Gravitation

Consortium on Individual Development (CID)

Annual Report 2016-2017

Consortium on Individual Development

Gravitation
Call 2012

Consortium on Individual Development (CID)

Why some children thrive and others do not

Application number: 024.001.003

The annual report was written by Chantal Kemner (program chair), Hilleke Hulshoff Pol (Work Package 1), Marinus van IJzendoorn (Work Package 2), Wim Meeus (Work Package 3), Marian Joëls (Work Package 4), and Jacobine Buizer-Voskamp (project manager), with input from the co-applicants and principal investigators.

This annual report covers the period from the start of the project (May 2013) until August 2017.

Approved by the Steering Committee at November 2, 2017.
Approved by the Supervisory Board at November 23, 2017.

NWO
Nederlandse Organisatie voor Wetenschappelijk Onderzoek

Consortium on Individual Development

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Introduction

Most children develop well and find their way in society without major problems, but some do not. A combination of the child's disposition and the environment in which he or she is raised is thought to underlie this developmental difference. In order to gain a better understanding of the factors involved, the Consortium on Individual Development (CID) was set up in May 2013 and brings together twenty top researchers (principal investigators, PIs) from different disciplines, working in seven institutes. Together, we have the necessary expertise in developmental research, including the role of parents, peers and media, epigenetics, interventions, brain development, and animal and statistical models, to advance our knowledge and understanding of why some children thrive and others do not. To this end, we plan to develop a model of how developmental differences between children arise as a result of the interplay between child characteristics and environmental factors, by filling in crucial gaps in our knowledge of the role of brain development, effects of interventions in the environment, and intergenerational transmission.

Over the past years, we have grouped research into four work packages (WPs), each focusing on specific aspects of development: the role of brain development in WP1, effects of interventions in WP2, the role of generational transmission in families in WP3, and animal and mathematical models of development in WP4. Two new study cohorts have been set up, to provide longitudinal data: a longitudinal cohort based in Utrecht (YOUth, WP1) and an intervention cohort based in Leiden (L-CID, WP2). In WP3 information from four existing cohorts is analyzed: TRAILS (Groningen), Generation-R (Rotterdam), RADAR (Utrecht), and NTR (Amsterdam). In each cohort both shared and specific subsets of measures guide monitoring of the development of two aspects of behavior and their correlates, namely, social competence and behavioral control, skills that are needed for functioning in society and for reducing the risk of behavioral and emotional problems. Social competence is the ability to engage in meaningful interactions with others. Behavioral control is the ability to control one's emotions, behavior, and impulses and to adapt to rules. In addition to the measures for social competence and behavioral control, several developmental traits are collected in all cohorts. This allows both integration of datasets and more focused analysis in two or more cohorts. The broad approach including social sciences, humanities, biomedical/medical sciences is unique to CID.

A series of interrelated PhD and postdoc projects on the identification and interplay of factors critical to the development of behavioral control and social competence are now in progress, under the supervision of at least two PIs from different disciplines, in order to stimulate the integration of expertise.

Please see the website (www.individualdevelopment.nl) for additional information on our consortium.

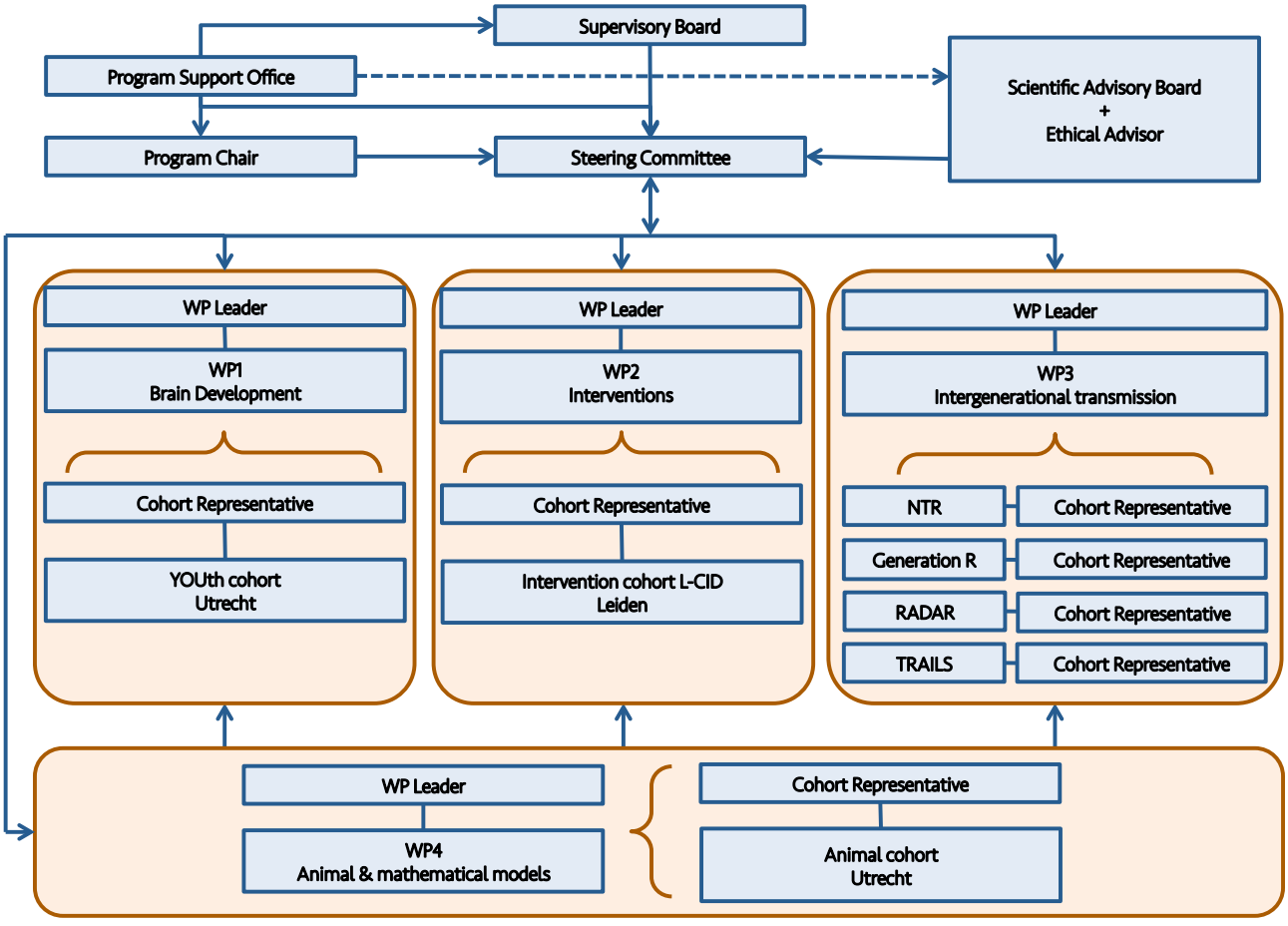
1 – Participating researchers and organization

WP0, general management	Program Chair: Prof. dr. C. Kemner

The Consortium on Individual Development (CID) started in May 2013. A Consortium Agreement was formulated, specifying the governance structure in more detail than was given in the proposal (amongst others including cohort representatives), the aim of collaboration, the relationship between parties, consortium management, and the rights and obligations of the parties concerning the implementation of research projects and use of project budgets. Conform the Consortium Agreement, structures for meetings, documentation, administration, and finance have been set up. The Finance Office (manager and controller) set up a financial structure (control sheet, forms) and visited the finance staff of all parties to explain procedures and structures.

The organizational structure of CID can be found in the organogram below. The research program is subdivided into four WPs, each led by a WP leader. The WP leader implements the policy of the Steering Committee for their own WP. The WP leader monitors scientific progress and is responsible for the management of the scientific staff (PhD students/postdocs) associated/assigned to their WP. For each cohort, a CID Cohort representative is responsible for organizing measurements that are needed to achieve the scientific goal of the WP and for organizing the financial management of their cohort. The Scientific Advisory Board is an advisory board to the research program in general and advises the Steering Committee, as specified in the Consortium Agreement.

Organogram



All PIs received a budget to fund PhD students and postdocs according to the scientific plan outlined in the proposal. It has also been possible to appoint temporary (scientific) personnel on the cohort budgets. Co-funding budgets have been used to appoint additional PhD students, postdocs, and research staff. To ensure integration of expertise, it is mandatory that at least two PIs be involved in the supervision of PhD students and postdocs that are appointed on the CID budget.

As of August 2017, CID consists of 18 PIs, 32 PhD students, 25 postdocs, and 12 other CID researchers.

For the coming 5 years, we will adhere to the plans for PI budgets, cohort budgets, and co-funding as described in in the original application.

Names of the members of the different bodies

Main applicant: Prof. dr. C. Kemner
Co-applicants: Prof. dr. D.I. Boomsma, Prof. dr. S. Durston, Prof. dr. M. Joëls, Prof. dr. P.M. Valkenburg, Prof. dr. M.H. van IJzendoorn

PIs: Prof. dr. M.J. Bakermans-Kranenburg, Prof. dr. J.J. Bolhuis, Prof. dr. D.I. Boomsma, Prof. dr. E.A.M. Crone, Prof. dr. M. Dekovic, Prof. dr. S. Durston, Prof. dr. H.J.A. Hoijtink, Prof. dr. H.E. Hulshoff Pol, Prof. dr. M.H. van IJzendoorn, Prof. dr. M. Joëls, Prof. dr. C. Kemner, Prof. dr. R.S. Kahn, Prof. dr. W.H.J. Meeus, Prof. dr. A.J. Oldehinkel, Prof. dr. J. Ormel, Prof. dr. H. Tiemeier, Prof. dr. P.M. Valkenburg, Prof. dr. W.A.M. Vollebergh

Steering Committee: Prof. dr. C. Kemner (Program Chair), Prof. dr. D.I. Boomsma, Prof. dr. M. Joëls, Prof. dr. H.E. Hulshoff Pol, Prof. dr. W.H.J. Meeus, Prof. dr. P.M. Valkenburg, Prof. dr. M.H. van IJzendoorn

Work Package Leaders: Prof. dr. H.E. Hulshoff Pol (WP1), Prof. dr. M.H. van IJzendoorn (WP2), Prof. dr. W.H.J. Meeus (WP3), Prof. dr. M. Joëls (WP4)

Cohort Representatives: Prof. dr. C. Kemner (YOUth cohort, Utrecht), Prof. dr. M.H. van IJzendoorn (L-CID Intervention cohort, Leiden), Prof. dr. D.I. Boomsma (NTR, Amsterdam), Prof. dr. H. Tiemeier (Generation-R, Rotterdam), Prof. dr. A.J. Oldehinkel (TRAILS, Groningen), Prof. dr. W.H.J. Meeus (RADAR, Utrecht), Prof. dr. M. Joëls (Animal cohort, Utrecht)

Scientific Advisory Board: Prof. dr. J. Belsky (University of California, Davis, USA), A.L. Bredenoord, PhD (University Medical Center Utrecht, the Netherlands), Prof. dr. B.J. Casey (Cornell University, New York, USA), Prof. dr. M.H. Johnson (Birkbeck University of London, UK), Prof. dr. N. Martin (University of Queensland, Australia), Prof. dr. M.J. Meaney (Douglas Mental Health University Institute, Québec, Montreal, Canada), Prof. dr. L. Steinberg (Temple University, Philadelphia, USA)

Supervisory Board:
Prof. dr. M.A.G. van Aken (Chair, UU), Prof. dr. F.J. Oort (UvA), Prof. dr. P.J. Beek (Vrije Universiteit Amsterdam), Prof. dr. V.W.V. Jaddoe (Erasmus UMC Rotterdam), Prof. dr. E. Sterken (University of Groningen), Prof. dr. F. Miedema (UMC Utrecht), Prof. dr. J.T. Swaab (Leiden University)

Program Support Office: Dr. J.E. Buizer-Voskamp (Project Manager), Drs. W. Zinger (Finance Office), Drs. H. Aalders (Finance Office)

Changes in organization:

- Because of health reasons, Prof. dr. Sarah Durston has passed on her role as WP leader and

member of the Steering Committee from the start of the project to Prof. dr. René Kahn. However, due to his appointment at Mount Sinai (New York), Prof. dr. René Kahn had to hand over his tasks as Steering Committee member and Work Package Leader to Prof. dr. Hilleke Hulshoff Pol. He will still be a PI of our consortium, since he is part-time employed at the University Medical Center Utrecht.

- Prof. dr. Robert Plomin (King's College, University of London) had to withdraw from the Scientific Advisory Board for personal reasons and has been replaced by Prof. dr. Mark Johnson. Prof. dr. Laurence Steinberg joined the Scientific Advisory Board in early 2013.
- As of March 2016, prof. dr. Rutger Engels – participating PI from our consortium – was appointed at Utrecht University. From that moment, he finished his appointment at the Radboud University Nijmegen (RU). In accordance with the research director and the dean involved from the RU, it was agreed that prof. Engels was allowed to take his PI budget to Utrecht University. As prof. Engels was the only PI from the RU within our consortium, the RU could no longer be a participating institute within CID due to his leave. Prof. dr. Daniël Wigboldus, the participating dean from the RU, thereby withdraw from our Supervisory Board. Our consortium therefore now consists of seven participating institutes. As of April 2017 prof. dr. Rutger Engels is no longer connected to the consortium as PI. Due to lack of time, he was forced to stop his involvement with CID.
- As of 19 May 2017, prof. dr. Frank Verhulst of Rotterdam has retired and will no longer perform his tasks as PI of CID. Prof. dr. Henning Tiemeier has been put forward and approved as his successor.
- Prof. dr. Elmer Sterken, rector of the University of Groningen, has taken prof. dr. Folkert Kuipers' place as member of our Supervisory Board.
- Prof. dr. Eco de Geus of Vrije Universiteit Amsterdam has also left our Supervisory Board, and we are pleased to announce that prof. dr. Peter Beek has taken his place.
- Prof. dr. Jos van Berkum decided to leave our consortium as PI in June 2017. We are looking for a successor from the faculty of Humanities from Utrecht University.
- Prof. dr. Marcel van Aken replaced Prof. dr. Werner Raub as dean of the Faculty of Social and Behavioral Sciences at Utrecht University and thereby as member within our Supervisory Board.
- Starting January 2018, prof. dr. Wim Meeus of Utrecht University will retire and hand over his tasks within CID to prof. dr. Susan Branje. She will take over his tasks as PI, cohort representative and WP leader (and because of this will also become a member of the Steering Committee).

Participating institutes:

Vrije Universiteit Amsterdam, University of Amsterdam, Leiden University, Erasmus Medical Center Rotterdam, University Medical Center Groningen, Utrecht University (coordinator), and University Medical Center Utrecht.

2 – Progress report of the research program

The four work packages, their scientific methods and objectives, their progress, and any substantial changes to the original research plan are described below. In WPs 1, 2 and 3, research is centered on the new and existing cohorts and thus the research lines mainly focus on the design and development of the cohorts. PhD students and postdocs have started projects along the lines envisaged in the original proposal, which are described in **Appendix 8**.

WP1	WP leader:	Prof. dr. H.E. Hulshoff Pol
	YOUth cohort representative:	Prof. dr. C. Kemner
	Other PIs:	Prof. dr. M. Dekovic, Prof. dr. S. Durston, Prof. dr. R.S. Kahn, Prof. dr. P.M. Valkenburg, and Prof. dr. W.A.M. Vollebergh

Aim/objectives: The neurobiological developmental trajectory of newborns, children, and adolescents is not fully understood. In particular, we are only just beginning to learn to what extent genetic and environmental factors influence brain development and how these effects in turn influence behavior. WP1 focuses on brain development in relation to behavior, specifically on social competence and behavioral control and addresses questions regarding their interrelationships, how associations might develop as a function of age, gender, genetic influences, and environmental exposures.

Method/Cohorts: The YOUth cohort includes children from before birth until 18 years of age in two independent but related samples from the general population. The first entry point consists of 3000 babies recruited via their pregnant mothers. The mothers will be tested (including 3-dimensional ultrasound) at 20 and 30 weeks of pregnancy, and their infants will be evaluated at about 5 and 10 months, and at about 3 and 6 years of age. The second entry point consists of a similar number of 8 –to 10-year-old children recruited via schools. They will be tested at about 12 and 15 years of age. In both groups, at each visit behavioral development and brain development will be assessed by using EEG/ERP (in the infants and young children), structural and functional MRI (in the school-age children), and eye-tracking, behavioral, and computer tasks. The tasks will focus on behavioral control and social competence, and longitudinal changes therein. Parent-child interactions and IQ (both child and parents) will also be evaluated. In addition, questionnaires will be administered to parents and children, and biological samples will be collected at the various assessment times.

Projects: In WP1, eight PhD students and five postdocs are employed via the CID budget.

Start and progress: Preparations for setting up the cohort started in 2013. This required decisions to be taken about the cohort composition, participant age at testing, and choice of measures and instruments to be used. Tests were developed and tested. A dedicated soft- and hardware structure was designed to incorporate MRI and Biobank data stored at the UMC Utrecht, and questionnaire and experimental data stored at the UU. Personnel for running the cohort have been hired and trained, and protocols covering logistics, and safety and ethical issues have been prepared. We have also developed a strategy for the recruitment and retention of cohort participants and have a dedicated location and facilities for testing children (the Child Research Center (CRC), http://www.kinderkenniscentrum.nl).
The two enrolment moments were described in two protocols submitted to the Institutional Review Board of the UMC Utrecht. These described the general idea of YOUth, including follow-up and inclusion of pregnant women. Subsequently, for each round of assessments an amendment describing the specifics of that assessment round will be submitted for approval. In March and April 2015, the two framework protocols were approved (14-616/NL51465.041.14 and 14-617/NL51521.041.14), and the amendments for the first round of measurements were recently approved. Three large pilot studies have been performed: in one data were collected from children at 5 months, and in another data were collected at 10 months, with measurements being performed twice within 2 weeks, to establish test-retest reliability. The third study collected data from children aged 8 to 16 years. Functional Near-Infrared Spectroscopy (fNIRS) is still being piloted in infants, and preliminary data have been used to adapt the measurements and protocols. At the end of May 2015, we started the recruitment of pregnant women, and in March 2016 the first children in

the second enrolment period (8–10 years) were recruited. At the moment, we have included almost 900 pregnant women in YOUth Baby & Child and 450 children in YOUth Child & Teenager. Inclusion rates are still increasing and we expect to finish the fist wave of YOUth Baby & Child in three years' time. The second baby wave (babies aged 5 months and 10 months old) has started as well and the first few hundred babies have visited our center. A pilot study for the third wave (children aged 2 to 4 years old) is currently running and we expect to see the first children of that age return at spring 2018.

A common problem with cohort studies is that participants with a relatively high social economic status (SES) tend to participate, leaving low SES families underrepresented. Especially in the case of YOUth this is a problem, as SES is an important predictor in behavioral development of children. Therefore, we are currently investing significant effort in the inclusion of low SES families.

We have extended the YOUth website with specific information for researchers, among others the study design, information on the investigators involved in YOUth, and instruments that are being used in YOUth. Also, we have developed guidelines for data access and publication. We will stimulate the actual use of data as broadly as possible.

We are also working on efficient integration of our data streams, requiring integration of Utrecht University and UMC Utrecht ICT support systems, since part of the data processing pipeline is being hosted by the UMCU (SLIM (data about the participants and the appointments), Research Online 2 (RO2, online questionnaires) and the Research Data Platform (RDP, long-term storage at UMCU)), another part by the UU (YODA, long-term storage at UU). YODA was developed for the YOUth study and is a facility for safe data storage and retrieval. As part of the YOUth cohort study, also an innovative internet platform is being developed, that will be aligned with the YODA data storage system. The first goal of the internet platform is to support participant recruitment and retention on a larger scale over the course of several years. The internet platform can play an important role by offering dynamic feedback to (parents of) participating children. The second goal is the possibility of collecting additional data through the internet. The platform will be able to support the use of questionnaires, computerized cognitive tasks, and serious games. The platform will also be designed as an open tool, available to other researchers within (and in time outside) the UU. The third goal is to facilitate broader collaborations, both between the university and partners, such as the Wilhelmina Children's Hospital and the municipality of Utrecht.

YOUth crucially depends upon a highly structured data flow and workflow. This requires standardized procedures, which form the backbone of a transparent and efficient system of data collection, processing and storage. To facilitate this highly structured data flow and workflow we are developing STEP: Structured Tools for Enhanced Processing. STEP has a modular design, with modules providing unified coverage of all aspects of longitudinal large-scale studies.

In addition, we are in the process of building a second location for the YOUth cohort at the UMCU.

Changes compared to original proposal: An important change is that the initial number of 4500 subjects in each cohort has been revised to 3000 per cohort and the number of visits in young children has been reduced, mainly for logistic and financial reasons. Even with this reduced number of participants, the study will be amply powered to estimate differences in the primary outcome measures (i.e. typical brain development, social competence, and behavioral control), as these are continuous outcomes. We decided to test children over a wider age range (e.g., the assessment time "9 years" will include children aged 8-10 years), and we have included 3D ultrasound studies of pregnant women, to allow the tracking of brain development prenatally. Also, we decided to collect hair and saliva samples, to allow for more detailed determination of environmental influences. In general, we started recruitment to the YOUth cohort later than envisaged, because of the need to build a dedicated research center and extensive discussion of instruments to be used, etc. Furthermore, recruitment of the cohort of 8- to 10-year-old children was delayed because the dedicated 3T Philips MRI scanner was delivered later than planned: it came in use in February 2016.

Future: In WP1, a pilot study is running on structural and functional MRI in pregnant women and in newborns, to study early brain development in greater detail. We are also discussing the possibility of greater cooperation with other partners at the Utrecht campus, to enable a more in-depth assessment of environmental effects (Geosciences) and somatic factors (with the Wilhelmina Children's Hospital).

WP2	WP leader:	Prof. dr. M.H. van IJzendoorn
	L-CID cohort representative:	Prof. dr. M.H. van IJzendoorn
	Other PIs:	Prof. dr. M.J. Bakermans-Kranenburg, Prof. dr. E.A.M. Crone

Aim/objectives: Children are not equally vulnerable to adverse rearing environments and nor do they equally profit from supportive environments. Differential susceptibility theory proposes that vulnerable children, who suffer most from bad environments, are also more receptive to positive changes in the child rearing and wider social environment. Central questions are: Which children are most susceptible to environmental influences, and what are the neurobiological mechanisms by which the environment influences children's social competence and behavioral control? These questions are addressed experimentally in longitudinal randomized controlled trials (Leiden-Consortium Individual Development, L-CID), using cognitive and behavioral interventions.

Method/Cohorts: The intervention studies within L-CID constitute an experimental cohort-sequential design. This implies a number of pre- and post-tests to examine intervention effects, with the added advantage that the control groups of the studies partly overlap in such a way that they can be combined in one series of quasi-longitudinal analyses from the first pre-test evaluation in the youngest L-CID cohort to the last post-test evaluation in the oldest L-CID cohort. The longitudinal studies cover (1) infancy, (2) early childhood, and (3) pre-adolescence, with (4) extension of assessments until late adolescence. The first 5 years of the 10-year CID program focused on L-CID cohort 2 (starting at 3 years of age) and L-CID cohort 3 (starting at 7 years of age); in the second half of the 10-year CID program the focus will mainly be on L-CID cohort 1 and the extension of cohort 3.

Projects: In WP2 four PhD students and two postdocs are employed with the CID budget, and several PhD students, research assistants and postdoc were matched by Leiden University (nine in total, see **Appendix 5**).

Start and progress: On the basis of discussions with the Scientific Advisory Board and the research team, we decided to recruit families with same-gender monozygotic (MZ) and dizygotic (DZ) twins and their parents. This approach has the advantage of: (i) more efficient recruitment/data collection/implementation of the intervention, (ii) potential for genetic modeling of intervention effects, and (iii) observation of differential intervention effects between siblings within the same family at a behavioral, (epi-)genetic, hormonal, and neural level. The overall design of the intervention studies and the main behavioral and biological measures to be included have been piloted and implemented in several waves of data collection (see below). Experts in various domains were consulted (ambulatory assessments, imaging, hormonal measures, VIPP intervention) to finalize the design.

