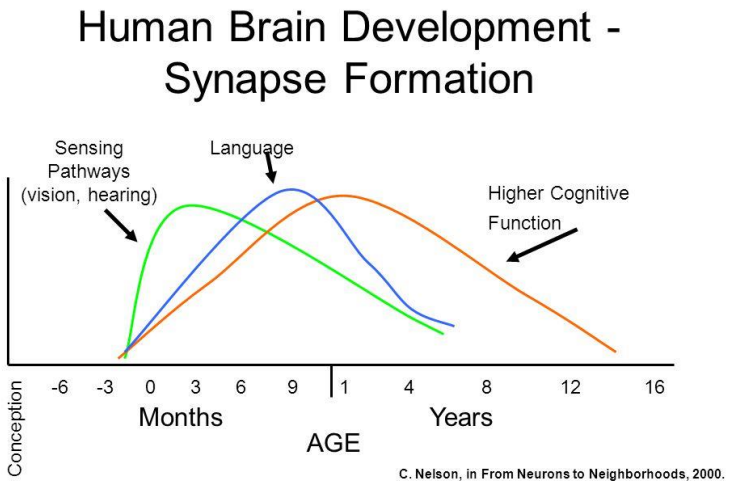
Best clinical practice – when and how to diagnose ASD

Maria Luisa Scattoni

Coordinator of the
Italian Network for early detection of Autism Spectrum Disorders (NIDA)
Istituto Superiore di Sanità

EARLY DETECTION

In the absence of targeted pharmacological therapies, early surveillance and assessment leading to early intervention represents the only successful strategy to reduce the severity of symptoms and improve quality of life for children and their families.



Autism spectrum disorder (ASD) is often diagnosed after 3-4 years of age despite the presence of impairment in a range of skills from the earliest months of life

EARLY DETECTION: METHODS

- Parental reports
- Home-videos

Retrospective studies

PARENTAL REPORTS

First alarm signs retrospectively recognised between 14 and 19 months:

- **75% report them below 18 months of age**
- **25% report them below 12 months of age**
- **First reported alarm signs:**
  - ✓ **No social smile**
  - ✓ **No name response**
  - ✓ **Absence of initiative and responsivity**
  - ✓ **Motor development difficulties**

Medical consultation at 2 year of age requested for:

- ✓ **Language delay**
- ✓ **Low reciprocity**
- ✓ **Regulation disorder**
- ✓ **Sterotipated behaviors**

HOME VIDEOS

From the study of the first symptoms to the study of the emergence of social skills and intersubjectivity, from the analysis of the developmental trajectories of vocalizations and movement to the analysis of the interactions between the child and his caregivers

Original article

An exploration of symmetry in early autism spectrum disorders: Analysis of lying

Gianluca Esposito [a,*], Paola Venuti [a], Sandra Maestro [b], Filippo Muratori [b]

[a] *Department of Cognitive Science, University of Trento, Italy*
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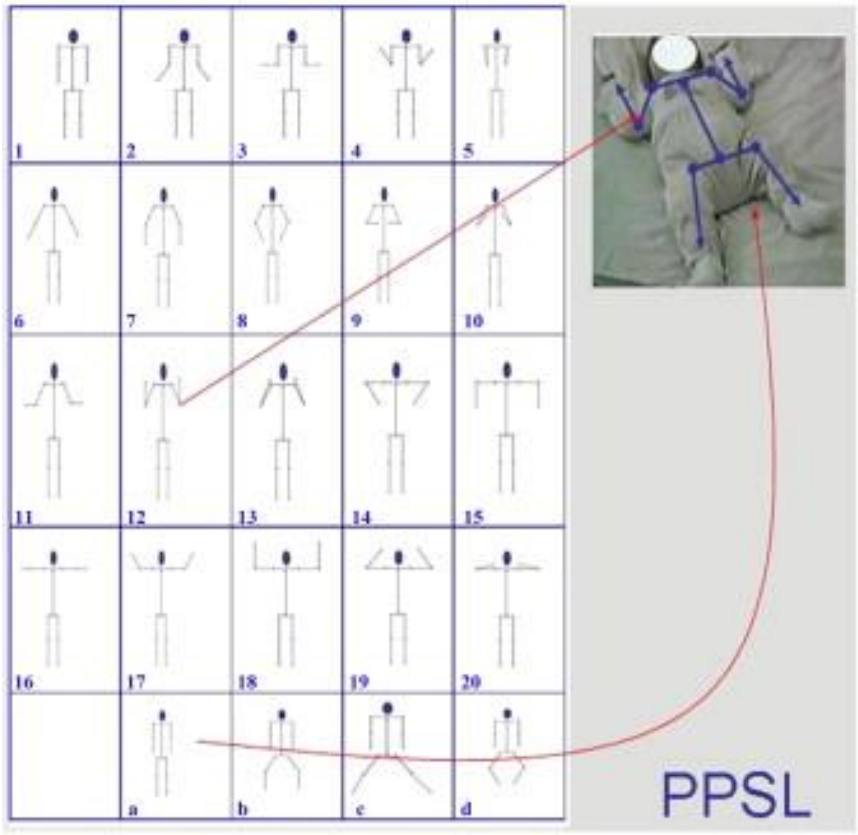
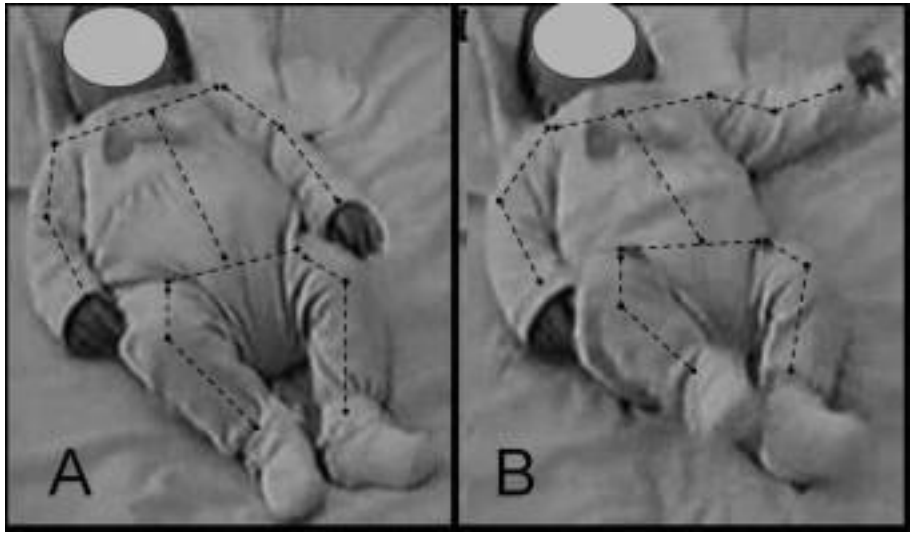
Received 14 November 2007; received in revised form 9 April 2008; accepted 19 April 2008

Lying position at 5 months





Symmetry

No symmetry

Original article

Analysis of unsupported gait in toddlers with autism

Gianluca Esposito [a,b,*], Paola Venuti [a], Fabio Apicella [c], Filippo Muratori [c]

[a] *Department of Cognitive Science and Education, University of Trento, Italy*
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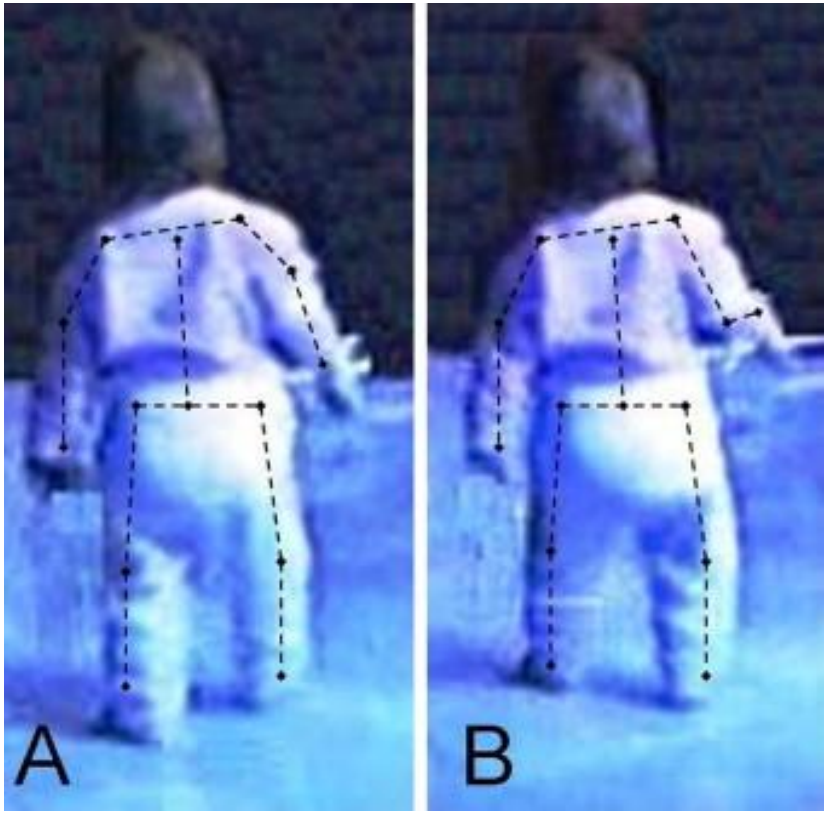
Received 14 April 2010; received in revised form 18 June 2010; accepted 21 July 2010

