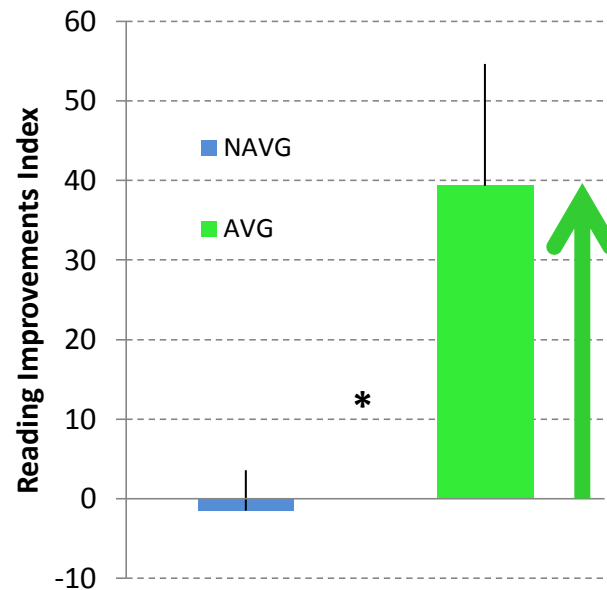
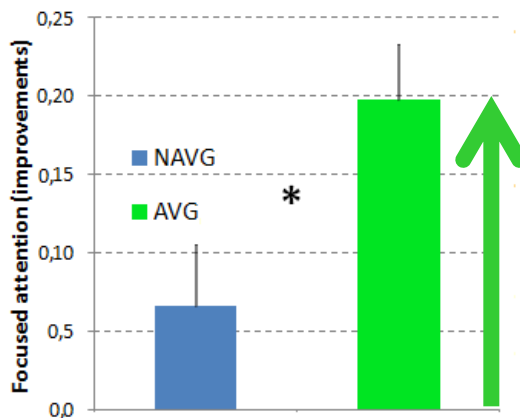
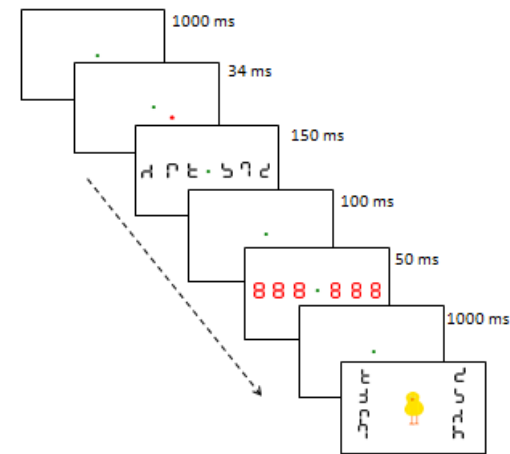
Abilità del circuito M-D
Abilità visuo-attenzionale
Denominazione rapida automatizzata
Abilità uditive-fonologiche

(3) Migliorare la lettura nei bambini con dislessia RIDUCENDO i loro disturbi visuo-attenzionali

Current Biology 23, 1–5, March 18, 2013

Report

Action Video Games Make Dyslexic Children Read Better



(4) Migliorare la lettura nei bambini con dislessia “AGGIUSTANDO” i loro disturbi del circuito dorsale

Cerebral Cortex Advance Access published October 6, 2015

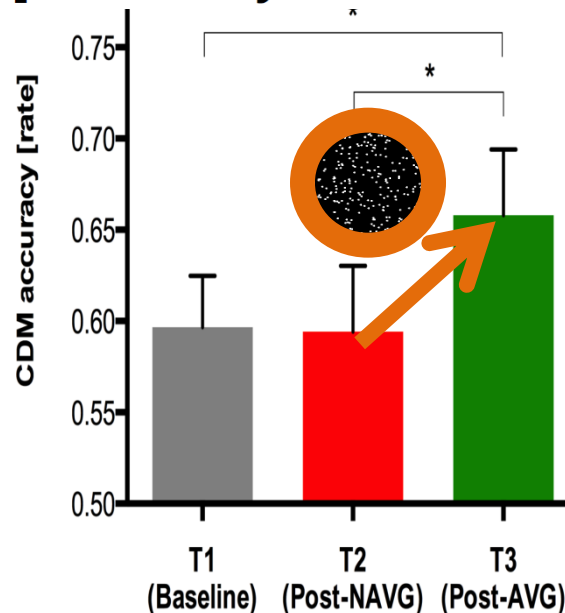
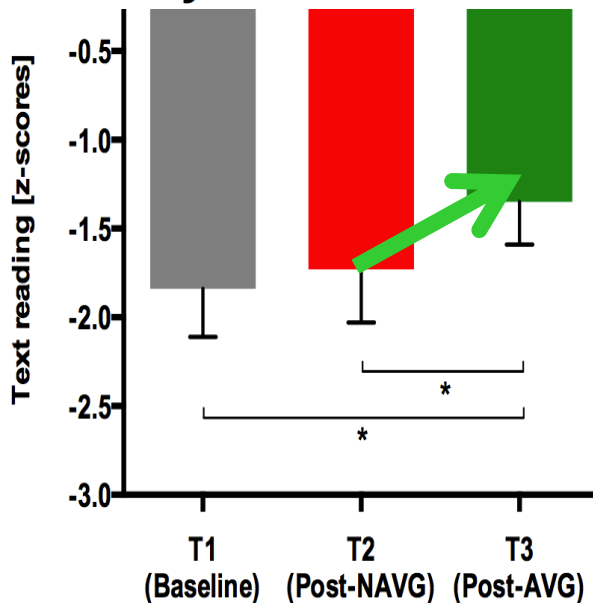


Cerebral Cortex, 2015, 1–14

doi: 10.1093/cercor/bhv206
Original Article

ORIGINAL ARTICLE

Multiple Causal Links Between Magnocellular–Dorsal Pathway Deficit and Developmental Dyslexia



(4) Migliorare la lettura negli adulti con dislessia “AGGIUSTANDO” i loro disturbi del circuito dorsale

Cerebral Cortex Advance Access published October 6, 2015

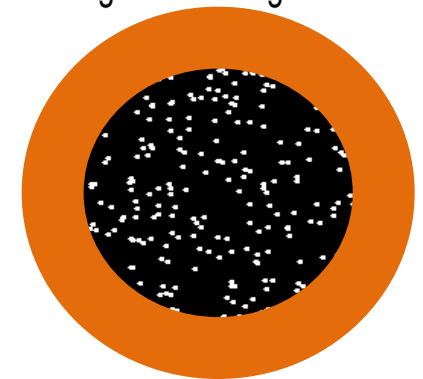
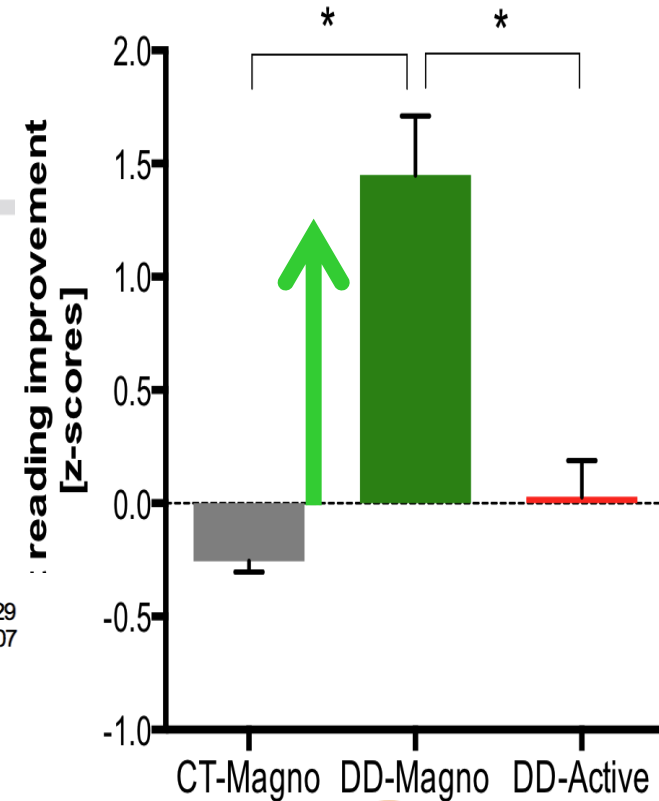
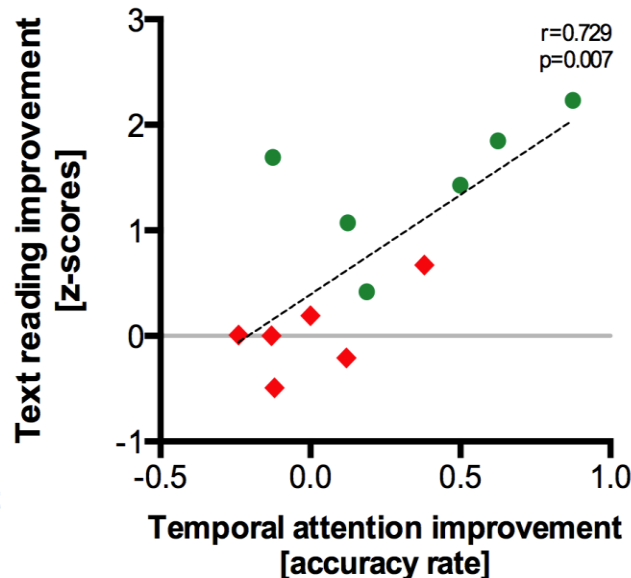
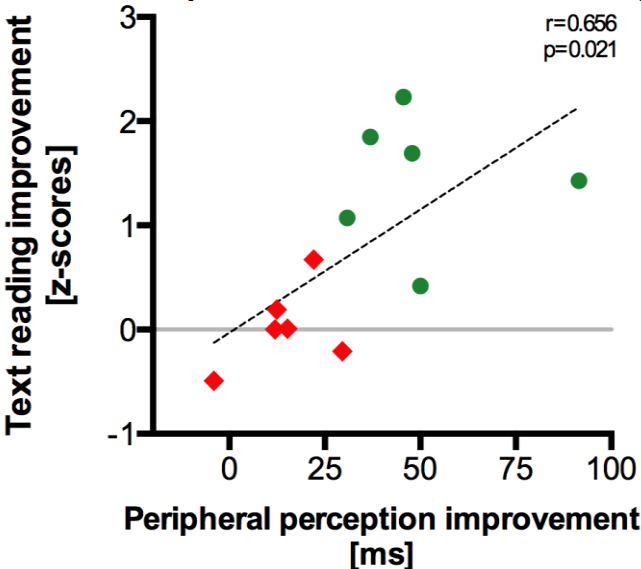