Several pilot studies have been carried out. The first pilot study investigated the association between behavioral problems and tympanic membrane temperature asymmetry (N=92). In the second study, the Video-feedback Intervention to promote Positive Parenting (VIPP) was revised to include 1 booster session. Internet provision was piloted to see whether it could be used for assessments instead of home visits (with the intention to improve efficiency). Unfortunately, pilot parents and research staff considered it not to be feasible because of technical problems with two-way transfer of videotaped interactions and strict confidentiality requirements. We adapted the VIPP intervention for use with twins and successfully piloted the adapted protocol with three families. In the third study, two paradigms to assess central outcomes, namely, prosocial behavior (Prosocial Cyberball, PCB) and aggressive behavior (Social Network Aggression Task, SNAT) were developed and tested (N=136). PCB and SNAT were adapted to be used in the MRI scanner and with younger children. In the fourth pilot study, the Motionlogger (an actigraph worn on the wrist) was used to measure physical activity and sleep characteristics. In addition, the LENA (Language Environment Analysis), a small apparatus, was tested to record and analyze speech/language and other auditory stimuli in the home environment. In the fifth pilot study, a digital ambulatory assessment app was

developed to collect data in real-life contexts and to remind parents to collect saliva samples.

Protocols for the early childhood (cohort 2) and pre-adolescence (cohort 3) studies have been submitted to the Institutional Review Board of the Institute of Education and Child Studies and the Institute of Psychology, revised and submitted to the Medical Ethics Committee of Leiden University Medical Centre (LUMC; obligatory for studies with a neurobiological component), and to the Central Committee on Research Involving Human Subjects. Both cohorts have been registered in the Netherlands Trial Register (NTR5312).

Recruitment of the early childhood cohort has been successfully completed: 238 families with twins (472 children) have been visited at home for the first wave of data-collection. Between September 2015 and October 2017, families came twice to the EEG laboratory for the second wave of data-collection (second pre-test; N= 215 families; N= 430 children) and the second wave of data-collection (first post-assessment; N= 202 families; N = 404 children). In addition, between the second and third wave of assessments, a random 40% of the families (N = 84) were visited at home for the VIPP-Twins intervention. Families in the control condition (N = 119) received a dummy intervention, comprised of telephone calls instead of home visits. Currently, the first 7 families have been visited at home for the fourth wave (second post-test assessment), comparable to the first pre-test assessment, and another 17 families have been scheduled for visits.
Recruitment of the pre-adolescence cohort has also been successfully completed: 256 families with twins (512 children) have visited the MRI laboratory for the first wave of data-collection, with great enthusiasm. Imaging and other tests were conducted in a newly built MRI facility at Leiden University Medical Centre, with two dedicated laboratory rooms, and a mock scanner nearby. Between September 2016 and September 2017 96% of the families (N = 246 families; 492 children) were visited at home for the second wave, where we administered similar behavioral tests as in the first assessment, but adapted to the home situation. This year, families are invited to visit the MRI laboratory again for the third wave of data-collection. At the time of writing, 13 families (26 children) have completed this visit and sessions have been scheduled for another 29 families (58 children). Attrition rates in both cohorts are low, with no more than 10% loss to follow-up per year.

Changes compared to original proposal: As explained above, we decided to recruit families with same gender MZ and DZ twins as subjects, to enable comparison of the effectiveness of the intervention in siblings raised in the same family/environment. The VIPP intervention has been adapted to meet the specific needs of families with twins; the aim and general approach of the intervention program remained unchanged. Moreover, since parenting twins can be complicated, the parents of twins are eager to participate in the intervention to get support and advice on sensitive parenting and discipline strategies. We decided to stop recruitment after the inclusion of about 500 children in each of the two cohorts, instead of the projected 600 children. Implementation of the original design with several rounds of assessments at specific ages would have been impossible because of the overlapping rounds of data collection within and between the cohorts. The advantage of recruiting twin families is the greater variation in socioeconomic status (and consequently greater statistical power) in the sample relative to that of non-twin families because we have consistently found that families from lower socioeconomic backgrounds are more motivated to participate in research when they have twins.

As noted above, the first 5 years of the 10-year CID program focused as planned on L-CID cohort 2 (starting at 3 years of age) and L-CID cohort 3 (starting at 7 years of age) which are now well on their way; we decided to focus in the second half of the 10-year CID program mainly on starting L-CID cohort 1 and on the extension of cohort 3 with extra assessment rounds to cover adolescence, instead of starting the originally planned cohort 4 from scratch.

Because our VIPP intervention focuses on optimizing parental sensitivity and sensitive discipline, we decided to add some specific neurophysiological measures to evaluate the effects of VIPP on the parents across pre- to posttest. In 121 families randomly selected from cohort 2 primary caregivers were asked to participate in extra lab assessments using EEG/ERP to measure markers of enhanced sensitivity to child

signals. We also assessed parental behavioral control, parallel to the measurements in the children. This way we hope to shed more light on the mechanisms that carry the changes in parental behavior from pre- to posttest due to the intervention. The protocol for this parent-focused part of L-CID has been approved by the CCMO and this part of the trial has been pre-registered (NTR5312). Data collection on 68 families has been finished, and data processing is in full speed.

Future: In WP2, the studies involving cohorts 2 and 3 and its extension into adolescence will continue with assessment rounds. Protocols for cohort 1 and the extension of the cohort 3 of L-CID will be prepared, and these studies will be started after prior assessment of the measures that are unique to these cohorts. Ethical approval will be sought and the trial will be registered in the Netherlands Trial Register.

WP3	WP leader:		Prof. dr. W.H.J. Meeus
	Cohort representatives:	*Generation-R*	Prof. dr. H. Tiemeier
		TRAILS	Prof. dr. A.J. Oldehinkel
		RADAR	Prof. dr. W.H.J. Meeus
		NTR	Prof. dr. D.I. Boomsma
	Other PIs:		Prof. dr. J. Ormel

Aim/objectives: The WP3 studies investigate how the characteristics of grandparents (Generation 1, G1) impact the development of parents (Generation 2, G2) and – through them – the development of their children (Generation 3, G3). These studies have a multigenerational design and investigate the extent to which genetic and non-genetic transmission between generations causes differences in developmental outcomes in children and adolescents. The three-generation design is used to study behavioral transmission. Two- and three-generation designs are used to study the epigenetics of transmission and to untangle genetic and environmental processes of transmission of processes related to behavioral control and social competence.

Method/Cohorts: The WP3 studies use data collected from existing G1 and G2 cohorts and collect data from the G3 cohort. These cohorts are part of four strong cohort studies of child and adolescent development currently in progress in the Netherlands: Generation-R, the Netherlands Twin Register (NTR), Research on Adolescent Development and Relationships (RADAR), and the Tracking Adolescents' Individual Lives Survey (TRAILS).

Projects: In WP3 four PhD students and four postdocs are employed via CID budget.

Start and progress:

Generation-R

The epigenetic measurements are in progress. The additional methylation became available for analysis in 2016. We already have genome-wide epigenetic array data for cord blood from 960 children and will add cord blood methylation data for another 500 children, and measurements repeated at 5 and 9 years of age (G3). These data are unique and constitute one of the largest population-based repeated epigenome-wide datasets for children worldwide. The collection of data on childhood trauma (obtained by maternal interview, G2) has been completed. In total about 5800 primary caregivers completed the structured interview about their child's life events and traumatic experiences. These data are currently being cleaned, checked for inconsistencies, and prepared for analysis.

NTR

All participants in the Netherlands Twin Register (NTR) belonging to the group parents of young twins who are twins themselves (~650 families), sisters who are mothers of twins (~450 families) and adult twins with adult offspring (~700 families) have been identified. Data available for these children and their parents are, amongst others, psychopathology, wellbeing, educational achievement and behavioral control (ASEBA). The data collection in the group young twins who become parents themselves is ongoing. At this time twins from the cohorts 1986-1991 (~800 persons) have been invited to register their children with the NTR and ~135 families agreed to participate. Data collected in these children include measures on psychopathology, well-being, behavioral control (Childhood Behavior Questionnaire), temperament, the home environment and parenting styles. Teachers of 7, 9 and 12-year-old twins and their siblings filled out, after having

ascertained parental consent, questionnaires on the development of the children. Up until now two waves of data collection (2016: N ~1900 and 2017: N ~1600) have been done and pupil monitoring test scores are available for one third of these children. In the last wave the Social Skills Rating System questionnaire was included and data on social competence are available for ~1000 children.

RADAR

In 2016 we cleaned the data wave 8 assessment of G2 took place in fall 2014 and spring 2015. In 2016-2017 we collected Wave 9 data of G2: in total, data were collected for 1149 target parents and 650 partners. Attrition between the Wave 1 and Wave 9 assessments was about 15%. We are now cleaning the data of the Wave 9 assessment. Key aspects include measures of personality, behavioral control, parent-child relationships, social competence, peer relationships, and psychopathology. The preparation of questionnaires and observational measures (special attention given to social competence and behavioral control) for G3 was completed in 2014. Data collection for G3 participants is in progress, in close collaboration with TRAILS. Inclusion of respondents is on track.

TRAILS

In 2016, data were collected for the 6th assessment wave of G2, at about age 25. Preparation for a 7th wave have started recently. In addition to the TRAILS participants themselves and their parents, participants' romantic partners are requested to fill out a questionnaire as well. Furthermore and in close collaboration with the RADAR study group, we have continued data collection for the third generation (G3), using questionnaires and/or observational measures during pregnancy and at 3, 30, and 54 months of age. Parental measures include personality, psychopathology, life events, and difficulties; offspring measures include early movements, milestones, temperament, behavioral control, social competence, and psychopathology. Data collection started in April 2015, with screening of the cohort regarding pregnancies, and the first home visits started in September 2015. By now, we have included about 150 children of 115 TRAILS participants, and expect a rising incidence of newborns in the years to come.

Changes compared to original proposal: The Generation-R, NTR, and RADAR studies are being carried out according to the original plans. This is also true for the TRAILS study, with the exception that offspring follow-up assessments are planned at 3, 30, and 54 months of age instead of the originally planned twice within 12 months, at 18 months, and once every year thereafter. We made this change to optimize the time window for specific assessments (e.g. early motor activity should be assessed between the 11th and 16th week in order to be informative) and to enable comparisons with the other cohorts of the CID, as far as possible given the budget.

Future: In WP3, the data collection of the four studies (Generation-R, NTR, TRAILS, and RADAR) is on track. WP3 continues to collaborate with Geosciences UU to study the effects of neighborhoods on child and adolescent development.

WP4	WP leader:	Prof. dr. M. Joëls
	Animal cohort representative:	Prof. dr. M. Joëls
	Other PIs:	Prof. dr. J.J. Bolhuis
		Prof. dr. H.J.A. Hoijtink

Aim/objectives: We aim to gain an understanding of *how* gene x environment (G x E) interactions influence the development of behavioral control and social competence (relevant to work packages 1-3). To this end, we will use models to study G x E interactions under highly controlled conditions; use experimental methods to examine specific brain connections (down to the level of synapses); investigate trans-generational effects within a time-frame of a few years; and test the validity of specific theoretical frameworks, which in turn can be used to guide future experiments. Like the other WPs, WP4 makes use of shared technology (e.g. neuroimaging) and has a focus on behavioral control and social competence.

Methods/cohorts: In the animal (rodent and bird) cohort, we will focus on genes known to be important in environmental/intervention susceptibility (WP2), e.g. *DRD4*. We will also investigate the influence (i) of parent-infant interactions in rodents and birds or (ii) of growing up in a complex environment, on the development of various cognitive skills including social communication and behavioral control (WPs 1-3).

We will also examine trans-generation parallels in parenting styles and the commonalities/differences in epigenetic programming between humans and rodents (aligned with WP3). We will apply (Bayesian) statistics to existing human/animal datasets to test the interaction between early life stress and stress in adulthood.

Projects: In WP4 five PhD students and four postdocs have been employed via the CID PI budget; and 2 postdocs, 1 senior consultant and 1 technician from the cohort budget.

Start and progress:

Use of rodent models/rodent cohorts

This part started in October 2013, with the optimization of the animal models and behavioral tasks. Two animal models for early life adversity (limited bedding/nesting material in mice from postnatal day 2-9; maternal deprivation on postnatal day 3) have been developed, as well as the complex housing environment. We have set up various cohorts: genetically modified mouse lines with Mineralocorticoid Receptor (MR) overexpression or knockout; Glucocorticoid Receptor (GR) knockout; combinations thereof; and DRD4 knockouts. Most behavioral set-ups were optimized in 2013/2014. More recently we developed 2 different tests for prosocial behavior.

We are currently investigating whether the consequences of early life stress on the developing rodent brain can be normalized during the sensitive peripubertal period, by means of environmental or pharmacological interventions, and the role of epigenetic programing. Special attention will be paid to male-female differences. Experimental endpoints include: behavioral control in the 5-choice serial reaction time task, and social competence (play behavior, social interaction behavior, behavioral flexibility, and 2 tests for prosocial (empathic) behavior).

Use of avian models/avian cohort

There are two research lines: (1) Gene-environment interactions in the development of social behavior in a cohort of birds, and (2) How do developmental factors affect each other in the development of song and social preferences in birds? In research line 1, we are examining the neurogenetics of birdsong learning. In research line 2, further technical advances in the high-density multielectrode recording set-up have enabled us to measure auditory-evoked and event-related action and local field potential activity in a sleep-like state with sub millisecond precision over long recording episodes (hours). We have recently finished collecting data from a first experiment. One of the goals is to find precursors for good or bad vocal learning. We have completed a first experiment on song recognition in zebra finches, in which the birds were exposed to manipulated songs in phonotaxis preference tests.

Use of statistical models

We have developed inferential procedures that are relevant for CID research in cooperation with CID researchers. In the past year, we have started the following projects:

- Use of data and expert knowledge to estimate and evaluate statistical models
- Development of statistical tools for replication studies in the context of cumulative stress and match/mismatch theories
- Development of statistical tools for theory-based evaluation of contingency tables in the context of eye-tracking studies

An essential component of these projects is consultation and cooperation with PIs from other WPs. The newly developed statistical techniques will be implemented in CID projects.

Changes compared to original proposal: At this stage, there have been no changes to the plans described in the original proposal.

Future: In WP4, three series of experiments using rodent models have been started in collaboration with WP1 – WP3. The development of avian models and their use in studies will continue as planned. The statistical foundation for theory-based data evaluation and the evaluation of replication studies will be finalized in the coming year. These developments will be used/implemented in different CID projects from

WP1, WP2 and WP3. Within WP4, there is also interaction between the rodent studies and Bayesian modeling group.

Interaction and coherence between the lines of research

CID brings together top researchers from different disciplines. We have established several ways to stimulate interaction, coherence, and complementarity that are in line with our original plans.

WP1 is collaborating closely with WP2 in its research on the development of connectivity. Cooperation and complementarity with WP3 exists with NTR in its research on (epi)genetics and brain development in a twin model, with RADAR in its research on parenting during adolescence and young adulthood, and with TRAILS in its research on the development of parenting and its role in adolescent adaption. Furthermore, WP1 is collaborating with WP4 in the predictive Bayesian analysis of relevant cohort results and in a project to study social interaction in a hybrid setting, where a live setting of two people interacting is mimicked, under controlled laboratory conditions. As this is a novel method of studying social interaction, there are few tools available to analyze such data, so WP1 and WP4 are developing a tailored statistical tool.

WP2 has collaboration with WP1, WP3, and WP4. Generation-R and L-CID are collaborating in epigenetic and genetic-environment interaction studies, for example, in the analysis of the psychometrics of cortisol levels in hair samples collected in the Generation-R study, and in the analysis of structural MRI findings in Generation-R children in relation to parental sensitivity. With WP4 the collaboration is rather intensive, with 2 PhDs, both co-supervised by PIs from WP2 and WP4, involved in projects testing behavioral control and prosocial competence, as well as models of differential susceptibility and parenting support in mice and rat models. With WP1 a common interest is shared in the replicability of neurobiological measures across time and age, resulting in workshops for discussions of replicability and in exchanges of paradigms.

WP3: NTR is collaborating within CID in the application of Genome-wide Complex Trait Analysis (GCTA) for attention and aggression issues, using a combined dataset from Generation-R and NTR in order to obtain a lower bound estimate of Single Nucleotide Polymorphism (SNP) heritability. Similarly, GCTA is currently being used in the analysis of pro-sociality characteristics. WP3 is collaborating closely with WP1 in its research on brain development adolescent identity, adolescent drug use, and victimization. TRAILS (WP3) is collaborating with WP4 in its research into the cumulative stress and mismatch hypotheses.

With Herbert Hoijtink (WP 4) we initiated a CID-broad meta-analysis project on the relation of childhood outcomes (self control, childhood behavioral problems) and parental age.

WP4 is participating in several projects with WP1; for example, the role of epigenetics in early adversity, the relation between exposure to fiction and social competence, the use of theory-based evaluation in the context of eye-tracking data, and the development of language. WP4 is also collaborating with L-CID in its studies of the influence of parenting on cognitive development and the role of genes in susceptibility.

3 – Joint activities

Joint activities since the start in 2013
22 March 2013, Utrecht: Brainstorming with all 20 CID PIs about the implementation of the research program.
10 October 2013, Utrecht: First Scientific Advisory Board meeting with the Steering Committee and Scientific Advisory Board members; presentations and discussion about all WPs.
11 October 2013, Utrecht: Kick-off CID symposium with presentations by international experts (Scientific Advisory Board members and PIs) and poster presentations by PhD students and postdocs.
30 October 2013, Utrecht: PI meeting to decide on the core measures for social competence and behavioral control.
26 November 2013, Utrecht: Cohort expert meeting. Advice meeting for the YOUth cohort. Experts from other cohorts within the consortium were attending.
15 January 2014, Utrecht: PI meeting on core measures for social competence and behavioral control. Core measures were selected for use in each cohort in the consortium: http://www.individualdevelopment.nl/research/measurements.
25 June 2014, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties. Giving the opportunity to meet each other, to present work and learn about each other activities. Along with a community coffee session, the PI meeting, the Steering Committee meeting, and an informal reception. This meeting is held regularly every 6 months (*see below **).
29 October 2014, Utrecht: Seminar for directors of primary schools, teachers, internal counselors, and care teams on behavioral problems in children. Organized by the Brain Center Utrecht (CID PI Joëls) and the Child Research Center (CID PI Kemner).
17 December 2014, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*
18 March 2015, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*
9 April 2015, Utrecht: Second Scientific Advisory Board meeting with the Steering Committee and Scientific Advisory Board members; presentations and discussion about all WPs.
10 April 2015, Utrecht: Second CID symposium with presentations by international experts (Scientific Advisory Board members and PIs) and poster presentations by PhD students and postdocs.
31 August 2015, Utrecht: Jet Bussemaker, Minister of Education, Culture and Science, and Jos Engelen, Chairman of the Governing Board of NWO visited the Child Research Center Utrecht (KinderKennisCentrum Utrecht), base of the WP1 YOUth cohort.
30 September 2015, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*
22 March 2016, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*
7 June 2016, Utrecht: Tour de Consortium for all CID PhD students and postdocs to visit a participating institute, to look at its laboratories, facilities, and methods/tools.
27 October 2016, Utrecht: Third Scientific Advisory Board meeting with the Steering Committee and Scientific Advisory Board members; presentations and discussion about all WPs.
28 October 2016, Utrecht: Third CID symposium with presentations by international experts (Scientific Advisory Board members and PIs) and poster presentations by PhD students and postdocs.
18 April 2017, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*
4 October 2017, Utrecht: CID meeting with all PIs, PhD students, postdocs, and other interested parties.*

* CID meeting with all PIs, PhD students, postdocs, and other interested parties. Giving the opportunity to meet each other, to present work and learn about each other activities. Along with a community coffee session, the PI meeting, the Steering Committee meeting, and an informal reception. This meeting is held regularly every 6 months

4 – Institutional and organizational embedding

The consortium is associated with one of the four strategic themes of Utrecht University, namely, *Dynamics of Youth* (*DoY*, www.uu.nl/doy), which focuses on child development, but with an even broader scope and participation (including involvement of all Utrecht Faculties: Social and Behavioral Sciences, Geosciences, Humanities, Law, Economics and Governance, Science, Medicine, and Veterinary Medicine). This clear nucleus of organization at Utrecht University increases the coherence of the program and provides structural embedding. The co-funding reflects local embedding provided by different institutes, both in material and personnel. Furthermore, all participating research groups have excellent, state-of-the-art facilities and equipment at their disposal. The institutional embedding of the different sites and examples of national and international embedding are described below.

WP1:

Institutional embedding: WP1 (the YOUth cohort) is embedded within the UU strategies research theme, "Dynamics of Youth". The focus of Dynamics of Youth is on stimulating multidisciplinary research on child development in direct relation to societal issues, connecting scientists with backgrounds that vary from molecular neuroscience to education psychology, with societal and private partners. In the next four years more coherence will be achieved in activities by creating the hub Child Expertise Center. It will be an umbrella for activities, facilities, research and educational projects. Specifically, a dedicated research agenda will be developed that focuses on specific societal issues in cooperation with external partners, and an infrastructure will be further implemented (including the YOUth cohort) that stimulates integrative research efforts. Cooperation exists with the strategic research program *'Child Health'* of the UMC Utrecht, the Julius Center, the Wilhelmina Children's Hospital, the University of Applied Sciences, RIVM, Utrecht municipality, Trimbos Institute, and the Princess Maxima Center. There is also overlap with the *'Brain'* strategic research program of the UMC Utrecht.

National embedding: WP1 is collaborating with the Erasmus University Medical Center, Rotterdam, in the ongoing large-scale longitudinal study *'Flemish Study on Parenting, Personality, and Development'* (FSPPD), in the Open Data Infrastructure for Social Sciences and Economics Innovation (Oddissei), in the *'BBMRI-NL2.0 Roadmap for Large-Scale Research Facilities',* and in the NL-Biobank Research Facility Neuroimaging. It is also collaborating with the Radboud University Medical Center, Nijmegen, with a focus on infant research.

International embedding: At an international level, WP1 is collaborating with the Marie-Curie training school on neurocognitive methods in infants (Brainview), and with the European IMI EU-AIMS consortium. Furthermore, WP1 is collaborating within the *Enhancing Neuroimaging Genetics through Meta Analysis' (ENIGMA) Consortium for imaging-genetics studies* (Paul Thompson, Keck University, Los Angeles, USA). Kirby Deater-Deckard (Virginia Tech, USA) and Bruce Ellis (University of Arizona, USA) – experts on the development of self-regulation and differential susceptibility, respectively – both visited the Department of Clinical Child and Family Studies (UU, Faculty of Social and Behavioral Sciences) for a few months, financed by NWO visitor travel grants. Furthermore, WP1 is collaborating with Ohio State University, Nanyang Technological University Singapore, and with the *European FP7 TACTICS consortium* with, among others, the Institute of Psychiatry, London (UK), the Institute of Psychiatry, Mannheim (Germany), the Institute of Psychiatry, Nijmegen, and the Karolinska, Institute Stockholm (Sweden).

WP2:

Institutional embedding: L-CID is part of the Leiden University profile area *'Health, Prevention and the Human Life Cycle'*, and the neurobiological projects of L-CID are also part of the *Leiden Institute for Brain and Cognition* (LIBC).

National embedding: At a national level, L-CID has cooperative links resulting in co-publications with the Vrije Universiteit Amsterdam on challenges to child-caregiver relationships, with Generation-R (Erasmus University Medical Center Rotterdam), Brain Center Rudolf Magnus (Utrecht University), NTR (Vrije Universiteit Amsterdam), and Trimbos Institute (Utrecht).

International embedding: L-CID is collaborating with Gusto, a large cohort study in Singapore, on epigenetics of parenting, and with Imperial College, department of Medicine, London (UK), University

College London, Research Department of Clinical, Educational and Health Psychology (UK), and the University of Cambridge School of Clinical Medicine on video feedback interventions. Furthermore, there are cooperative links with the *Avon Longitudinal Study of Parents and Children* (ALSPAC) in the UK in research into the genetics of parenting and child development, and with *Mercy Pregnancy and Emotional Well-being Study* (MPEWS) in Melbourne (Australia) in research on stress-related aspects of parenting. The imaging studies are embedded in a large network, e.g. organized in the Jacobs Foundation Network Initiative on prosocial development. There are collaborative links with Columbia University, New York , the University of Illinois, the University of Oregon, and Harvard University for research into methods for longitudinal imaging analysis in adolescents. Finally, there is ongoing collaboration with the Youth Development Lab at UC Berkeley (USA).

