Autistic Spectrum Disorder individual brain neural connectivity articles review on comparative analysis with neurotypical; theoretical & practical methods and CNS-related hypothesis
Vital Abbreviations

ToM Theory of Mind
MNS Mirror Neuron System
NtD Neurotypical Development
ASD Autistic Spectrum Disorder
ICA Individual Component Analysis
fcMRI functional connectivity MRI
WCC Weak Central Coherence
EF Executive Functioning
ROI Region of interest
Abstract

• **ASD study motivation:**
ASD researches increasing quantity
ASD population increasing rate
ASD symptoms unclear reason
ASD unique talents
lack of ASD learning programmes, especially in Estonia
Interest in neural connectivity and information compilation

• **This project problemacity:**
Untimely notification
Unconditioned intermediation
Unreasonable critics

*Journey Through Autism*

*Wendy Middlemass*
Intro

Visual and Audible Perception Asynchronicity

Multimodal Overload
**Simple terms**

**ASD** - distributed neural systems disorder

**NTD** - psychologically health persons’ lifelong development

**Between-network connectivity** - cortical or long-distance connectivity

**Within-network connectivity** - local or short-distance connectivity

**Disrupted cortical connectivity** - over-under-within-network connectivity

**Anatomical (structural) connectivity** - white-gray matter integrity

**Functional (physiological) specialisation** - different areas of the brain are specialised for different cognitive functions

**Functional (physiological) integration** - the coordination among brain areas to accomplish a task

**Effective connectivity** - the directionality of information transfer or influence of one region on another, have provided a multilevel characterisation of neural communication
ASD basic symptoms

- **Impaired ToM:** inability to ascribe mental states to oneself and others

- **Impaired EF:** underlies the observable cognitive and social deficits

- **Impaired WCC:** limited ability to integrate representations of stimuli, resulting in a fragmented information-processing style
Relevant Theoretical Methods

- **Graph theory**
- **Complex and Adaptive Dynamical Systems**
- **Compilation**
Developmental Practical Methods

★ fcMRI - systems-level approach to study brain functioning

★ Individual component analysis - component-level approach to study brain functioning

★ Brain-Computer interface (BCI)

★ Machine Learning
BCI game applications for combined neurofeedback and biofeedback treatment for children on ASD

- Innovative
- Socially interactive
- Neural- and body-based feedback
- Corresponds directly to the underlying significance of the trained signals and reinforced behavior

Closed feedback loop of the Social Mirroring Game
Hypothetical statement

BCI game applications for neurobiofeedback with regulated learning level, duration and periodicity on interdisciplinar topics will increase ASD between-network connectivity relieving the most active within-networks’ connections
Perspective

✴ Field: Translational Computational Neuropsychiatry

✴ Research: ASD multimodal learning processes by fMRI

✴ Basic: Qualitative comparative analysis (ASD & NT)

✴ Results: Multimodal integrative learning

Typically developing children

Children with autism
I WANT YOU
FOR FEEDBACK!
References

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Developmental changes in large-scale network connectivity in autism (Jason S. Nomi, Lucina Q. Uddin 2015)

Brain hyper-connectivity in children with autism and its links to social deficits (Kaustubh Supekar, Lucina Q. Uddin, Amihan Khouzam, Jennifer Phillips et al 2013)

Disrupted Cortical Connectivity as an Explanatory Model for Autism Spectrum Disorder (Jennifer Drude Borup, Christoffer Boving Kolgaard 2011)

Brain-computer interface game applications for combined neurofeedback and biofeedback treatment for children on the autism spectrum (Elisabeth V.V. Friedrich et al 2014)

Identification of neural connectivity signature of autism using machine learning (Gopikrishna Deshpande et al 2013)