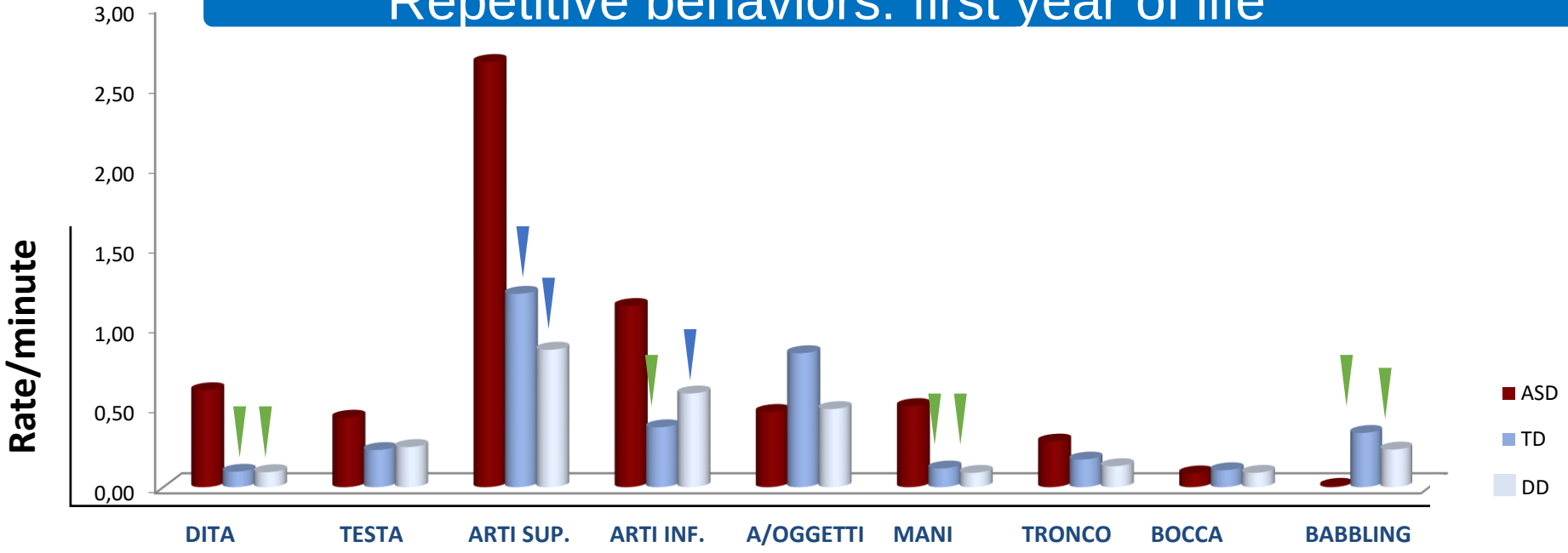
Unsupported gait at 12 months

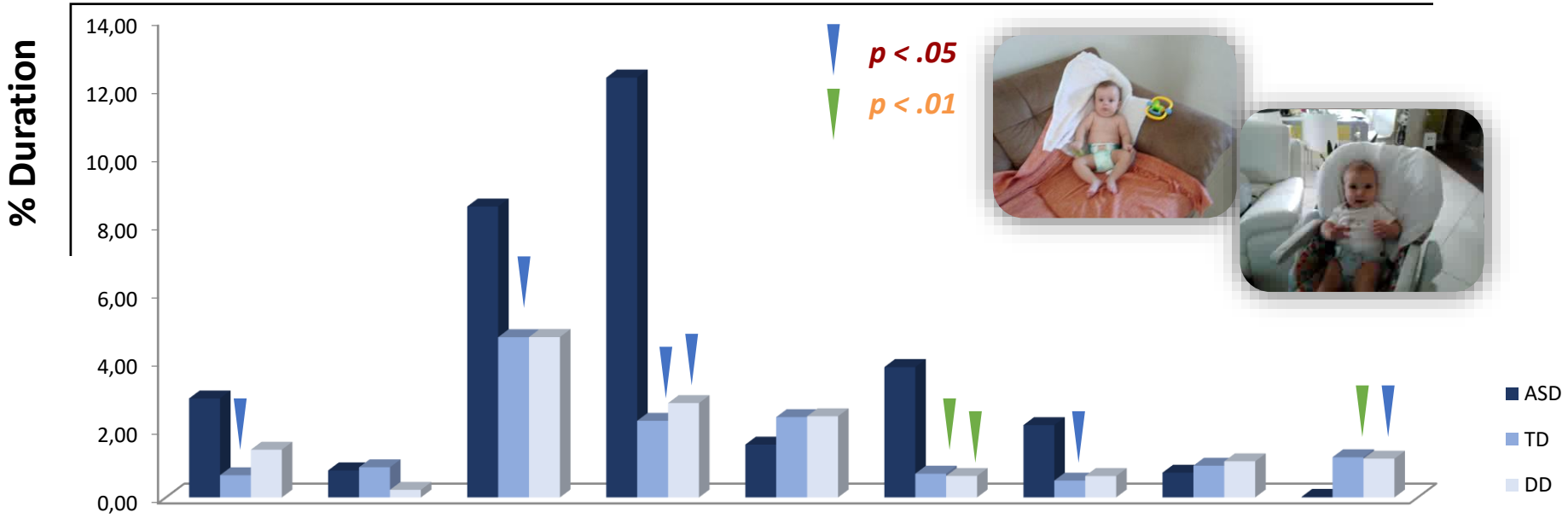


Symmetry

No symmetry

Repetitive behaviors: first year of life





JIDR Journal of Intellectual Disability Research
Published on behalf of mencap and in association with IASSID

Contents lists available at SciVerse ScienceDirect

Research in Developmental Disabilities

Differential brain responses to cries of infants with autistic disorder and typical development: An fMRI study

Paola Venuti [a,*], Andrea Caria [a,b], Gianluca Esposito [a,c], Nicola De Pisapia [a], Marc H. Bornstein [d], Simona de Falco [a]

[a] *Department of Cognitive Science and Education, University of Trento, Trento, Italy*
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disorder and typical development

Gianluca Esposito [a,b,*], Jun Nakazawa [c,*], Paola Venuti [b], Marc H. Bornstein [d]

[a] *RIKEN Brain Science Institute, Unit for Affiliative Social Behavior, Japan*
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RED FLAGS:

No big smiles or other warm, joyful expressions
by six months or thereafter

No back-and-forth sharing of sounds, smiles or other facial expressions
by nine months

Language trajectories

No babbling
by 12 months

No back-and-forth gestures such as pointing, showing, reaching or waving
by 12 months

No words
by 16 months

No meaningful, two-word phrases (not including imitating or repeating)
by 24 months

Disengagement/shifting attention

Contact searching

Visual attention to social stimoli

Reactivity for sensorial stimoli

Response to name

Motor abnormalities

Any loss of speech, babbling or social skills at any age

HIGH RISK INFANTS

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Recurrence Risk for Autism Spectrum Disorders: A Baby Siblings Research Consortium Study

Sally Ozonoff, Gregory S. Young, Alice Carter, Daniel Messinger, Nurit Yirmiya, Lonnie Zwaigenbaum, Susan Bryson, Leslie J. Carver, John N. Constantino, Karen Dobkins, Ted Hutman, Jana M. Iverson, Rebecca Landa, Sally J. Rogers, Marian Sigman and Wendy L. Stone

Pediatrics; originally published online August 15, 2011;
DOI: 10.1542/peds.2010-2825

Recurrence risk up to 18%
(25.9% for boys 9.6% for girls)

Early detection: methods

Retrospective studies

- Parental reports
- Home-videos

Prospective studies

- Siblings
- *At risk population*

BRSC (USA) & BASIS (UK)

- 2003: Autism Speaks High Risk Baby Siblings Research Consortium (BSRC)
- 2011: British Autism Study of Infant Siblings (BASIS)

The Baby siblings network bring together research groups from around the world with the mission of discovering the earliest predictors of autism.

THE JOURNAL OF CHILD PSYCHOLOGY AND PSYCHIATRY
ACAMH
Journal of Child Psychology and Psychiatry 54:7 (2013), pp 763–771 doi:10.1111/jcpp.12032

Quality of interaction between at-risk infants and caregiver at 12–15 months is associated with 3-year autism outcome

Ming Wai Wan,[1] Jonathan Green,[1] Mayada Elsabbagh,[2] Mark Johnson,[2] Tony Charman,[3] Faye Plummer,[1] and the BASIS Team*

[1]Institute of Brain, Behaviour and Mental Health, University of Manchester, Manchester; [2]Centre for Brain and Cognitive Development, Birkbeck, University of London, London; [3]Centre for Research in Autism and Education, Institute of Education, University of London, London, UK

lings. **Results:** Parent nondirectiveness and sensitive responsiveness differed in relation to ASD/risk status (at-risk ASD, at-risk no-ASD and low-risk) at both 6 and 12 months. At 6 months, infant liveliness was lower in the at-risk groups; at 12 months, infant attentiveness to parent and positive affect were lower in the at-risk group later diagnosed with ASD. Dyadic mutuality and intensity of engagement showed a group effect at 12 months. Dyadic mutuality, infant positive affect and infant attentiveness to parent at 12 months (but not 6 months) predicted 3-year ASD outcome, whereas infant ASD-related behavioural atypicality did not. **Conclusions:** This is the first prospective evidence that early dyadic

Infant/parent touching each other

Mutual gaze (i.e. infant and parent making eye contact)

Infant affect

Joint attention

THE JOURNAL OF CHILD PSYCHOLOGY AND PSYCHIATRY

ACAMH

Journal of Child Psychology and Psychiatry 52:5 (2011), pp 588–598

doi:10.1111/j.1469-7610.2010.02332.x

Out of the mouths of babes: vocal production in infant siblings of children with ASD

Rhea Paul,[1] Yael Fuerst,[2] Gordon Ramsay,[1,3] Kasia Chawarska,[1] and Ami Klin[1]

Background: Younger siblings of children with autism spectrum disorders (ASD) are at higher risk for acquiring these disorders than the general population. Language development is usually delayed in children with ASD. The present study examines the development of pre-speech vocal behavior in infants at risk for ASD due to the presence of an older sibling with the disorder. **Methods:** Infants at high risk (HR) for ASD and those at low risk, without a diagnosed sibling (LR), were seen at 6, 9, and 12 months as part of a larger prospective study of risk for ASD in infant siblings. Standard clinical assessments were administered, and vocalization samples were collected during play with mother and a standard set of toys. Infant vocal behavior was recorded and analyzed for consonant inventory, presence of canonical syllables, and of non-speech vocalizations, in a cross-sectional design. Children were seen again at 24 months for provisional diagnosis. **Results:** Differences were seen between risk groups for certain vocal behaviors. Differences in vocal production in the first year of life were associated with outcomes in terms of autistic symptomotology in the second year. **Conclusions:** Early vocal behavior is a sensitive indicator of heightened risk for autistic symptoms in infants with a family history of ASD.
Keywords: Autism, speech, vocalization, infant siblings.

