

## INTERNSHIPS at BIOLOGICAL PSYCHOLOGY, VRIJE UNIVERSITEIT AMSTERDAM

2021-2022

The Department of Biological Psychology offers a wide variety of internships, including behavioural genetic, psychophysiological, and epidemiological topics, or internships focussed on statistical methodology. Internships are open to Bachelor and Master students within the Department of Biological Psychology but also, when sufficient background knowledge is present, for students from other departments and universities.

To apply for an internship, please read through the list of internship supervisors, choose one or more supervisors and follow the relevant procedure, as outlined below.

### **Bachelor students learning track Genes, Brain and Behaviour**

You will be requested by the B-thesis coordinator to indicate the top-3 supervisors that provide topics you are interested in. The B-thesis coordinator will allocate the students equally across supervisors, taking into account as much as possible the preferences indicated by all B-thesis students. Note that you need to have followed the related minor and methodology 3 course prior to enrolling in the B-thesis course.

### **Research Master students Genes in Behaviour and Health**

You will be requested by the M1- and M2-thesis coordinators to indicate the top-3 supervisors that provide topics you are interested in. The M-thesis coordinators will allocate the students equally across supervisors, taking into account as much as possible the preferences indicated by all M-thesis students. If you have well-outlined ideas, provide these to supervisor(s) and timely make an appointment to jointly discuss what is feasible.

### **All other Bachelor and Master programmes**

If you are interested in doing a thesis with one of the Biological Psychology supervisors, send an email with a motivation letter, CV, and a list of your grades to the Internship coordinator, Dennis van 't Ent ([d.vant.ent@vu.nl](mailto:d.vant.ent@vu.nl)).

## LIST OF INTERNSHIP SUPERVISORS AT THE DEPARTMENT OF BIOLOGICAL PSYCHOLOGY

### Dr Michel Nivard

I am interested in cognition (the mental processes involved in gaining knowledge and comprehension), psychopathology and personality. I am basically interested in all or most psychological processes. I use genetic and family designs because they allow me to study causal relationships between psychological phenomena, which is essential if we want to be able to design successful interventions.



For an example of work on (the genetics of) cognition see:

<https://www.biorxiv.org/content/10.1101/2020.01.14.905794v1>

and

<https://www.biorxiv.org/content/10.1101/2020.09.15.296236v2>

For an example of my work on psychopathology see:

<https://www.medrxiv.org/content/10.1101/2020.09.22.20196089v1>

For an example of a (very successful) Master's thesis someone wrote supervised by me see:

<https://thesiscommons.org/c4wz5>

In these projects I often collaborate with **Wonuola Akingbuwa**, **Perline Demange** and **Elsje van Bergen** with whom I also jointly supervise students. I am a great proponent of team science where we all collaborate regardless of level (PhD, B-thesis and M-thesis) to maximize learning and scientific discovery. I am open to student-initiated thesis ideas.

### Some B-thesis topics:

- Effects of school performance (grades) and social position (bullying & Being bullied) on mood and the psyche and vice versa in primary school children (With **Elsje van Bergen**)
- The effect of parental SES/education on objective ability (CITO) and teacher judged ability. Do we provide a fair advice? (With **Perline & Elsje**)

**Requirements:** My B-thesis projects typically require basic knowledge of R, an interested in (developmental) psychology, and minimal knowledge of genetics, stress physiology, and epidemiology.

### Some M-thesis topics:

- Sex differences in depression, are the male and female manifestation of depression different at symptoms level?
- Sex differences in sibling interaction. Siblings may influence each other during development, are these mutual influences distinguishable from their common genetic and parental influences?
- Effects of school performance (grades) and social position (bullying & Being bullied) on mood and the psyche and vice versa in primary school children. (With **Elsje van Bergen**)
- The life course (genetic) epidemiology of cycling (for work and pleasure). Cycling is common in the Netherlands but still rare in other countries, we study the cost/benefit associated with cycling to work and for pleasure in terms of increased accidents, and better health using mendelian randomization and sibling differences analysis (comparing the health of a cycling person to their siblings health, controlling for upbringing and genetics).
- The life course (genetic) epidemiology of (excessive) TV/screen time. We test the effects of too much streaming on health using mendelian randomization and sibling differences analysis

(comparing the health of an excessive TV watching person to their sibling's health, controlling for upbringing and genetics).

