

# Cognitive and behavioral development of children with 47,XXX: first results of the **TRIXY** study

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# TRIXY Center of Expertise

## Trisomy of the X and Y Chromosomes

Clinical  
Neurodevelopmental  
Sciences

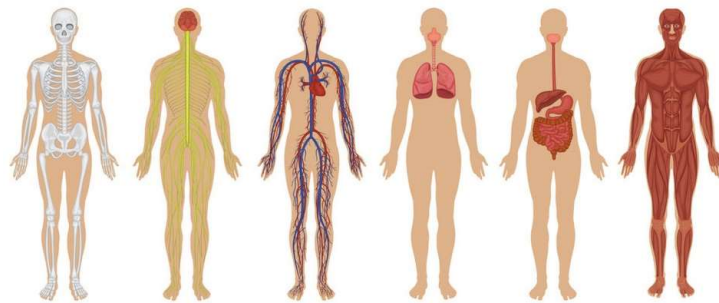


Treatment and  
Expertise Center

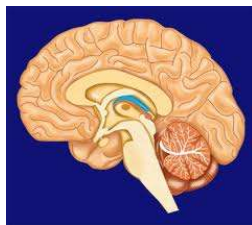


Academic Medical Center

Extra X/Y



75 % of research focused on  
physical/medical issues (Pieters et al, 2011)





## A review of neurocognitive functioning and risk for psychopathology in sex chromosome trisomy (47,XXY, 47,XXX, 47, XYY)

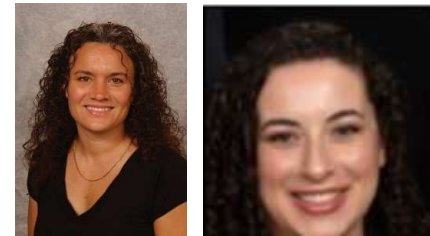
Sophie van Rijn<sup>a,b</sup>

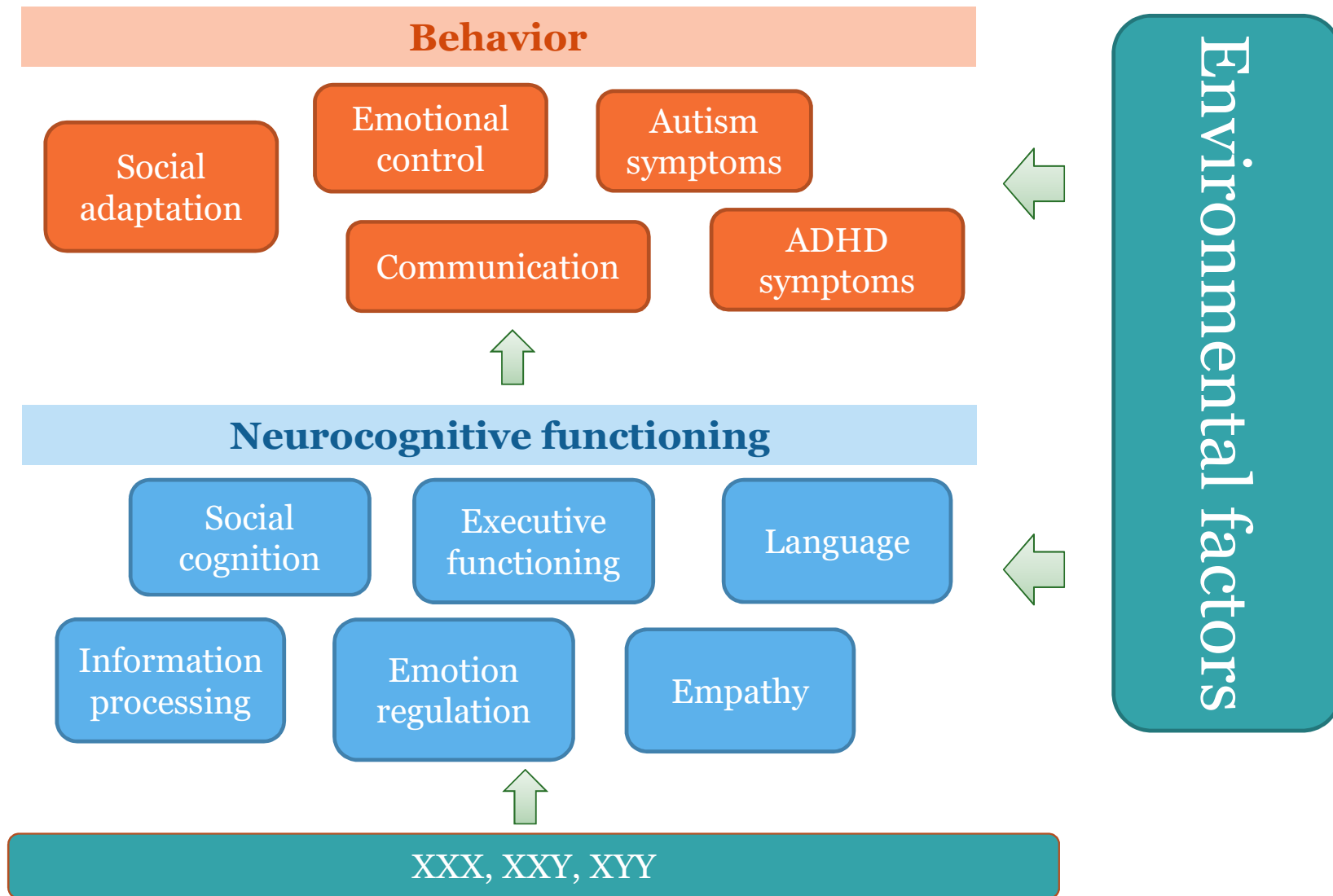
diagnosis	general population	47,XXX	range	symptoms
ASD	0.6 %	15 %	10-20 %	10-20 %
ADHD	7 %	30 %	25-35 %	49 %
Anxiety	7 %	20 %	-	27-30 %
Depression	13 %	36 %	18-54 %	27-30 %