Cerebral Cortex, 2015, 1–14

doi: 10.1093/cercor/bhv206
Original Article

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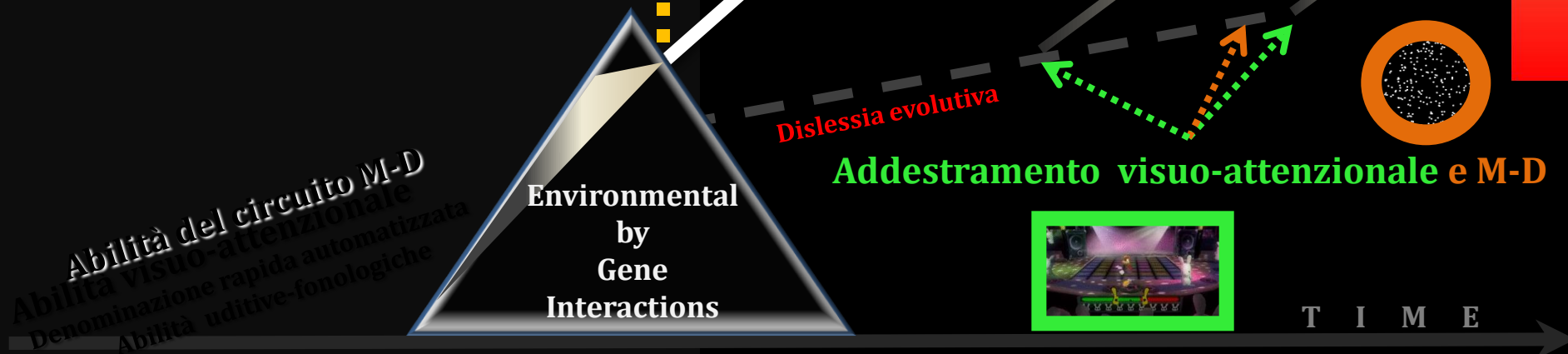


PRE-LETTURA

Scuola dell'infanzia

ACQUISIZIONE DELLA LETTURA

Primaria Secondaria Università

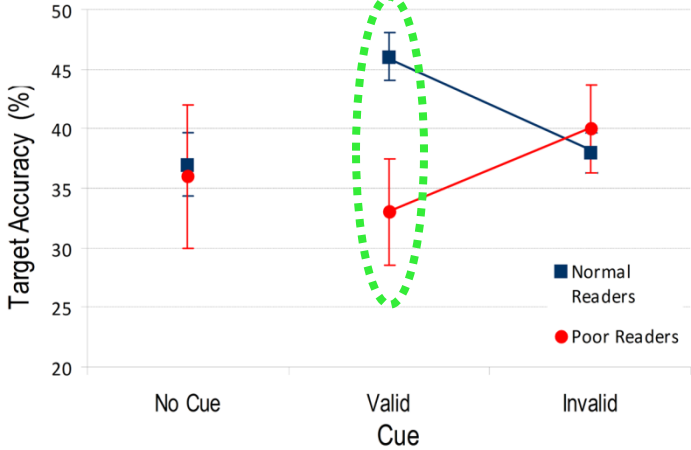
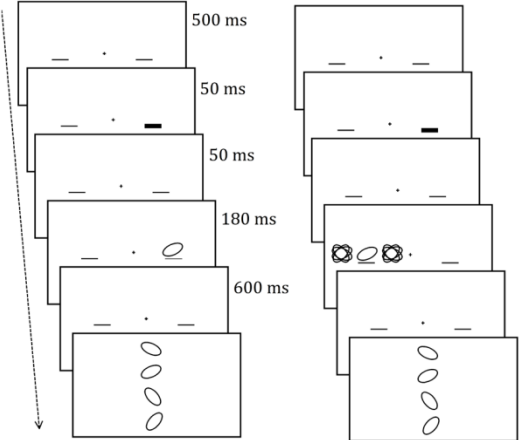
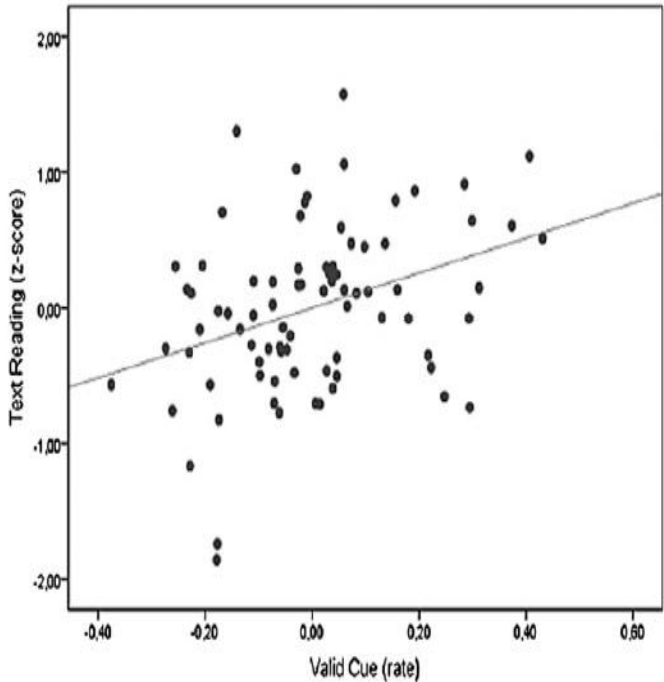
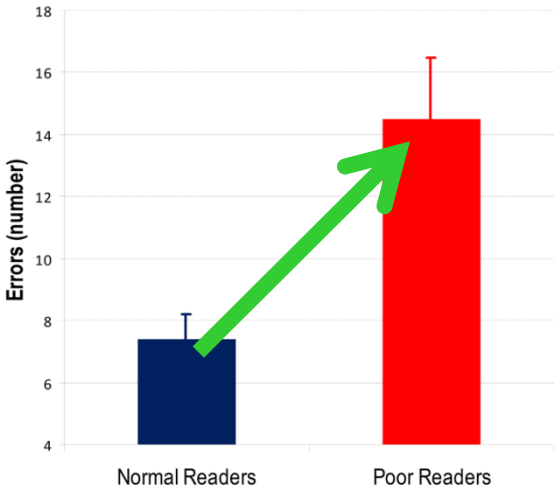
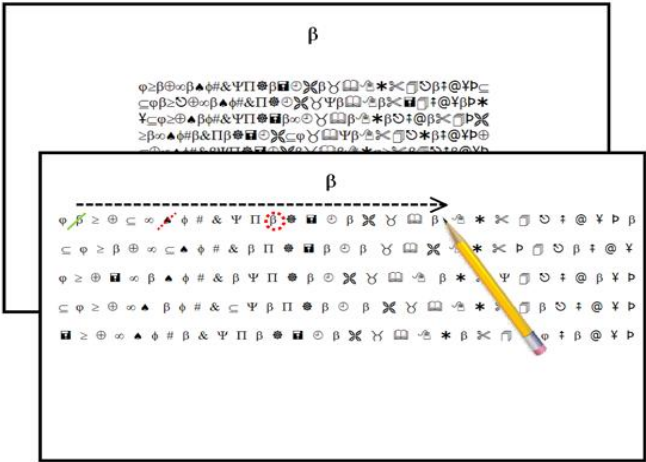


(iv) PREDICTING dyslexia in pre-readers by MEASURING the visuo-attentional functioning

Current Biology 22, 814–819, May 8, 2012 ©2012 Elsevier Ltd All rights reserved DOI 10.1016/j.cub.2012.03.013

Report

A Causal Link between Visual Spatial Attention and Reading Acquisition



(v) PREDICTING dyslexia in pre-readers by MEASURING the dorsal-attentional network

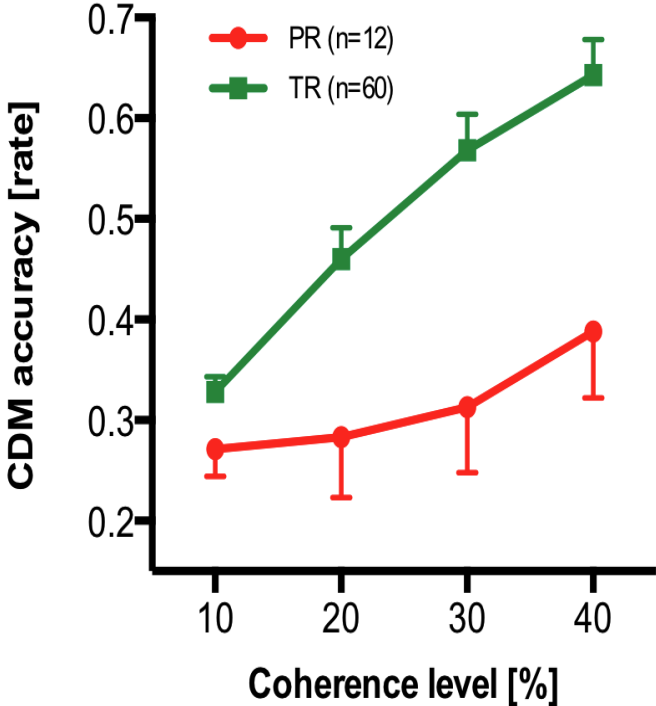
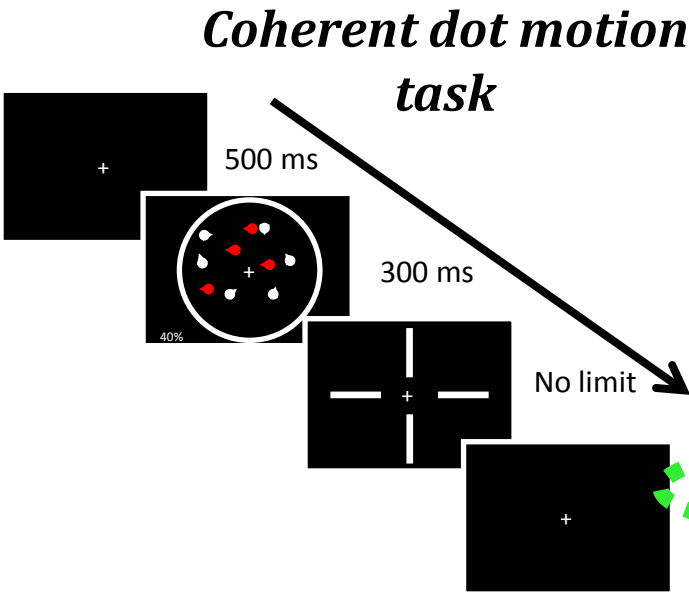