WP3:

Institutional embedding: Generation-R is embedded in five different research groups of the Erasmus Medical Center Rotterdam: *'Mother & Child'*, *'Behavior & Cognition'*, *'Asthma & Atopy'*, *'Diseases in childhood'*, and *'Health & Healthcare'*. NTR was founded on February 1 1987 at the Vrije Universiteit Amsterdam and is part of Amsterdam Public Health (APH). TRAILS is a joint project of various research institutes, including the University Medical Center Groningen, University of Groningen, Radboud University Nijmegen Medical Center, and Utrecht University. TRAILS is embedded in departments of Psychiatry, Sociology, Health Science, Child & Adolescent Psychiatry, and Social Sciences. RADAR is embedded at long-term research lines of Utrecht University and the Free University Amsterdam.
National embedding: NTR collaborates with the Max Planck Institute, Nijmegen, regarding its research on literacy development, and with the VUmc Amsterdam in its research on gene-environment interactions (GECCO consortium). TRAILS maintains close collaborative links with its consortium members, who represent institutes across the Netherlands. TRAILS and RADAR are both involved in ODISSEI, an initiative to build a national data infrastructure for the social sciences.
International embedding: At an international level, NTR, Generation-R, and TRAILS collaborate as part of the EAGLE consortium (EArly Genetics and Lifecourse Epidemiology) the and Early Growth Genetics (EGG) Consortium with other international groups in studies to identify genes underlying childhood psychopathology. NTR leads the EU-ACTION (Aggression in Children: Unraveling gene-environment interplay to inform Treatment and InterventiON strategies consortium with a focus on childhood aggression). Furthermore, NTR is collaborating with the University of Oxford (UK) in its research on literacy development and is part of a newly established genome-wide association consortium on literacy, named *GenLang*. RADAR is collaborating with Pittsburgh University (USA) in its research on adolescent delinquency, and with Leuven University (Belgium) in its research on gene-environment interactions. TRAILS has collaborative links with, among others, the University of Utah (USA) for its research on mechanisms involved in adaptive calibration, with the University of Ohio (USA) for its research on positive affect, and with the University of Leuven (Belgium) in the context of an international collaborative network on child temperament.

WP4:

Institutional embedding: WP4 is embedded in the research program *'Translational Research' of the* Brain Center Rudolf Magnus of the UMC Utrecht. Furthermore, the research of WP4 is part of *Neuroscience & Cognition Utrecht* (NCU); its replication studies for TRAILS are carried out within existing research programs of the University of Groningen.
National embedding: At a national level, WP4 collaborates with Radboud University Nijmegen and has collaborative links with Utrecht University, the University of Amsterdam, and Tilburg University.
International embedding: WP4 has a close collaboration with the Max Planck Institute for Psychiatry, Munich (Germany), and with the Massachusetts Institute of Technology, Cambridge (USA). Furthermore, WP4 is collaborating closely with the Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig (Germany), the British Heart Foundation and the Department of Neuroendocrinology of Edinburgh University (UK), and the Department of Data Analysis of Ghent University (Belgium).

Talent management

We designed a curricular environment in which our Master's and PhD students can obtain the right mix of deep disciplinary expertise *and a* wider interdisciplinary outlook. To this end, we determined what is already in place in the participating graduate programs and added specific facilities relevant to our CID junior scientists. A list of specialized courses at Master's and PhD levels organized by the participating graduate programs for PhD students and postdocs working in CID can be downloaded from the CID website (www.individualdevelopment.nl). The Program Support Office facilitates participation in courses outside its own graduate program for the CID PhD students and postdocs. PhD level courses, Master's-level courses, and Master classes are regularly organized by CID PIs. In addition:

- All cohorts offer on-the-job training and coaching. They provide students with the possibility to participate for several months (Master's level) or several years (PhD level). To foster interdisciplinary development, all CID PhD students have a second supervisor with a different disciplinary background from the consortium.
- Graduate program students are regularly invited to attend lectures given by one of the researchers, which address a specific topic from the research program in depth.
- During the course of the research program, graduate schools are encouraged to organize Summer Schools that rotate over the participating institutes. Students have the opportunity to present their research via mini-presentations.
- Extra to the original proposal, a journal opinion article assignment has been initiated to stimulate the multidisciplinary cooperation between CID PhD students and postdocs. In small groups (2–4 persons) PhD students and postdocs participate in ongoing discourse in scientific communities or media. They write a journal club article, an opinion article in a scientific journal, or an opinion article in the (inter) national media.
- We organized a Tour de Consortium on 7 June 2016 in Utrecht. All CID PhD students and postdocs were invited to visit the participating institute, to look at its laboratories, facilities, and methods/tools. We are exploring the possibilities to integrate Tour de Consortium visits with the CID meetings we organize twice a year.
- We have reviewed available courses on ethical aspects of research and we are planning to close ethical educational gaps by providing workshops in collaboration with our Ethical Advisor.
- The first CID 2-days retraite is planned for 20 and 21 April 2018, combined with our Scientific Advisory Board meeting. We are planning to organize an evening lecture and workshops for junior scientists on e.g. ethical aspects and (EU) funding opportunities. There will also be room for 'meet-the-senior'/'speed-date' sessions for CID PhD students and postdocs with PIs and Scientific Advisory Board members in order to explore their research career possibilities.

5 – Knowledge utilization

CID acknowledges the importance of knowledge dissemination and utilization and is fully committed to actively communicate information about the objectives, approach, and results of this research to the community. Given the relatively short time since the start of CID, dissemination of knowledge specifically related to consortium efforts is necessarily limited, although pilot results have been presented at conferences, at meetings open to the general public, in newspapers, and in other popular media. Specific examples of knowledge utilization and societal relevant activities by our PIs are described below and in **Appendix 6**.

WP1:
WP1 has a longstanding cooperation with The Netherlands Youth Institute (*Nederlands Jeugdinstituut*), the national institute for disseminating knowledge on children and youth matters. In the current phase of the YOUth cohort acquisition we organize evenings with parents to exchange knowledge to ensure that knowledge utilization can be optimized in the future when the cohort will generate new findings. Already in this phase of the studies, PhDs, post-docs and junior and senior researchers provide lectures and other events to transfer knowledge. One example of science communication for WP1 is the research of our CID postdoc Karin Fikkers, which was highlighted on NPO Radio 1 and by the NOS (http://nos.nl/artikel/2088530-games-leiden-niet-per-definitie-tot-meer-agressie.html). Furthermore, we were involved in the development of teaching material (postdoc Carlijn van den Boomen, e.g. http://docplayer.nl/47246009-Lesbrief-onderzoekend-en-ontwerpend-leren-onderzoekend-leren-over-zien-met-kopieerbladen-voor-groep-5-tot-en-met-8-van-het-basisonderwijs.html), blogs were posted on the YOUth cohort (https://youthonderzoek.nl/2017/07/11/verwonderd-door-de-wetenschap/), and one of our CID postdocs Gijs Holleman participated on the *Betweter festival* in Utrecht in a science experience (https://www.betweterfestival.nl/programma/2017/eerst-zien-dan-geloven). WP1 further communicates study findings through study websites, newsletters and Facebook.

WP2:
WP2 contributes to the Child and Family Blog of the University of Cambridge. Furthermore, video blogs have been prepared (www.brainanddevelopmentlab.nl/index.php/video), and the Braintime Festival in Corpus was co-organized (http://www.universiteitleiden.nl/nieuws/2016/02/feest-voor-het-puberbrein). PhD students of cohort 3 (Achterberg and van de Meulen) regularly write blogs for the Leiden Psychology blog on topics related to the study. Several invited talks to professionals and policy makers, in the Netherlands and abroad have been given, and workshops on the VIPP parenting intervention as well as on parental sensitivity and sensitive discipline are provided on a regular basis, for researchers as well as professionals and clinicians in the Netherlands and abroad (e.g. China, South-America, the UK, USA and various European countries)

WP3:
WP3 communicates study findings through Twitter (NTR and TRAILS; NTR maintains separate Twitter accounts for science and for participants), study websites, and newsletters for respondents (NTR, RADAR, TRAILS; NTR newsletters may be downloaded from the website). NTR and TRAILS have also Facebook pages.

WP4:
WP4 provides educational modules for professionals in the teaching world. Furthermore, they published several interviews in national magazines, newspapers, online, on television, and in radio programs. They maintain the website informative-hypotheses.sites.uu.nl, containing free software that can be used by researchers interested in theory based data evaluation and/or the evaluation of replication studies. The website contains an overview of applied papers of researchers that used and published with the approaches from the website.

Appendices

Appendices

Appendix 1 – Realization and budget

CID started in May 2013. The accounts and budgets presented below show that CID has made a successful start and that personnel and infrastructure are in place to support the further development of CID and its research.

Tables A-C reflect the tables conform the original application, but with actual costs up to August 2017.

Table A: According to the original proposal, every work package was divided into objectives to which specific PIs were assigned. Originally, the scientific staff budget per work package was subdivided into PhD students and postdocs. In order to come to the realization of this budget, we further subdivided the total budget per work package into the different PIs participating (and thereby into the different objectives per WP). The PIs were allowed to use maximally 50% of their allocated budget in the first 5 years (€810,000 = €405,000; other PIs: €540,000 = €270,000; see Table D) for the appointment of PhD students and postdocs, subject to the approval of NWO. There would appear to be a discrepancy between projected and actual costs (see Table A), which can be explained by the fact that PhD students and postdocs are appointed for a number of years. The 5- and 10-year personnel costs given in **Table D** show that most PIs have allocated their total 5-year budget, as planned. Monies remaining will be carried over to and merged with the second 5-year period.

Tables B and C: Table B provides an overview of projected and actual investment costs and Table C an overview of co-funding acquired. Every institute gave a short description on the realization (actual) of their budget.

Table of content:

Table A: Scientific staff (PhD student and postdoc costs per work package)
Table B: Investment costs (per cohort for the different work packages)
Table C: Co-funding description (for the institutes specified in the original proposal)
Table D: Specification of Table A (scientific staff) per principal investigator

Table A – Allocation PI budgets and actuals (PhD students and postdoc costs)

Up to August 2017

(€)	2013		2014		2015		2016		2017		2018	2019	2020	2021	2022	2023	Total Actual	Total Allocated	Total Budget	
	Actual	Allocated	Actual	Allocated	Actual	Allocated	Actual	Allocated	Actual	Allocated	Allocated	Allocated	Allocated	Allocated	Allocated	Allocated	2013-2017	2013-2021	5 yr budget	10 yr budget
WP1 - Brain Development																				
Berkum, Jos van	.	.	39.983	61.106	51.661	62.182	44.230	68.961	.	62.821	14.930	.	.	.	.	.	135.874	270.000	270.000	540.000
Deković, Maja	.	.	3.219	4.306	28.449	37.197	49.725	54.543	34.102	55.216	57.951	14.425	.	.	.	.	115.495	223.638	270.000	540.000
Durston, Sarah	.	.	.	.	43.246	75.254	50.315	70.950	11.585	14.700	.	.	.	.	.	.	105.146	160.904	405.000	675.000
Hulshoff Pol, Hilleke	.	.	.	.	20.243	62.917	87.722	50.188	14.742	66.127	59.625	31.144	.	.	.	.	122.707	270.000	270.000	675.000
Kahn, René	.	.	20.513	25.903	48.603	68.386	89.200	71.729	21.811	75.808	27.158	.	.	.	.	.	180.127	268.983	270.000	540.000
Kemner, Chantal	.	3.750	68.926	68.147	51.496	53.168	100.513	64.955	46.124	52.500	66.124	68.361	58.751	19.999	.	.	267.059	455.755	405.000	810.000
Valkenburg, Patti	.	.	.	.	23.360	25.696	113.062	108.599	36.850	79.201	56.718	39.842	.	.	.	.	173.273	310.056	405.000	810.000
Vollebergh, Wilma	.	.	.	.	31.654	33.961	29.932	35.782	12.235	37.542	39.360	.	.	.	.	.	73.821	146.645	270.000	540.000
Total WP1	**.**	**3.750**	**132.640**	**159.462**	**298.713**	**418.761**	**564.699**	**525.706**	**177.449**	**443.914**	**321.866**	**153.772**	**58.751**	**19.999**			**1.173.501**	**2.105.982**	**2.565.000**	**5.130.000**
WP2 - Intervention																				
Bakermans-Kranenburg, Marian	19.443	21.332	33.755	40.550	33.124	42.639	24.586	45.389	.	46.534	7.853	.	.	.	.	.	110.908	204.297	270.000	540.000
Crone, Eveline	.	.	9.451	11.658	33.390	35.046	30.992	40.123	.	43.010	45.405	30.093	.	.	.	.	73.832	205.335	270.000	540.000
Engels, Rutger	.	.	.	.	30.828	32.975	30.864	39.187	.	41.996	45.038	46.139	.	.	.	.	61.692	205.335	270.000	540.000
Ijzendoorn, Rien van	6.797	6.682	38.260	44.964	44.879	51.791	53.194	86.521	.	90.396	42.145	42.145	10.536	.	.	.	143.130	375.179	405.000	810.000
Total WP2	**26.240**	**28.014**	**81.466**	**97.173**	**142.221**	**162.451**	**139.635**	**211.220**	**.**	**221.935**	**140.441**	**118.376**	**10.536**	**.**	**.**	**.**	**389.562**	**990.146**	**1.215.000**	**2.430.000**
WP3 - Intergenerational																				
Boomsma, Dorret	.	.	4.579	1.387	91.349	96.035	99.129	115.864	25.778	116.256	56.558	18.900	.	.	.	.	220.835	405.000	405.000	810.000
Meeus, Wim	.	.	27.605	40.440	97.539	105.084	50.373	52.797	98.951	122.132	115.588	53.719	56.882	39.914	.	.	274.469	586.556	405.000	810.000
Oldehinkel, Tineke	15.327	16.570	58.384	68.624	60.134	66.864	42.277	44.713	13.229	45.230	3.811	.	.	.	.	.	189.351	245.812	270.000	540.000
Ormel, Hans	8.516	11.811	43.316	45.662	52.313	52.224	75.394	75.710	26.166	77.609	6.984	.	.	.	.	.	205.705	270.000	270.000	540.000
Verhulst, Frank	.	.	17.814	75.349	45.650	61.887	.	54.655	.	58.263	19.846	.	.	.	.	.	63.463	270.000	270.000	540.000
Total WP3	**23.843**	**28.380**	**151.698**	**231.462**	**346.985**	**382.094**	**267.173**	**343.739**	**164.124**	**419.490**	**202.787**	**72.619**	**56.882**	**39.914**	**.**	**.**	**953.823**	**1.777.368**	**1.620.000**	**3.240.000**
WP4 - Animal																				
Bolhuis, Johan	.	.	5.928	27.427	78.822	72.337	74.642	73.981	47.526	72.321	23.934	.	.	.	.	.	206.918	270.000	270.000	540.000
Hoijtink, Herbert	.	.	23.741	25.153	71.765	83.905	48.605	75.931	28.471	56.260	28.351	.	.	.	.	.	172.582	269.600	270.000	540.000
Joëls, Marian	13.069	11.802	6.811	71.775	75.774	89.405	55.267	55.627	15.821	94.517	133.750	114.223	122.326	71.699	.	.	166.741	765.123	405.000	810.000
Total WP4	**13.069**	**11.802**	**36.480**	**124.355**	**226.361**	**245.647**	**178.514**	**205.539**	**91.818**	**223.098**	**186.035**	**114.223**	**122.326**	**71.699**	**.**	**.**	**546.242**	**1.304.723**	**945.000**	**1.890.000**
TOTAL	**63.151**	**71.945**	**402.285**	**612.451**	**1.014.280**	**1.014.280**	**1.150.021**	**1.286.204**	**433.392**	**1.308.438**	**851.129**	**458.991**	**248.495**	**131.612**	**.**	**.**	**3.063.128**	**6.178.218**	**6.345.000**	**12.690.000**

The difference between actual and allocated for the years 2013 and 2014 can be explained by the starting period for projects. PhD students and postdocs sometimes started later than originally allocated.

The total allocated budget reflects to which extend the PIs allocated their total 5-years budget.

Table B – Investment costs (per cohort for the different work packages)

Up to August 2017

Including	2013		2014		2015		2016		2017		2018	2019	2020	2021	2022	2023	Total	Total	Total Budget	
August 2017 (€)	Actual	Budget	Acual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Actual 2013-2017	Budget 2013-2023	5 yr budget	10 yr budget
WP0																				
Project Management	44.735	104.400	107.403	156.600	110.615	156.600	92.149	155.700	37.440	155.700	155.700	155.700	155.700	155.700	155.700	52.200	392.342	1.559.700	779.850	1.559.700
General Project Costs	51.224	38.020	13.865	57.030	37.022	57.030	30.456	57.030	5.847	57.030	57.030	57.030	57.030	57.030	57.030	19.010	138.414	570.300	285.150	570.300
Total WP0	**95.959**	**142.420**	**121.269**	**213.630**	**147.637**	**213.630**	**122.605**	**212.730**	**43.287**	**212.730**	**212.730**	**212.730**	**212.730**	**212.730**	**212.730**	**71.210**	**530.755**	**2.130.000**	**1.065.000**	**2.130.000**
WP1 (a)																				
Direct Costs	88.400	119.520	204.645	352.062	357.122	352.062	397.002	352.062	230.385	352.062	352.062	352.062	352.062	352.062	352.062	59.760	1.277.553	3.347.838	1.673.919	3.347.838
Marketing & Communication	0	27.240	2.871	66.150	29.445	66.150	96.524	66.150	32.709	66.150	66.150	66.150	66.150	66.150	66.150	13.620	161.549	636.210	318.105	636.210
Recruitment	0	67.488	19.710	163.350	38.932	163.350	67.520	163.350	40.037	163.350	163.350	163.350	163.350	163.350	163.350	33.744	166.200	1.571.382	785.691	1.571.382
Accommodation	0	6.780	92	22.500	10.834	22.500	12.946	22.500	6.496	22.500	22.500	22.500	22.500	22.500	22.500	3.390	30.369	212.670	106.335	212.670
ICT cost	0	43.080	0	127.800	21.969	127.800	135.910	127.800	81.579	127.800	127.800	127.800	127.800	127.800	127.800	21.540	239.458	1.214.820	607.410	1.214.820
Equipment	0	217.080	186.918	0	63.157	0	68.291	0	26.391	0	0	0	0	0	0	0	344.758	217.080	108.540	217.080
Total WP1	**88.400**	**481.188**	**414.237**	**731.862**	**521.459**	**731.862**	**778.193**	**731.862**	**417.598**	**731.862**	**731.862**	**731.862**	**731.862**	**731.862**	**731.862**	**132.054**	**2.219.887**	**7.200.000**	**3.600.000**	**7.200.000**
WP2																				
Intervention (b)	21.587	234.000	162.703	351.000	271.232	351.000	280.312	351.000		351.000	351.000	351.000	351.000	351.000	351.000	117.000	735.833	3.510.000	1.755.000	3.510.000
Total WP2	**21.587**	**234.000**	**162.703**	**351.000**	**271.232**	**351.000**	**280.312**	**351.000**		**351.000**	**351.000**	**351.000**	**351.000**	**351.000**	**351.000**	**117.000**	**735.833**	**3.510.000**	**1.755.000**	**3.510.000**
WP3																				
NTR (c)	98	24.000	31.806	36.000	26.272	36.000	37.116	36.000	9.231	36.000	36.000	36.000	36.000	36.000	36.000	12.000	104.522	360.000	180.000	360.000
RADAR (d)		24.000		36.000	4.758	36.000	111.883	36.000	55.001	36.000	36.000	36.000	36.000	36.000	36.000	12.000	171.642	360.000	180.000	360.000
TRAILS (e)	0	24.000	21.412	36.000	24.506	36.000	14.558	36.000	7.078	36.000	36.000	36.000	36.000	36.000	36.000	12.000	67.554	360.000	180.000	360.000
Generation-R (f)		6.000	25.000	9.000		9.000		9.000		9.000	9.000	9.000	9.000	9.000	9.000	3.000	25.000	90.000	45.000	90.000
Total WP3	**98**	**78.000**	**78.218**	**117.000**	**55.535**	**117.000**	**163.557**	**117.000**	**71.310**	**117.000**	**117.000**	**117.000**	**117.000**	**117.000**	**117.000**	**39.000**	**368.718**	**1.170.000**	**585.000**	**1.170.000**
WP4																				
Animal costs (g)	21.402	60.000	91.459	90.000	51.411	90.000	53.088	90.000	29.825	90.000	90.000	90.000	90.000	90.000	90.000	30.000	247.186	900.000	450.000	900.000
Total WP4	**21.402**	**60.000**	**91.459**	**90.000**	**51.411**	**90.000**	**53.088**	**90.000**	**29.825**	**90.000**	**90.000**	**90.000**	**90.000**	**90.000**	**90.000**	**30.000**	**247.186**	**900.000**	**450.000**	**900.000**
TOTAL	**227.446**	**995.608**	**867.886**	**1.503.492**	**1.047.274**	**1.503.492**	**1.397.755**	**1.502.592**	**562.020**	**1.502.592**	**1.502.592**	**1.502.592**	**1.502.592**	**1.502.592**	**1.502.592**	**389.264**	**4.102.380**	**14.910.000**	**7.455.000**	**14.910.000**

(a) YOUth Utrecht (WP1): it took longer than anticipated to set up the cohort, because of careful tuning with the Institutional Review Board and their request for additional information (in the form of, among others, performing several pilot studies). Moreover, the dedicated MRI scanner and relevant software were not delivered on time.

(b) L-CID Leiden: The investment budget for 2013-2015 has been carried over because collection and analysis of saliva samples and cheek swabs will be done at the same time for all first-wave samples. Measurements are in progress. Delayed ethical approval of the cohort 2 study meant that it started in September 2014 instead of June 2014. This also delayed the appointment of personnel.

(c) NTR: The costs of the cohort studies are lower than projected, mainly because the PhD student and postdoc started later than planned. The remaining sum will be carried over to 2016 onward.

(d) RADAR: Other funding sources were first used for data collection in Wave 8 (2014–2015). The CID cohort budget will be spent from 2016 onward.

(e) TRAILS: The cost of data collection in TRAILS is lower than budgeted, mainly because there were fewer assessments of infants born before the start of CID. The primary focus was to include all new pregnancies, and recruitment of pregnant women was complicated and logistically difficult (problems now solved). An additional problem was that the interviewer training to perform the home visits at 24 months was appointed later than anticipated. The expenditures will be compensated in the upcoming years.

(f) For Generation-R there was a prepayment, resulting in higher actual costs than budgeted for 2014. This was compensated for in the years 2013 and 2015.

(g) Animal costs: Animal costs were lower than projected, because of the long time needed to start-up the different mouse lines (e.g., quarantine and some problems with the bringing on and breeding of mice). At this moment, everything is running on schedule.

Table C – Co-funding description (for the institutes specified in the original proposal)
Up to August 2017

Including August 2017 (€)	2013		2014		2015		2016		2017		2018	2019	2020	2021	2022	2023	Total Actual	Total Budget
	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Budget	Budget	Budget	Budget	Budget	Budget	2013-2017	2013-2023
UMCU Contribution of strategic budget year 1 to 5	51.311	360.000	80.871	360.000	180.011	360.000	310.143	360.000	0	360.000	0	0	0	0	0	0	622.336	1.800.000
UMCU Contribution strategic budget year 6 to 10	0	0	0	0	0	0	0	0	0	0	360.000	360.000	360.000	360.000	360.000	0	0	1.800.000
UMCU Free MRI Scans (a)	0	0	0	777.778	0	777.778	113.314	777.778	0	777.778	777.778	777.778	777.778	777.777	777.777	0	113.314	7.000.000
UU Toparea Youth (b)	0	1.000.000	434.339	1.000.000	424.871	1.000.000	569.662	1.000.000	77.224	0	0	0	0	0	0	0	1.506.096	4.000.000
UU Contribution FSW for additional postdocs (b)	16.769	0	203.275	0	186.198	340.000	169.449	340.000	41.430	340.000	340.000	0	0	0	0	0	617.121	1.360.000
UMCG Add. PhDs infrastr. TRAILS & int. PhDs (c)	22.600	200.000	132.238	200.000	150.158	200.000	223.125	200.000	69.119	0	0	0	0	0	0	0	597.240	800.000
UL Free MRI-scans (d)	0	0	0	20.000	28.692	20.000	121.866	20.000	0	20.000	24.000	24.000	24.000	24.000	24.000	0	150.558	200.000
UL Additional PhDs (e)	0	0	0	50.000	0	50.000	0	50.000	0	50.000	0	0	0	0	0	0	0	200.000
UvA Four additional PhDs (f)	0	0	0	0	0	0	0	50.000	0	50.000	50.000	50.000	0	0	0	0	0	200.000
TOTAL	**90.681**	**1.560.000**	**850.723**	**2.407.778**	**969.930**	**2.747.778**	**1.507.558**	**2.797.778**	**187.774**	**1.597.778**	**1.551.778**	**1.211.778**	**1.161.778**	**1.161.777**	**1.161.777**	**0**	**3.606.666**	**17.360.000**

(a) University Medical Center Utrecht (UMCU): The dedicated 3T Philips MRI scanner arrived later than planned, so that the funds dedicated for the scans has not been spent so far. Some of these funds have been used by Division of Neuroscience to pay the baby recruitment team.