Table 3 Mean (and s.d.) vocal productions in two risk groups

Age	Risk group	# Total vocalizations (speech + non-speech)	# Speech-like vocalizations	Total # consonants	# Early consonants	# Middle consonants	# Late consonants	% Canonical syllables	% Non-speech productions
6 mo.	HR	36.5 (27.4)	15.0 (16.0)	2.5 (2.9)	1.5 (1.7)	.5 (1.1)	.5 (.9)	4.5 (7.0)	60.2 (28.6)
	LR	39.2 (27.8)	18.3 (15.3)	3.7 (3.9)	2.1 (2.2)	1.1 (1.4)	.5 (.9)	8.3 (11.5)	57.0 (25.2
9 mo.	HR	25.7 (19.6)	15.1 (16.2)	**2.7 (3.0)**	**1.9 (1.7)**	**.5 (.9)**	**.4 (.8)**	**8.7 (11.5)**	50.6 (21.7)
	LR	31.1 (18.6)	22.6 (16.4)	**5.6 (3.9)**	**3.2 (2.1)**	**1.3 (1.4)**	**1.1 (1.1)**	**20.5 (17.6)**	34.0 (24.2)
12 mo.	HR	35.2 (18.1)	**12.6 (16.8)**	6.2 (3.6)	3.8 (2.2)	1.6 (1.2)	.8 (.9)	27.1 (22.9)	**36.5 (28.4)**
	LR	39.1 (18.1)	**31.9 (15.7)**	7.3 (3.7)	4.5 (2.1)	1.8 (1.5)	1.0 (1.1)	28.8 (19.0)	**19.3 (16.1)**

HR = High Risk group; LR = Low Risk group.
Significant difference between groups at $p < .05$.

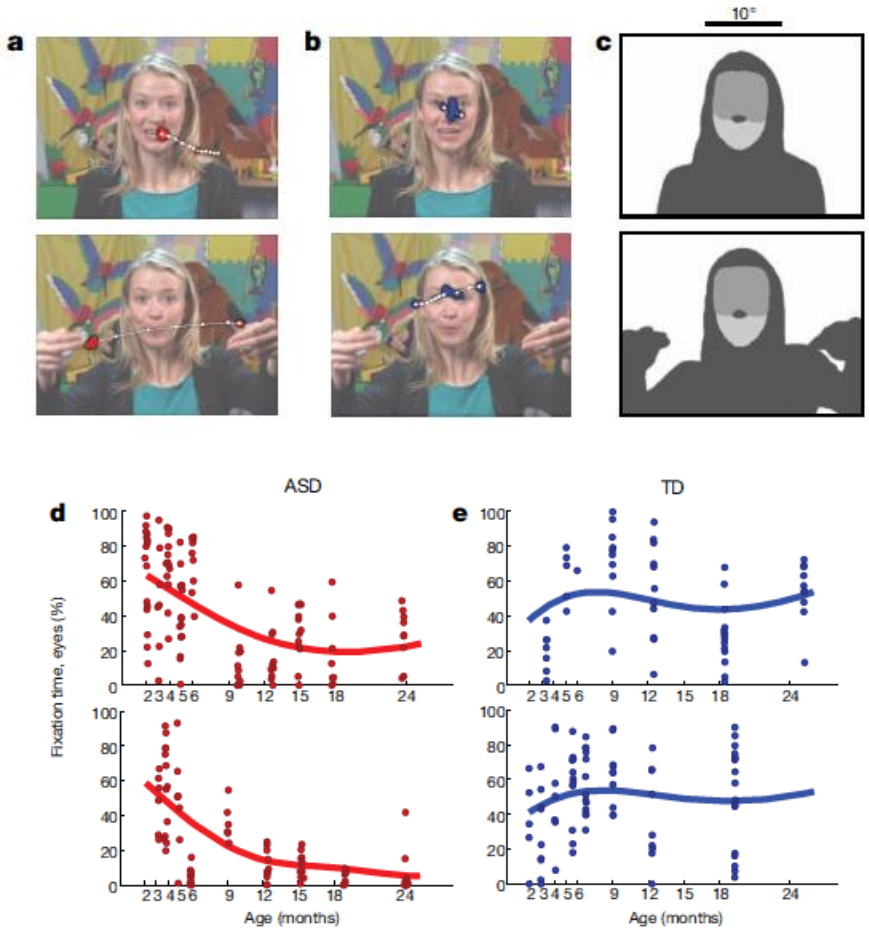
19/26 DECEMBER 2013 | VOL 504 | NATURE | 427

doi:10.1038/nature12715

Attention to eyes is present but in decline in 2–6-month-old infants later diagnosed with autism

Warren Jones[1,2,3] & Ami Klin[1,2,3]

Infants later diagnosed with autism spectrum disorders exhibit mean decline in eye fixation from 2 to 6 months of age, a pattern not observed in infants who do not develop ASD.



Infancy. 2013 Sep;18(5):639-661.

Posture Development in Infants at Heightened vs. Low Risk for Autism Spectrum Disorders.

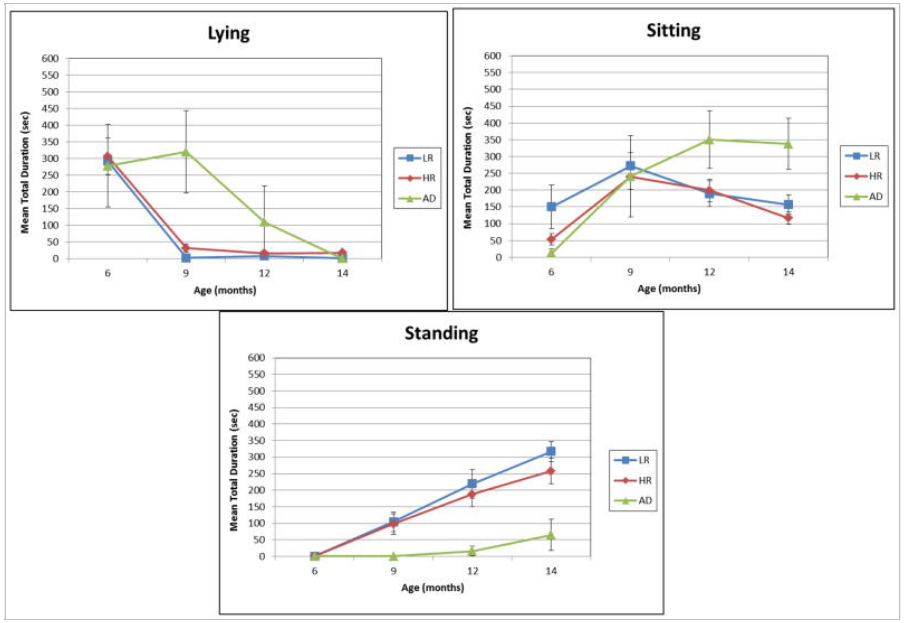
Nickel LR[1], Thatcher AR, Keller F, Wozniak RH, Iverson JM.

Author information

Abstract

Evidence suggests that children and adults diagnosed with **autism** spectrum disorders (ASD) exhibit difficulties with postural control. Retrospective video studies of **infants** later diagnosed with ASD indicate that **infants** who eventually receive an ASD diagnosis exhibit delays in postural development. This study investigates early **posture** development prospectively and longitudinally in 22 **infants** at heightened biological risk for ASD (**HR**) and 18 **infants** with no such risk (Low Risk; LR). Four **HR infants** received an **autism** diagnosis (AD **infants**) at 36 months. **Infants** were videotaped at home at 6, 9, 12, and 14 months during everyday activities and play. All **infant** postures were coded and classified as to whether or not they were **infant**-initiated. Relative to LR **infants**, **HR infants** were slower to develop skill in sitting and standing postures. AD **infants** exhibited substantial delays in the emergence of more advanced postures and initiated fewer **posture** changes. Because **posture** advances create opportunities for **infants** to interact with objects and people in new and progressively more sophisticated ways postural delays may have cascading effects on opportunities for **infant** exploration and learni These effects may be greater for **infants** with ASD, for whom **posture** delays are more significant.

HR infants were slower to develop skill in sitting and standing postures



Mean total duration of Lying, Sitting, and Standing postures for LR, HR, and AD infants at 6, 9, 12, and 14 months of age. Error bars indicate standard errors.

Ready, Set, Go! Low Anticipatory Response during a Dyadic Task in Infants at High Familial Risk for Autism

frontiers in Psychology

ORIGINAL RESEARCH
published: 25 May 2016
doi: 10.3389/fpsyg.2016.00721

Rebecca J. Landa[1,2], Joshua L. Haworth[1,2] and Mary Beth Nebel[3,4]*

READY

SET (rolling)

GO (anticipation)

Visual- motor coupling, or action anticipation, during a dynamic, interactive ball-rolling activity.

LR and HR infants demonstrated context appropriate looking behavior, both before and during the ball's trajectory toward them.

HR infants were less likely to exhibit context appropriate anticipatory motor response to the approaching ball (moving their arm/hand to intercept the ball) than LR infants.

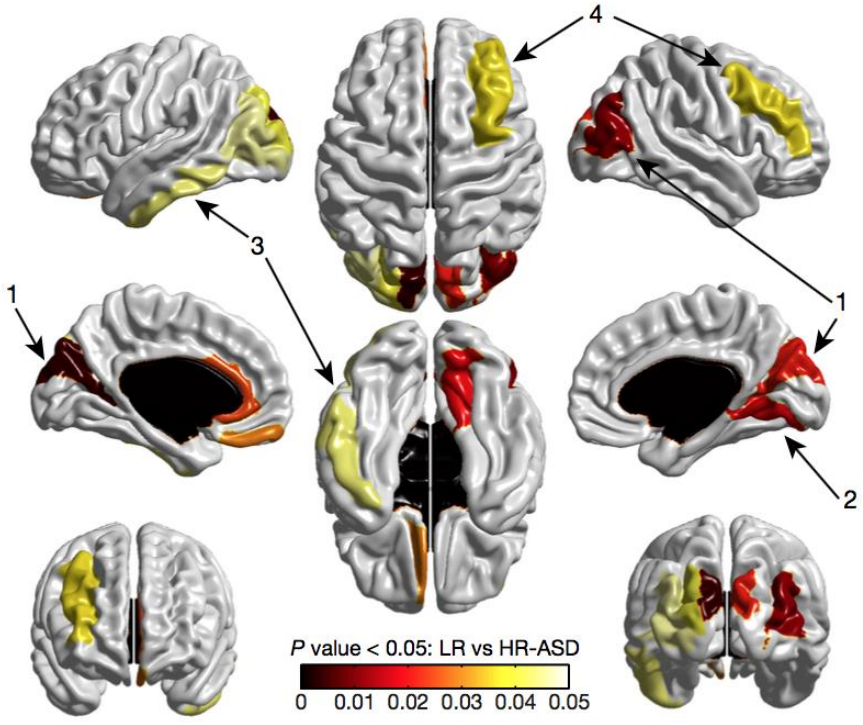
This finding did not appear to be driven by differences in motor skill between risk groups at 6 months of age and was extended to show an atypical predictive relationship between anticipatory behavior at 6 months and preference for looking at faces compared to objects at age 14 months in the HR group.