Cerebral Cortex, 2015, 1–14
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Original Article

ORIGINAL ARTICLE

Multiple Causal Links Between Magnocellular–Dorsal Pathway Deficit and Developmental Dyslexia

Simone Gori^{1,2,†}, Aaron R. Seitz³, Luca Ronconi^{2,4}, Sandro Franceschini^{2,4} and Andrea Facoetti^{2,4,†}



	Typical readers (n = 60) Mean (SD)	Poor readers (n = 12) Mean (SD)
Chronological age (months)	71.18 (3.41)	71.17 (3.97)
Verbal IQ (standard point)	12.63 (2.79)	11.25 (2.7)
Syllabic segmentation (errors/15 items)	1.02 (1.9)	3.64 (4.99)
Visual search (errors/25 targets)	3.27 (3.19)	6 (5.71)
Visual search (s)	93.03 (30.37)	122.60 (38.75)

THE EARLY YEARS

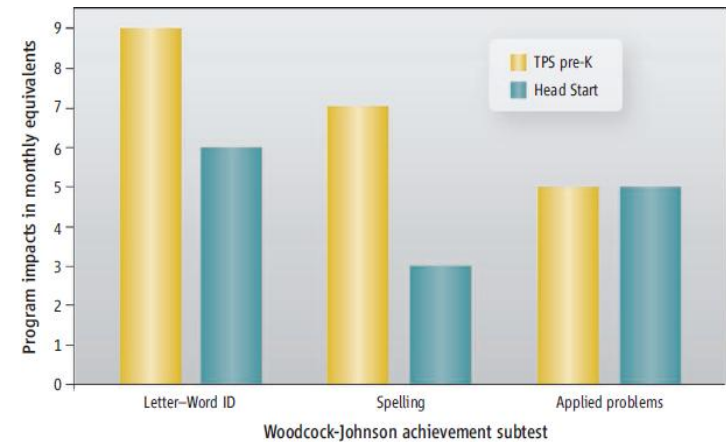
Preschool Programs Can Boost School Readiness

William T. Gormley Jr.,* Deborah Phillips, Ted Gayer

Preschool programs in Oklahoma help children to succeed in school.



Preschool programs strengthen reading, writing, and math skills



Dyslexia: A New Synergy Between Education and Cognitive Neuroscience

John D. E. Gabrieli

Reading is essential in modern societies, but many children have dyslexia, a difficulty in learning to read. Dyslexia often arises from impaired phonological awareness, the auditory analysis of spoken language that relates the sounds of language to print. Behavioral remediation, especially at a young age, is effective for many, but not all, children. Neuroimaging in children with dyslexia has revealed reduced engagement of the left temporo-parietal cortex for phonological processing of print, altered white-matter connectivity, and functional plasticity associated with effective intervention. Behavioral and brain measures identify infants and young children at risk for dyslexia, and preventive intervention is often effective. A combination of evidence-based teaching practices and cognitive neuroscience measures could prevent dyslexia from occurring in the majority of children who would otherwise develop dyslexia.

5. Dyslexia prevention

To date, dyslexia prevention is only a dream far from being achieved but see



massachusetts institute of technology — computer science and artificial intelligence laboratory

Towards the Prevention of Dyslexia

Gadi Geiger & Domenic G. Amara

Rovertto
Attention
Workshop

simone.gori@unipd.it
andreafacoetti@unipd.it

de.co.ne lob

Can Action Video Game Training Prevent
Future Reading Disabilities?

Simone Gori,^{1,2} Milena Ruffino,² Maria Enrica Sali,² Massimo Molteni,² &
Andrea Facoetti^{1,2}

1. Department of General Psychology, University of Padua & 2. Scientific Institute E. Medea, Bosio Parini (LC) Italy

Learning to read is extremely difficult for about 10% of children across cultures; they are affected by a neurodevelopmental disorder called dyslexia. The neurocognitive causes of dyslexia are still hotly debated (Gabrieli, 2009; Peterson & Pennington, 2012). To date, dyslexia prevention is only a dream far from being achieved.

Pre-reading children (n=86):
-ADCL= No risk (n=41);
-Cognitive = At risk no training (n=15);
-ds = At risk "Action" training (n=16);
-lpad = At risk "Serious" training (n=14).

Visuo-spatial Improvement: Block Design

Visual Attention Improvements:
(i) Peripheral Discrimination;

(ii) Temporal Attention;

(iii) Rapid spatial cuing.

Early Language Predictors of Future Reading Abilities

(i) Letter Recognition;
(ii) Rapid Naming;
(iii) Phoneme Discrimination.

It has been demonstrated that action video games efficiently improve attention (Green & Bavelier, 2003, 2012) and reading abilities in children with dyslexia (Franceschini et al., 2013); our results showed, for the first time, that these attentional improvements can directly translate into better language and reading-related abilities, providing a new, fast and fun potential prevention training for dyslexia that has theoretical relevance in unveiling the causal role of attention in reading acquisition.

Attention &
Dyslexia

Experimental design

71 pre-reading (5-6 years old) **children at familial risk for dyslexia:**

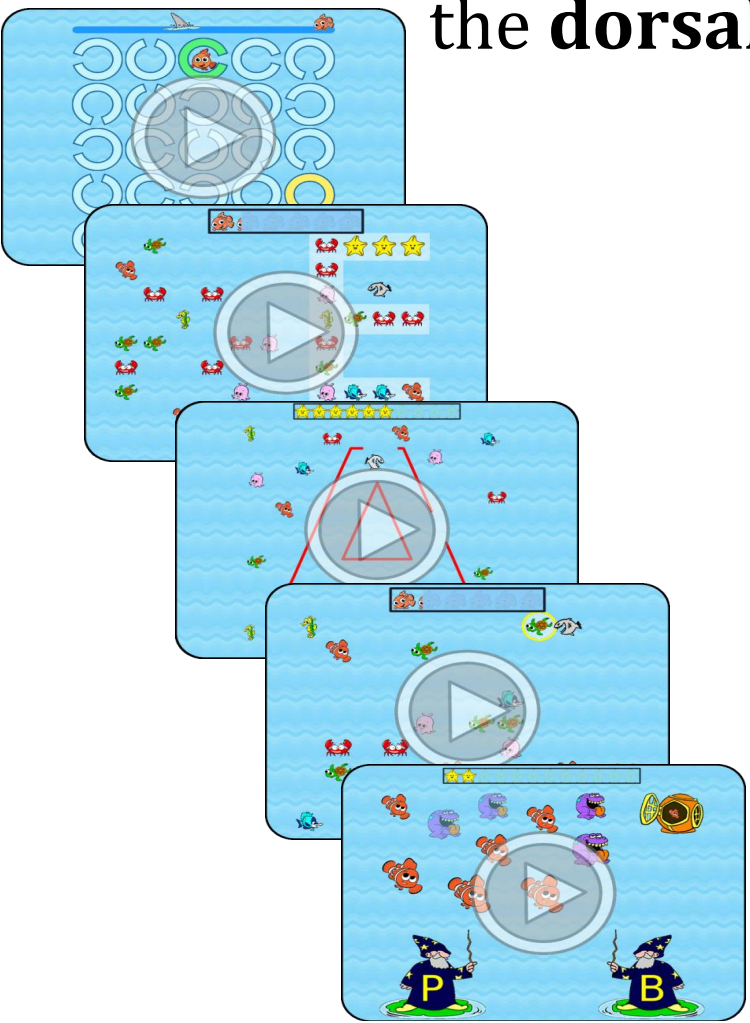
- **41 Low risk** = none deficits in the neurocognitive predictors of reading acquisition;
- **30 High risk** = one or more deficits in the neurocognitive predictors of reading acquisition.

30 pre-readers at High risk One or more deficits in: (i) letter recognition, (ii) RAN of colors, (iii) phoneme discrimination and/or (iv) serial visual search:

-16 “Action” video games
(20 hours);

- 14 “Serious” video games
(20 hours).