(b) Utrecht University (UU): The budget for Toparea Youth (i.e., the strategic theme *Dynamics of Youth*) and the contribution for additional postdocs are received in the first 4 years of the project, whereas actual costs will be spread out over the total 10-year period of the project. Therefore, the numbers in 'actual' columns for 2013 to 2015 are given according the proposed budget.

(c) University Medical Center Groningen (UMCG): Up to August 2017, one PhD student has been matched by co-funding from the UMCG.

(d) University of Leiden (UL): In September 2015, MRI scans were started. In total, the aim is to carry out approximately 1500 scans, which probably will exceed the proposed total matching budget.

(e) University of Leiden (UL): Up to August 2017, two PhD students and three postdocs have been matched by co-funding university budgets. Due to unclear financial positions, there are no actuals represented in this table, but we are working on the correct representation of costs made.

(f) University of Amsterdam (UvA): The co-funding of one PhD student in the first period did not materialize for two reasons. First, it was the intention that the PhD student would work on the WP1 cohort data, but data became available much later than anticipated. Second, the Amsterdam School of Communication Research has received significantly less Government funding in the last 2 years, so that it is no longer possible to fund additional PhD projects.

Table D – Specification of table A (scientific staff) per principal investigator
Up to August 2017

Including August 2017 (€)	Total Budget		Total
	5 yr budget	10 yr budget	Allocated
WP1			
Berkum, Jos van	270.000	540.000	270.000
Deković, Maja	270.000	540.000	223.638
Durston, Sarah	405.000	675.000	160.904
Hulshoff Pol, Hilleke	270.000	675.000	270.000
Kahn, René	270.000	540.000	268.983
Kemner, Chantal	405.000	810.000	455.755
Valkenburg, Patti	405.000	810.000	310.056
Vollebergh, Wilma	270.000	540.000	146.645
Total WP1	**2.565.000**	**5.130.000**	**2.105.982**
WP2			
Bakermans-Kranenburg, Marian	270.000	540.000	204.297
Crone, Eveline	270.000	540.000	205.335
Engels, Rutger	270.000	540.000	205.335
IJzendoorn, Marinus van	405.000	810.000	375.179
Total WP2	**1.215.000**	**2.430.000**	**990.146**
WP3			
Boomsma, Dorret	405.000	810.000	405.000
Meeus, Wim	405.000	810.000	586.556
Oldehinkel, Tineke	270.000	540.000	245.812
Ormel, Hans	270.000	540.000	270.000
Verhulst, Frank	270.000	540.000	270.000
Total WP3	**1.620.000**	**3.240.000**	**1.777.368**
WP4			
Bolhuis, Johan	270.000	540.000	270.000
Hoijtink, Herbert	270.000	540.000	269.600
Joëls, Marian	405.000	810.000	765.123
Total WP4	**945.000**	**1.890.000**	**1.304.723**
Total	**6.345.000**	**12.690.000**	**6.178.218**

The column *'Total Allocated'* reflects the total budget allocated from (most of the time) the 5-year budget per principal investigator (PI). Some PIs already allocated budget from the second tranche. This is only possible when one fulfills the following two criteria: (1) There is sufficient budget left in the 5-year budget to finance the project until 1 May 2018, and (2) the PI is employed at a participating institute on 1 May 2018 and therefor is still PI of CID at the start of the second tranche.

Almost all PIs have allocated most of their 5-year budget, indicating that all work packages have taken off successfully. Budgeted funds left from the 5-year budget will be carried over to and merged with the second 5-year period and used to appoint new junior staff.

Appendix 2 – CID appointed PhD students and postdocs from principal investigator budget

PhD students or postdocs financed by CID through PI-budget, as seen in **Appendix 1, Table A.**

CID appointed PhD students and postdocs from PI-budget	
WP1	
Dienke J. Bos *Connected and in control* Durston, Crone; UMC Utrecht	**Postdoc** Mar/15 – Mar/17
Ine Beyens *The effect of media on ADHD-symptoms* Valkenburg, Dekovic; University of Amsterdam	**Postdoc** Nov/15 – Nov/19
Fraukje Coopmans *Developmental trajectory of the human connectome in health and disease* Kahn, Crone; UMC Utrecht	**PhD student** Jun/14 – Aug/15
Karin Fikkers *The effects of media violence exposure on aggression: A differential susceptibility perspective* Valkenburg, Dekovic, University of Amsterdam	**Postdoc** Sept/15 – Sept/19
Sanne B. Geeraerts *Development of infant self-regulation within the early caregiver relationship: A cascade model* Dekovic, Kemner; UU Faculty of Social and Behavioral Sciences	**PhD student** Oct/14 – Apr/19
Bram Gooskens *Neural circuitry and individual differences in cognitive control* Durston, Crone; UMC Utrecht	**PhD student** July/17 – July/21
Roy S. Hessels *The effects of social stimulation/interaction on perceptual and social development* Kemner, Hoijtink; UU Faculty of Social and Behavioral Sciences	**PhD student** Jan/14 – Dec/16
Jalmar Teeuw *Genetic and environmental influences on development of structural and functional brain connectivity* Hulshoff Pol, Boomsma; UMC Utrecht	**PhD student** Jul/15 – Jun/19
Hannah de Mulder *The power of stories: exploring the effects of (self) narrative on the development of social competence and behavioral control* Van Berkum, Valkenburg; UU Faculty of Humanities	**Postdoc** Jan/14 – May/17
Margot Peeters *Behavioral control and reward sensitivity as predictors of adolescents' risk behaviors* Vollebergh, Oldehinkel; UU Faculty of Social and Behavioral Sciences	**Postdoc** Jan/15 – Dec/18
Bauke van der Velde *Connectivity of the social brain* Kemner, Kahn; UU Faculty of Social and Behavioral Sciences *The PhD is financed for 25% from PI-budget Kemner (Appendix 1 Table A), for 25% from co-funding budget from the UMCU (Kahn, Appendix 1 Table C, Appendix 5) and for 50% from cohort budget (Appendix 1 Table B, Appendix 4)*	**PhD student** Dec/15 – Nov/19

WP2	
Michele Achterberg *Social aggression regulation in childhood and emerging adolescence* Crone, Bakermans-Kranenburg; UL Faculty of Social and Behavioral Sciences	**PhD student** Sep/14 – Dec/19
Elisabeth Bilo *Hormonal correlates of social and behavioral development in childhood* Bakermans-Kranenburg, van IJzendoorn, Joëls; UL Faculty of Social and Behavioral Sciences *The PhD was first financed from co-funding budgets*	**PhD student** April/16 – Feb/20
Mara van der Meulen *Prosocial development in childhood and emerging adolescence* Crone, Van IJzendoorn; UL Faculty of Social and Behavioral Sciences	**PhD student** Jan/15 – Jan/20
Claudia I. Vrijhof *Intervention effects of video-feedback on social competence and behavior control in preschoolers: the mediating role of parenting and physiological regulation* Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences	**PhD student** Nov/13 – Nov/17
WP3	
Andrik Becht *Why some adolescents thrive and others don't: The role of uncertainty dynamics* Meeus, Vollebergh; UU Faculty of Social and Behavioral Sciences	**PhD student** Sep/14 – Sep/18
Barzeva, Stefania *Social withdrawal and romantic relationships* Oldehinkel, Meeus; UMC Groningen *Only partly financed by CID*	**PhD student** Sep/17- Sep/18
Tina Kretschmer *Examining the complex interplay between relationship experiences and individual factors to understand adolescent development* Oldehinkel, Meeus, Dekovic; UMC Groningen Project to be continued by: **Jennifer Klop-Richards**	**Postdoc** Oct/13 – Nov/15 **Postdoc** Dec/15 – Feb/18
Odilia M. Laceulle *Investigating developmental models of psychological distress: transactional processes and explanatory models of individual differences* Ormel, Meeus, Van IJzendoorn; UMC Groningen Project to be continued by: **Anoek Sluiter-Oerlemans**	**Postdoc** Oct/13 – Aug/18 **Postdoc** Sep/15 – Feb/18
Stefanie A. Nelemans *Development of anxiety symptoms in adolescence and early adulthood: over/time links with biological, psychological, and social factors* Meeus, Oldehinkel; UU Faculty of Social and Behavioral Sciences	**Postdoc** Sep/14 – Sep/18
Alexander Neumann *The epigenetics of intergenerational transmission* Verhulst, Oldehinkel, van IJzendoorn; Rotterdam Erasmus MC	**PhD student** Aug/14 – Aug/18
Sabine Veldkamp *Intergenerational transmission of reading and cognitive skills* Boomsma, Van Berkum; Vrije Universiteit Amsterdam *To be continued with matching funds*	**PhD student** May/15 – Oct/16

Eveline de Zeeuw *Longitudinal development and intergeneration transmission of psychopathology versus wellbeing* Boomsma, Oldehinkel; Vrije Universiteit Amsterdam	**Postdoc** Dec/14 – Dec/17
WP4	
Gabriël J.L. Beckers *A neurogenetic analysis of birdsong learning as a model for infant development* Bolhuis, Joëls; UU Faculty of Social and Behavioral Sciences	**Assistant professor** Oct/14 – Oct/17
Sita M. ter Haar *A neurogenetic analysis of birdsong learning as a model for infant development* Bolhuis, Joëls; UU Faculty of Social and Behavioral Sciences	**Postdoc** Mar/15 – Jan/16
Sofia Kanatsou *Environmental influences on brain development: rodent models* Hoijtink, Joëls; UU Faculty of Social and Behavioral Sciences	**Postdoc** Aug/15 – Apr/16
Jiska Kentrop *Maternal care as predictor of later life success: possibilities for intervention* Joëls, Bakermans-Kranenburg; UMC Utrecht, UL	**PhD student** Jul/14 – Jul/18
Manila Loi *Intervention at puberty after early life adversity* Joëls, van IJzendoorn; UMC Utrecht	**PhD student** Sep/13 – Sep/15
Carien Mol *Twitter evolution: Comparative linguistics of birdsong and child language acquisition* Bolhuis, Kemner; UU Faculty of Social and Behavioral Sciences *The PhD is financed for 67% from PI-budget Bolhuis (Appendix 1 Table A), and for 33% from co-funding budget from the UU (Dynamics of Youth, Appendix 4)*	**PhD student** Oct/15 – Jun/18
Mariëlle A.J. Zondervan-Zwijnenburg *Formalization and evaluation of prior knowledge based on prior/posterior predictive inference* Hoijtink, van Berkum; UU Faculty of Social and Behavioral Sciences	**PhD student** Jul/14 – Jun/18
Valeria Bonapersona *Impact of early life adversity on networks: pathways, transmitters, cognitive domains* Joëls, Hoijtink; UMC Utrecht / UU Faculty of Social and Behavioral Sciences	**PhD student** Sep/17 – Aug/21

Appendix 3 – CID PhD students, postdocs or researchers from cohort budget

PhD students, postdocs or researchers financed from CID cohort budget, as seen in **Realization and budget, Appendix 1, Table B.**

CID PhD students, postdocs or senior researchers from cohort budget	
WP1	
Stefanos Mastrotheodorus Branje, Dekovic; UU Faculty of Social and Behavioral Sciences	**PhD student** Dec/15 – Dec/19
Dr. N. Charlotte Onland-Moret UMC Utrecht	**Associate professor**
Soundry Staats *The role of parenting and self-regulation in (pre)adolescent psychosocial functioning: Macro- and micro-level relations.* Dekovic, Huijding; UU Faculty of Social and Behavioral Sciences	**PhD student** Mar/16 – Mar/20
Bauke van der Velde *Connectivity of the social brain* Kemner, Kahn; UU Faculty of Social and Behavioral Sciences *The PhD is financed for 25% from PI-budget Kemner (Appendix 1 Table A, Appendix 3), for 25% from co-funding budget from the UMCU (Kahn, Appendix 1 Table C, Appendix 5) and for 50% from cohort budget (Appendix 1 Table B)*	**PhD student** Dec/15 – Nov/19
WP2	
Bianca G. van den Bulk *Integrating neural intervention effects in a longitudinal twin study with a sequential cohort design.* Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences	**Postdoc** Aug/14 – Jan/23
Jizzo Bosdriesz *Integrating behavioral genetics across cohorts in longitudinal perspective* Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences	**Postdoc** Mar/17 – Feb/18
WP4	
Angela Sarabdjitsingh UMC Utrecht *The postdoc is financed for 14% from cohort budget (Appendix 1 Table B), and for 86% from co-funding budget (VENI grant, Appendix 5)*	**Postdoc** Nov/13 – Feb/18
Rixt van der Veen UMC Utrecht, UL Faculty of Social and Behavioral Sciences *The postdoc is after this period financed from co-funding budget from Leiden University (Appendix 5)*	**Postdoc** Oct/13 – Aug/14
Rinke Klein-Entink UU Faculty of Social and Behavioral Sciences	**Senior Research Consultant** Sept/14 – Aug/18
Ruth Damsteegt UMC Utrecht	**Technician** Oct /16 – Oct /20

Appendix 4 – CID researchers from co-funding budgets conform NWO application

PhD students, postdocs or researchers not financed by CID, but directly from the government, from the government through a funding allocation agency or by contracts with third parties and specified within the original NWO application as matching, as can be recognized from **Realization and budget, Appendix 1 Table C.**

CID researchers from co-funding budgets conform NWO application	
WP1	
Marieke E.W. Albers UMC Utrecht, Contribution of strategic budget year 1 to 5	**PhD student** Feb/15 – Feb/19
Bauke van der Velde *Connectivity of the social brain* UMC Utrecht, Contribution of strategic budget year 1 to 5 *The PhD is financed for 25% from PI-budget Kemner (Appendix 1 Table A, Appendix 3), for 25% from co-funding budget from the UMCU (Kahn, Appendix 1 Table C) and for 50% from cohort budget (Appendix 1 Table B, Appendix 4)*	**PhD student** Dec/15 – Nov/19
Janna Cousijn UU Faculty of Social and Behavioral Sciences, Contribution FSW for additional postdocs	**Postdoc** Jan/14 – Nov/15
Caroline Junge UU Faculty of Social and Behavioral Sciences, Contribution FSW for additional postdocs	**Postdoc/Assistant professor** Jun/14 – present
WP3	
Annelene Bloemen *Determinants and consequences of (low) cognitive control* UMC Groningen, Additional PhDs infrastructure TRAILS and intended PhDs	**PhD student** Dec/14 – Dec/17

Appendix 5 – Other CID researchers from co-funding budgets

PhD students, postdocs or researchers not financed by CID, but directly from the government, from the government through a funding allocation agency or by contracts with third parties and not specified within the original NWO application as matching, but contributing to the consortium.

Other CID researchers from co-funding budgets	
WP1	
Carlijn van den Boomen UU Faculty of Social and Behavioral Sciences	**Postdoc** Sep/09 – present
Elisabeth Buimer UMC Utrecht	**Research assistant** Sep/17 – Feb/18
Jolien van der Graaf UU Faculty of Social and Behavioral Sciences	**Postdoc** Oct/13 – Dec/13
Marinka M.G. Koenis UMC Utrecht	**Postdoc** Feb/15 – Aug/17
Renske Koordeman UU Faculty of Social and Behavioral Sciences	**Postdoc** Sep/13 – Dec/13
Nicolette Munsters UU Faculty of Social and Behavioral Sciences	**PhD student** Mar/13 – Mar/18
Pascal Pas UMC Utrecht	**PhD student** Jan/17 – Dec/20
Matthijs Vink UU Faculty of Social and Behavioral Sciences	**Assistant professor** Jan/16 – present
WP2	
Dr. Szilvia Biro UL Faculty of Social and Behavioral Sciences	**Assistant Professor** May/13 – April/23
Dr. Anna C.K. van Duijvenvoorde UL Faculty of Social and Behavioral Sciences	**Assistant Professor** May/15 – April/23
Dr. Saskia Euser *Intervention effects of video feedback on social competence and behavioral control in early childhood and early adolescence: The role of children's daily experiences.* Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences; UL Faculty of Social and Behavioral Sciences	**Postdoc** Dec/13 – Jan/23
Dr. Renske Huffmeijer UL Faculty of Social and Behavioral Sciences	**Assistant Professor** May/13 – April/23
Laura Kolijn *Neural mechanisms involved in a parenting intervention that aims to enhance parental sensitivity and sensitive discipline.* Bakermans-Kranenburg; Van IJzendoorn, UL Faculty of Social and Behavioral Sciences; UL Faculty of Social and Behavioral Sciences	**PhD student** Apr/16 – Apr/20
Dr. Nikolaus Steinbeis UL Faculty of Social and Behavioral Sciences	**Assistant Professor** Sep/15 – Sep/17

Rixt van der Veen UMC Utrecht, UL Faculty of Social and Behavioral Sciences *The postdoc was first financed from cohort budget from WP4 (Appendix 3)*	**Postdoc** Aug/14 – May/23
Dr. Lara Wierenga UL Faculty of Social and Behavioral Sciences	**Postdoc** Jan/17 – Nov/20
Ilse C. van Wijk *Neural correlates of social rejection and aggression in young children* Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences; UL Faculty of Social and Behavioral Sciences	**PhD student** Feb/14 – June/18
WP3	
Dr. E. van den Berg Vrije Universiteit Amsterdam	**Assistant professor** Apr/15 – Mar/18
WP4	
Yasin Altinişik UU Faculty of Social and Behavioral Sciences	**PhD student** Mar/14 – Mar/18
Ruth Damsteegt UMC Utrecht	**Research analyst** Oct/15 – Oct/16
Nienke Derks UMC Utrecht	**PhD student** Jun/14 – Jun/18
Carien Mol *Twitter evolution: Comparative linguistics of birdsong and child language acquisition* Bolhuis, Kemner; UU Faculty of Social and Behavioral Sciences *The PhD is financed for 67% from PI-budget Bolhuis (Appendix 1 Table A, Appendix 2), and for 33% from co-funding budget from the UU (Dynamics of Youth)*	**PhD student** Oct/15 – Jun/18
Angela Sarabdjitsingh UMC Utrecht *The postdoc is financed for 14% from cohort budget (Appendix 1 Table B, Appendix 3), and for 86% from co-funding budget (VENI grant)*	**Postdoc** Nov/13 – Feb/18
Jelle Knop Leiden University *PhD student matched by Leiden University and working at UMC Utrecht*	**PhD student** Apr / 16 – March /20
Rob Buurstede UMC Utrecht / LUMC *PhD student is financed during the first 3 years via LUMC and then for 1 year from PI budget Joëls*	**PhD student** Sept/17 – Aug/21

Appendix 6 – Examples societal relevant activities

Examples societal relevant activities (*see 5 – Knowledge utilization*)

For every PI a maximum of 5 examples of societal relevant activities are given.

Examples of societal relevant activities by CID PIs
Bakermans-Kranenburg, M.: Symposium *Kwetsbaarheid & Veerkracht*, De Amsterdamse School, January 2016.
Bakermans-Kranenburg, M.J. (2017). Parent intervention - the Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD). Forskningsseminar Børne- og Ungdomspsykiatri, Roskilde, Denmark (March 17).
Bakermans-Kranenburg, M.J. (2016). Neurobiologische aspecten van ouderschap. Wetenschappelijke Conferentie Vereniging voor Kinder- en Jeugdpsychotherapie (November 4).
Papa speelt mee – Volkskrant Magazine 18-3-2017 (Bakermans-Kranenburg, VIPP-interventie)
Bartels, M.: University of the Netherlands. *Hoe meet je hoe gelukkig je bent?* https://www.youtube.com/watch?v=W_t5oFz5plk&feature=youtu.be.
Bolhuis, J.: Interview online program 'Radio Rene' (http://www.radiorene.nl), "Taal definieert ons mens zijn", November 2015.
Bolhuis, J. With Everaert, M. And Huijbregts, R.: Royal Dutch Academy of Sciences (KNAW) Academy Colloquium 'The Biology of Language', plus Master class, Amsterdam, December 10-13, 2014.
Bolhuis, J.: TV interview in talkshow 'Pauw & Witteman', May 2013.
Bolhuis, J.: Radio interview 'Radio 1', May 2013
Bolhuis, J.: Interview in national newspaper 'De Volkskrant', April 2013.
Boomsma, D. (2015). *Het laatste nieuws over twee- en meerlingonderzoek*. Amsterdam, NVOM (Nederlandse Vereniging voor Ouders van meerlingen).
Boomsma, D. (02-2016) Het uiterlijk van tweelingen (Vrije Universiteit Amsterdam)
Boomsma, D. (20-05-2016) Het eerste toeval. (KNAW symposium Uitgedaagd door het toeval, Amsterdam)
Boomsma, D. (17-06-2016) Multi-generational transmission. NSCR (Nederlands Studiecentrum Criminaliteit en Rechtshandhaving) Amsterdam
Boomsma, D. (01-11-2016) Tweelingonderzoek: Van gen naar gedrag. Studium Generale Groningen
Crone, E.: Videoblog: http://www.brainanddevelopmentlab.nl/index.php/video-blog
Crone, E.: Braintime Festival in Corpus: http://www.universiteitleiden.nl/nieuws/2016/02/feest-voor-het-puberbrein.
Crone, E.: 3rd Annual Flux Congress, Leiden, September 2015.
Crone, E. (September 22, 2017). NTR uitzending. *Dankzij Spinoza: Eveline Crone en Piek Vossen*: https://dekennisvannu.nl/site/media/Dankzij-Spinoza-Eveline-Crone-en-Piek-Vossen/6563
Dekovic, M.: co-author several chapters in books (*'Intieme relaties en seksualiteit', 'Jeugdcriminologie. Achtergronden van jeugdcriminaliteit', 'Handboek klinische ontwikkelingspsychologie', 'Leerboek psychiatrie kinderen en adolescenten', 'Psychologie van de adolescentie'*) that aim at higher education of students and professionals.
Dekovic, M.: member of the Accreditation Committee for Behavioral Interventions that helps the Ministry of Security and Justice to develop and implement a high quality program to prevent/reduce recidivism.
Deković, M., Van de Bongardt, D., Baams, L., Doornwaard, S., Dalenberg, W., Reitz, E., … Van Geert, P. (2016). Ontwikkeling van romantische relaties en seksualiteit van Nederlandse adolescenten in context: Project STARS. *Tijdschrift voor Seksuologie, 40*, 195-199.
Deković, M. (2016). Foreword *Inleiding in de gezinspedagogiek*. In F. van der Horst, N. Lucassen, R. Kok, M. Sentse, L. Jooren, & M. Luijk (Red.), *Opgroeien in het hedendaagse gezin. Inleiding in de gezinspedagogiek* (pp. 9-10). Houten: LannooCampus.
Deković, M., & Asscher, J. J. (2016). *Interventies voor jongeren met antisociaal gedrag*. In I. Weijers (Red.), *Justitiële interventies voor jeugdige daders en risicojongeren* (pp.147-163). Den Haag: Boom criminologie.

Deković, M., Asscher, J. J., & Stoltz, S. (2016). *Interveniëren in opvoeding bij (ernstige) gedragsproblemen van kinderen en adolescenten.* In M. H. van Ijzendoorn & L. van Rosmalen (Red.), *Pedagogiek in beeld*. *Een inleiding in de pedagogische studie van opvoeding, onderwijs en hulpverlening* (pp. 205-216). Houten, Nederland: Bohn Stafleu van Loghum.

Hoijtink, H.: Preconference Workshop on Bayesian Structural Equation Modelling. International Meeting of the Psychometric Society, 2013, Arnhem.

Hoijtink, H.: Preconference workshop on Informative Hypotheses. IRT meeting at the University of Twente, 2013.

Hoijtink, H. (and his research group) (2013-onwards). Website on informative hypotheses containing books, papers, software, manuals and examples. https://informative-hypotheses.sites.uu.nl/

Hoijtink, H. (2013-2017). Seconded for one day a week to the CITO institute for education testing in Arnhem, to develop a psychometric model for the diagnostic educational test.

Hoijtink, H. (and his research group) (2013-onwards). Applied Bayesian Statistics, a postgraduate course in the winter school of Utrecht University. https://www.utrechtsummerschool.nl/courses/winter

Hulshoff Pol, H.E., Ophoff, R., Bartels, M., Boomsma, D.I. (2015). *Chapter book – Influence of genes and environment on the brain (Invloed van genen en omgeving op de hersenen)*. In Hulshoff Pol & Aleman – Handboek Beeldvorming van het Brein, Imaging voor Psychiaters en Psychologen. Uitgeverij de Tijdstroom.

Hulshoff Pol, H.E. and Aleman, A. (Eds). Beeldvorming van het Brein, Imaging voor Psychiaters en Psychologen (Imaging of the Brain). Uitgeverij de Tijdstroom. 2015, 412 pag. ISBN 978 90 5898 262 9

Hulshoff Pol, H.E. Ontwikkeling van het Puberbrein I. Universiteitsdag, 1 april 2017. Presentation at the Utrecht University.