➤ Language, executive functioning, social cognition, emotion regulation

# The TRIXY study

- 800.000 euro funding in 2016
- XXX, XYY, XXY
- 1 to 6 years
- Longitudinal study
- Based at Leiden University
- Collaboration with all academic medical centers in The Netherlands and Belgium
- TRIXY Partner site: XtraordinaryY kids clinic, Denver CO





# Behavior

- Questionnaires
- Systematic observations





# Cognitive tests





# Social perception: Eyetracking



# Emotion regulation: Arousal markers in heart rate



# TRIXY study – update on 47,XXX

SCT group: 71 children  
Control group: 74 children (**41 girls**, 33 boys)

SCT variations: **23 children with XXX**  
36 children with XXY  
12 children with XYY

## Recruitment XXX group:

- 44 % active follow-up/monitoring after prenatal diagnosis
- 30 % interested in research (study flyer / supportgroups)
- 13 % in clinical care because of physical/medical issues
- 13 % in clinical care because of neurobehavioral issues

Time of diagnosis XXX group: 57 % prenatal diagnosis  
43 % postnatal diagnosis

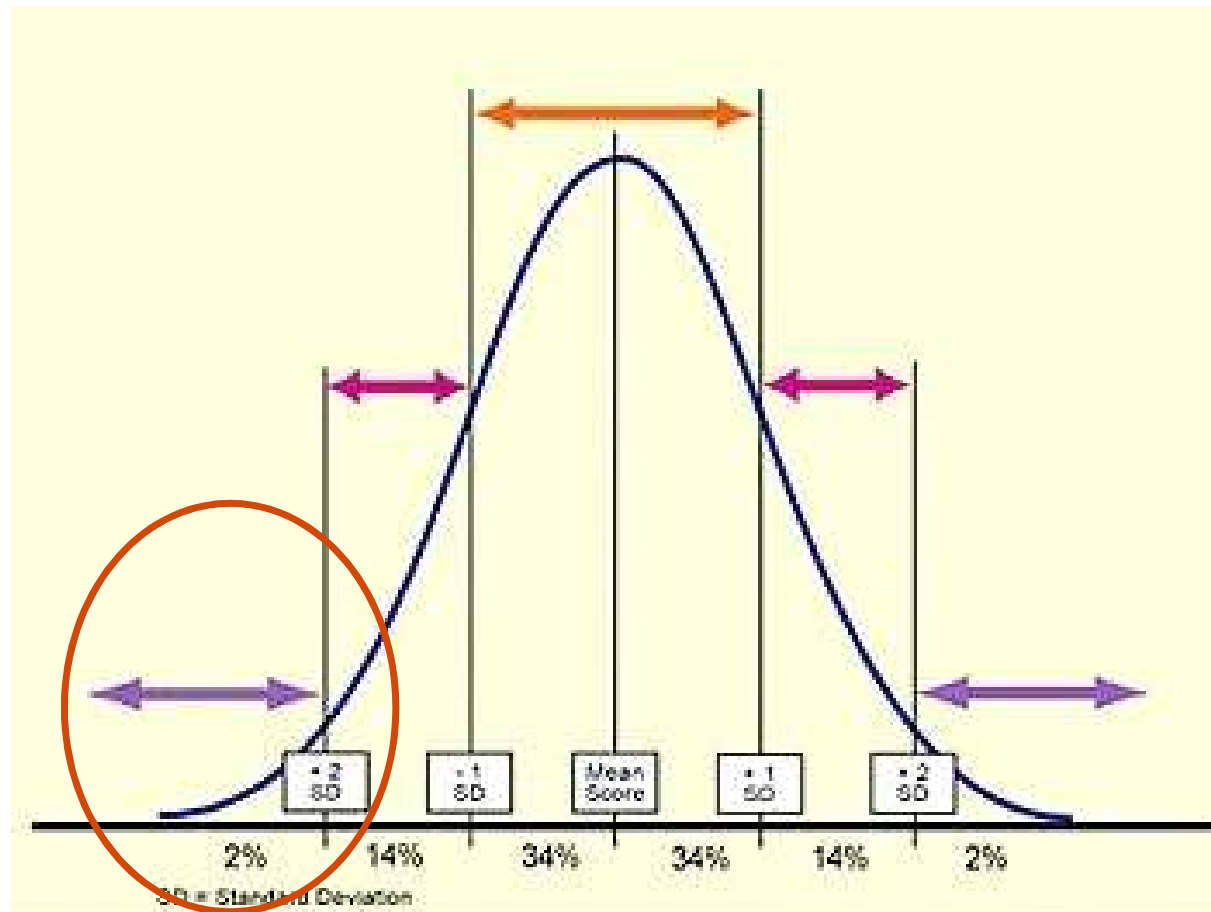
# Top 10 behavior observations of parents of children with 47,XXX