(vi) **PREVENTING** dyslexia in pre-readers by **TRAINING** the **dorsal-attentional** network



A Serious Game for Predicting the Risk of Developmental Dyslexia in Pre-readers Children

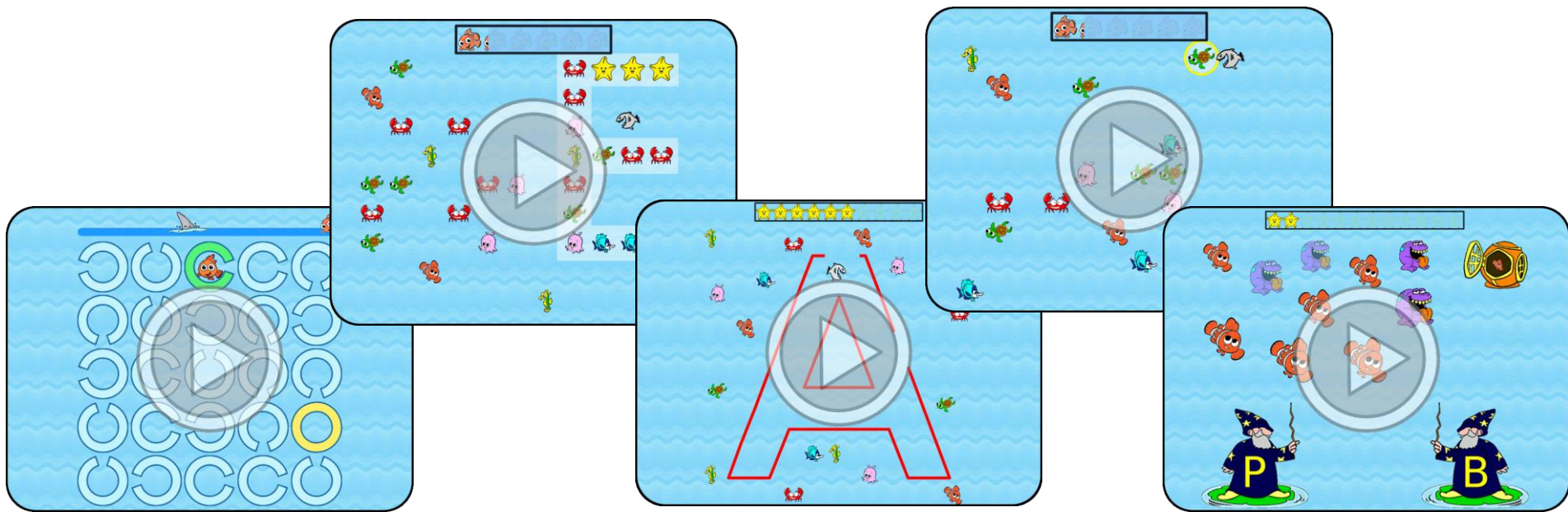
978-1-4673-1544-9/12/\$31.00 ©2012 IEEE

Ombretta Gaggi, Giorgia Galiazzo, Claudio Palazzi
Dept. of Mathematics
University of Padua
Padua, Italy

Andrea Facchetti, Sandro Franceschini
Developmental and Cognitive Neuroscience Lab
Dept. of General Psychology
University of Padua

5. Dyslexia prevention

“Serious” video games (by tablet) = training of visual attention (i.e., visual search and orienting), rapid auditory processing (i.e., speech sounds) and letter-to-speech sound mapping.



!!! Show video !!!

5. Dyslexia prevention

“Action” video games training (by Nintendo DS)



!!! Show video !!!

Attention &
Dyslexia

Space Invaders Extreme II

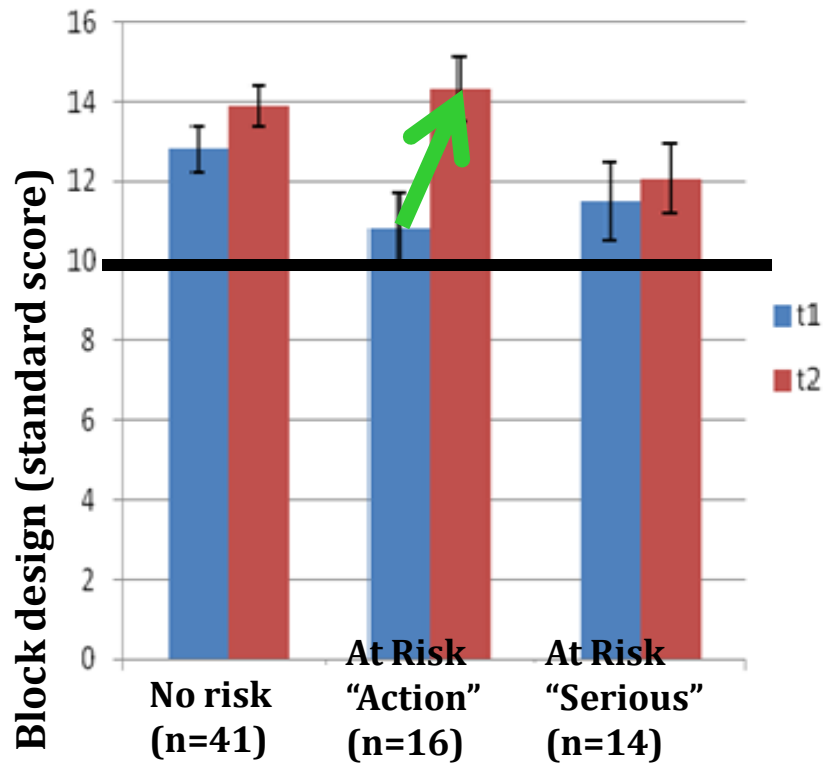
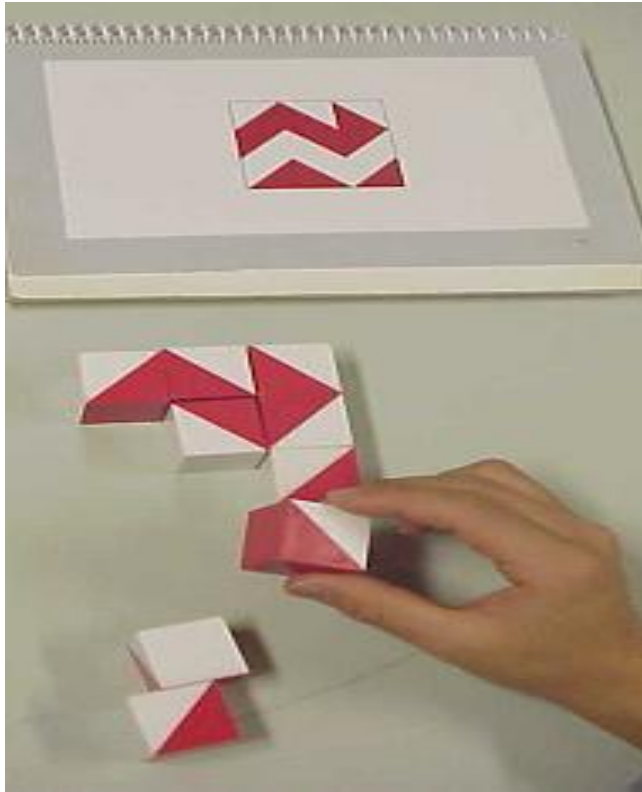


15 ore di **training**

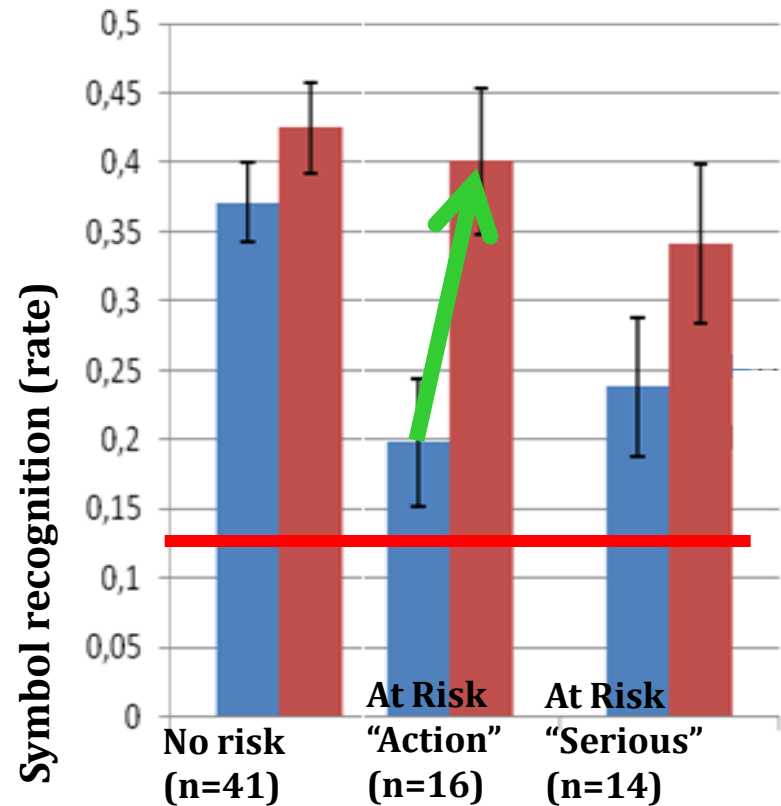
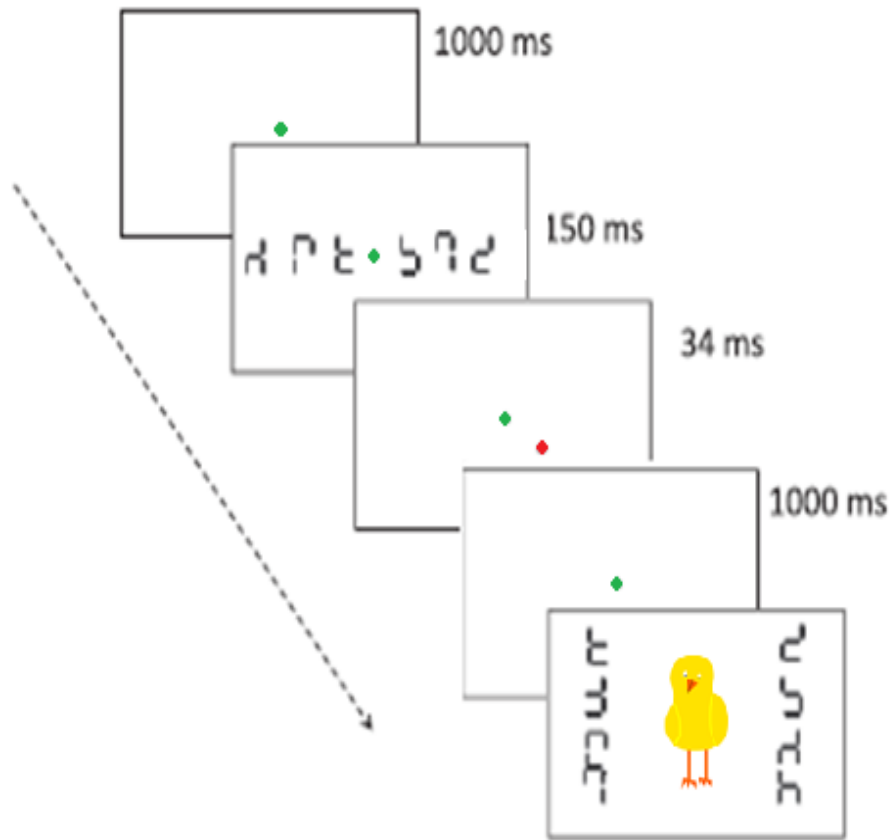