Joëls, M. (2015). *Stress en voordelen.* Interview Quest, October 2015.

Joëls, M. (2015). *Stress is goed, met mate*. Interview Flow Magazine, August 2015.

Joëls, M. (2015). *Werkstress bij jongeren*. Presentation at Workshop of Ministry of Social Affairs, The Hague, November 2015.

Joëls, M. and de Krom, M.: *Translational approaches in developmental disorders and schizophrenia*. Course for PhD students (including 5 plenary lectures accessible to a broad audience), Utrecht, May – June 2015.

Joëls, M., *S.M. Schaafsma, R.A. Sarabdjitsingh, C.H. Vinkers* (2016): *Stress in the Clinic*. Course for PhD students (including 5 plenary lectures accessible to a broad audience), Utrecht, May 2016.

Joëls, M. (2016): Science Festival Studium Generale (Vredenburg, Utrecht)

Kemner, C. and Hullshoff Pol, H. (2015). *Chapter book – Brain development of the young child (Hersenontwikkeling van het jonge kind)*. In: Hulshoff Pol & Aleman – Handboek Beeldvorming van het Brein, Imaging voor Psychiaters en Psychologen. Uitgeverij de Tijdstroom.

Kemner, C. (2013-2015). Public talks (*Festival De Beschaving 2013, Studium Generale 2013, Culturele Zondag Utrecht 2015, Nationale Wetenschapsagenda lezing KHMW 2015*).

Kemner, C. (2013-2014). TV and radio appearances (*e.g. NPO Hoe?zo! radio 2013, omroep Max Breingeheim 2013, VPRO Labyrinth 2013, RTV Utrecht 2014*).

Meeus, W. (November 24, 2015). Terrorisme is jeugdprobleem. *De Volkskrant,* p.20.

Meeus, W. (Mei 2015). Contribution to *SASS film RADAR, Slachtoffers en daders van jeugdcriminaliteit*. Amsterdam: Fast facts

Meeus, W. (2016, July 26). Interview bijdrage aan *Terrorist of amokmaker: is het onderscheid wel zinvol?* Trouw, p. 3.

Meeus, W. (October, 25). Interview bijdrage aan *Waarom zo hysterisch bij een concert van je idool?* NOS nl op 3, artikel 2139435.

Meeus, W. (May 2017). *Adolescent Development: Some Key Findings.* Key note (for high school teachers and youth workers) at the second Italian conference **"Supereroi fragili"** , Rimini, Italy.

Oldehinkel, A.J. (June 2015). Interview about TRAILS in *Kind en Adolescent Praktijk.*

Oldehinkel, A.J. (October 2014). *Stress-reactiviteit? Een uitnodiging om bestaande ideeën over stress en depressie te herzien.* Contribution to the *Studiedag Vlaamse Klinisch Psychologen,* Leuven.

Sarabdjitsingh, R.A. (2017): Science Cafe Studium Generale (Tivoli, Utrecht)

Valkenburg, P. (2014). *Schermgaande jeugd*. Publication of a Dutch book aiming at an academic and non-academic public. Prometheus, Amsterdam.

Van Bergen, E. (2015). *"Waarom is dyslexie familiair?"* Guest lecture for educational professionals, *Nationale Dyslexie Conferentie* (National Dyslexia Conference), Ede, The Netherlands, 8th April 2015.

Van Berkum, J.J.A. (2013). TV interview *VPRO Labyrint*: http://tvblik.nl/labyrint/groot-nationaal-onderzoek-taal.

Van Berkum, J.J.A. (2015). Radio interview *Radio 1*: http://www.eo.nl/ditisdedag/radio/item/krijg-de-rambam-beschaafd-schelden/.

Van Berkum, J.J.A. (2016). Interview *Quest* "God…#@$&" http://www.quest.nl/magazine/april-2016.

Van IJzendoorn, M.H. (August 31, 2017). *Necessary relational conditions for healthy development across developmental stages and in various child rearing arrangements.* Consensus Conference and Expert Symposium on Promoting child wellbeing when parents live apart. Oslo, Norway 31 August, 2017. Presentation also to the Norwegian Directorate of Children, Youth and Family Affairs, 1 September, 2017.

Van IJzendoorn, M.H. (30 September 2016). *Gehechtheid bij mensen met autisme.* Autismecongres: Hechting, emoties en autisme. Congrescentrum The Strip, Eindhoven.

Van IJzendoorn, M.H. (2014). *Attachment, oxytocin and infant crying. Key note at the joint conference of the RSM Psychiatry Section and RSM Obstetrics and Gynaecology Section on Women's Mental Health: Integrating body and mind.* A dialogue between Psychiatry, Obstetrics and Gynaecology. In association with the Royal College of Psychiatrists Mental Health Special Interest Group. Tuesday, 11th March 2014, at the Royal Society of Medicine, London, UK.

Van IJzendoorn, M.H. (2017). Herijking ouderschap pedagogisch belicht. *Tijdschrift voor Familie- en Jeugdrecht*, 39, 153-155.

Every year the Leiden Institute for Brain and Cognition (LIBC) organizes a 'publieksdag' (a day-long symposium open to the general public) to which several L-CID members have been contributing. The most recent Publieksdag attracted 800 enthusiastic participants from the general public (http://www.nieuws.leidenuniv.nl/nieuws-2015/800-mensen-kijken-in-de-wereld-van-het-sociale-brein.html).

Study websites

Study	Website
YOUth cohort	www.youthonderzoek.nl
Child Research Center	www.kinderkenniscentrum.nl
Dynamics of Youth	www.uu.nl/doy
L-CID cohort	www.samen-uniek.com
Generation-R	www.generationr.nl
NTR	www.tweelingenregister.org
RADAR	www.uu.nl/onderzoek/radar
TRAILS	www.trails.nl

Appendix 7 – CID publications and PhD student and postdoc activities

Publications are counting as CID publications when:

- The first or second author is appointed by CID (from PI-budget or cohort budget), or
- CID is mentioned in the acknowledgements

Authors indicated in **bold** are CID researchers. Authors indicated in **bold orange** are CID PhD students or postdocs.

Publications within consortium (156)	
1	**Achterberg, M., Bakermans-Kranenburg, M. J., Van IJzendoorn, M.H., Van der Meulen, M.,** Tottenham, N., & **Crone, E.A.** (Under Revision). *Distinctive heritability patterns in childhood subcortical-prefrontal cortex resting state connectivity: A twin study.*
2	**Achterberg, M., Van Duijvenvoorde, A.C.K., Van der Meulen, M., Bakermans-Kranenburg, M.J., & Crone, E.A.** (Under Review). *Heritability of aggression following social evaluation in middle childhood: an fMRI study.*
3	**Achterberg, M., Van Duijvenvoorde, A.C.K., Van der Meulen, M., Euser, S., Bakermans-Kranenburg, M.J., & Crone, E.A.** (2017). Understanding the neural correlates of social evaluation in children using a design with built-in replication and meta-analysis. *Developmental Cognitive Neuroscience, 24,* 107-117.
4	**Achterberg, M., Van Duijvenvoorde, A.C., Bakermans-Kranenburg, M.J.** & **Crone, E.A.** (2016). Control your anger! The neural basis of aggression regulation in response to social rejection. *Social Cognitive and Affective Neuroscience, 11*(5):712-720.
5	**Achterberg, M.**, Peper, J.S., **Van Duijvenvoorde, A.C.K.**, Mandl, R.C.W., & **Crone, E.A.** (2016). Fronto-striatal white matter integrity predicts development of delay of gratification: a longitudinal study. *Journal of Neuroscience*, 36(6), 1954-1961.
6	**Altınışık, Y.**, **Hoijtink, H.**, & Kuiper, R.M. (submitted). Evaluation of Inequality Constrained Hypotheses Using a Generalization of the AIC. *Psychological Methods*
7	**Altınışık, Y., Hessels, R.S.**, & Kuiper, R.M. (unpublished). An AIC-based Information Criterion Evaluating (In)equality Constrained Hypotheses for Contingency Tables.
8	**Altınışık, Y.**, **Joëls, M., Kanatsou, S.**, Naninck, E.F.G., Krugers, H., & **Klein Entink, R.H.** (unpublished). Evaluation of Directional Hypotheses Using Contingency Tables for Replication in Mice Studies.
9	**Altınışık, Y.** & Kuiper, R.M. (unpublished). The GORICA applied: An AIC-based Information Criterion for Evaluating Informative Hypotheses.
10	**Bakermans-Kranenburg, M.J.** & **Van IJzendoorn, M.H.** (2015). The hidden efficacy of interventions: Gene x Environment experiments from a differential susceptibility perspective. *Annual Review of Psychology*, 66, 381-409. doi: 10.1146/annurev-psych-010814-015407.
11	**Becht, A.**, **Nelemans, S.**, **Branje, S.**, **Vollebergh, W.**, Koot, H., Denissen, J., & **Meeus, W.** (2016). The quest for identity in adolescence: Heterogeneity in daily identity formation and psychosocial adjustment across 5 years *Developmental Psychology, 52,* 2010-2021.
12	**Becht, A., Nelemans, S., Branje, S., Vollebergh, W.**, Koot, H., & **Meeus, W.** (2017). Identity uncertainty and commitment making across adolescence: Five-year within-person associations using daily identity reports. *Developmental Psychology.*
13	**Becht, A., Nelemans, S.**, Van Dijk, M., **Branje, S.**, Van Lier, P., Denissen, J., & **Meeus, W.** (2017). Clear self, better relationships: Adolescents' self-certainty and relationship quality with parents and peers across 5-years. *Child Development.* Advance online publication.
14	**Becht, A.**, Bos, M., **Nelemans, S.**, Peters, S., **Vollebergh, W., Branje, S., Meeus, W.**, & **Crone, E.** (2017). Neurobiological underpinnings of identity formation in adolescence: A multi-method multi-sample longitudinal approach. *Child Development*.
15	**Becht, A.**, Branje, S., **Vollebergh, W.**, Maciejewski, D., Van Lier, P., Koot, H., Denissen, J., & **Meeus, W.** (2015). Assessment of identity during adolescence using daily diary methods: Measurement invariance across time and sex. *Psychological Assessment*. Advance online publication. http://dx.doi.org/10.1037/pas0000204.
16	**Becht, A.**, Prinzie, P., **Dekovic, M.**, van den Akker, A. L., & Shiner, R. L. (2015). Child personality facets and overreactive parenting as predictors of aggression and rule-breaking trajectories from childhood to adolescence. *Development and Psychopathology*.
17	**Beckers, G.J.L.**, Berwick, R.C., Okanoya, K. & **Bolhuis, J.J.** (2017) What do animals learn in artificial grammar studies? *Neuroscience & Biobehavioral Reviews*, in press.
18	**Beckers, G.J.L.** & Rattenborg, N.C. (2015). An in depth view of avian sleep. *Neuroscience & Biobehavioral Reviews*, 50, 120-127.
19	Berwick, R.C., Friederici, A.D., Chomsky, N., **Bolhuis, J.J.** (2013) Evolution, brain, and the nature of language.

	Trends in Cognitive Sciences, 17, 89-98.
20	**Beyens, I.**, **Valkenburg, P. M.**, & Piotrowski, J. T. (in press). Screen media use and ADHD-related behaviors: Four decades of research. *Proceedings of the National Academy of Sciences of the United States of America*.
21	**Biro, S.**, Alink, L.R., **Huffmeijer, R.**, **Bakermans-Kranenburg, M.J.**, & **Van IJzendoorn, M.H.** (2015). Attachment and maternal sensitivity are related to infants' monitoring of animated social interactions. *Brain and Behavior*, 5(12), e00410. doi: 10.1002/brb3.410.
22	**Bolhuis, J.J.** (2015) Evolution cannot explain how minds work. *Behav. Proc.*, 117, 82-91.
23	**Bolhuis, J.J.**, Tattersall, I., Chomsky, N., Berwick, R.C. (2014) How could language have evolved? *PLoS Biology*, 12(8), e1001934.
24	**Bolhuis, J.J.**, Moorman, S. (2015) Birdsong memory and the brain: In search of the template. *Neuroscience & Biobehavioral Reviews*, 50, 41-55.
25	**Bolhuis, J.J.**, Tattersall, I., Chomsky, N., Berwick, R.C. (2015) Language: UG or not to be, that is the question. *PLoS Biology*, 13(2): e1002063.
26	**D.J. Bos**, E.A. Ajodan, M.S. Silverman, J.P. Dyke, **S. Durston**, J.D. Power, R.M. Jones, Neural Correlates of preferred activities: development of in interest-specific go-nogo task, Social Cognitive and Affective Neuroscience, in press.
27	Brouwer, R.M., **Koenis, M.M.**, Schnack, H.G., van Baal, G.C., van Soelen, I.L, **Boomsma, D.I.**, **Hulshoff Pol, H.E.** (2015). Longitudinal development of hormone levels and grey matter density in 9 and 12-year old twins. *Behav. Genet.* 45 (3): 313-23. doi: 10.1007/s10519-015-9708-8.
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120	**Sarabdjitsingh, R.A.**, Pasrich, N., Smeets, J.A.S., Kerkhofs, A., Mikasova, L., Karst, H., Groc, L., **Joëls, M.** (2016). Hippocampal fast glutamatergic transmission is transiently regulated by corticosterone pulsatility. *PLoS*, January 7 (Epub). DOI: 10.1371/journal.pone.0145858.
121	**Sarabdjitsingh, R.A.**, Zhou, M., Yau, J.L., Webster, S.P., Walker, B.R., Seckl, J.R., **Joëls, M.**, Krugers, H.J. (2014) Inhibiting 11β-hydroxysteroid dehydrogenase type 1 prevents stress effects on hippocampal synaptic plasticity and impairs contextual fear conditioning. *Neuropharmacology*. 81:231-6.
122	**Sarabdjitsingh, R.A.**, **Joëls, M.** (2014) Rapid corticosteroid actions on synaptic plasticity in the mouse basolateral amygdala: relevance of recent stress history and β-adrenergic signaling. *Neurobiol Learn Mem* 112:168-75.
123	**Sarabdjitsingh, R.A.**, Jezequel, J., Pasricha, N., Mikasova, L., Kerkhofs, A., Karst, H., Groc, L., **Joëls, M.** (2014) Ultradian corticosterone pulses balance glutamatergic transmission and synaptic plasticity. *Proc Natl Acad Sci U S A*. 111(39):14265-70.
124	Schulte, M., **Cousijn, J.**, Den Uyl, T., Goudriaan, A.E., Van den Brink, W., Veltman, D.J., Schilt, T., Wiers, R.W. (2014): Recovery of neurocognitive functions following sustained abstinence after substance dependence and implications for treatment. *Clinical Psychology Review*, 34(2014): 531-550.
125	Sellaro, R., Steenbergen, L., Verkuil, B., **Van IJzendoorn, M.H.**, & Colzato, L.S. (2015). Transcutaneous Vagus Nerve Stimulation (tVNS) does not increase prosocial behavior in Cyberball. *Frontiers in Psychology*, 6, article 499. doi: 10.3389/fpsyg.2015.00499.
126	**Staats, S.**, Van der Valk, I.E., **Meeus, W.H.J.,** & **Branje, S.J.T.** (2017). Longitudinal transmission of conflict management styles across inter-parental and adolescent Relationships. *Journal of Research on Adolescence,* 1-17. doi:10.1111/jora.12324
127	Swagerman S.C., **Van Bergen E.**, Dolan C., **De Geus E.J.C.**, **Koenis M.M.G.**, **Hulshoff Pol H.E.**, **Boomsma D.I.** Genetic transmission of reading ability. *Brain Lang*. 2017, 172:3-8
128	**Teeuw J.**, Brouwer R.M., **Koenis M.**, Swagerman S., **Boomsma D.I.**, **Hulshoff Pol H.E.** Genetic influences on the

	development of cerebral cortical thickness during adolescence in a Dutch longitudinal twin sample: the BrainScale study. Cerebral Cortex, 2017, in revision
129	Thijssen, S., Wildeboer, A., Muetzel, R.L., **Bakermans-Kranenburg, M.J.**, El Marroun, H., Hofman, A., et al. (2015). Cortical thickness and prosocial behavior in school-age children: A population-based MRI study. *Soc Neurosci*, 10(6), 571-582. doi: 10.1080/17470919.2015.1014063.
130	Thijssen, S., Ringoot, A.P., Wildeboer, A., **Bakermans-Kranenburg, M.J.**, El Marroun, H., Hofman, A., **Jaddoe, V.W.V.**, **Verhulst, F.C.**, **Tiemeier, H.**, **Van IJzendoorn, M.H.**, White, T. (2015) Brain morphology of childhood aggressive behavior: A multi-informant study in school-age children. *Cognitive, Affective, & Behavioral Neuroscience*, 15, 564-577. DOI 10.3758/s13415-015-0344-9.
131	Treur, J.L., Verweij, K.J.H., Abdellaoui, A., Fedko, I.O., **De Zeeuw, E.L.**, Ehli, E.A., Davies, G.E., Hottenga, J.J., Willemsen, G., **Boomsma, D.I.**, **Vink, J.M**. Testing familial transmission of smoking with two different research designs. Nicotine Tob Res. 2017, epub
132	**Van den Boomen, C.**, Jonkman, L.M., Jaspers-Vlamings, P.H.J.M., **Cousijn, J.**, **Kemner, C.** (2015): Developmental changes in ERP responses to spatial frequencies. *Plos One*, 10(3): e0122507.
133	**Van der Graaff, J.**, **Meeus, W.**, De Wied, M., Van Boxtel, A., Van Lier, P. & Branje, S. (2016). Respiratory sinus arrhythmia moderates the relation between parent-adolescent relationship quality and adolescent's social adjustment. *Journal of Abnormal Child Psychology*, 44: 269-281.
134	**Van der Meulen, M.**, Steinbeis, N., **Achterberg, M.**, **Van IJzendoorn, M.H.**, & **Crone, E.A.** (Under Review). Heritability of neural reactions to social exclusion and prosocial compensation in middle childhood.
135	**Van der Meulen, M.**, Steinbeis, N., **Achterberg, M.**, **Bilo, E.**, **Van den Bulk, B.G.**, **Van IJzendoorn, M.H.**, & **Crone, E.A.** (2017). The neural correlates of dealing with social exclusion in childhood. *Neuropsychologia, 103,* 27-39.
136	**Van der Meulen M.**, **Van IJzendoorn M.H.**, & **Crone E.A.** (2016). Neural correlates of prosocial behavior: Compensating social exclusion in a four-player cyberball game. *PLoS ONE 11*(7): e0159045. doi:10.1371/journal.pone.0159045
137	**Van der Meulen M.**, Veldhuis J., Braams, B.R., Peters, S., Konijn, E.A. & **Crone, E.A.** (in press). Brain activation upon ideal-body media exposure and peer feedback in late adolescent girls. *Cognitive, Affective, and Behavioral Neuroscience*. Doi: 10.3758/s13415-017-0507-y.
138	**Van der Veen R.**, **Kentrop J.**, Van der Tas L., **Loi M.**, **Van IJzendoorn M.H.**, **Bakermans-Kranenburg M.J.**, **Joëls M.** (2015) Complex living conditions impair behavioral inhibition but improve attention in rats. *Front. Behav. Neurosci.* 9: 357. doi: 10.3389/fnbeh.2015.00357.
139	**Van IJzendoorn, M.H.**, & **Bakermans-Kranenburg, M.J.** (2014). Confined quest for continuity: the categorical versus continuous nature of attachment. *Monographs of the Society for Research in Child Development*, 79(3), 157-167. doi: 10.1111/mono.12120.
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141	**Van IJzendoorn, M.H.**, & **Bakermans-Kranenburg, M.J.** (2015). Genetic differential susceptibility on trial: Meta-analytic support from randomized controlled experiments. *Development and Psychopathology*, 27(1), 151-162. doi: 10.1017/S0954579414001369.
142	**Van Wijk, I.C., van den Bulk, B. G., Euser, S., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H.**, & Huffmeijer, R. (2017). Social judgments, frontal asymmetry, and aggressive behavior in young children: A replication study using EEG. *Neuropsychologia*. http://dx.doi.org/10.1016/j.neuropsychologia.2017.06.022
143	**Veldkamp, S.A.M.**, **Van Bergen, E.**, **de Zeeuw, E.L.**, van Beijsterveldt, C.E.M., **Boomsma, D.I.** & **Bartels, M.** (2017). Bullying and victimization: The effect of close companionship. *Twin Research and Human Genetics, 20 (10),* 19-27.
144	Vogel S, Fernández G, **Joëls M**, Schwabe L. Cognitive Adaptation under Stress: A Case for the Mineralocorticoid Receptor. *Trends Cogn Sci.* 2016 Mar;20(3):192-203.
145	**Vrijhof, C.I.**, **Van den Bulk, B.G.**, Overgaauw, S., Lelieveld, G-J., **Engels, R.C.M.E.**, **Van IJzendoorn, M.H.** (2016). The Prosocial Cyberball Game: compensating for social exclusion and its associations with empathic concern and bullying in adolescents. *Journal of Adolescence. 52,* 27–36.
146	**Vrijhof, C.I.**, Van der Voort, A., **Van IJzendoorn, M.H.**, & **Euser, S.** (2017). Stressful Family Environments and Children's Behavioral Control: A Multimethod Test and Replication Study With Twins. *Journal of Family Psychology*. Advance online publication. http://dx.doi.org/10.1037/fam0000345
147	Walker CD, Bath KG, **Joels M**, Korosi A, Larauche M, Lucassen PJ, Morris MJ, Raineki C, Roth TL, Sullivan RM, Taché Y, Baram TZ. Chronic early life stress induced by limited bedding and nesting (LBN) material in rodents: critical considerations of methodology, outcomes and translational potential. *Stress*. 2017 Jul 12:1-28.
148	Wildeboer, A., Thijssen, S., **Van IJzendoorn, M.H.**, van der Ende, J., **Jaddoe, V.W.**, **Verhulst, F.C.**, et al. (2015).

	Early childhood aggression trajectories: Associations with teacher-reported problem behavior. *International Journal of Behavioral Development*, 39(3), 221-234. doi:10.1177/0165025414562239.
149	Windhorst, D.A., Mileva-Seitz, V.R., Linting, M., Hofman, A., **Jaddoe, V.W.V.**, **Verhulst F.C.**, **Tiemeier, H.**, **Van IJzendoorn, M.H.** & **Bakermans-Kranenburg, M.J.** (2014). Differential susceptibility in a developmental perspective: DRD4 and maternal sensitivity predicting externalizing behavior. *Developmental Psychobiology*, 57(1), 35-49. DOI 10.1002/dev.21257.
150	Yang, C., Crain, S., Berwick, R.C., Chomsky, N. & **Bolhuis, J.J.** (2017) The growth of language: Universal Grammar, experience, and principles of computation. *Neuroscience & Biobehavioral Reviews*, in press.
151	Yu, R., Aaltonen, M., Branje, S., Ristikari, T., **Meeus, W.**, Salmela-Aro, K., Goodwin, G., & Fazel, S. (2017). Depression and violence in adolescents and young adults: Findings from three longitudinal cohorts. *Journal of the American Academy of Child and Adolescent Psychiatry, 56,* 652-658.
152	**Zondervan-Zwijnenburg, M.A.J.**, (in progress). How to test replication: A tutorial.
153	**Zondervan-Zwijnenburg, M.A.J.**, Van de Schoot, R., & **Hoijtink, H** (submitted). Testing ANOVA replications by means of the prior predictive *p*-value. *Psychological Methods*
154	**Zondervan-Zwijnenburg, M.A.J.**, Depaoli, S., Peeters, M., & Van de Schoot, R. (submitted). Pushing the Limits: The performance of ML and Bayesian estimation with small and unbalanced samples in a latent growth model. *Methodology*
155	**Zondervan-Zwijnenburg, M.A.J.**, Peeters, M., Depaoli, S., & Van de Schoot, R. (in press). Where do priors come from? Applying guidelines to construct informative priors in small sample research. *Research in Human Development*. doi: 10.1080/15427609.2017.1370966
156	**Zondervan-Zwijnenburg, M.A.J.**, Van de Schoot-Hubeek, W., Lek, K., **Hoijtink. H.,** & Van de Schoot, R. (2017). An expert judgment elicitation procedure for correlations. *Frontiers in Psychology, 8*:90. doi: 10.3389/fpsyg.2017.00090.