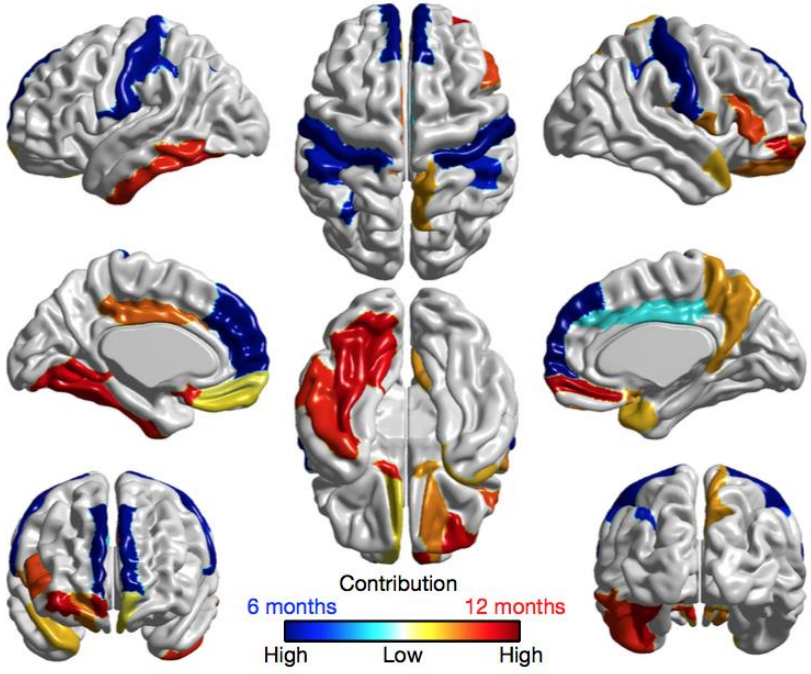
LETTER

doi:10.1038/nature21369

Early brain development in infants at high risk for autism spectrum disorder

Heather Cody Hazlett[1,2], Hongbin Gu[1], Brent C. Munsell[3], Sun Hyung Kim[1], Martin Styner[1], Jason J. Wolff[4], Jed T. Elison[5], Meghan R. Swanson[2], Hongtu Zhu[6], Kelly N. Botteron[7], D. Louis Collins[11], John N. Constantino[7], Stephen R. Dager[8,9], Annette M. Estes[9,10], Alan C. Evans[11], Vladimir S. Fonov[11], Guido Gerig[12], Penelope Kostopoulos[11], Robert C. McKinstry[13], Juhi Pandey[14], Sarah Paterson[15], John R. Pruett Jr[7], Robert T. Schultz[14], Dennis W. Shaw[8,9], Lonnie Zwaigenbaum[16], Joseph Piven[1,2] & the IBIS Network*





Biological Psychiatry

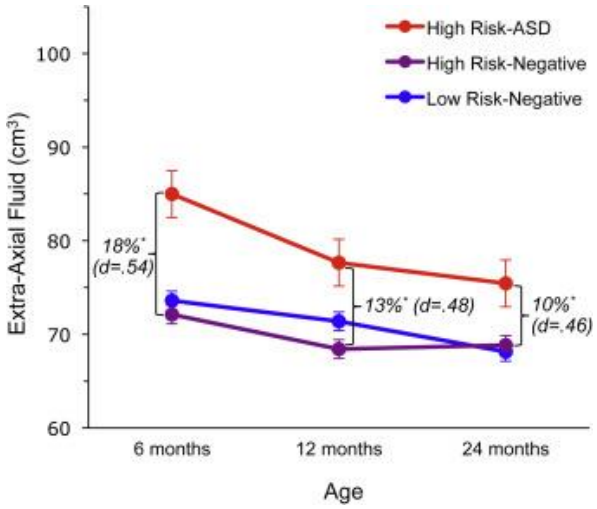
Available online 6 March 2017

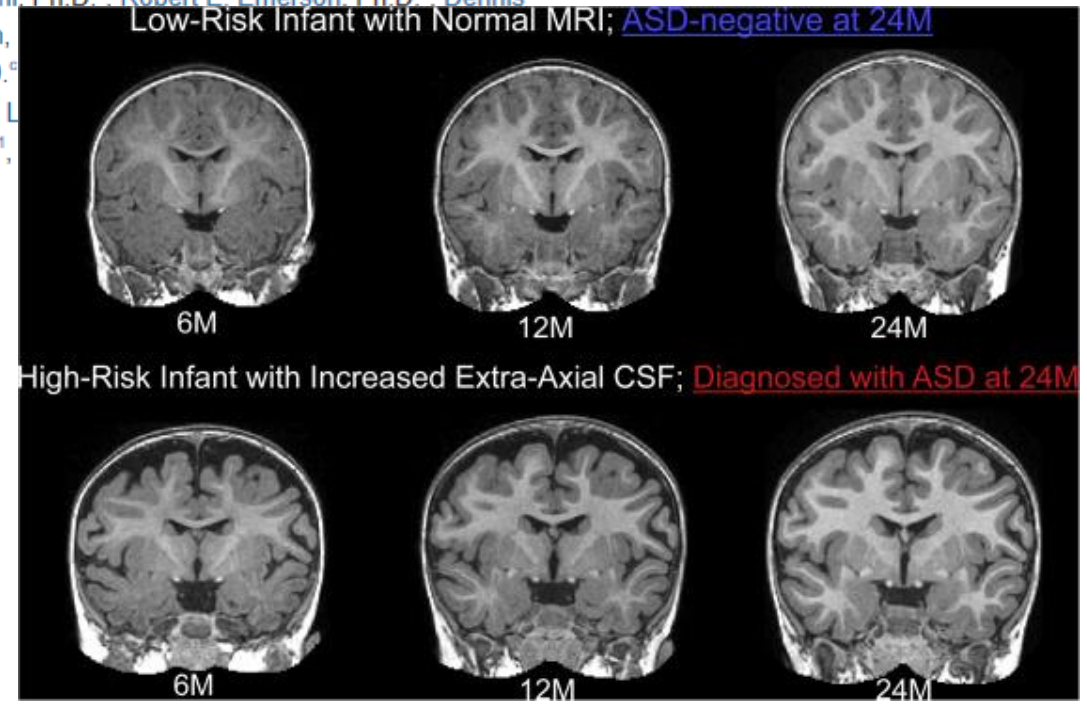
In Press, Accepted Manuscript — Note to users

Archival Report

Increased Extra-axial Cerebrospinal Fluid in High-Risk Infants who Later Develop Autism

Mark D. Shen, Ph.D.[a, b], Sun Hyung Kim, Ph.D.[a], Robert C. McKinstry, MD, Ph.D.[c], Hongbin Gu, Ph.D.[a, d], Heather C. Hazlett, Ph.D.[a], Christine W. Nordahl, Ph.D.[b], Robert E. Emerson, Ph.D.[a], Dennis Shaw, M.D.[e], Jed T. Elison, Ph.D.[f], Meghan R. Swanson, Ph.D.[h], Stephen R. Dager, M.D.[e], Kelly N. Botteron, M.D.[c], Ph.D.[j], Alan C. Evans, Ph.D.[g], Annette M. Estes, Ph.D.[k], L Ph.D.[a], David G. Amaral, Ph.D.[b, 1], Joseph Piven, M.D.[a, 1],





Example brain images indicating the presence of increased extra-axial CSF. (A) T1-weighted coronal images of a low-risk infant with normal MRI at 6, 12, and 24 months. (B) T1-weighted coronal images of a high-risk infant with increased extra-axial CSF at 6, 12, and 24 months. This child was diagnosed with ASD at 24 months.

Italian Network for early detection of Autism Spectrum Disorders (NIDA)

Project CCM 2012
Associazione Bambini delle Fate
Italian Minister of Health
Progetto BrainView (H2020)
Fondazione Italiana Autismo Onlus

Future challenges:

24 months: final diagnosis

18 months: provisional diagnosis

12 months: risk diagnosis

0-12 months: risk indexes

AIM of the NETWORK

Clinical and observational protocol for monitoring vocal-social-motor-cognitive development (from birth to three years old) of low- and high risk infants/toddlers

A WORKING MODEL THAT MAY BE EXTENDED TO:

1. **OTHER AT-RISK POPULATIONS,**
2. **OTHER CLINICAL CONTEXTS**
3. **THE ENTIRE ITALIAN TERRITORY**

NIDA

Coordinator:

Istituto Superiore di Sanità (Maria Luisa Scattoni)

WP data analysis: **Istituto Superiore di Sanità** (Maria Puopolo)

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2) **IRCCS Fondazione Stella Maris, Sezione di Neurologia della Prima Infanzia** (Andrea Guzzetta)
3) **IRCCS Ospedale Pediatrico Bambino Gesù** (Stefano Vicari-Giovanni Valeri-Luigi Mazzone)
4) **IRCCS Eugenio Medea – Associazione La Nostra Famiglia** (Massimo Molteni)
5) **Università Campus Bio-Medico di Roma** (Antonio M. Persico)
6) **Consiglio Nazionale delle Ricerche - ISASI** (Giovanni Pioggia)
7) **Policlinico Universitario "G. Martino" di Messina** (Antonio M. Persico)
8) **Policlinico Umberto I – Via dei Sabelli, Roma** (Carla Sogos e Francesco Cardona)
9) **Centro Interdipartimentale Mente e Cervello, CIMeC** (Giorgio Vallortigara)
10) **Centro Autismo e Sindrome di Asperger, Ospedale di Mondovì** (Maurizio Arduino)
11) **Università di Trento** (Paola Venuti e Gianluca Esposito)
12) **Azienda Ospedaliera Universitaria Senese** (Roberto Canitano-Valeria Scandurra)