- The effect of parental SES/education on objective ability (CITO) and teacher judged ability. Do we provide a fair advice? Do genes and the environment interact to influence high school placement?
- Are polygenic scores for cognitive and non-cognitive skills predictive for upward social educational mobility form one generation to the next. Do genes and the environment correlate to shape mobility (Supervised together with **Perline Demange**).
- Joint prediction based on PRS and structural genetic variants of severe psychopathology in UK Biobank (together with **Wonuola Akingbuwa**)

**Requirements:** Passed on the RM behavioural genetics course. Good statistical skills, knowledge of R.

### Dr Elsje van Bergen

I am interested in causes and consequences of individual differences in learning. In my research efforts I integrate theories and methods from psychology, education, and genetics to study achievement, particularly how genetic and environmental influences on educational skills work together in very complex way.

I am a great advocate of team science where researchers with different strengths collaborate regardless of career stage to maximize learning and scientific discovery. If you'd like to know more, please take a look at [www.evanbergen.com](http://www.evanbergen.com) or follow me and BioPsy on Twitter, [@drElsje](https://twitter.com/drElsje) & [@NTRscience](https://twitter.com/NTRscience).



#### B-thesis topics:

- Modelling the developmental process that leads to educational outcomes. In this project we will not just describe associations among school achievement and non-cognitive abilities, but we aim to study causal influences. (With **Dr Michel Nivard**)
- Dutch secondary schools are tracked (i.e., different levels). Children are tracked based on teacher advice and an achievement test in Grade 6. How do teacher advice and the achievement test compare? How is each of them influenced by parental socioeconomic status? What is the influence of the shared-environment (C-component in ACE models)? (With **Perline Demange, MSc & Dr Michel Nivard**)

**Requirements:** Interest in statistical modelling, interest in child development, good statistical knowledge, experience with the R programming environment.

B-these students must follow the learning track Genes, Brain and Behaviour.

#### M-thesis topics:

- Modelling the developmental process that leads to educational outcomes. In this project we will not just describe associations among school achievement and non-cognitive abilities, but we aim to study causal influences using two advanced statistical techniques. (With **Dr Michel Nivard**)
- Dutch secondary schools are tracked (i.e., different levels). Children are tracked based on teacher advice and an achievement test in Grade 6. How do teacher advice and the achievement test compare? Which one shows more influence of the shared-environment, and can we detect gene-environment correlations using polygenic scores? (With **Perline Demange, MSc & Dr Michel Nivard**)
- Having more ADHD symptoms is negatively associated with school achievement, but what is the causal direction? Here we make use of a recent methodological advancement, the MR-DoC twin model (Minică et al., 2018, <https://doi.org/10.1007/s10519-018-9904-4>), that combines the use of measured genetic variants within a direction of causation twin model. (With **Prof Conor Dolan**)
- In order to achieve the huge sample sizes needed for GWAS, we need quick phenotyping (e.g. with a short questionnaire). The upcoming GWAS for reading ability is relatively small compared to other phenotypes, because participants have been tested one on one. I have developed a short questionnaire to ask parents about their child's reading ability. In the project, you will evaluate the questionnaire's reliability and evaluate using bivariate twin models whether it picks up the same genetic variance as an individually-administered reading test. This project is with a collaborator in Florida who collected similar data

**Requirements:** Interest in statistical modelling, interest in child development, good statistical knowledge, experience with the R programming environment.

## **Dr Bruno Sauce**

My research focuses on the gene-environment interplay of intelligence. I want to know the impact of certain experiences on the way we think and learn, and how much this depends on our different genetic backgrounds.

I am studying (or have studied) the experiences of playing video games, growing up in wealth/poverty, going to school, physically exercising, sleeping well, and training with educational apps. I use twin analyses, latent change score models, and polygenic score analyses in large datasets such as the Netherlands Twin Register and the Adolescent Brain Cognitive Development.

This paper I wrote has the foundations for much of what I do:

<https://psycnet.apa.org/record/2017-48711-001>

(If you are interested, a quick skim will do already. It's a long paper and only some of it is worth it!)



On shakier grounds, I'm also interested in theories of intelligence (What is "intelligence" made of? Is it even a thing? How does it come about?), the evolution of intelligence (In what ways do species differ? Did these converge from different paths?), and on the gradual, worldwide increase in intelligence over the decades: the Flynn effect (What is behind it? Is it still happening?).

If you would like to know more, please take a look at [www.brunosauce.net](http://www.brunosauce.net). (There you can also find pdfs for all my work.)