PhD student and postdoc activities

See below a list of the most important PhD student and postdoc activities (max. 3 examples per person)

CID PhD student and postdoc activities
Achterberg, M., van Duijvenvoorde, A.C., Bakermans-Kranenburg, M.J. & Crone, E.A. (2015, September). *Control your anger! The neural basis of aggression regulation following social rejection.* Poster presentation of adult study and children pilot presented at: SRCD meeting and FLUX congress.
Achterberg, M., Van Duijvenvoorde, A.C.K., Bakermans-Kranenburg, M.J., Crone, E.A. (2017, April). *Heritability of Aggression following Social Rejection in Childhood.* Poster presented at the conference of the Society for Research in Child Development (SRCD), Austin, Texas.
Achterberg, M., van Duijvenvoorde, A.C., Bakermans-Kranenburg, M.J. & Crone, E.A. (2015, November). *Control your anger! The neural basis of aggression regulation following social rejection.* Oral presentation of adult study presented at Donders Discussions (06-11-'15); VNOP-ISED-CAS day (13-11-'15) and NVP Winter conference (18-11-'15).
Altinişik, Y., (2015, April 10). *Generalized Order Restricted Information Criterion Approximation.* Consortium on Individual Development (CID), Utrecht, The Netherlands.
Altinişik, Y., (2015, December 10). *A Generalization of the AIC that evaluates (in)equality constrained hypotheses.* The 25th IOPS Winter Conference, Leiden, The Netherlands.
Altınışık, Y., (2016, June 13). *A Generalization of the AIC that Uses Prior Knowledge.* International Society for Bayesian Analysis (ISBA) World Meeting, Cagliari, Italy
Becht, A. I., Bos, M. G. N., Nelemans, S. A., Peters, S., Vollebergh, A. M., Branje, S. J. T., Meeus, W. H. J., & Crone, E. A. (31-08-2017). Neurobiological Underpinnings of Identity Formation in Adolescence. In W. H. J. Meeus (chair, invited symposium), *Advances in the study of adolescent identity formation.* Symposium conducted at the 18th European Conference on Developmental Psychology (ECDP), Utrecht, The Netherlands.
Becht, A. I., Bos, M. G. N., Nelemans, S. A., Peters, S., Vollebergh, A. M., Branje, S. J. T., Meeus, W. H. J., & Crone, E. A. (18-04-2017). Neurobiological Underpinnings of Identity Formation in Adolescence: A Multi-Method Multi-Sample Longitudinal Approach. Results presented at the Consortium on Individual Development (CID) meeting 2017, Utrecht, The Netherlands.
Becht, A. I., Nelemans, S. A., Branje, S. J. T., Koot, H. M., Vollebergh, W. A. M., Meeus, W. H. J. (06-04-2017). The role of identity uncertainty in identity commitment making across adolescence: Five-year within-person associations. In A.I. Becht (chair), *Adolescents' ethnic and personal identity across the globe: Development, context, and social exclusion.* Symposium conducted at the Biennial meeting Society for Research in Child Development (SRCD), Austin, Texas, USA.
Beckers, G. (2015). *Vocal sequence predictability modulates traveling wave activity in songbird auditory forebrain.* Poster presentation at SfN Neuroscience conference, Chicago.
Beckers, G. (2015). Lecture *Plasticity in the avian brain: A bird's eye view* for UU Neuroscience and Cognition program, Utrecht, The Netherlands.
Beckers, G. (2015). Invited visit to Max Planck Institute for Brain Research (Frankfurt, DE), Laurent department, for establishing cooperation in sleep research.
Beyens, I., Piotrowski, J. T., & Valkenburg, P. M. (2017). Which came first? Assessing transactional relationships between children's violent media use and ADHD-related behaviors. Paper presented at the 67th International Communication Association Conference, San Diego, United States, 25-29 May 2017.
Beyens, I., Piotrowski, J. T., & Valkenburg, P. M. (2017). Screen media use and ADHD-related behaviors in children and adolescents: Four decades of research. Paper presented at the 67th International Communication Association Conference, San Diego, United States, 25-29 May 2017.

Beyens, I., Piotrowski, J. T., & Valkenburg, P. M. (2017). Assessing intraindividual relationships between children's violent media use and ADHD-related behaviors. Presentation presented at the Consortium on Individual Development Meeting, Utrecht, The Netherlands, 18 April 2017.
Bos D (2016) Cognitive control and brain connectivity in Autism Spectrum Disorders and ADHD, Child Mind Institute, New York University, New York, USA
Bos D (2016) Cognitive control in Autism Spectrum Disorders (and ADHD), Hartley Lab, New York University, New York, USA
Bos D (2016) Brain connectivity and cognitive control in Autism Spectrum Disorders, Center for Autism and the Developing Brain, New York Presbyterian Hospital, White Plains, USA
Cousijn, J. (2015). Chair and organizer of symposium *From impulsivity to habit? Neuropsychopharmacological mechanisms underlying addiction.* Congress of the European College of Neuropsychopharmacology, Amsterdam, The Netherlands.
Cousijn, J. (2015). Chair and speaker within the symposium *Behavior in context: a neuro-cognitive, behavioral and educational perspective on cognition and adolescent substance use.* International Convention of Psychological Science, Amsterdam, The Netherlands.
Cousijn, J. (2015). *Tracking the development of behavioral control across 6,000 infants and children: Introduction to the Dutch Consortium on Individual Development.* Oral presentation at the International Society for Research on Impulsivity Meeting, Amsterdam, The Netherlands.
Damsteegt, R. C. (2015, March). *Owl task: Measuring prosocial behavior in early childhood.* Presentation at the CID meeting, Utrecht, The Netherlands.
De Mulder, H., Van der Graaf, J., Van den Bos, N., Branje, S. (2016, April). *Talking about the mind: effects of emotional language in mother-adolescent conflict on adolescents' empathic concern and prosocial behavior.* Society for Research on Adolescence Biennial Meeting, Baltimore, USA.
De Mulder, H., Bergstra, M., Coopmans, P. (2014, July). *'I know this is a mit!': Children's ability to use speaker certainty in learning novel words.* Poster presentation XIII International Congress for the Study of Child Language (IASCL), Amsterdam, The Netherlands.
De Zeeuw, E.L., van Beijsterveldt, C.E.M., Glasner, T.J., Bartels, M., Ehli, E.A., Davies, G.E., Hudziak, J.J., Social Science Genetic Association Consortium, Rietveld, C.A., Groen-Blokhuis, M.M., Hottenga, J-J., de Geus, E.J.C. & Boomsma, D.I. (2014). *Polygenic scores associated with educational attainment in adults predict educational achievement and ADHD symptoms in children.* Paper presented at the Annual Meeting of the Behavior Genetics Association, Charlottesville, USA
De Zeeuw, E.L. (2017). *How knowledge on genetics can be used to help children thrive* Presentation at a meeting from the research program Personalized Medicine from the Amsterdam Public Health, Amsterdam, the Netherlands
De Zeeuw, E.L. (2017). *Research shows possible link ADHD and low educational achievement.* Blog on Open Forest
Euser, S., Damsteegt, R.C., Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H. (2015, June, September). *The use of ambulatory real time assessments to measures children's daily life experiences.* Poster presented at 4th Biennial Society for Ambulatory Assessment Conference, State College, Pennsylvania and at 17th European Conference on Developmental Psychology, Braga, Portugal.
Euser, S., Van der Ploeg, N., Vrijhof, C.I., Van IJzendoorn, M.H. (2017, June). *Unraveling the association between household chaos and children's sleep quality: A test and replication study using moderated mediation analyses.* Poster presented at 5th Biennial Society for Ambulatory Assessment Conference, Luxembourg, Luxembourg.
Euser, S. (2015, June). *Leiden Consortium on Individual Development: Intervention effects on children's social competence and behavioral control.* Presentation at the Symposium on emotions and the social brain in adolescents,

Leiden, The Netherlands.
Fikkers, K.M. (2017, January). Organizer of and speaker at preconference "Moving beyond self-report: Measuring arousal, emotional, and cognitive responses to media through physiological measures". *Etmaal van de Communicatiewetenschap, Tilburg, The Netherlands*.
Geeraerts, S.B., Deutz, M. H. F., Deković, M., van Baar, A.L., & Prinzie, P., (2017, April). *Factor structure of the dysregulation profile: Evidence for a broad dysregulation syndrome.* Paper presented at the Biennial Meeting of the Society of Research in Child Development, Austin, USA.
Geeraerts, S.B., Huijding, J., Munsters, N., Helmich, M., & Deković, M. (2016, May). *Temporal dynamics in infants' and their parents' co-regulation processes.* Poster presented at the International Conference on Infant Studies (ICIS), New Orleans, USA.
Geeraerts, S.B., Deutz, M.H.F., Dekovic, M., Bunte, T., Schoemaker, K., Espy, K.A., … & Matthys, W. (2015, March). *The child behavior checklist dysregulation profile in preschool children: a broad dysregulation syndrome.* Poster presentation at the International Convention of Psychological Science (ICPS), Amsterdam, The Netherlands.
Hessels, R.S. (2017). *Eye tracking live social interaction to capture gaze behavior of subclinical autism and social anxiety*. Oral presentation at the European Conference on Eye Movements 2017, Wuppertal.
Hessels, R.S. (2016). *Methodological issues in infant eye-tracking*. Invited lecture at Tobii Pro Boot Camp 2016. Bro, Sweden.
Hessels, R.S. (2016). *Eye tracking in difficult subjects*. Invited workshop on eye tracking. University of Geneva.
Huijding, J.: Development of a massive online open course for Dynamics of Youth titled "Understanding development: from synapse to society". The course is available via Coursera.
Junge, C. (2015). Presenter at the course *Longitudinal data analysis: current best methods* (5-day advanced stats course), Faculty of Social and Behavioral Sciences, Utrecht University, The Netherlands.
Junge, C. (2015). *The learning brain.* Presentation for the general public on the opening of the childlab Terpstraschool, The Netherlands.
Junge, C. (2015). *Testing the scope of cross-situational learning: auditory context and retention.* Oral presentation at the 2nd workshop on Infant Language Development, Stockholm, Sweden and Psychology (EADP), Braga, Portugal.
Kentrop, J. (2014, 2015, 2016). *Pro-social behavior in animals*. Lecture for the Affective Neurosciences course for Neuroscience and Cognition, Master students at Utrecht University, The Netherlands.
Kentrop, J. (2014, 2015). *Early life stress, impulsivity and social competence.* Oral presentation at CID symposium, Utrecht, The Netherlands.
Kentrop, J. (2017, September). *The effects of early life stress and complex housing on social competence in adolescent rats*. Poster presentation at European Brain and Behaviour Society conference, Bilbao, Spain.
Koenis M.M. *Ontwikkeling van het Puberbrein II.* Universiteitsdag, 1 april 2017. Presentation for allumni of the Utrecht University.
Kolijn, L., Euser, S., van den Bulk, B.G., Huffmeijer, R., van IJzendoorn, M.H. & Bakermans-Kranenburg, M.J. (2016). *Which neural mechanisms mediate the effects of a parenting intervention program on parenting behavior: design of a randomized controlled trial.* Poster presented at and at Consortium on Individual Development symposium on October 2016, Utrecht, The Netherlands; the Donders Discussions in November 2016, Nijmegen, The Netherlands; at the VNOP-ISED-CAS day in November 2016, Leiden, The Netherlands
Kretschmer, T. (2017). *Ghosts from the past: Consequences of adolescent peer experiences across social contexts and generations.* ERC grant

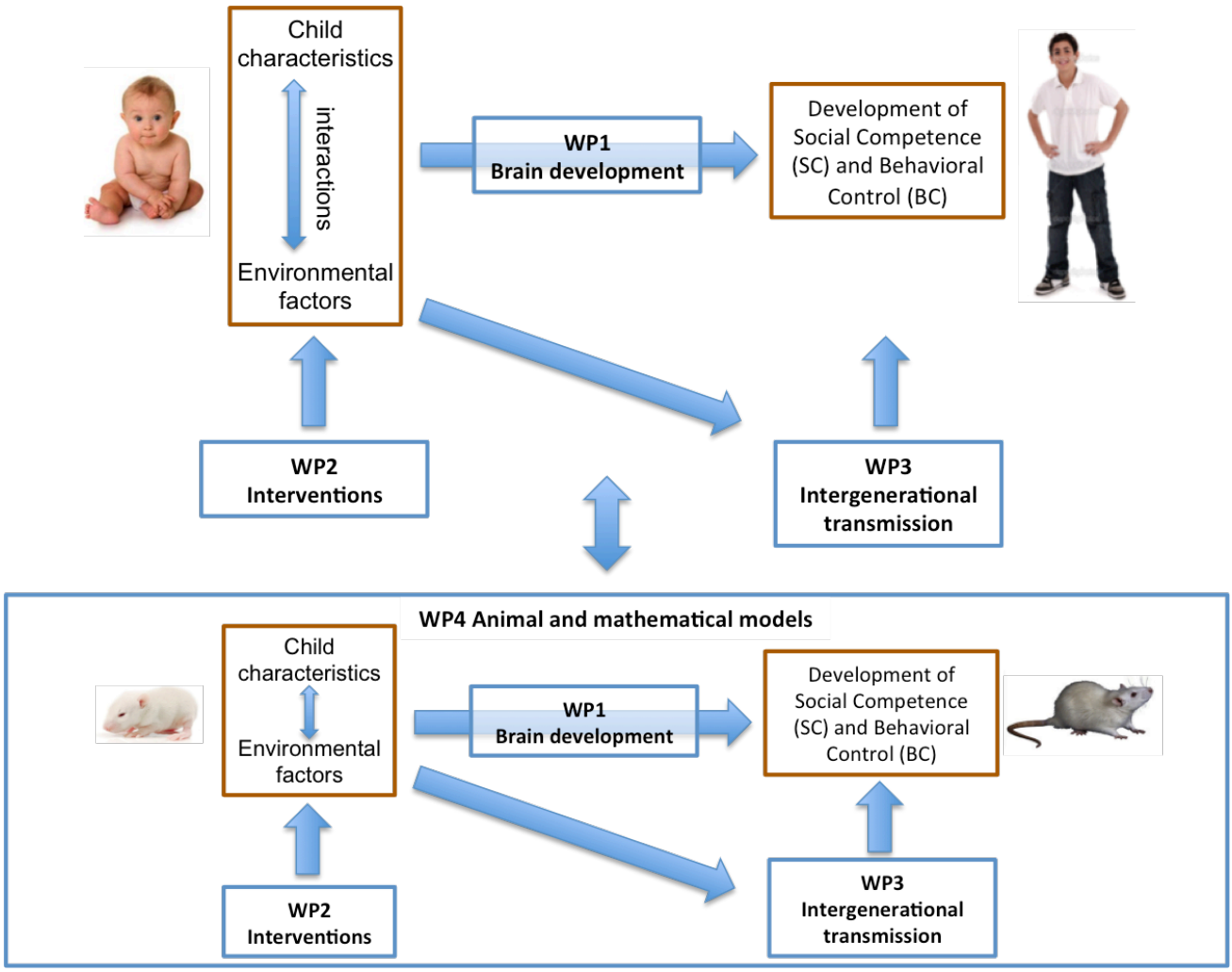
Kretschmer, T. (2015). *Multifinality of peer victimization: Are genetic polymorphisms influential in determining individual pathways?* Biennial Meeting of the Society for Research in Child Development, Philadelphia, USA
Kretschmer, T. (2015). *Sticks and stones will break my bones but words can never harm me? Current knowledge and new avenues in research on outcomes of peer victimization.* Lecture at Tilburg University.
Kretschmer, T. (2014). *Peer victimization and individual variation in maladjustment.* Biennial meeting of the European Association for Research on Adolescence, Çesme, Turkey (invited presentation).
Loi, M. (2013, October 5-9). *Effects of early life experiences on brain structure and function: neurogenesis and decision-making*. ECNP Conference, Barcelona, Spain.
Loi, M. (2014, June 18-20). *Effects of early life experiences on brain structure and function: neurogenesis and decision-making.* Stress Neurobiology Workshop, Cincinnati, USA.
Loi, M. (2014, July 5-9). *Effects of early life experiences on brain structure and function: neurogenesis and decision-making.* FENS Forum, Milan, Italy.
Mol, C. (2015, July). *Tutor song recognition is not dependent on syllable order in zebra finches.* Oral presentation at Helmholtz PhD day, Utrecht, The Netherlands.
Mol, C. (2015, March). *Comparative linguistics of birdsong and child language acquisition.* Oral presentation at CID meeting, Utrecht, The Netherlands.
Mol, C. (2014). *Tutor song recognition is not dependent on syllable order in zebra finches.* Poster presentation at Society for Neuroscience Conference (SfN), Washington, USA.
Nelemans, S. A. (2016). *Anxiety development in adolescence*. Invited presentation at the Biennial Conference of the European Association for Research on Adolescence (EARA), La Barrosa, Cádiz, Spain.
Nelemans, S. A., Branje, S. J. T., Hale, W. W. III, Goossens, L., Koot, H. M., Oldehinkel, A. J., & Meeus, W. H. J. (2016). *Discrepancies in adolescent and parent perceptions of the parent-adolescent relationship and early adolescent depressive symptoms*. Paper presented at the annual International Conference on Child and Adolescent Psychopathology (ICCAP), London, UK.
Nelemans, S. A., Hale, W. W. III, Branje, S. J. T., Meeus, W. H. J., & Rudolph, K. D. (2017). Anxiety trajectories across the middle school transition: Individual vulnerability and contextual stressors. In **S. A. Nelemans** (Chair), *A psychosocial perspective on the development of internalizing symptoms across adolescence*. Symposium conducted at the Biennial Conference of the European Association of Developmental Psychology (ECDP), Utrecht, the Netherlands.
Sarabdjitsingh, R.A. (2017, September). Invited lecture, European Brain and Behavior Society, Bilbao, Spain.
Sarabdjitsingh, R.A. (2017, June). Moderator parallel symposium at the Dutch Neuroscience Meeting, The Netherlands.
Sarabdjitsingh, A. (2015, November). Poster presented at the Colston Research Society Symposium, Bristol.
Sluiter, A. (2017). *De vroegste signalen van autism en ADHD.* Gratama subsidie
Staats, S., Van der Valk, I. E., Meeus, W. H. J., & Branje, S. J. T. (2017, August). *Longitudinal transmission of conflict management styles across inter-parental and adolescent Relationships.* Poster presentation at the European Conference on Developmental Psychology (ECDP), Utrecht, The Netherlands.
Staats, S., Huijding, J. & Dekovic, M. (2016, November). *The role of parenting and self-regulation in (pre)adolescent psychosocial functioning: Macro- and micro-level relations.* Poster presentation at the VNOP-ISED-CAS Research Days, Leiden, The Netherlands.
Staats, S., Van der Valk, I. E., Meeus, W. H. J., & Branje, S. J. T. (2016, September). *Longitudinal transmission of conflict management styles across inter-parental and adolescent Relationships.* Oral presentation at the Conference

of the European Association for Research on Adolescence (EARA), Cádiz, Spain.
Teeuw J., Brouwer, R., Koenis, M., Swagerman, S., Boomsma, D., Hulshoff Pol, H. (2017) Genetic influences on development of cortical thickness from a longitudinal adolescent twin sample, Conference OHBM
Teeuw J., Brouwer, R., Koenis, M., Swagerman, S., Boomsma, D., Hulshoff Pol, H. (2016) Genetic factors of cortical development and intelligence in a longitudinal Dutch twin study, Conference OHBM
Teeuw J., Brouwer, R., Koenis, M., Swagerman, S., Boomsma, D., Hulshoff Pol, H. (2015) Trajectories of cortical thickness and their relation to cognitive abilities in the BrainSCALE project: preliminary results, ONWAR/BCRM & CID symposium
Van den Boomen, C. (2015). Organization and presentation Symposium *From infancy to adulthood: how to set up and succeed in longitudinal interdisciplinary studies'* at European Conference on Developmental Psychology, Braga, Portugal.
Van den Boomen, C. (2015). Organization and presentation Summerschool *Neurocognitive methods for infant and toddler research*, Utrecht University, Utrecht, The Netherlands.
Van den Boomen, C. (2014). Invited expert in panel discussion on infant imaging methods at COST ESSEA conference, Toulouse, France.
Van den Bulk, B.G., Van Wijk, I.C., Huffmeijer, R., Euser, S., Bosdriesz, J.R., Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H. (2017, April). *Genetic and environmental components of temperament and frontal asymmetry in young children.* Poster presented at the conference of the Society for Research in Child Development (SRCD), Austin, Texas.
Van der Meulen, M., Steinbeis, N., Achterberg, M., Bilo, E., van den Bulk, B. G., van IJzendoorn, M. H., & Crone, E. A. (2016). *The neural correlates of dealing with social exclusion in childhood. Poster presentation of replication study at FLUX congress (10-09-'16), CID meeting (28-10-'16), Donders Discussions (25-11-'16), ECDP congress (01-09-'17).*
Van der Meulen, M., Steinbeis, N., Achterberg, M., Bilo, E., van den Bulk, B. G., van IJzendoorn, M. H., & Crone, E. A. (2016). *The neural correlates of dealing with social exclusion in childhood. Oral presentation of replication study at VNOP-CAS-ISED Research Days (11-11-'16).*
Van der Meulen, M., Steinbeis, N., Achterberg, M., B. G., van IJzendoorn, M. H., & Crone, E. A. (2016). *Prosocial behavior in middle childhood: behavioral and neural correlates. Oral presentation of cross-sectional twin study at CID meeting (18-04-'17).*
Van Wijk, I.C., Van den Bulk, B.G., Euser, S., Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Huffmeijer, R. (2016, November) *Social judgments, frontal asymmetry and aggressive responses in young children: A replication study using EEG.* Oral presentation at VNOP/ISED, Leiden, Netherlands
Van Wijk, I.C., Van den Bulk, B.G., Euser, S., Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Huffmeijer, R. (2016, November; 2017, April, August) *Social judgments, frontal asymmetry and aggressive responses in young children: A replication study using EEG. P*oster presentation at Donders Discussions, Nijmegen, Netherlands; SRCD congress, Austin, Texas, USA; ECDP congress, Utrecht, Netherlands
Van Wijk, I.C., Van den Bulk, B.G., Euser, S., Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Huffmeijer, R. (2017, April) The social network aggression task – Early Childhood: a new task to measure aggression in response to social judgments in young children. SRCD congress, Austin, Texas, USA
Veldkamp, S.A.M., Van Bergen, E., de Zeeuw, E.L., van Beijsterveldt, C.E.M., Boomsma, D.I. & Bartels, M. (2017). *Bullying and victimization: The effect of close companionship*. Paper presented at the European Conference of Developmental Psychology, Utrecht, the Netherlands
Vrijhof, C.I., van der Voort, A., van IJzendoorn, M. H., & Euser, S. (2016, November). *The relation between a stressful family environment and children's behavioral control: A multimethod test and replication study with twins.* Presentation at the VNOP-ISED-CAS days, Leiden, The Netherlands.

Vrijhof, C.I., Overgaauw, S., van den Bulk, B.G., Lelieveld, G., Bakermans-Kranenburg, M.J. & van IJzendoorn, M.H. (2017, April). *The Prosocial Cyberball Game: Compensating behavior in typically and atypically developing children after observing social exclusion.* Poster presented at the conference of the Society for Research in Child Development (SRCD), Austin, Texas.
Vrijhof, C.I., Euser, S., van IJzendoorn, M.H. & the L-CID team (2017, August). *Parenting effects on children's hot and cool behavioral control: the role of sensitivity and sensitive discipline*. Poster presented at the European Conference on Developmental Psychology (ECDP), Utrecht, The Netherlands.
Zondervan-Zwijnenburg, M. A. J. (2015, March 13). *Including existing knowledge in your data analysis: An illustration from research on cognitive development*. International Conference of Psychological Science (ICPS).
Zondervan-Zwijnenburg, M. A. J. (2016, November 11). *How to test the replication of ANOVA findings.* VNOP ISED CAS Research Days, Leiden, The Netherlands.
Zondervan-Zwijnenburg, M. A. J. (2017, May 26). *Do we have a (mis)match? Checking whether rodent information replicates in other contexts.* 29th Annual Convention, American Psychological Society, Boston, USA.

Appendix 8 – CID PhD student and postdoc projects (progress reports)

Within CID several close-knitted projects focus on identifying critical factors and their interplay during development. CID PhD and postdoc projects study how environment (family characteristics, parents and siblings, peers, and broader societal influences including media) and child characteristics (genetic makeup, temperament, and pre- and perinatal factors) affect the development of social competence (SC) and behavioral control (BC), skills that are essential for functioning in society and for reducing risk of behavioral and emotional problems. **Figure 2** shows how CID aims to gain new insights in how developmental differences arise between children as a result of the interplay of child characteristics and environmental factors, by filling crucial knowledge gaps on the role of brain development, effects of interventions in the environment, and intergenerational transmission.



The WPs and how they are interrelated on their focus on the interplay of child characteristics and environmental factors, determining developmental differences, specifically on SC and BC.