Terza fase:
rivalutare i **predittori**

Visuo-spatial improvement: Block design

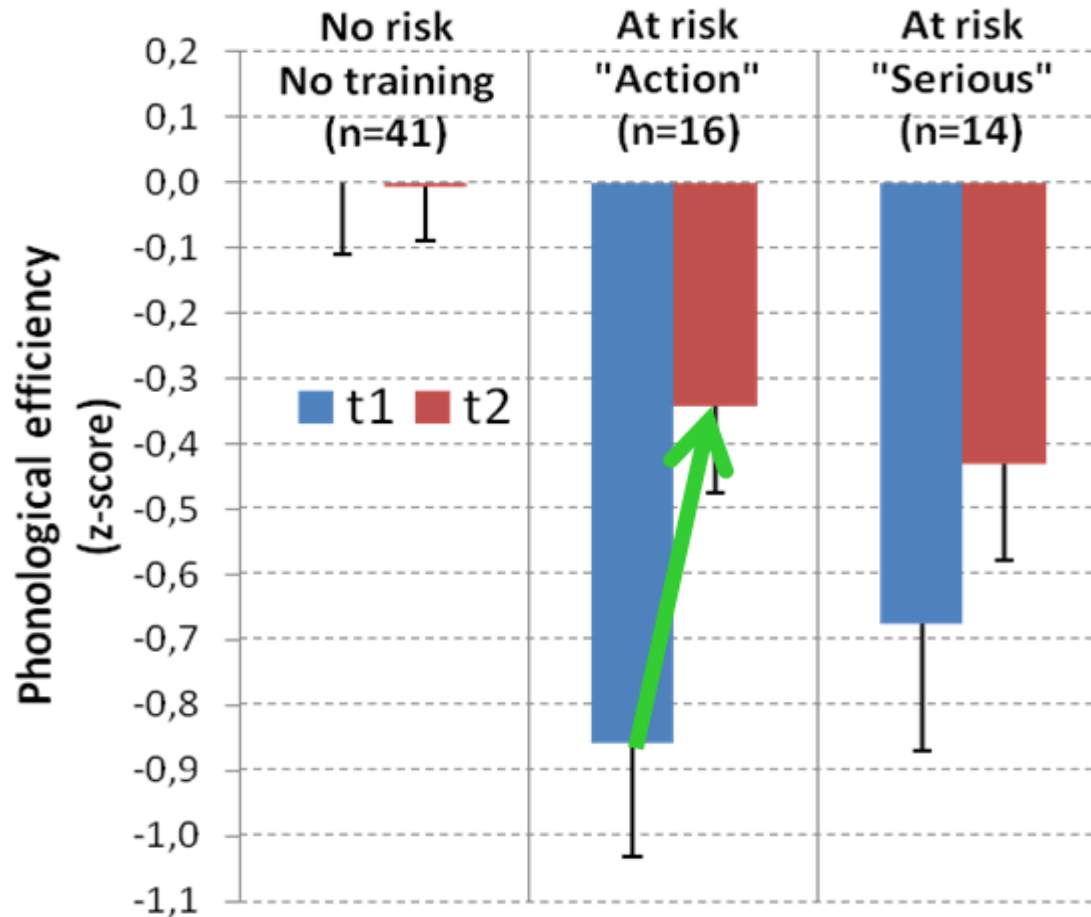


Visuo-spatial attention improvement



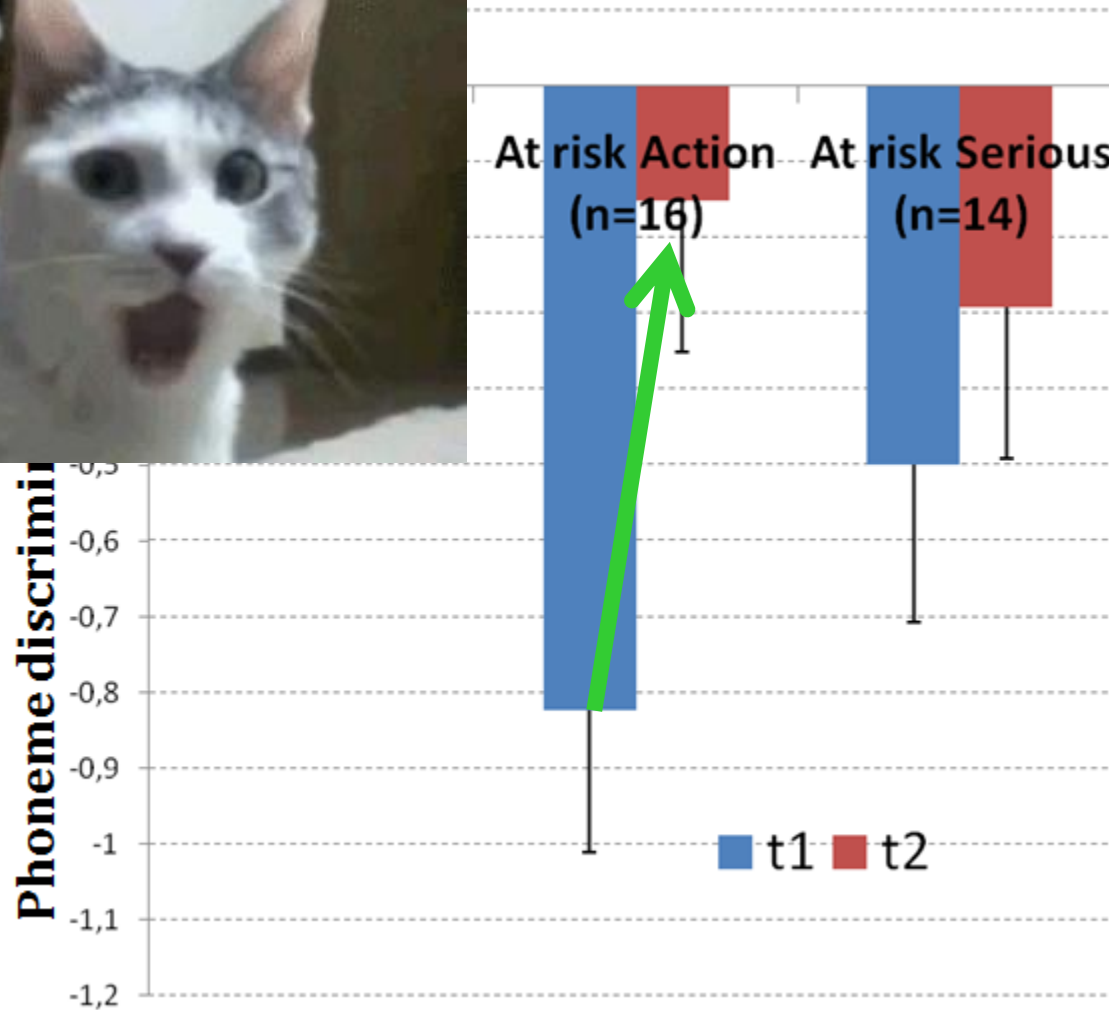
5. Dyslexia prevention

Global “phonological” (letter recognition, RAN of colors and phoneme discrimination) skills improvement



5. Dyslexia prevention

Phoneme discrimination improvement???