I am open to student-initiated thesis ideas.

### **Examples of B- or M-thesis topics:**

- The genetic and environmental sources of differences in learning ability.
- Does socioeconomic status moderate the heritability of literacy and numeracy skills in children?
- The impact of an educational intervention in Dutch primary schools. Is it better than standard schooling?
- Do different types of video games have different associations with intelligence?
- How much is our time spent using digital media (social media, streaming, etc.) predicted by polygenic scores for intelligence, ADHD, and/or impulsivity?
- Does the number of steps we walk and/or the quality of our sleep associated with intelligence at an early age? And do those interact with polygenic scores for intelligence?
- How much do initial abilities matter during school? Are differences in intelligence magnified or reduced by schooling? Is that independent from genetic effects?

**Requirements:** Interest in intelligence and psychology. Some knowledge of genetics. Good statistical knowledge. Experience with statistical programming environments (SPSS/R).

**Prof dr Conor Dolan**

My research interest is in the development and application of structural equation modelling (SEM) in genetically informative designs, such as the classical twin design. These applications include causal modelling, psychometrics, and modelling of “genotype – environment interplay” (GxE interaction, G-E correlation) using polygenic scores.



**Possible B- or M-thesis topics:**

At present my research focuses on the following themes.

- Twin models incorporating polygenic scores to detect AxE and AxC interaction
- Twin models incorporating polygenic risk scores to test reciprocal causal relations using the Mendelian Randomization method (MR-DOC)
- Twin models incorporating polygenic risk scores to test reciprocal causal relations using the cross-lagged regression model
- Can we identify the ACDE model using twin data if we add polygenic scores?
- Testing moderation in ordinal data

Students who have encountered statistical subjects along their educational way that they found interesting or intriguing are welcome to drop by to discuss them.

**Requirements:** students who are interested in the applications or development of genetic SEM should have an interest in applied statistics, data simulation and programming in R.

### **Prof dr Meike Bartels**

My line of research is focussed on understanding the causes of individual differences in wellbeing. It strikes me that the current attempts to reduce and prevent illness pay limited attention to the large group of healthy and happy people. Instead of wondering why people are ill and invest largely in unravelling the risk factors, one should also wonder why so many people are protected or resilient. Why do many individuals stay healthy and happy even when faced with severe adversity? What are the protective factors? And finally, why are most people happy most of the time? To answer these questions a shift in approach is needed that includes healthy and happy people, people who are not healthy but still happy, and people who are healthy yet unhappy. In these groups, the causes of individual differences in wellbeing should be assessed as a function of not only environmental risk and protective factors, but also as function of biological and genetic risk and protective factors. Within my line of research, I want to contribute to finding answer to these societally highly relevant questions by applying an interdisciplinary focus on genetics, environment, and its complex interplay. These are just examples of questions that could be addressed in internships. Students are welcome to bring their own questions related to these fields. Feasibility of course depends on the available data or the active data collection in ongoing experiments.



### **Some B-thesis topics:**

- Are optimistic individuals happier or does a half empty glass not influence overall wellbeing?
- Individual differences in Flourishing and meaning of life

**Requirements:** My B-thesis projects typically require basic statistical skills, knowledge of SPSS/R and minimal knowledge of regression analyses and uni- and multivariate twin modelling. B-thesis students should follow the learning track Genes, Brain and Behaviour.

### **Some M-thesis topics:**

- Do happy people pick different environments? (Active Gene-Environment correlation for Wellbeing)
- Individual differences in Flourishing and meaning of life
- Social support and wellbeing

**Requirements:** Passed on the RM behavioural genetics course. Good statistical skills, knowledge of SPSS, and ideally R.

### **Dr Dirk Pelt**

I am a postdoctoral researcher working on a project on the environmental and genetic influences on wellbeing. I have a background in psychometrics and individual differences research, and currently my focus is on the relation between personality and wellbeing. Example questions that drive my research interests are: to what extent are personality traits and wellbeing influenced by the same genetic factors? Do good social relationships lead to more wellbeing for everyone, or perhaps more so for certain types of people (e.g., extraverts) than for others (e.g., introverts)? Do individuals' social skills moderate the (genetic) relations between social support and wellbeing?



Recently, I have developed an interest in the use of machine learning methods to answer several research questions. One area is the assessment of well-being by applying machine learning algorithms to individuals' posts on social media. The other area is the use of machine learning to optimize our prediction of well-being using big datasets. For the latter project, collaborations with the VU Campus Center Artificial Intelligence & Health (<https://www.ai-health.nl/>) are possible and encouraged.