All WPs focus on the development of SC and BC (upper right-hand box of the **Figure**) and use the same core measures, as decided in the PI meeting of 15 January 2014 (*see 2.3*) and found on our website http://www.individualdevelopment.nl/research/measurements. In all WPs there is a focus on specific child characteristics (including candidate genes, perinatal factors, and temperament) and environmental factors (parent, peers, and media), and their interactions (upper left-hand box of the **Figure**).

CID PhD students and postdocs have started projects along the lines envisaged in the original proposal and these are described in short progress reports below.

Progress reports
WP1
Dr. Ine Beyens, Postdoc, Nov/15 – Nov/19 ***The relationship between media use and ADHD-symptoms: A differential susceptibility perspective*** Valkenburg; UvA Amsterdam School of Communication Research (ASCoR) and Center for research on Children, Adolescents, and the Media (CcaM) **Aim**: The aim of this project is to investigate (1) how and why certain types of media entertainment may influence children's ADHD-related behaviors and (2) which children are particularly susceptible to the effects of media entertainment on ADHD-related behaviors. More generally, the project aims to contribute to transactional (e.g., Slater, 2007) and differential susceptibility (e.g., Valkenburg & Peter, 2013) theories of media effects. **Methods**: This project will use data collected through the CID pilot and main study. In addition, the project uses survey data collected through a four-wave cohort study among 900 Dutch families (funded by an ERC Advanced grant to Valkenburg). The survey includes parent- and self-report measures of media exposure, ADHD-related behaviors (i.e., attention problems, impulsivity, and hyperactivity), as well as temperament, parenting style, and parental media mediation. **Progression up to now**: We developed the media exposure and media specific parenting measures to be included in the CID questionnaires. In addition, we analyzed data of the four-wave cohort study (ERC data) using random intercept cross-lagged panel modeling techniques to investigate transactional relationships between children's violent media use and ADHD-related behaviors. The findings of this paper were presented at the 2017 conference of the International Communication Association, where the paper was honored with a Top Paper award. A second paper in which we provide a systematic review of the literature on the relationship between children and adolescents' screen media use and ADHD-related behaviors was accepted for publication in the *Proceedings of the National Academy of Sciences (PNAS)*.
Dr. Dienke J. Bos, Postdoc, Mar/15 – Mar/17 ***Connected and in control: What puts the development of neural networks underlying behavioral control at risk?*** Durston, Crone; UMC Utrecht, Dept. of Psychiatry **Aim:** The aim of this project is to investigate the neurobiological processes underlying (a)typical development of behavioral control networks in a large cohort of children. **Methods:** Participants will be profiled on a broad, multimodal array of characteristics, including several MRI-based measures, neurocognition and psychophysiology. This project will consist of two phases. In the first phase, a pilot study using existing data will be conducted as a proof of concept before phase 2, where we will conduct a multimodal study of the development of behavioral control. **Progression up to now:** The preprocessing of all data of the pilot study (phase one) has recently been completed. The data are ready to be analyzed, which will happen as soon as Dienke has returned from her maternity leave (1 January 2016).
Dr. Carlijn van den Boomen, Postdoc, Sept/13 – Sept/16 ***Typical and atypical development of visual perception*** Kemner, UU Faculty of Social and Behavioral Sciences **Aim**: The aim of this project is examining the typical and atypical development of visual and social perception in children, thereby focusing on underlying processes involved in social competence. **Methods**: This project applies experimental designs. Visual stimuli of basic objects (e.g. stripe-patterns) and faces are shown to children, while we measure behavioral responses or neural processing using electroencephalography (EEG) and functional near infrared spectroscopy (fNIRS). We use existing databases and collect new data. The populations of interest are typically developing adults and children, and persons with Autism Spectrum Disorder. **Progression up to now**: Regarding typical development of emotional face perception in infants, I showed that detailed information is important for infants to discriminate between two emotions, and investigated the reliability of EEG measures of face perception in infants. We also investigated visual and social perception in 5-month-olds, and submitted the results for publication. In addition, I showed that detail perception develops until at least 12 years of age. Finally I investigated visual and social perception in adults with Autism Spectrum Disorder, of which the results are submitted for publication.

Karin Fikkers, Postdoc, Sep/15 – Sep/19

Understanding children's and adolescent's differential use of and susceptibility to media entertainment
Valkenburg; UvA Amsterdam School of Communication Research (ASCoR) and Center for research on Children, Adolescents, and the Media (CcaM)

Aim: The goal of this project is to understand (1) individual differences in children's and adolescents' emotional, cognitive, excitative, and behavioral responses to media entertainment, and (2) the role of parents in this process.
Methods: We use survey data on youths' media (violence) exposure, temperament, and self- and parent-reported behavior. In addition, data collected in an observational within-subjects experiment conducted in the Nemo Science Museum (August 2016) are used to inform the aim of our study.
Progression up to now: Data collection in Nemo (August 2016) was used in a submitted manuscript that describes children's individual differences in their emotional, cognitive, and arousal responses to positive and negative media entertainment, based on both child self-report, parent-report, and physiological data. Based on the current data set of Valkenburg's ERC-funded project on individual differences in media use and effects, analyses for a manuscript on the longitudinal relationship between parental media mediation and teens' entertainment use are currently underway. The results of these manuscripts will inform questions that can be answered using data of the CID main project.

Sanne B. Geeraerts, PhD student, Oct/14 – Sep/19

Development of infant self-regulation within the early caregiver relationship: A cascade model
Dekovic, Kemner; UU Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to examine the early processes through which self-regulation (behavioral control) develops within the proximal caregiver relationship.
Methods: We perform various longitudinal studies with a range of methods. We use both existing data and newly collected data, including the YOUth baby pilot data.
Progression up to now: At the moment we are coding observed parent-toddler interactions, and analyzing data for the first publication. The PhD candidate is currently at Penn State as a visiting Fulbright researcher, to collaborate with Dr. Cynthia Stifter.

Roy Hessels, PhD student, Jan/14 – Jan/17

The effects of social stimulation/interaction on perceptual and social development
Kemner; Hoijtink; UU Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to investigate the effects of social interaction (a critical aspect of social competence) on perceptual and social development.
Methods: Social development will be studied via two routes. First, by investigating face-scanning behavior of individuals diagnosed with autism, we can model face scanning during abnormal development. If abnormal looking behavior evokes reactive abnormal looking behavior in controls, this can shed light on the role of social interaction in abnormal development. Second, the development of infant face scanning will be investigated in an interactive eye-tracking setup.
Progression up to now: The setup for investigating social interaction has been developed. As this is a novel setup for studying social interaction there are few tools for statistical analyses available. In our collaboration we develop a tailored statistical tool for analyzing how people make eye contact and look at each other in a live setting. At the moment, the first prototypes are being tested. The results have been described in two publications.

Dr. Caroline M.M. Junge, Assistant professor, **Dr. Janna Cousijn,** Postdoc (until 1/12/15) and **Dr. Matthijs Vink**, Assistant professor (since 1/1/16)

Selecting suitable tasks from infancy to adolescence that tap social competence and behavioral control
Kemner, UU Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to select suitable tasks from infancy to adolescence that tap social competence and behavioral control.
Methods: For both cohorts, we will use a variety of SC- and BC-tasks repeated at each wave. The tasks are chosen such that they a) can be administered from infancy to adolescence; b) measure a key part of either social

competence or behavioral control, and c) are expected to yield meaningful differences at this age. Crucially, we do not only sample behavioral measures, but also eye-tracking and brain-related measures (baby-child cohort: EEG/ERP; child-adolescent cohort: (f)MRI). Some of the tasks will also be used in other work packages.
Progression up to now In 2015, the postdocs from WP1 made a final task selection for the longitudinal cohort studies (baby-child cohort and child-adolescent cohort). In addition, we have piloted as much of the tasks as possible for both cohorts. For the baby-child cohort, we tested a full-day procedure with 5-month-olds (n=44) and with 10-month-olds (n=77). For the child-adolescent cohort, we have piloted the behavioral and eye-tracking tasks in a cross-sectional design (n=135; range 8-16 years). Early 2016 we are fully prepared to test the first waves for both cohorts.

Dr. Hannah De Mulder, Postdoc, Jan/14 – May/17

The power of stories: exploring the effects of (self) narrative on the development of social competence and behavioral control
Van Berkum, Hoijtink, Valkenburg, Crone; UU Faculty of Humanities

The project consists of two subprojects: 1: From book smart to street smart: does exposure to fiction enhance social competence? And 2: What to say when you talk to yourself: the role of verbal reappraisal in behavioral control.
Aims: The aim of subproject 1 is to assess the predicted positive impact of exposure to fictional narrative on the child's development of social competence, in his/her actual behavior (tendency to engage in pro-social behavior) and in relevant cognitive component skills (perspective taking, empathy and moral values). The aim of subproject 2 is to assess how the development of verbally mediated reappraisal, at the level of linguistic form and content, affects the development of the child's ability to regulate emotion (a crucial component of behavioral control) and how general linguistic and narrative abilities mediate this relationship.
Methods: In the cohort study, we use dedicated questionnaires and experimental tasks to assess the various relevant constructs (e.g. exposure to various types of fiction, perspective-taking competence, moral profile), and we will relate those dedicated measures to WP1- and/or CID-wide assessments of social competence and behavioral control, as well as to WP1-wide measurements of brain-anatomical development. In experimental work conducted on non-cohort participants, we use additional lab tasks, as well as additional physiological measures (EEG, facial EMG (electromyography), skin conductance) to assess the effects of emotion regulation.
Progression up to now: In subproject 1 we a) created a fiction exposure questionnaire for use in the cohort (pilot data gathered from a large online study), b) created additional measures to assess fiction exposure for use outside of cohort (data gathered for validation of Author Recognition Test for 8-17 year olds), c) created a Bayesian analysis plan for analysis of data from the YOUth adolescent cohort (to be implemented once data collection has terminated), and d) are gathering data in an intervention study considering effects of reading particular types of fiction on adults' social competence (to be modified for use with adolescents at a later stage). In subproject 2 we a) are gathering data in an intervention study considering effects of particular reappraisal strategies on adults' ability to deal with verbal insults and with social exclusion (to be modified for use with adolescents at a later stage).

Dr. Margot Peeters, Postdoc, Jan/15 – Dec/18

Behavioral control and reward sensitivity as predictors of adolescents' substance use
Vollebergh, Oldehinkel; UU Faculty of Social and Behavioral Sciences

Aim: Former studies suggest that risk-taking behavior among adolescents is a result of different underlying motivational and cognitive processes, in particular a heightened sensitivity for reward on the one hand, and impaired behavioral control on the other. Most of this research includes fMRI studies that report on differences in brain activity, however, the translation of these neurocognitive results into actual behavior has less often been studied. In the present proposal, we intent to focus on the way these two processes interact with each other in impacting developmental trajectories of risk behavior in adolescence.
Methods: We use both a variable-centered and a person-centered approach. In addition, we will look at peer status as possible interacting variable. We will use data from a large longitudinal national cohort study, TRAILS (total sample N = 2223; and data from a high risk focus cohort used in this study N = 715), in which a number of behavioral tests have been taken.
Progression up to now: The first results suggest that self-reported behavioral control at age 11 predicts initiation of alcohol use at age 16. Both effortful control and measures of cognitive control at age 11 predict the initiation of cannabis use at age 16. For smoking no such effects were found. In addition, interaction effects between reward sensitivity at age 16 and effortful control at age 11 are found for alcohol and cannabis use, suggesting that lower levels of control in early adolescence combined with higher sensitivity for reward in mid adolescence predict alcohol and cannabis use.

Jalmar Teeuw, PhD student, Jul/15 – Jun/19

Imaging genetics of brain development in healthy adolescent twins
Hulshoff Pol, Boomsma, Brouwer; UMC Utrecht, Dept. of Psychiatry

Aim: The aim of this project is to disentangle the (epi)-genetic and environmental influences on brain development. In particular, brain development and its associations with functioning (intelligence, social competence, behavioral control) of healthy adolescent twins and their siblings are being studied.
Methods: The PhD position is a collaboration between UMC Utrecht and Vrije Universiteit Amsterdam / Netherlands Twin Register. Magnetic resonance imaging scans, cognitive test batteries and genetic material have been acquired from monozygotic and dizygotic twins and their older sibling at the ages of 9, 12, and 17 years old. In this project we integrate information from the different MRI modalities (including structural, diffusion, and resting-state functional imaging) to elucidate causal (epi)genetic and environmental influences on the development of the brain. A second approach consists of predicting cognitive and psychiatric conditions in early adulthood using brain measures acquired during adolescence.
Progression up to now: Work on predicting changes in cognitive abilities in relation to cortical thickness during late adolescence has been presented at two internal symposia. This work is currently being extended to include analysis of genetic and environmental influences. In addition, analysis of the resting-state functional imaging data is ongoing.

WP2

Michelle Achterberg, PhD student, Sep/14 – Jan/20

Social aggression regulation in childhood and emerging adolescence
Crone, Bakermans-Kranenburg; UL Faculty of Social and Behavioral Sciences

Aim: The goal of this project is to study how the developing brain is shaped by the interplay of personal and environmental factors using a randomized controlled trial with longitudinal brain imaging. Specifically, my project focuses on the developmental differences in social rejection related aggression and aggression regulation (as a part of social competence and behavioral control).
Method: We developed a new social evaluation paradigm. During the experiment, participants view pictures of peers who responded to the participants' profile (accept, neutral or reject). Participants are requested to react to the peer feedback by pressing a button, producing a loud noise. Noise blast duration is used as an index of aggression.
Progression up to now: The paradigm was first tested in an adult sample (N=30, 15 males), results are published (Achterberg et al., 2016). Next, we tested the paradigm in a pilot sample of 7 to 8 year old children (N=19, 10 males); these results are also published (Achterberg et al., 2017).
In September 2015 we started with the longitudinal data collection. We have included 256 families (N=512 children) in the first year. The first visit was a labvisit in which the children underwent (amongst others) a MRI scan. Results on replicability and heritability regarding resting state functional brain connectivity are currently under revision (Achterberg, Bakermans-Kranenburg et al., under revision). Results on heritability regarding social aggression are under review (Achterberg, van Duijvenvoorde et al., under review).
In September 2016 we started the second annual visit, which was a home visit. 10 families dropped out and one family started in the second year, so we collected data of 247 families (494 children). We are currently collecting data of the third annual visit, which is a lab-visit.

Elisabeth Bilo, PhD student, Apr/15 – Apr/20

Hormonal correlates of social and behavioral development in childhood
Bakermans-Kranenburg, van IJzendoorn, Joëls; UL Faculty of Social and Behavioral Sciences

Aim: The overall aim of this project is to explore the hormonal correlates of social competence and behavioral control of twins in childhood, with special emphasis on diurnal cortisol.
Methods: Caucasian families with young twins are invited to participate in our study. Two pretests are conducted, after which families are randomly assigned to an intervention or control group. Various measures are used to measure behavioral and hormonal development. To assess cortisol development, both saliva and hair samples are used. In this project the focus is on cortisol in the first pretest.
Progression up to now: I have started the project in April 2015 and have been fully immersed in data collection and analysis. In addition to the data collection, I am currently processing and analyzing salivary cortisol data from the first

pretest home visit of 239 families with a 3- or 4-year-old twin who also participates in the study. From these families, a total of 2335 saliva samples have been analyzed for cortisol concentration. In addition, I am involved in writing a review on hormonal assays such as collected in L-CID.

Dr. Jizzo Bosdriesz, Postdoc, Mar/17 – Feb/18

Integrating behavioral genetics across cohorts in longitudinal perspective
Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to investigate the behavioral genetic aspects of child behavioral control and social competence across age and cohorts, and determine the relative influence of genetic and environmental factors.
Methods: Structural equation modeling will be used to assess to what extent individual differences in behavioral control and social competence can be explained by genetic (A), shared environmental (C), or unique environmental (E) factors. Outcomes are derived from MRI, EEG, observational, and questionnaire data taken from two partially overlapping cohorts of same-sex monozygotic and dizygotic twins, starting at age 3-4, and 7-8.
Progression up to now: Several papers are currently in progress, some of them close to being submitted. Specific topics of these papers include: hot and cool behavioral control, the associations between fear, effortful control, and frontal asymmetry, and neural reactions to social exclusion and prosocial compensation behavior. My main role in L-CID beside coordinating data-collection and interventions is the statistical support and consultation of the L-CID PhD students, postdocs and senior researchers.

Dr. Bianca van den Bulk, Post-doc, Jun/14 – Jan/23

Integrating neural intervention effects in a longitudinal twin study with a sequential cohort design
Bakermans-Kranenburg, van IJzendoorn, Crone; UL Faculty of Social and Behavioral Sciences

Aim: Within the Leiden Consortium on Individual Development (L-CID) we study the genetic, neurobiological and environmental influences on the development of social competence and behavioral control. We set-up a longitudinal twin study with an accelerated cohort-sequential design, in which a random selection of families is assigned to the VIPP-SD intervention or a control group. With this study design we are able to investigate the underlying mechanisms of differential susceptibility within and between families. Within L-CID, I focus on the effect of the intervention on neurobiological measurements like EEG/ERP and the relation to the development of social competence and behavioral control in early childhood. In addition, I am involved in the parent project in which we examine (1) whether the VIPP-SD influences parents' neural processing of children's emotional expressions and the neural precursors of response inhibition and (2) whether neural changes in these two neurocognitive factors mediate intervention effects on parenting behavior.

Methods: During all waves we collected child data on social competence and behavioral control, parent-child interaction data to examine sensitivity and sensitive discipline, a broad range of parent reported questionnaire data and ambulatory measurements. Wave two and three were conducted at the university and also included EEG/ERP/ECG measurements with the children. In addition, a random selection of primary parents were invited to the EEG lab at Leiden University right before and after the VIPP-SD/control condition to participate in the parent project which also included the collection of EEG/ERP/ECG data.

Progression: For the first wave, we included 237 families with a 3-4 year old same-sex twin and 256 families with a 7-8 year old same-sex twin. Currently we are starting up the fourth wave of data collection with the younger children in which 210 families are still participating. Of these families, 84 families were assigned to the VIPP-SD between wave two and three. For the older children, we are currently starting up the third wave of data collection in which 247 families are still participating. Together with Dr. Saskia Euser I am coordinating and supervising the L-CID project. In addition, I am involved in the supervision of two PhD. students (Ilse van Wijk and Laura Kolijn).

Rani Damsteegt, PhD student, May/13 – Mar/18

Parenting and prosocial development in childhood
Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to examine the effects of an intervention focused on positive parenting and sensitive discipline on prosocial behavior (a hallmark of social competence) of preschoolers.
Methods: Families with 3 or 4-year-old twins were invited to participate in our study. Two pretests will be

conducted, after which families will be randomly assigned to an intervention or control group. Prosocial behavior will be measured annually with two tasks: the Owl task (an age-appropriate version of prosocial Cyberball) to measure non-costly prosocial behavior, and the Donating task to measure costly prosocial behavior. We will also annually administer the Strengths and Difficulties questionnaire, which includes a prosocial behavior scale.
Progression up to now: Since September 2014 we have recruited 239 families with 3-4-year-old twins (total N = 478). Each family was visited at home for the first pretest. Furthermore, we successfully piloted Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD) for twin-families last summer. We have started year 2 of the study in September 2015, during which we invite families to the university for a lab visit. We are currently processing and analyzing data of the home visits from year 1, in which I will focus specifically on parental sensitivity and its relation with prosocial behavior.

Dr. Saskia Euser, Post-doc, Nov/13 – Jan/23

Intervention effects of video feedback on social competence and behavioral control in early childhood and early adolescence: The role of children's daily experiences
Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences

Aim: Within the Leiden Consortium on Individual Development (L-CID) we study the genetic, neurobiological and environmental influences on the development of social competence and behavioral control. We set-up a longitudinal twin study with an accelerated cohort-sequential design, in which a random selection of families is assigned to the VIPP-SD intervention or a control group. With this study design we are able to investigate the underlying mechanisms of differential susceptibility within and between families. In this project, I will focus on the role of children's daily life experiences in the intervention effects on children's behavioral outcomes.
Methods: During all waves we collected child data on social competence and behavioral control, parent-child interaction data to examine sensitivity and sensitive discipline, and a broad range of parent reported questionnaire data. In addition, several ambulatory assessments will be conducted during each of the pre- and posttests, such as self-reported mood and daily activities, observational measures of auditory stimuli in the environment and the family dinner, and several neurobiological measures like physical behavior during sleep and diurnal saliva samples.
Progression up to now: For the first wave, we included 237 families with a 3-4 year old same-sex twin and 256 families with a 7-8 year old same-sex twin. Currently we are starting up the fourth wave of data collection with the younger children in which 210 families are still participating. Of these families, 84 families were assigned to the VIPP-SD between wave 2 and 3. For the older children, we are currently starting up the third wave of data collection in which 247 families are still participating.
I have been and am currently involved in designing, developing, and fine-tuning the SamenUniek app, which is used for daily diary assessments and to help participants in performing all ambulatory assessments. Last June, I presented data on (behavioral genetics) of children's sleep quality on the conference of the Society for Ambulatory Assessments, and I am currently working on a paper about this data. Together with Dr. Bianca van den Bulk I am coordinating and supervising the L-CID project. In addition, I am involved in the supervision of two PhD students (Claudia Vrijhof and Elisabeth Bilo).

Laura Kolijn, PhD student, Apr/16 – Apr/20

Neural mechanisms involved in a parenting intervention that aims to enhance parental sensitivity and sensitive discipline
Bakermans-Kranenburg; Van IJzendoorn, UL Faculty of Social and Behavioral Sciences

Aims: The Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD) has proven effective in increasing parental sensitivity. However, the mechanisms involved are largely unknown. The focus of my PhD project is on two parental neurocognitive factors that may mediate the intervention effects on parenting behavior; face processing and response inhibition. More specifically, our first aim is to examine whether the VIPP-SD influences parents' neural processing of children's emotional expressions and the neural precursors of response inhibition. Our second aim is to test whether neural changes in these two neurocognitive factors mediate intervention effects on parenting behavior. By using electroencephalographic (EEG) we hope to gain more insight in neurocognitive factors that may underlie parenting behavior.
Methods: We tested 67 mothers of 4-6 year old same-sex twins. A random half of the mothers received the VIPP-SD (i.e. VIPP-SD adapted for twin families), consisting of 5 home visits in a 3-month period; the other half received a dummy intervention. Neurocognitive measures were acquired approximately 2 weeks before and 2 weeks after the intervention. Mothers' EEG activity was measured while they performed a stop signal task and in response to children's facial expressions. To obtain a complementary behavioral measure, mothers performed an emotion

recognition task. Parenting behavior was assessed during parent-child interactions at pre and post intervention lab visits.
Progression up to now: From April 2016 to August 2016 we prepared the assessments to start testing in September 2016. From September 2016 until now (testing will be finished in October 2017) we tested 67 mothers twice (pretest and posttest). I presented a poster about my study design in October 2016 (CID symposium Utrecht), in November 2016 (VNOP-ISED-CAS Research Days Leiden) and again in November 2016 (Donders Discussions Nijmegen). In March 2017 the study protocol of this study was published in BMC Psychology. In terms of data progression: the available EEG data in response to children's facial expression is preprocessed and ready for analysis once we finished the final participants in October.

Mara van der Meulen, PhD student, Jan/15 – Jan/20

Prosocial development in childhood and emerging adolescence
Crone, van IJzendoorn; UL Faculty of Social and Behavioral Sciences

Aim: The goal of this project is to study how the developing brain is shaped by the interplay of personal and environmental factors using a randomized controlled trial with longitudinal brain imaging. Specifically, my project focuses on developmental differences in compensating prosocial behavior, a hallmark of social competence.
Methods: We use a four-player Cyberball Game to investigate prosocial behavior. During the task, the participant is one of the four players in the game. Initially all players toss the ball to each other. In the second block two players no longer toss the ball to the third player, thereby giving the participant the opportunity to compensate for this exclusion. The percentage of tosses to the excluded player, compared to tosses to the other two players, is used as a measure for prosocial behavior.
Progression up to now: The paradigm was first tested in an adult sample (N = 23, all female), these results are published in van der Meulen et al., 2016. Next, we tested the same paradigm in a pilot sample of 7-8 year old children (N = 16, 8 males); these results are published in van der Meulen et al., 2017.
In September 2015 we started with the longitudinal data collection. We have included 256 families (N=512 children) in the first year. The first visit was a labvisit in which the children underwent (amongst others) a MRI scan. Results on heritability of neural reactions to social exclusion and prosocial compensation in middle childhood are currently under review (van der Meulen et al., under review).
In September 2016 we started the second annual visit, which was a home visit. 10 families dropped out and one family started in the second year, so we collected data of 247 families (494 children). We are currently collecting data of the third annual visit, which is a lab-visit.