Partecipanti

Gruppo
sperimentale

Allenati con DS

- DS Padova - I8
- DS Lecco - I6

Controllo
Passivo

Non allenati

- No Rischio - 4I
- Cognitivo - I5

Controllo
Attivo

Allenati con iPad

- iPad - I4

4. Prevenzione della dislessia

Disegno con Cubi

ABILITÀ VISUO-PERCETTIVE



Riconoscimento
figura-sfondo



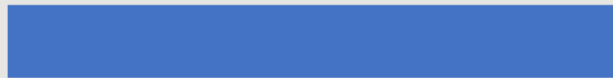
Ricerca visiva



Orientamento
spaziale

ABILITÀ

VISUO-COSTRUTTIVE



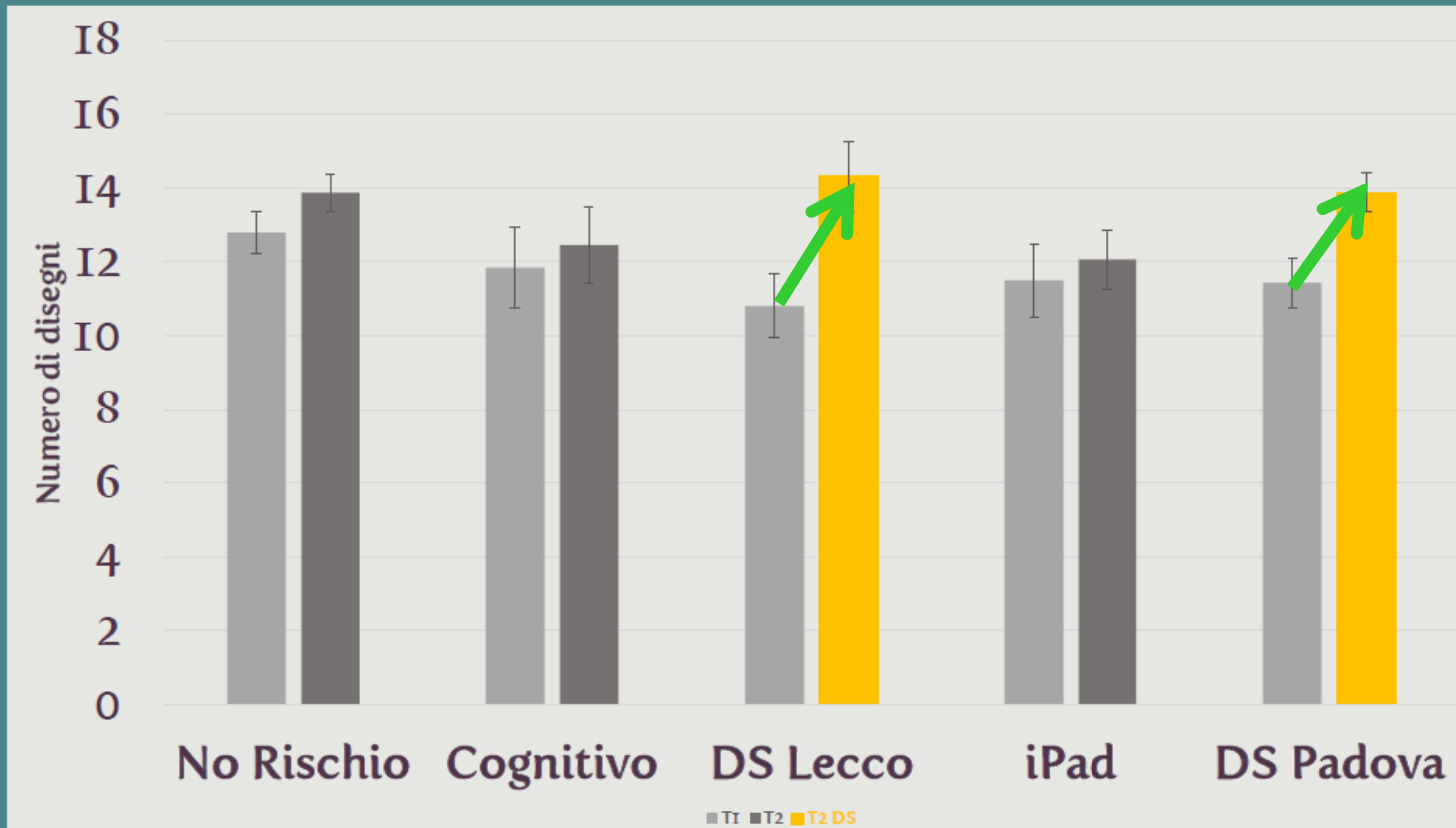
Assemblaggio dei
cubetti in una
configurazione
globale e coerente



4. Prevenzione della dislessia

Miglioramenti visuo-spaziali

**Migliore
distribuzione
delle risorse
attentive
nello spazio**



4. Prevenzione della dislessia

Coppie minime di non-parole

T_I – T₂

Versione ripetuta

1	PACA	BACA
2	BATA	PATA
3	PASE	PASE
4	FAMI	VAMI
5	VALA	VALA
6	LETA	LEDA
...		

CONSAPEVOLEZZA
FONOLOGICA

MEMORIA
FONOLOGICA
A BREVE TERMINE

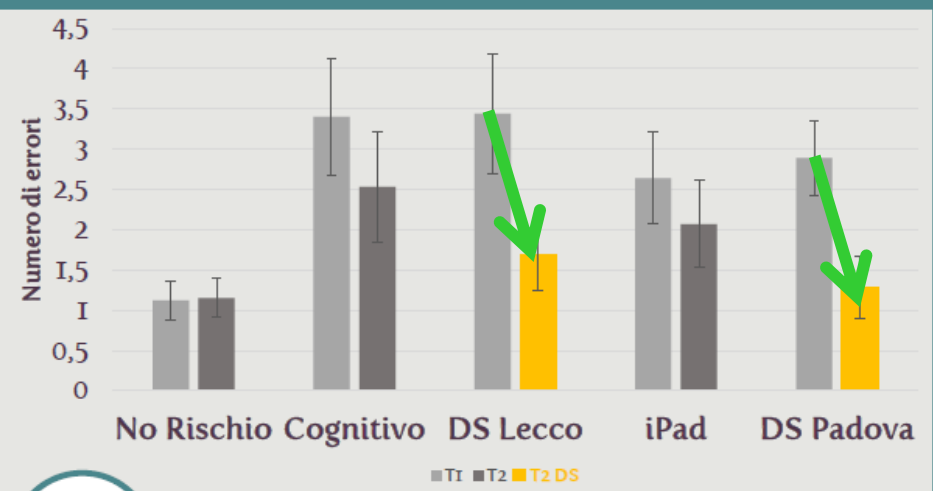
T₂

Versione nuova

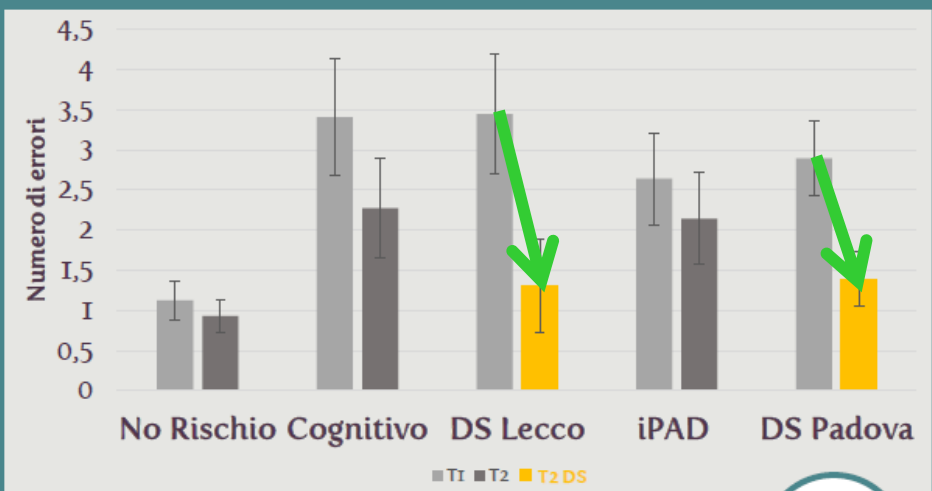
1	CAPA	CABA
2	TABA	TAPA
3	SEPA	SEPA
4	MIFA	MIVA
5	TAVA	TAVA
6	LATE	LADE
...		

4. Prevenzione della dislessia

Miglioramenti uditivo-fonologici



T1 - T2 **Versione ripetuta**



Versione nuova T2

In entrambe le versioni vi è una **riduzione** del numero di errori nella discriminazione di non-parole

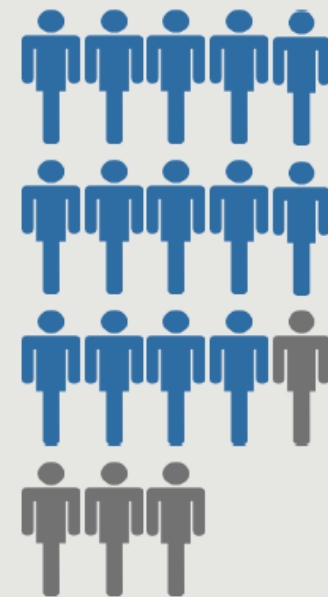
4. Prevenzione della dislessia

Analisi singole



I7
bambini
su I8
migliorano
di almeno
I DS rispetto
al gruppo a
rischio
cognitivo

I4
bambini
su I8
migliorano
di almeno
I DS rispetto
al gruppo
iPad



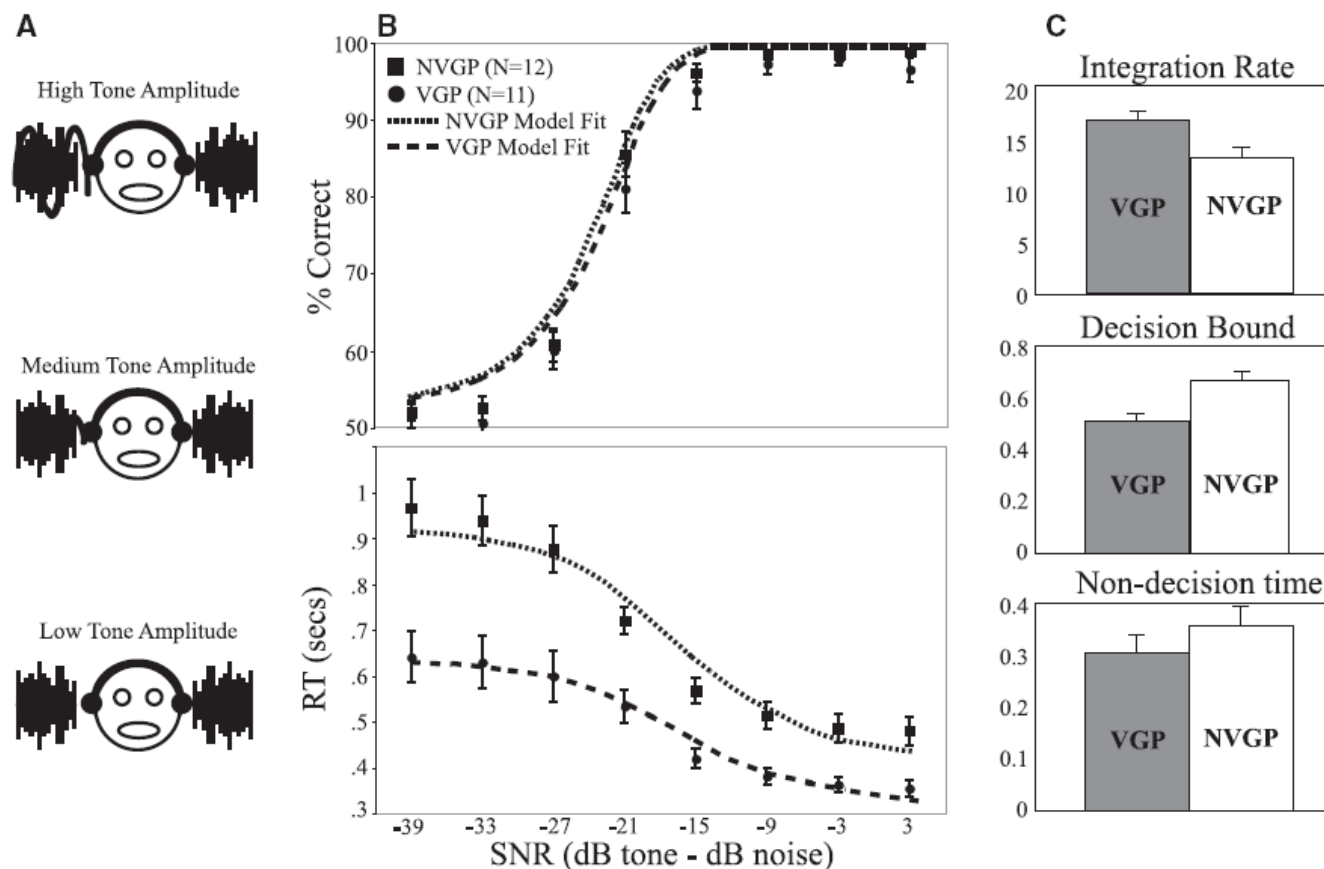
Report

Improved Probabilistic Inference as a General Learning Mechanism with Action Video Games