Does your child currently have, or had in the past, any of the following behaviors on a regular basis?

60 %	Tamper tantrums
43 %	Short attention span/distractable
43 %	Bothered by things touching him / her
40 %	Cries often
40 %	Poor coordination
39 %	Immature
39 %	Shy
34 %	Nail-biting
30 %	Resistance to change in routines
30 %	Anxiety
22 %	Moodiness



# Cognitive and behavioral risks



# DSM scales in girls with 47,XXX

<b>CBCL</b>	Average (T<65)	Borderline (65<T<70)	Clinical (T>70)	Different from control group?
<b>Pervasive developmental problems</b>	69 %	10 %	21 %	yes
<b>Anxiety problems</b>	79 %	-	21 %	yes
<b>Affective problems</b>	90 %	10 %	-	yes
<b>Oppositional defiant problems</b>				no
<b>Attention problems</b>				no



## RESEARCH ARTICLE

# Autism and social anxiety in children with sex chromosome trisomies: an observational study

## 5 to 16 years

Alexander C. Wilson<sup>1</sup>, Judith King<sup>2</sup>, Dorothy V.M. Bishop<sup>1</sup>

<sup>1</sup>Department of Experimental Psychology, University of Oxford, Oxford, OX2 6GG, UK

<sup>2</sup>Department of Psychiatry, University of Oxford, Oxford, UK

		Low Bias			High Bias	
Diagnosis	XXX	XXY	XYY	XXX	XXY	XYY
N	25	14	15	4	14	17
Neither	20 (80%)	9 (64.3%)	10 (66.7%)	2 (50%)	7 (50%)	4 (23.5%)
PDDNOS	3 (12%)	1 (7.1%)	1 (6.7%)	1 (25%)	1 (7.1%)	3 (17.6%)
Autism	2 (8%)	1 (7.1%)	4 (26.7%)	1 (25%)	2 (14.3%)	9 (52.9%)
Social Phobia only	0 (0%)	2 (14.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Social Phobia+PDDNOS	0 (0%)	1 (7.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Social Phobia+Autism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (28.6%)	1 (5.9%)

# Social behavior/cognition in girls with 47,XXX

<b>Social Responsiveness Scale</b>	Average ( $T < 65$ )	Mild range ( $65 < T < 70$ )	Clinical range ( $T > 70$ )	Different from control group?
Social awareness	67 %	22 %	11 %	yes
Social cognition	50 %	12 %	38 %	yes
Social communication	72 %	6 %	22 %	yes
Social motivation	67 %	11 %	22 %	yes
Restricted interests and repetitive behaviors	83 %	11 %	6 %	yes



# Neurocognitive functioning in girls with 47,XXX

## Global intelligence (WPPSI)

	FSIQ	VIQ	PIQ
Control	105	106	103
SCT	94	92	91

## Executive functioning (BRIEF):

More problems in **emotional control** and **shifting (flexibility)**

Similar scores as controls on organizing, inhibiting, working memory

## Language (NEPSY, PPVT):

Similar scores as controls on receptive/expressive language and phonological processing



# What's next?

## Mechanisms of emotion regulation:

- Executive function tests
- Arousal regulation, based on heart rate
  - unexpected events
  - in response to (emotions of) others
  - when frustrated



## Mechanisms of social behavior:

- Recognizing and understanding emotional expressions of others
- Empathy (emotional sharing)
- Coordinating social gaze (including joint attention)
- Attention to social cues: Eyetracking
- Perspective taking (theory of mind)



# Prediction over time



Early cognitive functioning



Behavioral outcome

**We thank all participating families!**

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**[www.trixyexpertisecentrum.nl](http://www.trixyexpertisecentrum.nl)**



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