I am also strongly interested in psychometrics and statistical methods, so students are also welcome to come up with their own questions with a more methodological character.

### **Some example B- or M-thesis topics:**

- The genetic overlap between personality and self-esteem
- The relation between emotional intelligence, social support and well-being from a genetic point of view
- Can we predict people's well-being based on their posts on Twitter?
- Can machine learning algorithms increase our prediction, and understanding, of well-being and depression?

**Requirements:** B-thesis projects: basic statistical skills, knowledge of SPSS/R and minimal knowledge of regression analyses and (ideally) twin modelling.

M-thesis projects: Passed on the RM behavioural genetics course. Good statistical skills, knowledge of SPSS, and ideally R.



### **Dr Dennis van 't Ent**

I am a researcher in the field of neuroimaging genetics and at the department I am the contact person for access and use of neuroimaging data. My personal interest is in exploring individual differences in brain structure and function and how these differences relate to individual variation in cognitive and psychological traits. To this end I collect and analyze neuroimaging data, mainly MRI, in genetically informative samples of monozygotic and dizygotic twins and additional family members.



#### **Some examples of possible B- or M-thesis topics:**

- Associations between externalizing behaviours and brain structure
- Investigating genetic and environmental contributions to brain-aggression relations by means of bivariate twin modeling
- Investigating the relationship between polygenic scores, metabolomic and neuroimaging measures, and their role in externalizing behaviours (**with Fiona Hagenbeek**)

**Requirements:** Good statistical skills, experience with statistical programming environments (SPSS/R). Basic knowledge of the brain.

### **Dr Jenny van Dongen**

Epigenetic mechanisms regulate the expression of genes in cells, and can respond to environmental influences. My research focuses on these epigenetic mechanisms, in particular DNA methylation. I work with data from the Netherlands Twin Register within national and international collaborative projects to study the causes of individual differences in DNA methylation, and to study the connections between DNA methylation, other omics layers, and complex traits. My current projects focus on aggressive behaviour, ADHD, handedness, victimization, smoking, cannabis use, twinning, and exercise. For a B-thesis, students can perform a (discordant) twin analysis on a small set of variables. For an M-thesis, students can analyse genome-wide DNA methylation data. For analyses of genome-wide DNA methylation data, some experience in R is required.



Below are some examples of topics for internships. Students are welcome to bring their own questions related to these fields. Feasibility of course depends on the available data and if the question fits within the scope of ongoing research projects.

#### **B-thesis topics:**

- The relationship between epigenetic clocks and exercise
- The relationship between epigenetic clocks and handedness
- The relationship between epigenetics and addiction
- The relationship between handedness and ADHD symptoms

**Requirements:** My B-thesis projects typically require basic statistical skills, knowledge of SPSS and minimal knowledge of genetics, epigenetics, and epidemiology. Knowledge of R is a pre.

#### **Some M-thesis topics:**

- Epigenome-wide association study of cannabis use
- Epigenome-wide association study of ADHD symptoms

**Requirements:** Passed on the RM course Epigenomics and sequencing in behaviour and health. Passed the RM course on Statistical Programming in R (or a different R course).

### **Dr Jouke- Jan Hottenga**

All my research is related to finding genes for complex traits, which I have been doing for the last 25 years. First in family-based studies, and later in population-based studies. My expertise is quality control, alignment, imputation and statistical analysis of genotype data. Furthermore, I am developing bioinformatics analysis pipelines to do this more efficiently in a Linux based environment. Recently, I have been focusing more on Polygenic Risk Scores and the nature of nurture by examining the effect of untransmitted parental haplotypes on the kids' phenotypic diversity. In line with this research, I also have been doing several population genetic studies with the Netherlands Twin Register (NTR).



If you want to do a Bachelor or Master internship with:

- Genotype data quality control
- Imputation
- Genome wide association
- Analysis of transmission of alleles in families
- Population genetics
- Genetic data analysis validation
- Polygenic Risk Score Prediction

then you're welcome to come and do this for the phenotype(s) in which you are interested.

Note that a limitation is that this phenotype should be present for enough genotyped individuals within the NTR to make a sensible study. And of course, I would like to have a short online interview with you, how the chosen topic fits our current ideas & research, as well as if the topic fits the requirements of a full Bachelor or Master internship at the VU.