RECRUITMENT

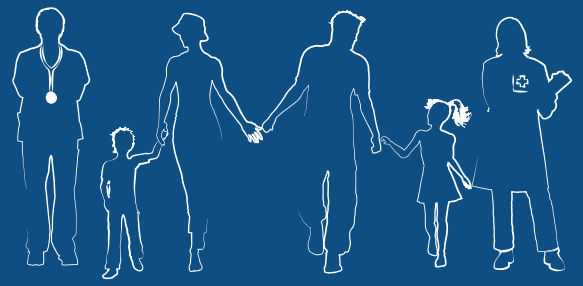
Inclusion criteria

- **Low risk infants:** born after 37 gestational weeks (GW) and with birth weight > 2400 gr
- **Baby siblings (high risk):** siblings of children diagnosed with ASD
- **Small for Gestational Age (SGA) infants**: birth weight below the 10th percentile
- **Premature**: born between 26 and 31 GW

Exclusion criteria

- Infant born before 37 GW and/or with birth weight < 2400 gr
- Presence of known genetic syndrome (in proband or infant) related to ASD (e.g. TSC, FXS, 22q11, 16p11.2, Rett'syndrome)
- Presence of severe cardiovascular, lung, kidney, endocrinological or hematological diseases

ACCOMPAGNA PER MANO LA RICERCA



Accompagnare per mano la ricerca
vuol dire scegliere di avere un ruolo attivo
nella costruzione di un futuro migliore per i nostri figli

Se siete interessati a partecipare ai nostri studi o a conoscere meglio le nostre attività, scrivete una mail a: marialuisa.scattoni@iss.it

Progetto di studio coordinato dall'Istituto Superiore di Sanità

Unità Operative:

IRCCS Fondazione Stella Maris

Istituto di Scienze Applicate e Sistemi Intelligenti, Consiglio Nazionale delle Ricerche

IRCCS Ospedale Pediatrico Bambino Gesù

Università Campus Bio-Medico di Roma e Policlinico Universitario "G.Martino" di Messina

IRCCS Eugenio Medea –Associazione La Nostra Famiglia

Centro Interdipartimentale Mente e Cervello, CIMeC Università di Trento

Centro Autismo e Sindrome di Asperger, Ospedale di Mondovì, ASLCN1

Dipartimento di Pediatria e Neuropsichiatria Infantile, Policlinico Umberto I, via dei Sabelli

Dipartimento di Psicologia e Scienze Cognitive dell'Università di Trento

Azienda Ospedeliera Universitaria Integrata di Verona

ISTITVTO SVPERIORE DI SANITÀ

Stai diventando mamma per la seconda volta?

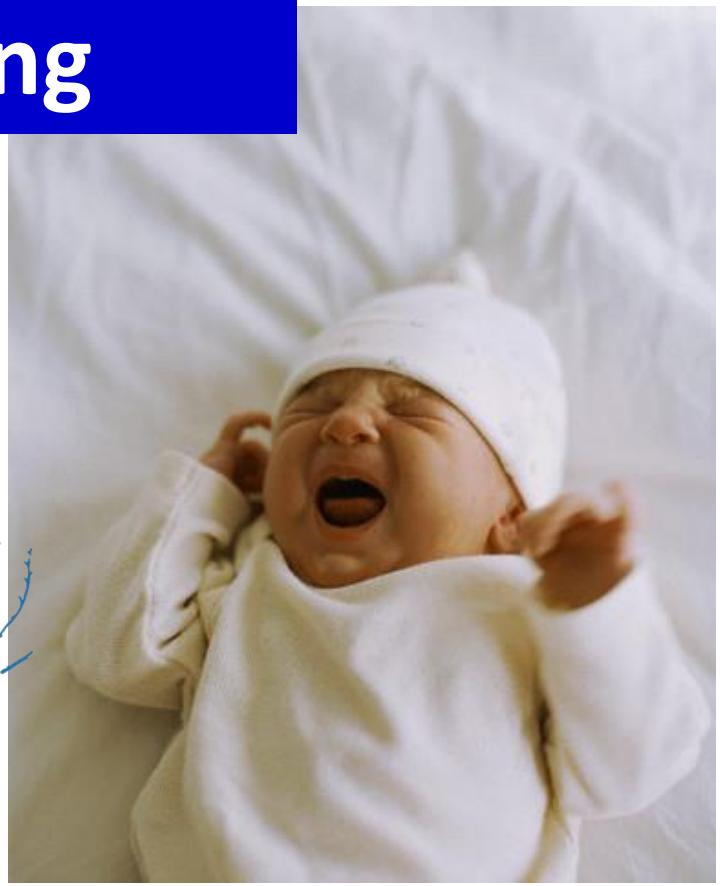
**Nessuno più di te
sa quanto siano importanti
i primi anni di vita
di un bambino**

***Tu e il tuo bambino
potete aiutarci a capire…***


BABY EINSTEIN
Modestamente .... nel mio piccolo
Ho dato una mano alla SCIENZA!


BABY EINSTEIN
Modestamente .... nel mio piccolo
Ho dato una mano alla SCIENZA!

Spontaneous infant crying



Crying can be viewed as both part of a first communicative system and an early social structure in human development

A number of studies that examined cries of infants with specific medical conditions related to neurological damage have shown that fundamental frequency (f_0) is particularly influenced by neurological damage.

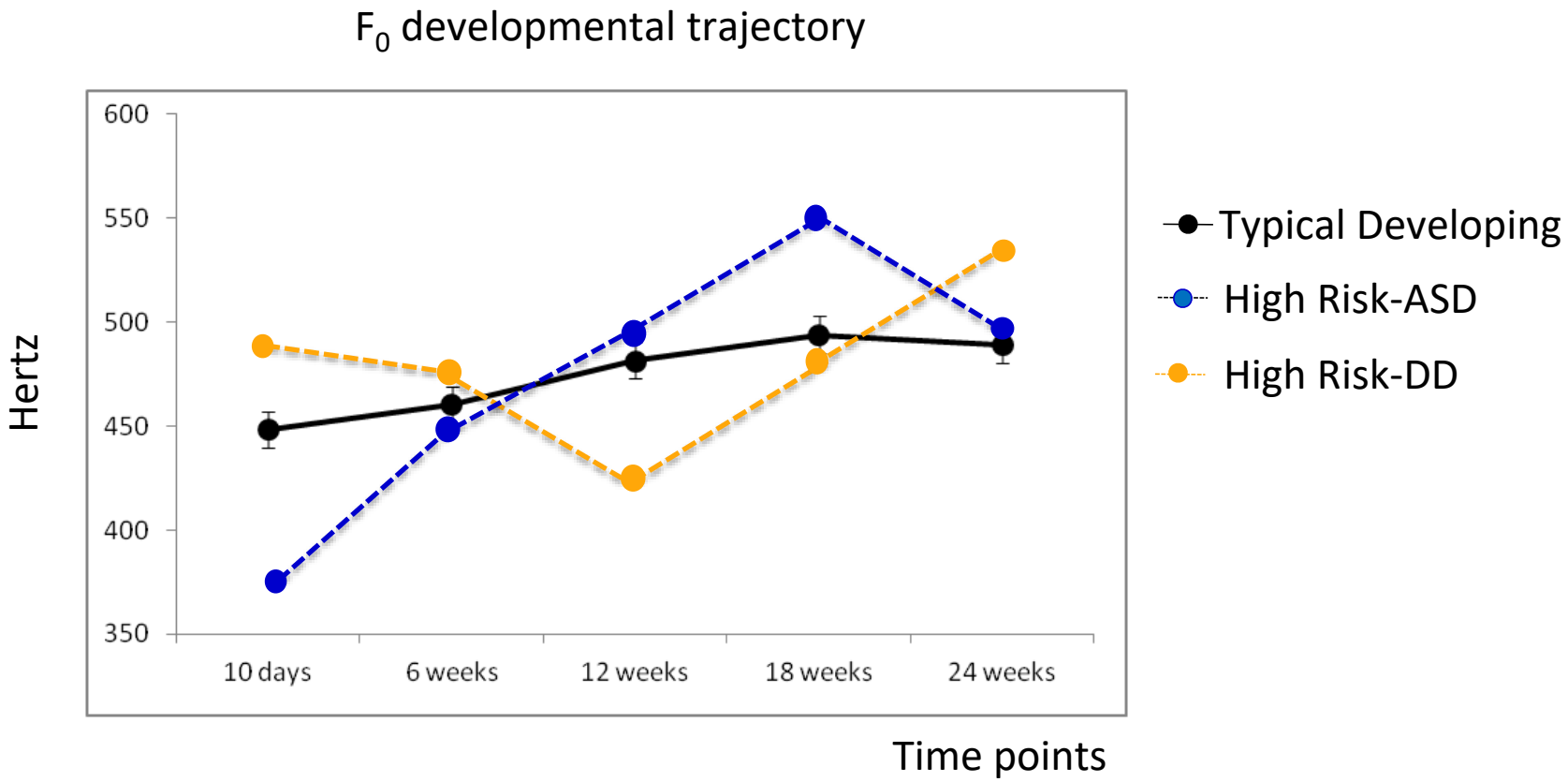
Higher level of f_0:

- **Brain damage**
- **Meningitis**
- **Asphyxia**

Lower levels of f_0:

- **Hypothyroidism**
- **Children with Trisomy 13, 18, 21**

Longitudinal profile of F_0



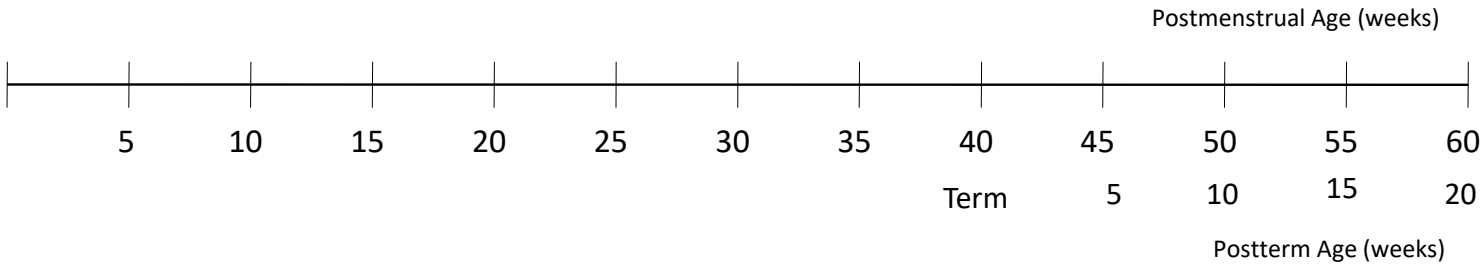
Analysis of General Movements

NIDA

DEVELOPMENTAL COURSE OF GENERAL MOVEMENTS

FIDGETY
Movements

WRITHING
Movements



Prechtl's Method on General Movement Assessment

GM Optimality List for Preterm GMs and Writhing Movements

(Ferrari et al 1990, modified)