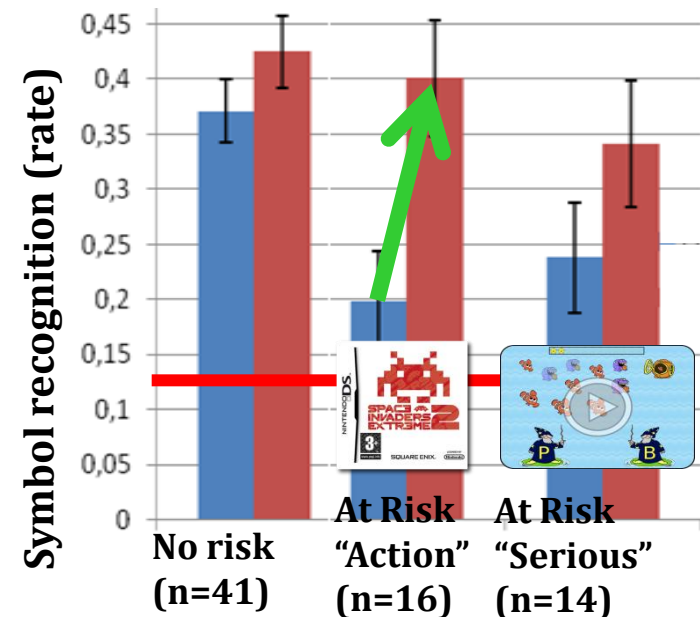
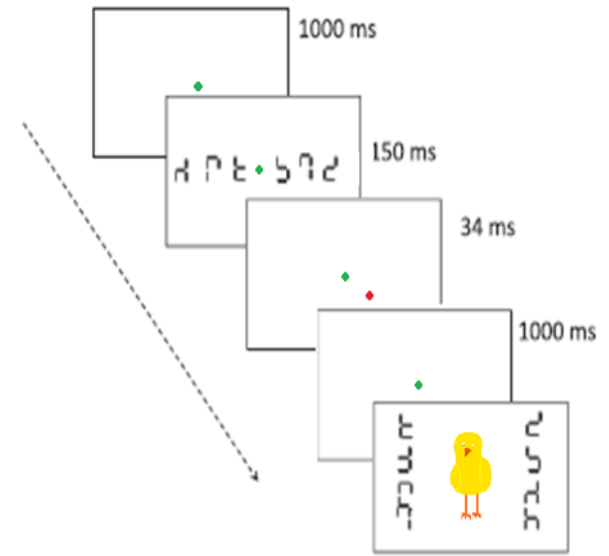
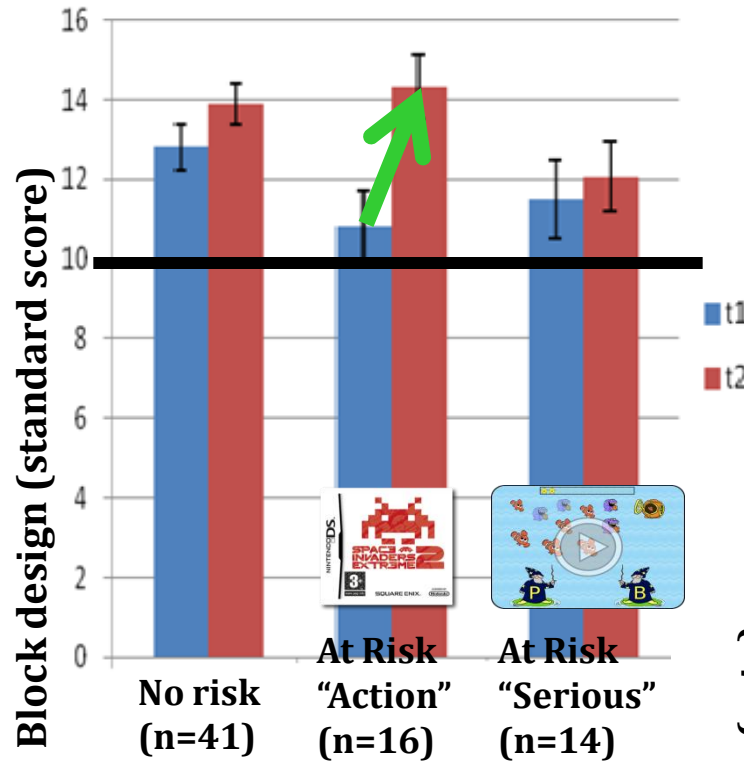
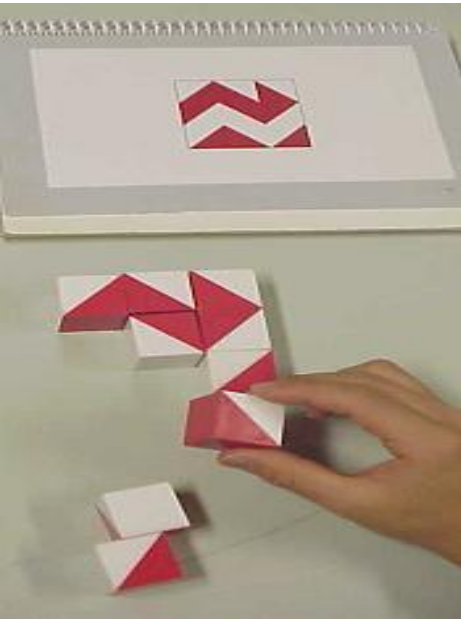
C. Shawn Green,^{1,2} Alexandre Pouget,¹
and Daphne Bavelier^{1,*}

¹Department of Brain and Cognitive Sciences, University of Rochester, Rochester, NY 14627, USA

meet our standards for improved probabilistic inference. These can be defined rigorously in the task we chose by considering decision making from a probabilistic perspective. Before committing to a choice, the best a subject can do is to

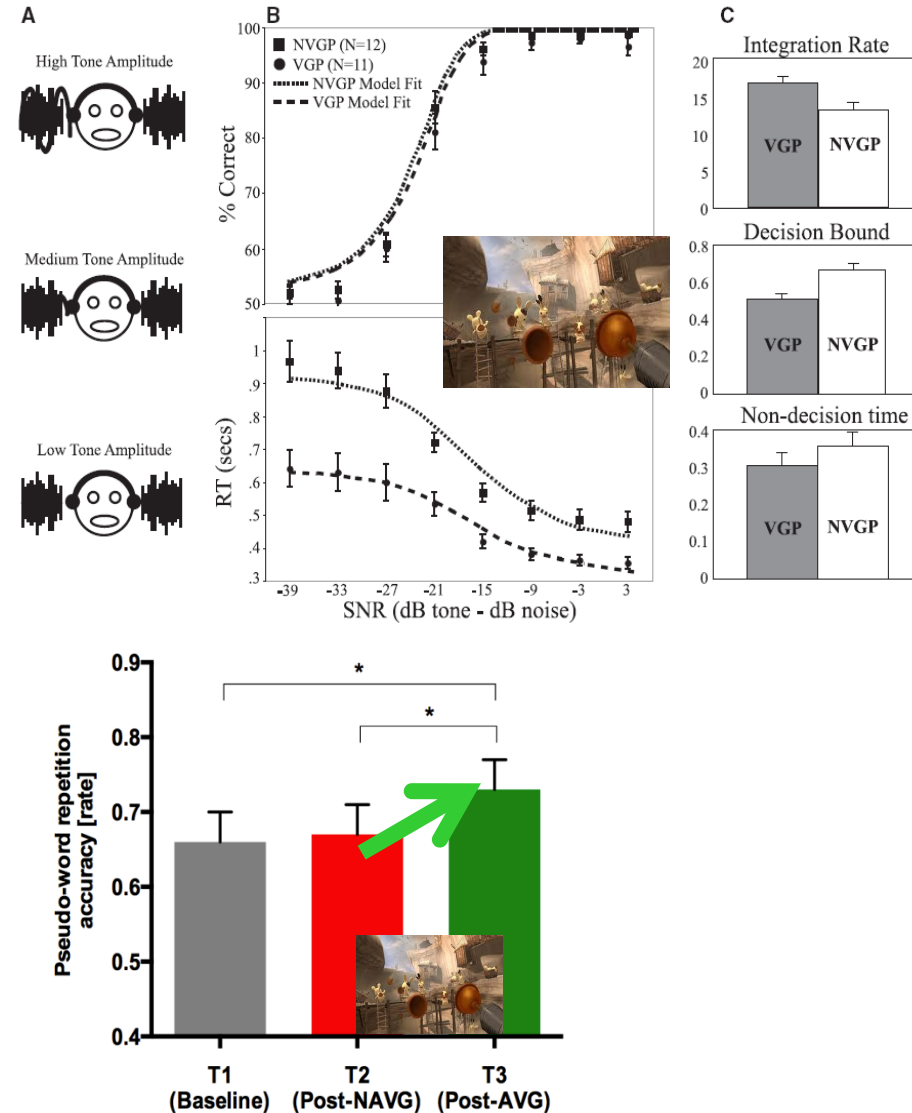
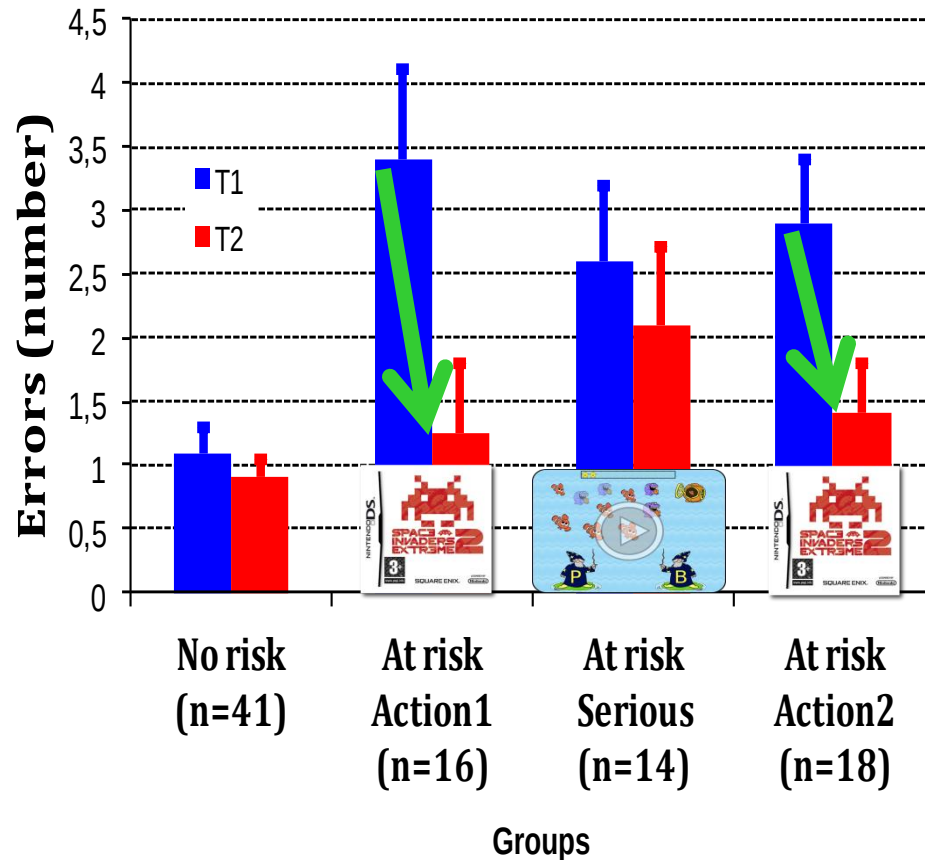