### **Some examples of possible B- or M-thesis topics:**

- The chromosome Y and mitochondrial DNA distribution over the Netherlands.
- How much trait heritability is explained by PGRS for a given phenotype?
- Does genotype imputation improve or decrease the explained variance of PGRS?
- Is / are "known" gene(s) X involved in trait Y within the NTR?

Is method X vs. Y for GWAS or PGRS better or worse in detecting variants?

### **Dr René Pool**

I am a researcher in the field of metabolomics. As such I manage the metabolomics data hosted by the Netherlands Twin Register (NTR). We try linking individual differences in other omics layers (e.g., genomics, epigenomics) or higher level phenotypes (e.g., behavioural traits) to metabolic fingerprints of participants. In doing so we aim to gain insights in how omics levels are interconnected but also how such connections ultimately lead to biological (dys)function.



As the work at the department of Biological Psychology often involves computation, we are (heavy) users of (national) high performance computing facilities. At the department I am the contact person for accessing and using such infrastructures. You can expect that an internship with me contains a nice mix of computational science and molecular biology.

### **Some B-thesis topics:**

- Modelling the interaction between metabolites at the phenotypic and at the genetic levels
- Estimating the heritability of metabolites
- Generation of hypotheses based on metabolites available at the NTR

**Requirements:** Basic statistical skills, some knowledge of R or python, basic understanding of molecular biology.

### **Some M-thesis topics:**

- Modelling the interaction between metabolites at the phenotypic and at the genetic levels
- Estimating the heritability of metabolites
- Generation of hypotheses based on metabolites available at the NTR

**Requirements:** Good statistical skills, knowledge of R or python, good understanding of molecular biology.

## **Prof dr Dorret Boomsma**

My research interest is in the causes of population variation in health, human behaviour and cognition. I approach explanations of individual differences in humans from the perspective of genetics. This perspective has a firm basis in the theory of quantitative genetics and I believe this approach is the strongest to elucidate etiological pathways to complex behavioural and neuropsychiatric traits and common diseases. For my research, I established the Netherlands Twin Register (NTR: [www.tweelingenregister.org](http://www.tweelingenregister.org)) in 1987. NTR collects epidemiological data by longitudinal surveys and in-depth phenotypes in subgroups including biomarker data. One of my longstanding interests also is the genetics of twinning and fertility, and twinning as a risk factor for health. To serve the special needs of twin families dr P Zwijnenburg and I established a twin clinic ([www.twinvumc.nl/](http://www.twinvumc.nl/)) where twins, parents of twins, patients, their physicians and caretakers are welcome with any type of (health-related) question that they feel needs to be addressed with an awareness of their twin status. The presence of (identical) twins in NTR who are discordant for disorders (e.g. ADHD) or other traits (e.g. smoking, BMI) offers unique possibilities for research into questions about causality. A good example and explanation why this is so, is given in this paper: "Evidence for a causal association of low birth weight and attention problems" by Maria Groen-Blokhuis and colleagues in *J Am Acad Child Adolesc Psychiatry*, 2011; 50(12):1247-54. ( doi: 10.1016/j.jaac.2011.09.007).



### **Some example B- or M-thesis topics:**

Students who are interested in questions about association and causality can focus on:

- Does ADHD have any 'beneficial' effects? We tend to focus on problems, but in NTR we found that adults with a higher number of ADHD symptoms tend to be more often entrepreneurs. Do we see that identical twins who are discordant for entrepreneur status differ in ADHD symptom count?
- Can we disentangle the relation of smoking and depression? Do identical twin who differ in smoking status also differ in depression status?
- Is there an association of stuttering and other behavioural and emotional problems? Do identical twin who differ in stuttering status also differ on externalizing or internalizing problems?
- Do identical twins who have different food preferences differ in BMI or in lipid biomarker profiles?
- We published on cross-gender behaviour in childhood (van Beijsterveldt CE, Hudziak JJ, Boomsma DI: Genetic and environmental influences on cross-gender behaviour and relation to behaviour problems: a study of Dutch twins at ages 7 and 10 years. *Arch Sex Behav.* 2006;35(6):647-58). How do these children do longitudinally in their emotional development? Do we see differences between twins who were discordant as children?
- We can also take the discordant twin design to study sex differences: about 50% of dizygotic twin pairs are of opposite sex. Are sex differences within these twin pairs of the same magnitude as the sex differences we observe at the population level?
- With the availability of polygenic scores we can use genetics to understand more about psychometrics and measurement error. For example, we can explore the following hypothesis: people with a higher PGS (EA) are better in reporting about their phenotypic characteristics (less measurement error) than people with a lower PGS (EA). To test this hypothesis we need self-report data and an indicator of the same phenotype as measured by an 'objective' instrument. The general framework is that PGS (EA) might serve as an indicator of how well a person can report on him/herself (or in a next step, on e.g. their children). If the PGS could serve as an indicator of 'rater reliability' this might open up interesting possibilities to include such measures in psychometric models. An interested student should be able to carry out a sets of analyses of PGS based on educational attainment, (PGS (EA)), measured height and weight and self-reported height and weight.