Name: _____

Date of birth: _____ Gestational age at birth: _____ weeks

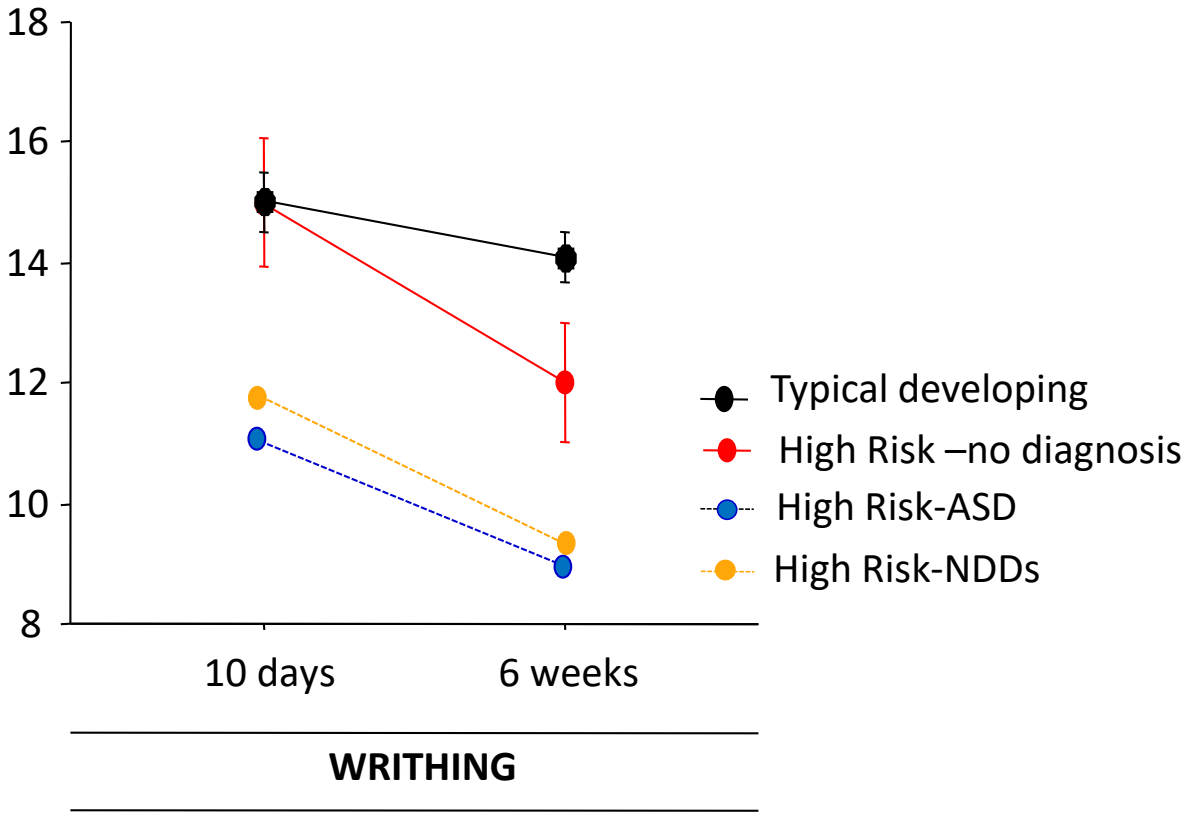
Recording date: _____

1.	Quality		
2.	Sequence		
3.	Amplitude	variable, full range …….....	2
		predominantly small range …….	1
		predominantly large range …….	1
		mainly one range, not variable … …..	1
4.	Speed	variable …….…….....	2
		monotonously slow ……..……..	1
		monotonously fast ……..……..	1
		mainly one speed, not variable … …..	1
5.	Space	from horizontal to vertical plane	2
		not the full space used ……..	1
6.	Rotatory components	present, fluent and elegant ..….....	2
		no or just a few rotations …..…….	1
7.	Onset and offset	smooth …….….....	2
		minimal fluctuations or abrupt ..…….	1
8.	Tremulous movements	absent …….….....	2
		present ..……	1

GM Optimality Score : _____ **Maximum** 18 **Minimum: 8.**

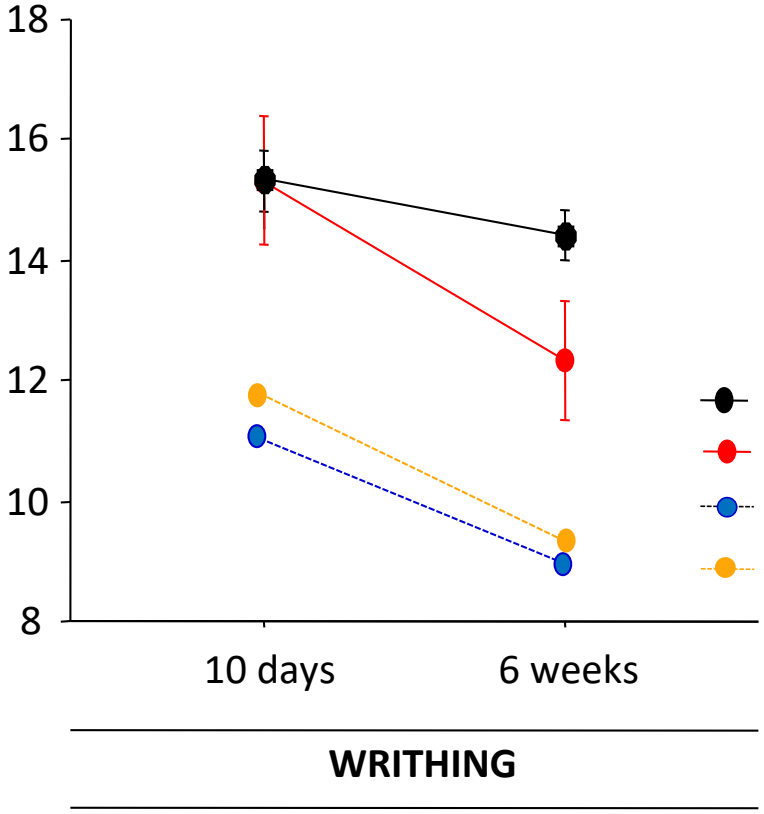
TRAJECTORY OF GENERAL MOVEMENTS

GM optimality score:
Maximum 18; Minimum 8

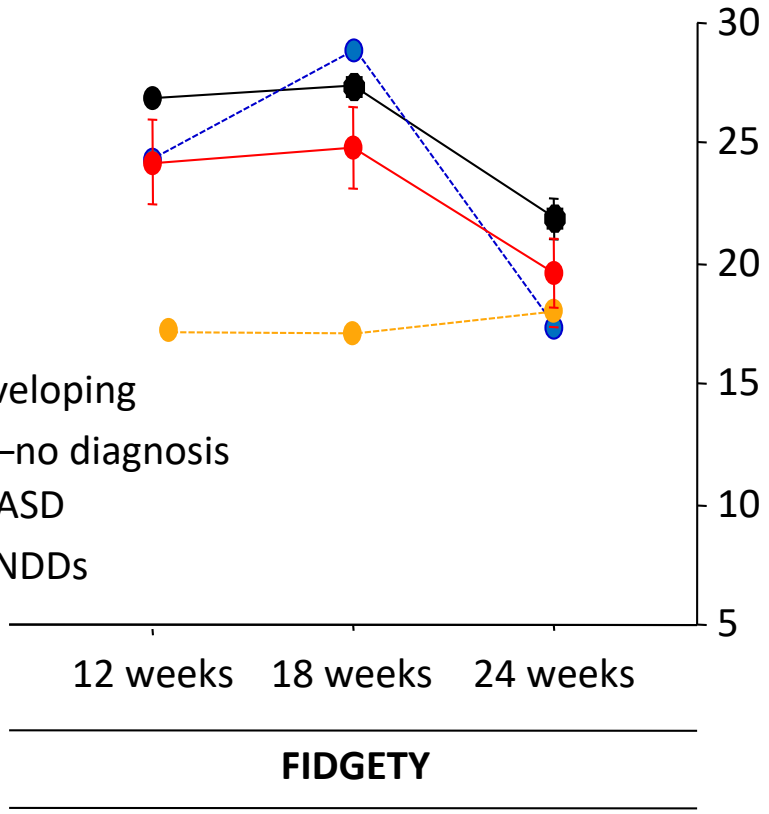


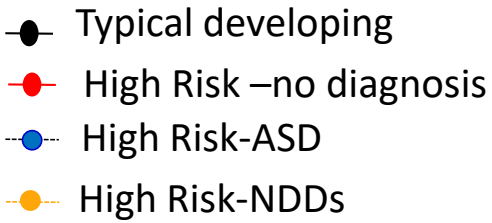
TRAJECTORY OF GENERAL MOVEMENTS

GM optimality score:
Maximum 18; Minimum 8



Motor optimality score:
Maximum 28; Minimum 5





Attention to social stimuli

SCIENTIFIC REPORTS

OPEN

Difference in Visual Social Predispositions Between Newborns at Low- and High-risk for Autism

Received: 03 August 2015
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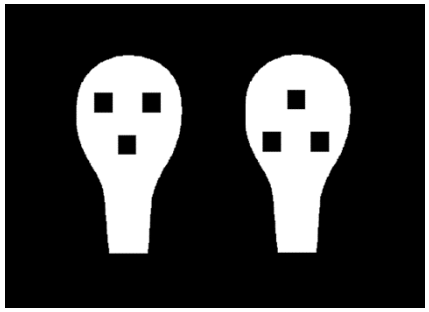
Elisa Di Giorgio[1], Elisa Frasnelli[1,2], Orsola Rosa Salva[1], Scattoni Maria Luisa[3], Maria Puopolo[3], Daniela Tosoni[1], NIDA-Network[§], Francesca Simion[4,5] & Giorgio Vallortigara[1]

