



# NTR studies of ADHD in children and adults: an overview

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In collaboration with many others

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**EAGLE, SAGA, GODOT & DETECT consortia**

## Projects

- heritability studies in kids, adolescents, adults (twins, families)
- comorbidity with BW, cognition, eczema, aggression, addiction
- measurement invariance
- polygenic score (PGS) prediction
- linkage studies (adults)
- candidate gene studies
- Genetic Relatedness based (SNP) heritability
- GWA / meta analysis in children and in adults
- record linkage NTR with medical data

## Phenotypes

- CBCL, TRF, YSR, ASR (ASBEA: attention problems (AP) scale)
- Conners' Rating Scales (CTRS-R) for parents and teachers
- Conners' Adult ADHD Rating Scales (CAARS)
- Diagnostic Interview Schedule for Children (DISC)

## Genotypes

- Microsatellite data
- Candidate genes
- Genome wide SNP data: Affymetrix Perlegen 5.0, Illumina 370, Illumina 660, Illumina Omni Express 1M and Affymetrix 6.0.

## Epigenetics

- Illumina 450K data (currently in adults only)

## Collaborations GWA & META-analyses

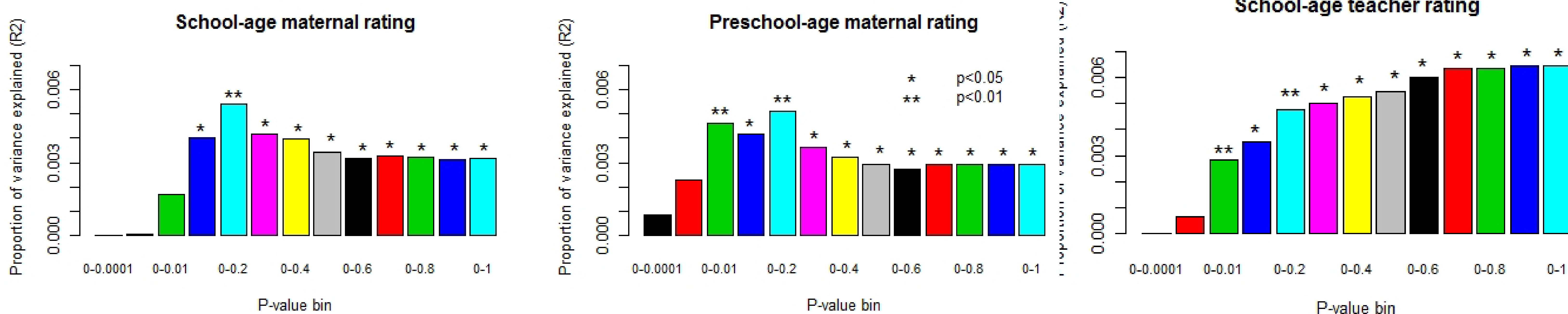
- EAGLE: EARly Genetics and Life course Epidemiology
- SAGA: Study of ADHD trait Genetics in Adults

## Results

- AP is heritable in children and in adults (Kan et al 2013)
- AP in childhood predicts later IQ, educational attainment
- BW is causally related to AP / ADHD (Groen et al 2011)
- kids with asthma/eczema have higher AP (v Beijsterveldt et al)
- ADHD and problem drinking related in adults (Derks et al 2014)
- ADHD and smoking related (Treur et al)
- MI applies to most Conners' scales (de Zeeuw et al)

## Results

- PGS based on clinical samples predict AP in NTR (Groen et al; *see figure*)
- PGS for EDU predict cognition / ADHD in kids (de Zeeuw et al.)
- Linkage on 18q21.31/32 and 2p25.1 for adult ADHD (Saviouk et al. 2011)
- SNP based heritability significant in adults (NTR and NESDA)
- SNP based heritability estimation in kids in progress (with GenR)
- Meta analyses in children and adults in progress



polygenic score (PGS) prediction: scores based on PGC discovery (clinical) samples predict Attention Problems in NTR

## In progress:

Meta-analyses of ADHD symptoms in adults: **SAGA**:

Nine cohorts, six population-based, two clinical ADHD and one clinical cohort ascertained on the basis of MDD/GAD, all from European origin. The smallest cohort consisted of 117 individuals, and the largest one included 6,268 related individuals with valid information on genome-wide genotypes and ADHD total symptom count score. In total, the sample size was 13,358 individuals.

Meta-analyses of ADHD symptoms in children: **EAGLE**:

Nine population-based cohorts including a total of 17,560 children with ADHD symptom and genotype data; imputed against the 1000 Genomes reference panel. ADHD symptoms were rated by mothers and teachers at preschool and school age.

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## Publications:

www.tweelingenregister.org