- Onderzoeksproject: het verband tussen spontane miskramen en tweelingzwangerschappen (Boomsma, Willemsen, Hubers). Op grond van observaties in ons eigen onderzoek in het NTR en op grond van vragen van meerlingmoeders willen we met gegevens die zijn verzameld in NTR-vragenlijsten de volgende hypothese testen: spontane miskramen voorafgaand aan een tweelingzwangerschap komen vaker voor bij moeders die een eeneiige tweeling krijgen. Vereisten: interesse in meerlingen en onderzoek bij en met meerlingen, endocrinologie; vaardigheid om om te gaan met grote datasets (of de bereidheid dit te leren in spss), basale statistische vaardigheden.
- Project jointly supervised by **Boomsma, Willemsen, Hubers**: the link between spontaneous miscarriages and twin pregnancies. Based on observations in our own study in the NTR and based on questions from multiple mothers, we want to test the following hypothesis with data collected in NTR questionnaires: spontaneous miscarriages prior to twin pregnancy are more common in mothers who have identical twins. Requirements: interest in multiple births and research in and with multiple births, endocrinology; ability to handle large data sets (or the willingness to learn this in spss), basic statistical skills.

### **Camiel van der Laan MSc**



My work focuses on improving the infrastructure to conduct research using data from Statistics Netherlands (CBS). Specifically, I am interested in utilizing CBS' information on family ties in order to apply genetically sensitive designs for a wide variety of research questions. Some related questions that could be addressed in internships are: Is family composition related to certain outcomes (for example, income or illness)? Do twins differ from non-twins on certain traits? I also very much welcome students to come up with their own research topics that are uniquely suited to be studied using CBS data. In recent years my genetic epidemiological research was focused on aggression and rule-breaking behaviour. Much of my work focused on the role of family in driving individual differences. For example, I studied the clustering of aggression within families, the relative influences of environment and genes in intergenerational transmission of aggression, and whether genetic influences on aggression in early-life continue to affect aggression across the life-course. I have experience in genome-wide association studies, (longitudinal) polygenic score analyses, and multilevel/mixed effects analyses.

### **Some B- or M-thesis topics (in joint supervision with Dorret Boomsma):**

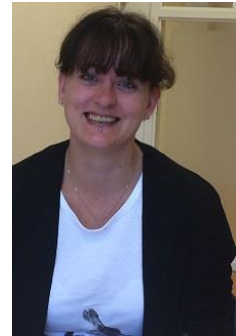
- Twins in CBS: do they differ from non-twins?
- Genetic and environmental influences on (the stability of) antisocial behaviour across the life-course
- Does the relationship between potential risk factors and antisocial behaviour hold in within-family designs?

**Requirements:** Good statistical skills, knowledge of R.

### **Fiona Hagenbeek MSc**

My research focusses on investigating the genetic etiology of metabolite levels and the use of classic biomarkers (e.g., lipids and inflammation markers) and omics data (e.g., genomics, epigenomics, and metabolomics) to elucidate the biological etiology of problem behaviour such as aggression. I am especially interested in research designs that integrate or combine two or more omics layers. For an example of our recent integrative multi-omics study see:

<https://doi.org/10.1101/2021.09.13.21263063>.



### **M-thesis topics:**

- Integrative multi-omics analysis of adult aggressive behaviour (together with **Prof dr Dorret Boomsma**).
- Investigating the relationship between polygenic scores, metabolomic and neuroimaging measures, and their role in externalizing behaviours (together with **Dr Dennis van 't Ent**)

**Requirements:** Passed on the RM course Introduction to Omics and the RM course Statistical Programming in R and Python (or a different **R course**). Good statistical skills.