AREA OF INTEREST: FACE AND EYE GAZE

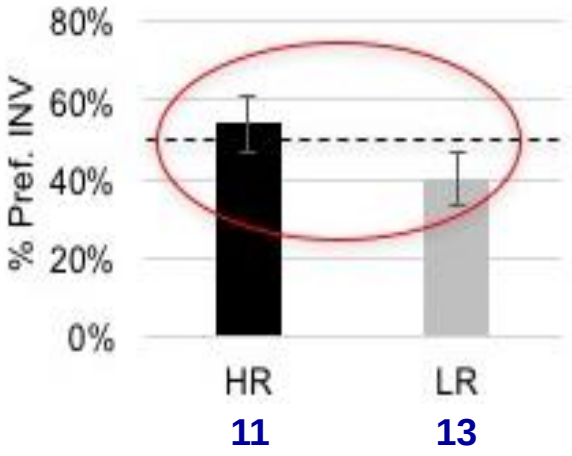
Di Giorgio e al., Sci Rep 2016

1)

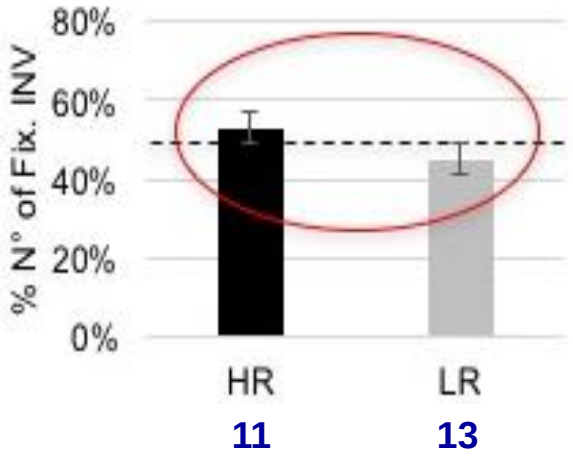


UPRIGHT *vs.*
INVERTED FACE-LIKE

***p* = .016**

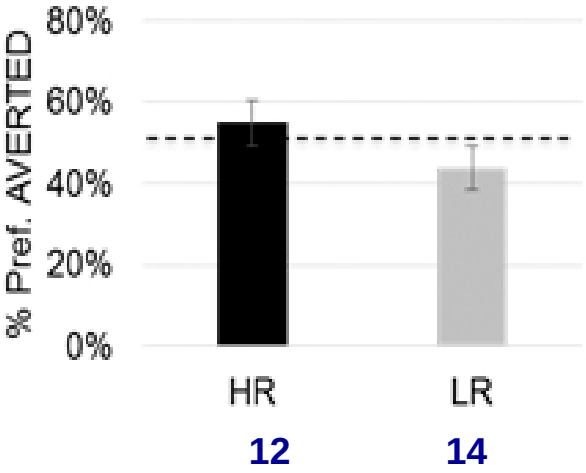


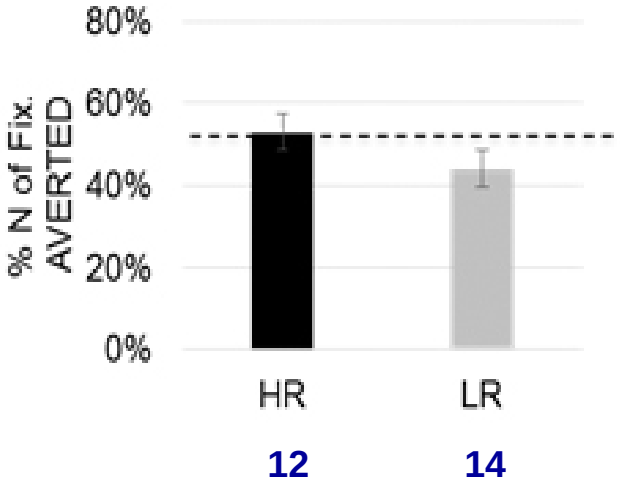
***p* = .041**



2)

DIRECT *vs.*
AVERTED EYE-GAZE





NIDA Network Protocol Summary

Assessment/Diagnostic tools	6m	12m	18m	24m	36m
VinelandAdaptive Behavior Questionnaire (VABS PL) II		X	X	X	X
MacArthur Communicative Development Inventory		X	X	X	X
Questionario Temperamento (QUIT)	X	X	X	X	X
M-CHAT			X		
Child Behavior Checklist (CBCL)			X	X	X
Griffiths (GMDS)	X	X	X	X	X
Autism Observation Scale for Infants (AOSI)	X	X			
ADOS-2 (modulo Toddler)		X	X	X	
ADOS-2 (modulo 1 o 2)					X
Autism Diagnostic Interview –Revised (ADI-R)					X
Parenting Stress Index (PSI)	X	X	X	X	X

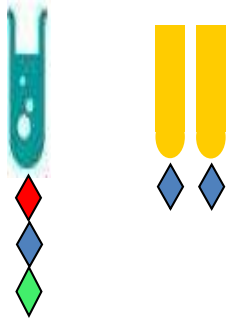
OMICS panel:

1) High risk infants

At 6 and 12 months

Saliva (swab)

Urines (10 ml)

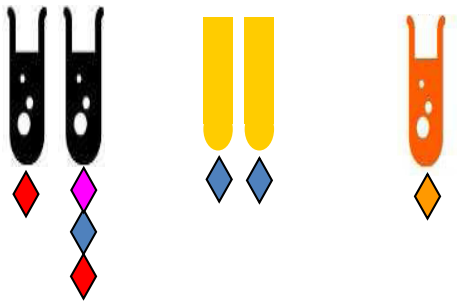


At 18 and 24 months

EDTA tubes (10 ml)

Urines (10 ml)

Tempus for RNA tube



- Genomic DNA
- Total RNA/miRNAs
- 5-HT
- Metabolomics
- Metallomics
- Proteomics

At the twelve-month-visit of the high risk infants:

2) Unaffected and ASD siblings

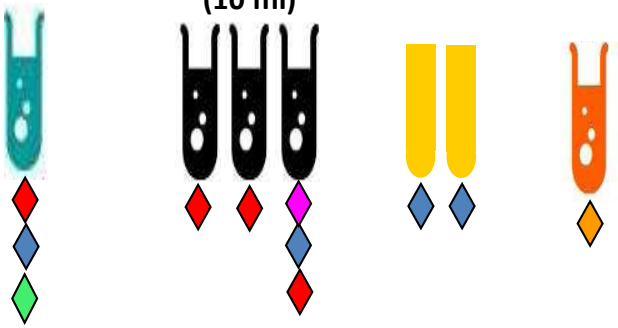
3) Parents

Saliva (swab)

EDTA tubes (10 ml)

Urines (10 ml)

Tempus for RNA tube



CONCLUSIONS

Establishment of normative values for the vocal, motor and social maturation profile in infants can be used not only for early diagnosis of ASDs, but also to identify other neurodevelopmental disabilities (i.e. intellectual disability, language or motor delay).

A WORKING MODEL THAT MAY BE EXTENDED TO OTHER AT-RISK POPULATIONS

Early detection: methods

- Parental reports
- Home-videos

Retrospective studies

Prospective studies

- Siblings
- *High-risk populations*

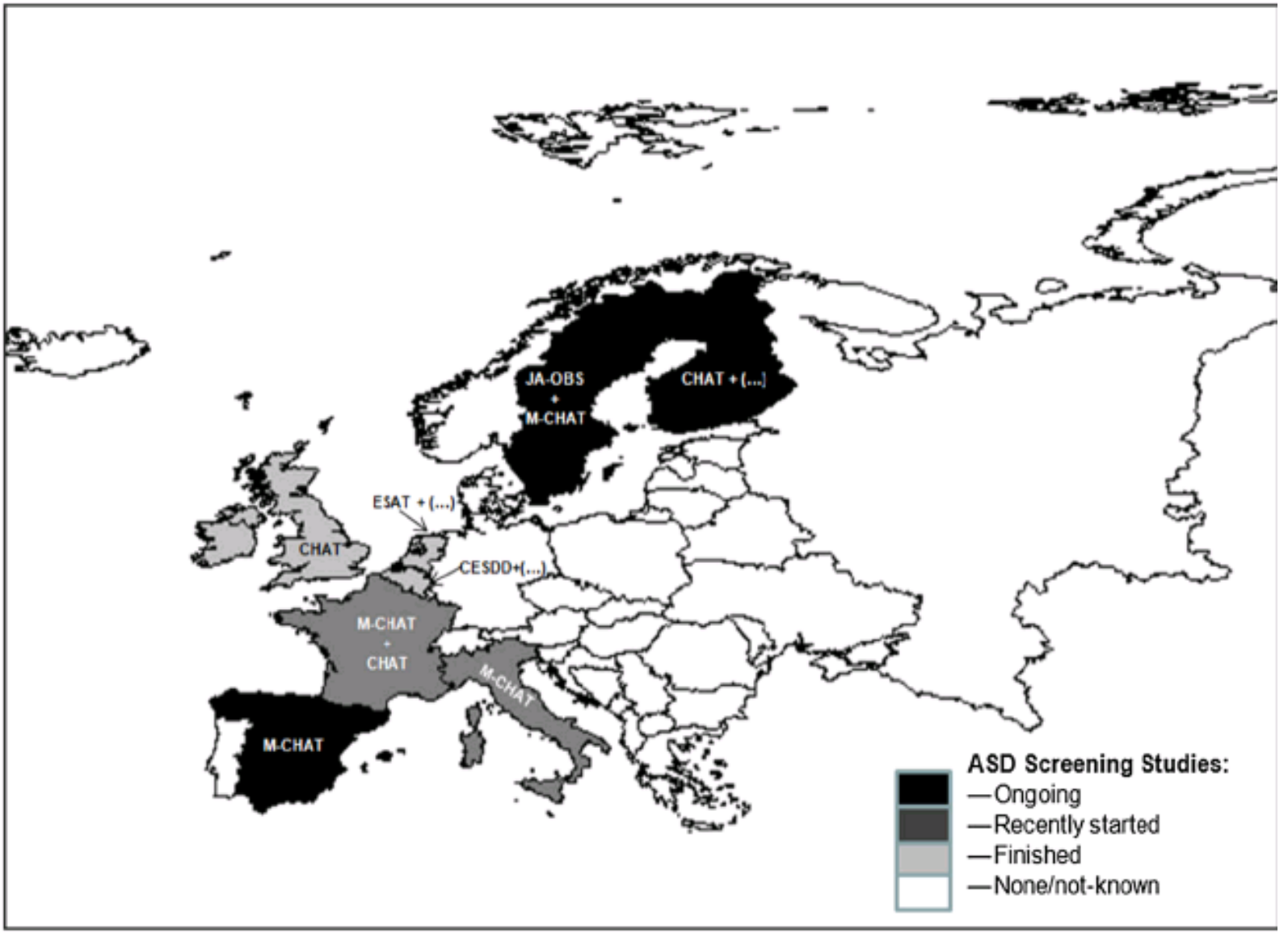
- Large scale screening (paediatricians/parents)
- Well-child surveillance protocol by paediatricians
- Kindergarten teachers training