(vi) PREVENTING dyslexia in pre-readers by TRAINING the dorsal-attentional network (Study 1)

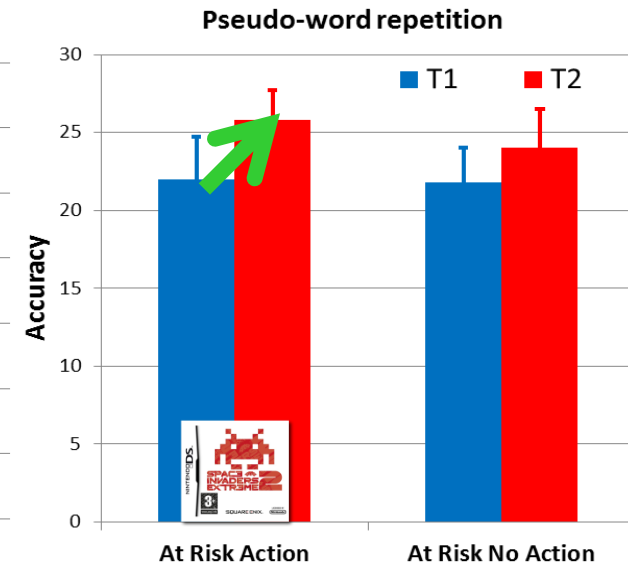
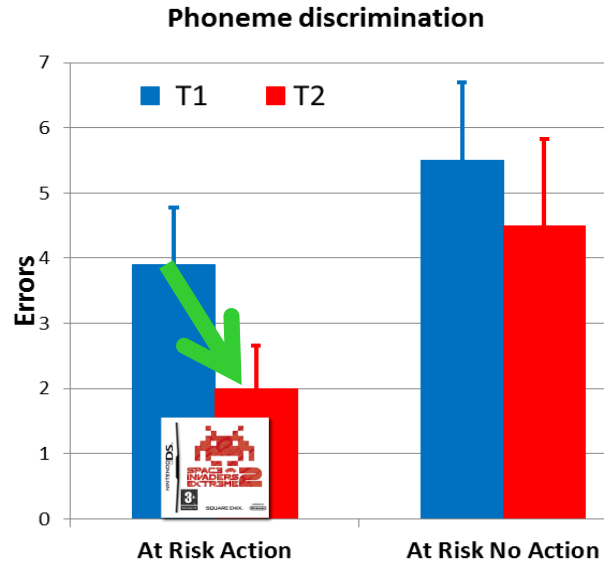
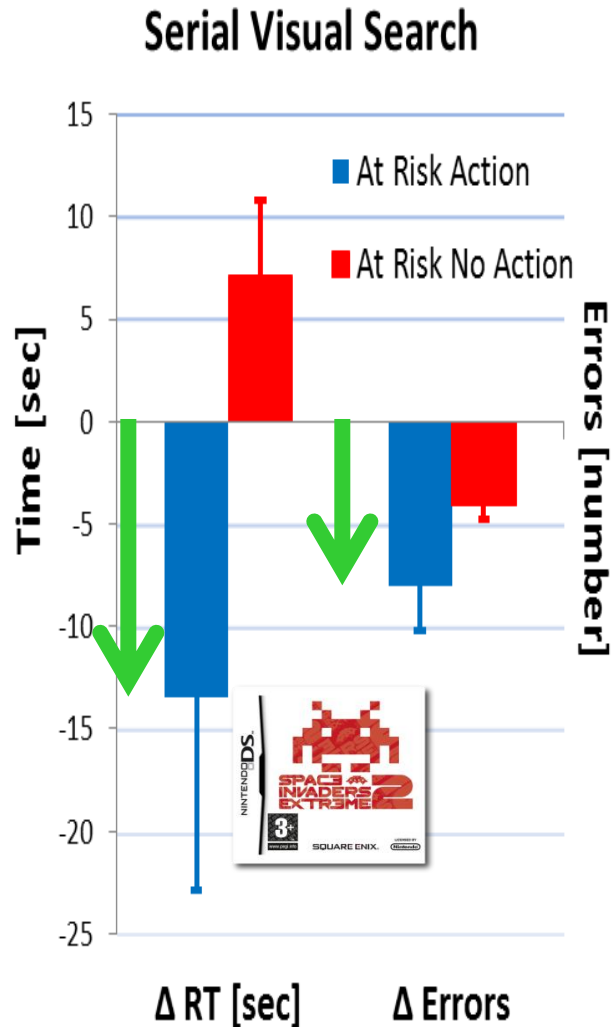


(vi) PREVENTING dyslexia in pre-readers by TRAINING the dorsal-attentional network (Study 2)

Phoneme discrimination task:
"paca" "baca" same or different?



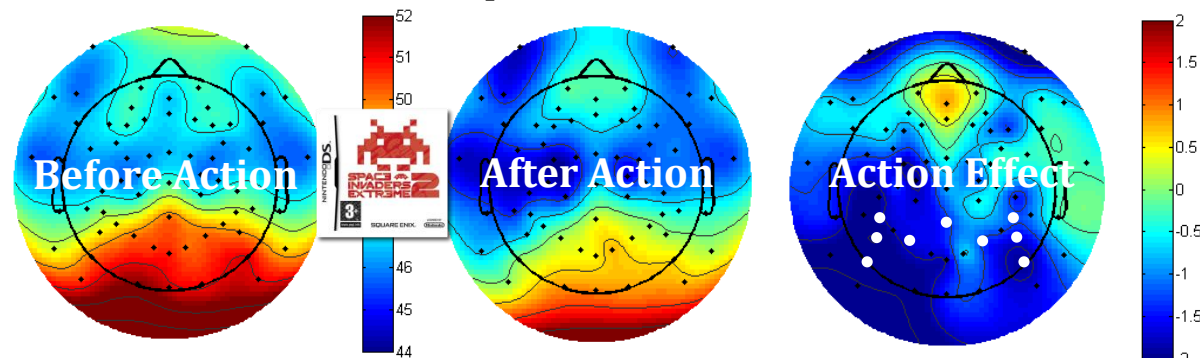
(vi) PREVENTING dyslexia in pre-readers by TRAINING the dorsal-attentional network (Study 3)



Neural basis of AVG training in at DD risk children:

A resting-state EEG study

A reduction of alpha band (10-14 Hz) oscillatory activity in posterior areas



Messaggi da portare a casa (i)

- L'attenzione visiva è disturbata nei individui con dislessia:
MA... CAUSA O SEMPLICE
EFFETTO???
- Semplici manipolazioni visive del testo migliorano l'efficacia di lettura nei dislessici;
- Un disturbo dorsale-attentionale predice le future difficoltà di lettura;

Messaggi da portare a casa (ii)

- I video giochi d'azione migliorano la lettura nei dislessici riducendo le loro difficoltà visuo-attenzionali causate da un disturbo dorsale;
- I video giochi d'azione migliorano i disturbi fonologici nei bambini prescolari a rischio di dislessia;
- **La dislessia è un disturbo multifattoriale probabilistico** dove diversi disturbi (attenzionali visivi, uditivi e difficoltà nell'apprendimento multisensoriale) sono le possibili cause.



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