### **Prof dr Eco de Geus**

I am an active researcher in the fields of genetic psychophysiology and genetic epidemiology. My psychophysiological research is focused on the ambulatory assessment of autonomic nervous system reactivity to daily life stress, and the individual resilience and susceptibility characteristics that modulate such reactivity. My genetic epidemiological research is focused on exercise ability and exercise behaviour. Why do some people become regular exercisers and others couch potatoes? To what extent are the associations between exercise behaviours and cardiovascular disease risk factors, or exercise behaviours and mental health causal?



These are just examples of questions that could be addressed in internships.

Students are welcome to bring their own questions related to these fields. Feasibility of course depends on the available data or the active data collection in ongoing experiments.

### **Some B-thesis topics:**

- Effects of regular physical activity and/or fitness on psychophysiological stress reactivity
- Ambulatory assessment of physiological stress reactivity in case-control designs (e.g. hearing impaired patients versus normal hearing)
- Ambulatory assessment of physiological stress reactivity in genetically informative designs
- Validation of (commercial) wearables for psychological research
- Determinants of physical activity and inactivity

**Requirements:** My B-thesis projects typically require basic statistical skills, knowledge of SPSS/R and minimal knowledge of genetics, stress physiology, and epidemiology.

### **Some M-thesis topics:**

- Genetic pathways involved in physical (in)activity at various ages
- Genomic prediction of athletic ability
- The role of gene-environmental interplay in autonomic nervous system functioning
- Causality testing in the exercise–mental health association
- Causality testing in the exercise–cardiovascular disease association
- Personality and sports preference: are runners introverts and team players extraverts?

**Requirements:** Passed on the RM behavioural genetics course. Good statistical skills, knowledge of SPSS, and ideally R/Matlab; background knowledge on the biology of the ANS.

### **Dr Martin Gevonden**

I have a background in nuclear imaging and psychiatric epidemiology, but currently my main research method is measuring psychophysiology in daily life situations using wearables. The primary outcome is usually reactivity of the autonomic nervous system, but contextual factors and the ways to measure them are limitless. I am interested in the underlying technology, and how it can be used to map and manage stress and other psychological phenomena. This also often involves measuring people's psychological state by asking to frequently self-report using their smart phone. A big benefit of these measures in a situation of social distancing is that they can be collected off-site, out of the lab. Since this is a rapidly evolving field, many of my projects also evolve around developing, testing out, refining and applying new wearables and methods. Content-wise, I teach a course on substance use and addiction, and I believe in science as a means to achieve social justice, for example to close the (mental) health gap experienced by minorities, so I may have projects around those topics.



I have posted some example topics below, but I welcome creativity and often the best projects come forth out of a student's natural curiosity.

#### **Some example B- or M-thesis topics:**

- The trade-off between quality and user-acceptance when measuring stress physiology with a consumer smartwatch (e.g., Fitbit Sense) vs. a research device
- Dissecting the ethnic density effect: Can we predict mental health outcomes better from ecological momentary assessment than from retrospective questionnaires?
- The subjective and physiological effects of dexamphetamine on drug naïve volunteers
- Predicting exam results from physiological measures before, during and after the exam
- Hot stuff: How to separate emotional sweating from temperature based sweating
- Optimizing additional heart rate as an index of stress by classifying physical activity

**Requirements:** Statistical prowess, an affinity for data science (e.g., some projects require programming in R, Matlab or Python), interest in technology

### **Matthijs van der Zee, MSc**

I am a researcher in the field of statistical genetics and bioinformatics. I am currently employed as a postdoc and mainly focus on the further programmatical development of the GenomicSEM package, so most of my time is spent programming. I recently finished my PhD dissertation in Exercise Genetics. I am open to student-initiated ideas with an emphasis on methodology and programming.



#### **B-thesis/M-thesis topic:**

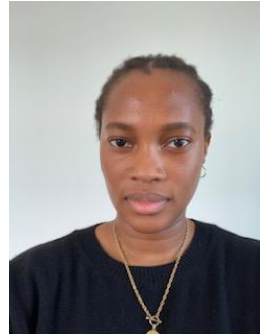
- GWAS-analysis of multiple (>10) phenotypes

**Requirements B-thesis:** Good statistical knowledge, good grade on B3-course Analyses Toolbox, proficient in R. Proficiency in a programming language (ideally Python/C/C#/C++ or Rust) is preferred.

**Requirements M-thesis:** Good statistical knowledge, good grade on RM1-course Statistical Programming in R and Python, proficient in both R and Python. Proficiency in a second programming language (ideally C/C#/C++ or Rust) is preferred.