Screening

LARGE SCALE SCREENING

Eur Child Adolesc Psychiatry (2014) 23:1005–1021

Map of the ASD European screening studies



Over 70,000 children have been screened in Europe using 18 different screening procedures

Population-based screening

ASD specific screening tool performed on children with a development delay

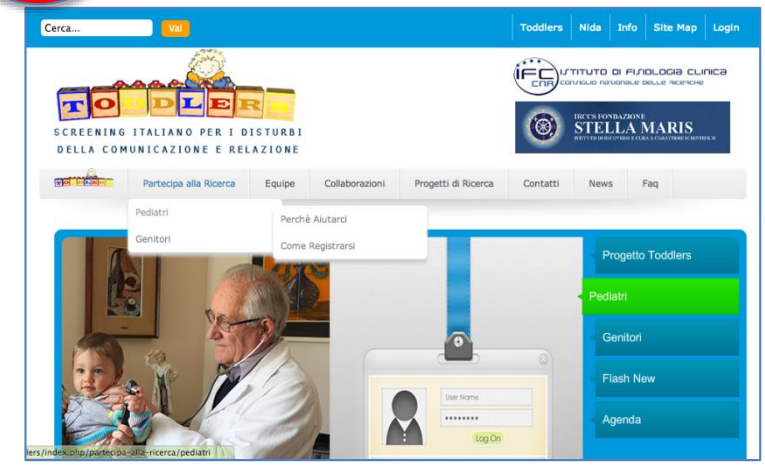
Table 1 ASD screening tools

Screening tool (long name)	Short name	Admin. time (min)	Admin. age (months)	Admin. method[b]	Items	Sensitivity	Specificity
Level 1[a]							
Checklist for Autism in Toddlers [16, 17]	CHAT	5–10	18	Parent + clinician rated	9 + 5	0.18–0.38	0.98–1.0
Social Communication Questionnaire [18]	SCQ	15–20	36–82	Parent rated	40	0.74	0.54
Modified-Checklist for Autism in Toddlers [19]	M-CHAT	5–10	18–30	Parent rated	23	0.87	0.99
Quantitative Checklist for Autism in Toddlers [20]	Q-CHAT	5	16–30	Parent rated	25	–	–
Communication and Social Behaviour Scale-Infant and Toddlers Checklist [21]	CSBS-DP	5–10	16–30	Parent rated	24	–	–
Level 2[a]							
Developmental Behaviour Checklist-primary care version [28]	DBC-ES	5–10	18–48	Parent rated	96	0.83	0.48
Screening tool for autism in 2 years old [29]	STAT	20	24–35	Child care worker rated	12	0.83	0.86
Screening for infants with developmental deficits and/or autism [30]	SEEK	30–40	8	Parent + clinician rated	9 + 28	–	–
Pervasive Developmental Disorders Rating Scale [31]	PDDRS	60	>12	Parent rated	51	–	–
Autistic behavioural indicators instrument [32]	ABII	30	24–72	Clinician rated	18	–	–
Autism Behaviour Checklist [33]	ABC	15	>36	Parent rated	57	0.58	0.76
Childhood Rating Scale [34]	CARS	15–20	>24	Clinician rated	15	0.92–0.98	0.85
Autism detection in early childhood [35]	ADEC	12	12	Parent or nurse rated	16	0.79–0.94[a]	0.88–1.00[a]
Baby and Infant Screen for Children with Autism Traits [36–39]	BISCUIT	15	17–37	Parent rated	42	0.84	0.86
Three-item direct observation screen test [40]	TIDOS	5	18–60	Clinician rated	3	0.95	0.85

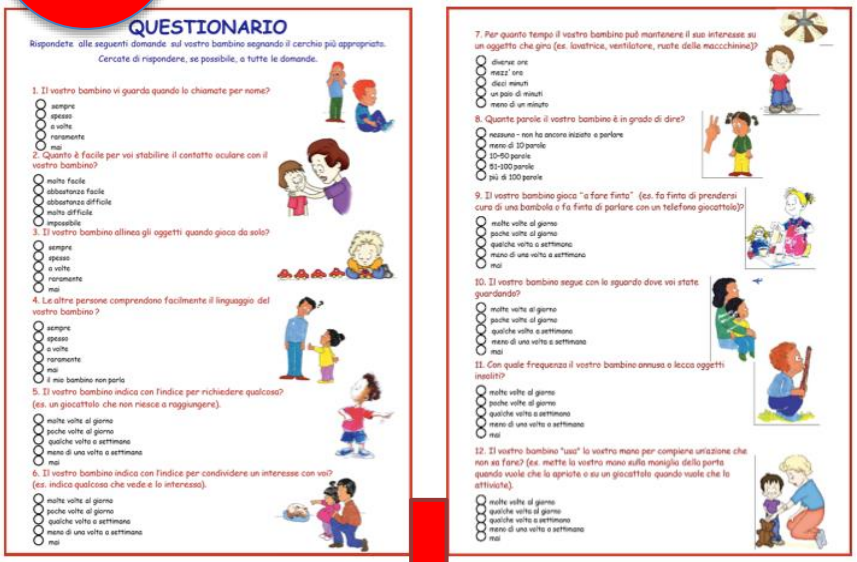
[a] Level 1 = population-based screening; level 2 = ASD specific screening tool after developmental delay risk confirmation at a routine developmental surveillance

[b] Clinician = usually paediatrician or primary care physician

1 Web-based platform



2 CHAT-MCHAT-QCHAT



3 Diagnostic Assessment

- ADOS
- Griffiths' Mental Development Scale
- Vineland Adaptive Behavior Scale

Well-child surveillance protocol

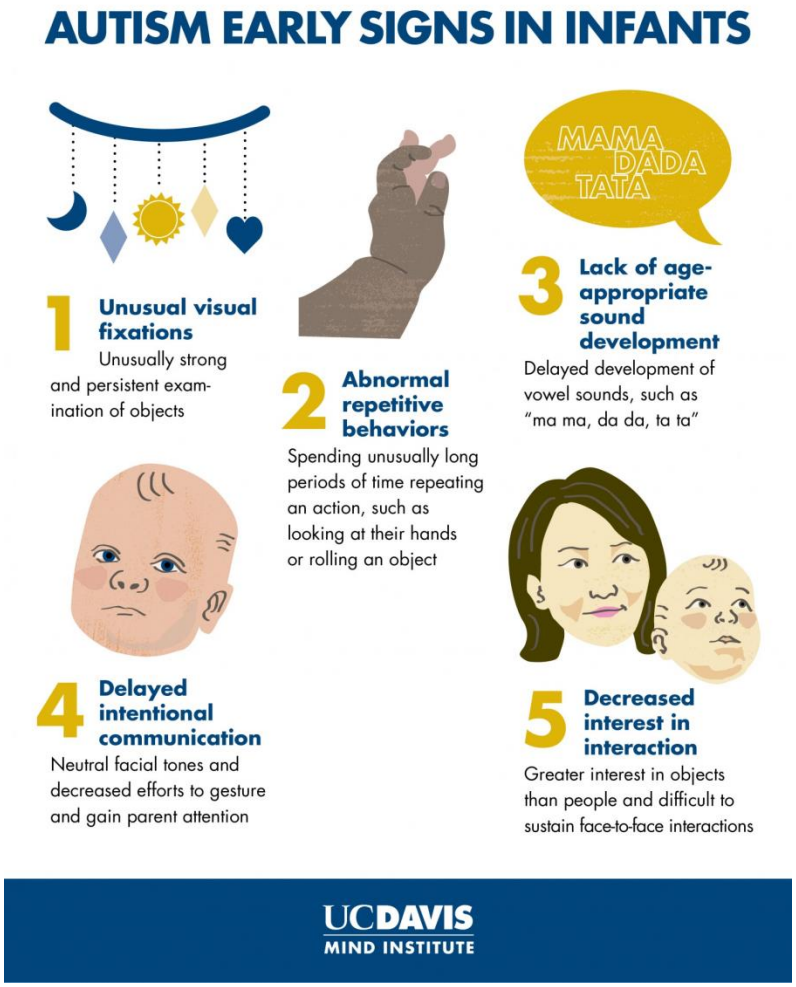
Neurodevelopment assessment (with a special focus on socio-comunicative skills) by paediatricians

Kindergarten teachers training

Early signs identification

Paediatrician assessment

Early detection and diagnosis



BEST CLINICAL PRACTICES: suggestions

- **Screening procedures - ASD-specific questionnaires (M-CHAT, Q-CHAT etc.)**
- **Protocol for assessing and promoting neurodevelopment (well-child surveillance protocol – paediatricians)**
- **Web-based platform to connect paediatricians/ neonatologists with the child psychiatric/neurologic units**
- **Monitoring of at-risk populations: siblings of children with ASD, prematures and SGA etc.**

Thank you for your attention

Italian Network for early detection of Autism Spectrum DIsorders (NIDA)

Ministero della Salute

EUROSIBS
The European Babysibs Autism Research Network

BRAINVIEW
Marie Skłodowska-Curie Actions (MSCA)
Innovative Training Networks (ITN)
H2020-MSCA-ITN-2014

asdeu
Autism Spectrum Disorders in the European Union
DG Santé