### **Wonuola Akingbuwa MSc**

I am a postdoctoral researcher in the field of psychiatric genetics. My research generally concerns polygenic analyses of complex traits, and is currently focused on the role of rare genetic variants in psychopathology and other complex traits. I have experience in polygenic score analyses, structural equation modelling, and rare variant analyses using exome sequenced data. I am also open to discuss ideas outside of those previously listed, if students already have specific questions or other statistical genetic methodologies they are interested in exploring.



#### **Possible B- or M-thesis topics:**

- Investigation of shared genetic aetiology between traits, using polygenic scores (PGS)
- How much phenotypic variance is explained by PGS
- Joint prediction based on PGS and structural genetic variants of severe psychopathology in UK Biobank (together with **Michel Nivard**)

**Requirements:** Potential B-thesis students should follow the B3 learning track in Genes, Brain and Behaviour, as well as have some knowledge of regression analyses and programming in R. M-thesis students should have passed on the RM behavioural genetics course, have good statistical skills, and knowledge of R.

### Prof dr Gonneke Willemsen

My research interests are directed towards understanding the cause of individual differences in health and behaviour. To this aim, I am involved in both behavioural and molecular genetic as well as epidemiological studies on lifestyle, personality, and health parameters. Of particular interest to me is the role of psychosocial factors, such as stress and socioeconomic status, in the development of disease and as a moderator of the genetic influence on health and wellbeing. We recently coded all the occupational data with the Netherlands Twin Register and linked these data to estimated income. This allows for a new set of analyses within the NTR, when combining these data with the genetic and survey data already available.



### Some examples of possible B- or M-thesis topics:

- How is personality related to occupational choice? Some occupations are seen as more male or female orientated, is this reflected in a different personality profile?
- To what extent are the stress levels reported by NTR participants explained by (the interaction of) occupational class and genetic stress sensitivity?
- Are the physiological responses during the day, but especially during the recovery at night, different for different classes of occupation?
- Is wellbeing related to socioeconomic status, once we control for familial or genetic factors by looking at discordant twins?
- To what extent the polygenic score for education explain some of the socioeconomic differences in health behaviour? Think of BMI, smoking or alcohol use.
- Project jointly supervised by **Boomsma, Willemsen, Hubers**: the link between spontaneous miscarriages and twin pregnancies. Based on observations in our own study in the NTR and based on questions from multiple mothers, we want to test the following hypothesis with data collected in NTR questionnaires: spontaneous miscarriages prior to twin pregnancy are more common in mothers who have identical twins. Requirements: interest in multiple births and research in and with multiple births, endocrinology; ability to handle large data sets (or the willingness to learn this in spss), basic statistical skills.

In addition, within the Netherlands Twin Register we developed the NTR participant portal to provide feedback to our participants. However, while we made the portal available to many of our participants, not everyone activates the portal or looks at the content. Why? An additional thesis topic is therefore:

- Which traits predict whether someone activates and accesses the information on the NTR portal?

### **Dr Toos van Beijsterveldt**

I have a broad background in Biological Psychology and Data management. As PhD-student at the department of Biological Psychology, I studied the genetics of electrophysiological indices of brain activity using the twin methodology. Currently, my research interest are the causes of individual differences in health and problem behaviours in young children.



### **Some B-thesis topics:**

- Relation between asthma and anxiety
- Relation between asthma and BMI
- Relation between ADHD and BMI

**Requirements:** My B-thesis projects typically require basic statistical skills, knowledge of SPSS/R and minimal knowledge of regression analyses and uni- and multivariate twin modelling.

**Dr Lannie Ligthart**

I work as a researcher at Biological Psychology, and I am also the senior data manager for the phenotype data of the Adult Netherlands Twin Registry. My research focuses on migraine and other chronic pain conditions, and particularly how they relate to other conditions and environmental factors, such as depression, anxiety and adverse life events.



**Some B-thesis topics:**

- Genetic and environmental overlap between migraine and various pain conditions, including chronic back pain, abdominal pain etc.
- The association between chronic pain (including migraine) and life events: which life events are most strongly related to chronic pain and why?
- Migraine without aura vs. aura without headache: how do they relate to each other?

**Requirements:**

My projects typically require basic statistical skills, basic knowledge of SPSS, twin modelling (depending on the topic), and ideally some basic knowledge of R.