Claudia I. Vrijhof, PhD student, Nov/13 – Nov/17

The way to success: behavioral control and prosocial behavior
Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to explore the relations between child characteristics and children's social, physical and economic environment on the one hand and children's behavioral control (preschool period, cohort 2) and prosocial behavior (early to mid-adolescence, cohort 3 pilot) on the other hand.
Methods: We use various observational measures to assess different aspects of behavioral control, including the ability to internalize and follow rules, even when tempted (cheating game), inhibitory control (stop-signal task), and delay of gratification (marshmallow test). Furthermore, we use parent-reports on children's behavioral control (the Child Behavior Questionnaire). Prosocial behavior is assessed with a four player virtual ball game in which one of players is excluded (the Prosocial Cyberball Game).
Progression up to now: For cohort 2 we recruited and visited 239 families with 3-5 year old twins (September 2014 to October 2015). Of these families, 215 participated in the lab visit one year later. Approximately 8 months after this lab visit, 84 families received the Video-feedback Intervention to Promote Positive Parenting and Sensitive Discipline for families with twins (VIPP-Twins) and 119 received a dummy intervention. One month after the (dummy) intervention, which was approximately one year after the first lab visit, 203 families participated in the third year visit in the lab. Currently, the one year follow-up assessment (year 4 visit) is conducted at the homes of the families. I contributed to the recruitment of the families, the data collection in the first and part of the second year and I trained and supervised the VIPP-Twins and dummy interveners. Furthermore, I delivered the VIPP-Twins to families myself. The pilot study of cohort 3 was conducted in 2013. I published one paper in 2016 and one in 2017 and I will submit a third paper within this month, and will finalize my dissertation before the end of the year.

Ilse van Wijk, PhD student, Feb/14 – May/18

Neural correlates of social rejection and aggression in young children
Van IJzendoorn, Bakermans-Kranenburg, Crone; UL Faculty of Social and Behavioral Sciences

Aim: The goal of this project is to study how the developing brain is shaped by genetic and environmental factors (for instance parent-child interactions) using a randomized controlled trial in a longitudinal twin study (six years). Specifically, my project focuses on the development of brain activity differences in frontal asymmetry and the neural correlates of social rejection and aggression.
Methods: To study frontal asymmetry a rest measurement during EEG was conducted (6x30 seconds eyes open and closed). Furthermore, social rejection and aggression was measured with a new social judgment task. Participants were shown pictures of peers that judge a personal belonging of the participant (positive, negative or neutral). Participants were requested to react to the peers' feedback by pressing a button, resulting in destroying the balloons of the peer. Balloon bursts (duration of button press) were used as a behavioral index of aggression.
Progression up to now: The social network aggression task in early childhood (SNAT-EC) was tested in a pilot study (N = 50) and used in the second year (N = 215) and third year (N = 203) of the longitudinal twin study. In a replication study with three samples (pilot sample and two test samples from the second wave in which each co-twin was randomly assigned to test 1 or test 2 sample; total N=150) we examined whether frontal asymmetry mediated the relation between social judgments and aggression; the results were published in July 2017. The data collection of year three is almost completed and we expect that all the EEG data is preprocessed (and thus ready for analyses) at the beginning of 2018. We are currently working on a paper about the behavioral genetics of temperament (fear and effortful control) and frontal asymmetry for which we use CBQ data from year 1 and EEG data from year 2.

WP3

Annelene J.P. Bloemen, PhD student, Dec/14 – Dec/17

Determinants and consequences of (low) cognitive control
Oldehinkel, Hartman, UMC Groningen, Dept of Psychiatry, Interdisciplinary Center Psychopathology and Emotion regulation (ICPE)

Aim: Adolescence is characterized by extensive neurodevelopmental changes. It has been hypothesized that disorders with a high incidence during adolescence, such as depression and anxiety, are neurodevelopmental disorders that result from premorbid vulnerabilities of the brain. Low cognitive control is an often-used marker of such brain vulnerabilities. Within the context of CID, cognitive control is highly relevant because it is a prerequisite for behavioral control, one of the two core outcomes. Whereas prior research suggests that low cognitive control is not a strong predictor of depression and anxiety in general, it may still do so in particular subgroups, e.g. youth with a vulnerable temperament. Cognitive control is important in regulating our behaviors and emotions, which may be particularly relevant in the context of specific risk factors. The central aim of this project is to examine the role of cognitive control in relation to the question why some individuals develop psychiatric problems while others do not, and why some remit while others have chronic and even worsening psychopathology. Insight will be gained by investigating how cognitive (behavioral) control may provide a buffer in the context of a vulnerable temperament, stress exposure, comorbid childhood psychopathology, and a high familial presence of psychopathology.
Methods: Existing (multiwave) cohort data will be used from TRAILS (TRacking Adolescents' Individual Lives Survey), LifeLines, ARIADNE, and NeuroIMAGE. Cognitive control was measured using either paper-and-pencil or computerized tasks. All other variables were measured by interviews or questionnaires.
Progression up to now: Start of the project was 20th of October 2014. Current situation is: one paper submitted; and for the second paper the analyses are finished and we are halfway through writing up the manuscript.

Andrik Becht, PhD student, Sep/14 – Sep/18

Why some adolescents thrive and others don't: The role of uncertainty dynamics.
Meeus, Vollebergh, UU Faculty of Social and Behavioral Sciences

Aim: There is massive evidence that uncertainty is a major risk factor in adolescent development. However, information on the development of uncertainty, the transmission of uncertainty in parent-adolescent relationships and how uncertainty predicts adaptive development is lacking. Aim of this CID-project is to overcome these limitations.

Methods: An intensive longitudinal design is used including 75 between day measures across five years to tap into certainty-uncertainty dynamics across adolescence.
Progression up to now: A 1st paper (published in *Psychological Assessment*) investigated longitudinal measurement invariance and measurement invariance across sex of the daily diary reports on identity, which are used for further study in the CID project. A 2nd paper (published in *Developmental Psychology)* investigates heterogeneity in development of certainty and uncertainty in identity formation across adolescence and concurrent development of psychosocial adjustment (social competence). A 3rd paper (published in *Child Development)* investigated socialization of self-certainty (as a part of social competence) across adolescence. We studied reciprocal within-person associations between parent and peer quality of relationships and the development of self-certainty, using a 5-year longitudinal, multi-informant approach. A 4th paper (in press, *Developmental Psychology*) investigated certainty-uncertainty dynamics in identity formation across adolescence. Specifically, we tested the direction of effects (i.e., developmental order) between certainty and uncertainty across adolescence. A 5th paper (in press, *Child Development),* investigated the neurobiological underpinnings of adolescent identity. Specifically, we tested how structural changes in grey matter volume of Nucleus accumbens and pre-frontal cortex predicted later identity. In A 6th paper (under review at *European Psychologist*) we provide a systematic review of the identity literature. Specifically, we provide an overview of key components (i.e., a sense of distinctiveness, coherence, and continuity) of identity formation. Another paper is in progress (not part of my dissertation, but concerns collaboration within the CID-community; to be submitted by February 1st). In this opinion paper, I am the second author, in which I collaborate with colleagues from CID in writing an opinion paper concerning statistical methods to study brain development in childhood and adolescence (Title: Moving beyond the study of mean level brain development: Studying heterogeneity in developmental trajectories).

Dr. Tina Kretschmer, Postdoc (until 1/12/2015) and **dr. Jennifer Klop-Richards**, Postdoc (since 1/12/15)

Examining the complex interplay between relationship experiences and individual factors to understand adolescent development
Oldehinkel, Meeus, Dekovic; UMC Groningen, Dept. of Psychiatry, Interdisciplinary Center Psychopathology and Emotion regulation (ICPE) and Dept. of Sociology

Aim: This project seeks to identify predictors of positive outcomes (educational and occupational success, prosocial behavior, self-competence, empathy; all hallmarks of social competence) and problem development (internalizing and externalizing behavior). In detail, project component #1 asked whether experiences in parent-child relationships are associated with experiences in relationships with peers and intimate partners and project components #2 and #3 focus on the interplay between relationship experiences and individual factors in predicting positive and negative outcomes.
Method: Data from all waves of the Tracking Adolescents' Individual Lives Survey (TRAILS) are used, though the focus is on measures of social relationships with parents, peers, and romantic partners and measures of adjustment.
Progression up to now: An article on the link between parent-child relationships/parent characteristics and peer experiences has been published in the Journal of Research on Adolescence (co-authors Sentse, Meeus, Verhulst, Oldehinkel); an article on the link between parent positivity in early adolescence and romantic involvement, commitment, and satisfaction (co-authors Vollebergh, Oldehinkel) is published in the International Journal of Behavioral Development. A third article on bullying development and its negative outcomes (co-authors Veenstra, Dekovic) is under review. This research has also been presented at conferences (European Association for Research on Adolescence, 2014; Society for Research on Child Development, Philadelphia). By the end of 2015, Tina Kretschmer accepted a UD position at the University of Groningen and was followed-up by Jennifer Klop-Richards, who is now preparing a paper on the optimal operationalization of the concept of thriving.

Dr. Odilia M. Laceulle, Postdoc (until 1/9/2015) and **dr. Anoek M. Sluiter-Oerlemans,** Postdoc (since 15/9/2015)

Developmental models of psychopathology an life outcomes
Ormel, Oldehinkel, Vollebergh, Van IJzendoorn, Van Aken, UMC Groningen, Dept. of Psychiatry, Interdisciplinary Center Psychopathology and Emotion regulation (ICPE) and UU Dept. of Developmental Psychology

Aim: In addition to work related to the enrichment of TRAILS study with measurements of a third generation, we started to investigate developmental models of psychopathology. The main aim was to use longitudinal data to disentangle the structure of psychopathology, the complex interplay between individuals and their environments (transactional models) in the prediction of psychopathology and life outcomes.
Methods: Data from all five waves of the Tracking Adolescents' Individual Lives Survey (TRAILS) are used, though the focus to date has been on measures of mental health, temperament/personality, social relationships, and early adult

life outcomes.
Progression up to now: A number of papers have been published and submitted. One article targeted the mediating role of perceived relationship affection in the temperament-stressful events association (European Journal of Personality; co-authors van Aken and Ormel). A second article investigated the structure of psychopathology in adolescence (Clinical Psychological Science; co-authors: Vollebergh and Ormel). A third paper investigated the relationships between adolescent personality and basal, awakening and stress-induced cortisol responses (Journal of Personality, in press; co-authors Van Aken and Ormel). A fourth paper, titled "Sequences of Mal-adaption: Pre-adolescent Self-regulation, Adolescent Negative Social Interactions and Young Adult Psychopathology", is in progress (co-authors Vollebergh and Ormel). Spring 2015, Odilia Laceulle accepted a UD position at the university of Tilburg and left CID September 1, 2015. Her successor, Anoek M. Sluiter-Oerlemans, started September 15, 2015. Currently, Anoek is involved in finalizing two unfinished papers (one investigating life outcomes of psychopathology, and one investigating the scar model of the relationship between psychopathology and personality) and brainstorming with CID PIs on how to elaborate the aim given her skills and interests.

Dr. Stefanie A. Nelemans, Postdoc, Sep/14 – Dec/15 & Jan/17– Sep/18

Development of internalizing symptoms in adolescence and early adulthood: Over-time links with biological, psychological, and social factors
Meeus, Oldehinkel; UU Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to provide more insight in the development of anxiety and depressive (i.e., internalizing) symptoms from adolescence to emerging adulthood, including over-time links with individual characteristics (e.g., genetics and stress reactivity) and social relationships (e.g., parenting and the parent-adolescent relationship).
Methods: This project uses existing longitudinal data from RADAR (UU), CONAMORE (UU), and potentially TRAILS RUG/UMCG). Longitudinal questionnaire data, physiological and cognitive data during a laboratory setting, and genetic data will be used. Analyses include a combination of person-centered and variable-centered longitudinal modeling techniques.
Progression up to now: From 2016 onwards, my research has increasingly focused on biological correlates and predictors of adolescent depressive and anxiety (particularly Social Anxiety) symptom development from early to late adolescence, as well as interactions between biological and psychosocial factors (particularly parenting of parent-adolescent relationship quality) or a more in-depth focus on the relevance of the parental context in predicting this development. A number of papers have been recently accepted for publication, are currently under review, or are currently in progress on these topics. Specifically, we have focused on the role of stress reactivity (of the HPA axis and ANS) in the persistence of adolescent Social Anxiety symptoms over time (Nelemans et al., 2017), the importance of discrepancies between parent and adolescent perceptions of the parent-adolescent relationship and early adolescent depressive symptoms (Nelemans et al., 2016), and polygenic × parenting environment interactions predicting adolescent social anxiety symptom development (Nelemans et al., under review; in collaboration with KU Leuven, Belgium) and adolescent depressive symptom development (Nelemans et al., in progress). In addition, we are currently focusing on the relevance of the parental context in predicting adolescent social anxiety symptom development (Nelemans et al., in progress; in collaboration with KU Leuven, Belgium) and adolescent depressive and Generalized Anxiety symptom development (Nelemans et al., in progress).

Alexander Neumann, PhD student, Aug/14 – Jan/18

The epigenetics of intergenerational transmission
Verhulst, Oldehinkel, van IJzendoorn; Rotterdam Erasmus MC, Department of Child and Adolescent Psychiatry

Aim: Co-occurrence of mental disorders is commonly observed, but the etiology underlying this observation is poorly understood. Studies in adolescents and adults have identified a general psychopathology factor associated with a high risk for different psychiatric disorders. The aim of the project is to study and distinguish general and specific (epi-)genetic risk factors to develop psychological problems, as well as related hormonal and brain profiles.
Methods: We constructed latent general and specific psychopathology factors based on repeated multi-informant (parental, teacher and self-report) data in the Generation R cohort. The general factor's SNP-based heritability was estimated using the GREML method, i.e. we used a genetic similarity matrix (based on 504,617 common genetic variants) to predict similarity in general psychopathology among 2,115 children at ages 6-8 years. General and specific factors were also estimated at ages 6-10 years and associated with global white matter integrity (from diffusion MRI) in a structural equation model. Global white matter integrity was defined as latent construct underlying 12 white matter tracts in 3,042 children. Furthermore, we performed a genome-wide association study

(GWAS) of a total problem sum score of child behavioral and emotional problems within the EAGLE consortium (20 cohorts, n=ca. 32,978). Currently ongoing is an epigenome-wide associations study (EWAS) of ADHD symptoms within the PACE consortium (5 cohorts), using birth and age 6/7 DNA methylation as predictors. We also investigated a hair pigmentation bias of hair cortisol measurements using a polygenic score of hair color. This is an interesting stress marker that we plan to relate to the general psychopathology factor. Additionally we investigated the SNP-based heritability of saliva and plasma cortisol using GREML in the Rotterdam Study (n=5705) and LD score regression using data from the CORNET consortium (n = 12,597). Finally, we plan to investigate the impact of stressful life events (obtained via parental interview) on methylation changes from birth to age 6 and 10 in Generation R.
Progression up to now: We published following findings: we observed a significant SNP heritability of 37% (SE=0.16, p=0.01) for a general psychopathology factor (doi: 10.1016/j.jaac.2016.09.498); a 1-standard deviation (SD) higher polygenic score of hair pigmentation (darker hair) was associated with 0.08 SD higher cortisol levels (SE = 0.03, p = 0.002) independent of genetic ancestry (doi: 10.1038/s41598-017-07034-w); and the SNP-based heritability of saliva and plasma cortisol was below 10% (doi: 10.1016/j.psyneuen.2017.08.011) for acute morning and awakening levels, as well as for total daily output. Currently unpublished findings include: a one SD increase of the global white matter integrity factor was associated with a β=-0.09SD (SE=0.03, p<0.01) decrease in general psychopathology. In contrast, an increase of white matter integrity predicted an increase of β=+0.08SD (SE=0.03, p<0.01) specific externalizing factor levels. We found 3 genes (DMWD, DMPL, SIX5) significantly associated with total psychological problems in a GWAS, but were unable to replicate the findings. We received results for the EWAS of ADHD symptoms and cord blood methylation and now are planning analyses for methylation at age 6/7. Data is ready for the next project, the impact of stressful life events on methylation changes, and a first proof-of-principle analysis has been completed.

Sabine Veldkamp, PhD student, May/15 – Oct/16

Why some pupils thrive and others do not. The role of genes and the environment.
Boomsma, Van Berkum; Vrije Universiteit Amsterdam, Faculty of Psychology and Education

Aim: The overall aim of my project is to study why some pupils thrive and others do not, with a focus on etiological factors underlying social-emotional (social competence) and cognitive development. This project aims to unravel causes of individual differences in academic skills (literacy and numeracy), bullying behavior and victimization (at ages 7, 9 and 12). The project will be divided in two parts: behavioral genetics and molecular genetics. The main research questions are: 1) What are the causes of individual differences in academic skills and bullying/victimization? Is the individual variation and co-variation mainly caused by genetic differences or environmental effects? Does the etiology depend on school characteristics? 2) Which genomic regions are associated with academic skills, bullying behavior and victimization?
Methods: To answer these research questions, the study will be conducted in twin pairs and their non-twin siblings in the Netherlands Twin Register (NTR) cohort. If available, parent data will also be added. The focus is on cross-sectional and/or longitudinal multiple rater data and school-test scores. This project builds on and will extend the database of the NTR on cognition and DNA/epigenetic variants. In addition, data about different school characteristics will be collected. To be more specific, data that will be collected: 1) survey data of the primary school teachers, as well as scores on tests of the Pupil Monitoring System (Cito), 2) DNA/epigenetic variants, and 3) publically available data of school characteristics. Part 1) and 2) are ongoing processes, whereas part 3) will be a new addition to the data collection.
Progression up to now: *Papers:* I studied whether twins are at high or low risk compared to non-twin children regarding bullying and victimization and whether bullying and victimization in twins depend on whether the co-twin is 1) genetically identical, 2) in same class or not, 3) of same or opposite sex, and whether 3) changes as children age. Moreover, some interactions and non-twin specific characteristics are investigated, namely gender and age (Veldkamp, TRHG 2017). *Data collection:* Teachers of 7, 9 and 12-year-old twins and their siblings filled out, after having ascertained parental consent, questionnaires on the development of the children. Up until now two waves of data collection (2016: N ~1900 and 2017: N ~1600) have been done and pupil monitoring test scores are available for one third of these children. In the last wave the Social Skills Rating System questionnaire was included and data on social competence are available for ~1000 children.

Dr. Eveline de Zeeuw, Postdoc, Dec/14 – Dec/17

Longitudinal development and intergeneration transmission of psychopathology versus wellbeing
Boomsma, Oldehinkel; Vrije Universiteit Amsterdam

Aim: The aims of the project are to collect intergenerational genetically informative data, to disentangle in a multi-rater design genetic and environmental influences on psychopathology and well-being and to investigate intergenerational transmission of psychopathology and well-being.
Methods: The mechanisms will be investigated using, amongst others, gene-environment interaction moderator models (GxE), parent-offspring (PO) and children-of-twins (COT) model. Four types of intergenerational data will be collected: 1) parents of young twins who are twins themselves, 2) sisters who are mothers of twins, 3) young twins who become parents themselves and 4) adult twins with adult offspring.
Progression up to now: *Papers:* Using a genetically informative design I showed that the negative association between ADHD and lower educational achievement could at least partly be explained by a causative relationship (de Zeeuw, BG 2017). I showed in a multi-rater design (father and mother) that the differences between preschoolers in autistic traits were largely due to genetic differences and that one third of the identical twin pairs were discordant for high autistic traits possibly due to resilience (de Zeeuw, JCPP 2017). I showed in a GxE and polygenic score design that, although socioeconomic background has a very large main effect on educational achievement, the heritability of educational achievement did not depend on SES (manuscript to be submitted). I showed in a PO design that the reason that children resemble their parents in well-being is because of genetic and not cultural transmission and that for wellbeing assortative mating is high (manuscript in preparation). *Data collection:* All participants in the Netherlands Twin Register (NTR) belonging to group 1 (~650 families), 2 (~450 families) and 4 (~700 families) have been identified. Data available for these children and their parents are, amongst others, psychopathology, wellbeing, educational achievement and behavioral control (ASEBA). The data collection in group 3 is ongoing. At this time twins from the cohorts 1986-1991 (~800 persons) have been invited to register their children with the NTR and ~135 families agreed to participate. Data collected in these children include measures on psychopathology, well-being, behavioral control (Childhood Behavior Questionnaire), temperament, the home environment and parenting styles.

WP4

Dr. Gabriël J.L. Beckers, Assistant professor, Oct/14 – Oct/17

Tracking sleep slow waves during avian vocal development
Bolhuis, Joëls; UU Faculty of Social and Behavioral Sciences

Aim: Sleep is strongly involved in learning, including vocal learning in songbirds and grammar learning in human infants. However, the underlying neurophysiological mechanisms that enable this, and that require the brain to be `off-line' during sleep, remain poorly understood. The aim of the current project is to provide insight into the role of slow-waves, which are large-scale cortical oscillations that occur during deep sleep, in perception and learning of vocalizations in zebra finches, Taeniopygia guttata. This songbird is a prominent animal model system for neuroscientific research into speech and language acquisition in human infants.
Methods: As a first step, we record action and local field potential activity with high-density multi-electrodes in cortical areas of isoflurane anesthetized birds. This type of anesthesia is an accepted model for deep sleep, and makes it possible to record from 64 intracerebral electrodes in parallel. This essentially yields a neuroimaging technique enabling us to accurately determine fast and complex temporospatial propagation patterns of slow-wave activity. Earlier research has shown that zebra finch cortex has a response bias to learned vocalizations during sleep and anesthesia.
Progression up to now: We successfully recorded slow-wave activity in zebra finches and obtained good spontaneous, auditory evoked and event-related action and local field potential activity in sub millisecond precision over long recording episodes. Parallel recordings in pigeons (collaboration with MPI) show similar slow-waves in sleeping pigeons. Analyses show sensitivity to vocal sequence structure, particularly in secondary auditory cortices. These systems may be involved in perception and learning of phonological syntax. Results are written up in two data manuscripts to be submitted by the end of 2017. One meta-analysis study has been published end 2016 (*Neuroscience & Biobehavioral Reviews*).

Dr. Sita M. ter Haar, Postdoc, Mar/15 – Jan/16

A neurogenetic analysis of birdsong learning as a model for infant development
Bolhuis, Joëls; UU Faculty of Social and Behavioral Sciences

Aim: This research aims to study the neurogenetic mechanisms behind song learning in zebra finches, which is extensively used as a model for speech and language acquisition in human infants. The first question to be answered

is whether individual differences in learning performance are associated with differences in gene expression.
Methods: We perform neurobehavioral research in combination with innovative genetic techniques: song analyses, behavioral responses and RNA-sequencing or microarray.
Progression up to now: An ethical proposal has been written for the animal experimentation committee to be able to start the research on animals. The plans have been discussed with a genetic birdsong expert collaborator (Prof. Claudio Mello). Before we can start genetic analyses we need to develop methods to quantify individual differences in development. In order to be able to distinguish gene expression patterns in good and poor learners, it is necessary to find precursors in vocal development that indicate good or poor learning. Therefore I have started to analyze vocal development of already existing song recordings during development. I investigate whether specific song elements or syllables (the units of which song consists) are acquired early in development and if this acquisition is more accurate and/or faster in good learners than poor learners. Also, I study if fast development (i.e. early song stabilization) leads to better or worse song performance as an adult. Once we know the developmental precursors, we can start measuring genetic variation associated with individual differences.

Dr. Sofia Kanatsou, Postdoc, Aug/15 – April/16

Genetic resilience in a combined model of stress early in life and later in adulthood on behavior and neurogenesis in mice
Joëls; UMC Utrecht Dept. of Translational Neuroscience, Brain Center Rudolf Magnus (BCRM) and UvA Swammerdam Institute for Life Sciences, Center for Neuroscience

Aim: The general aim of this project is to model the neurodevelopmental aspects of behavior (social competence and behavioral control) and structural plasticity after stress early in life and later in adulthood in male mice. Mineralocorticoid receptor (MR) function is considered important in mediating stress resilience. We therefore aim to study whether combined exposure of early life stress and stress in adulthood affects memory and neurogenesis and whether these effects can be prevented by increased transgenic overexpression of MR's.
Methods: We have used a novel approach for developmental behavioral and structural analysis in which mice are assessed in adulthood on a series of behavioral tasks measuring neuroendocrinological markers, locomotor activity, anxiety, learning and memory and adult hippocampal neurogenesis.
Progression up to now: 1) We have established and validated (neuroendocrine and behaviorally) the limited nesting and bedding model (ELS) to induce early life stress in mice through fragmented mother care. 2) We have established and validated (neuroendocrine and behaviorally) the chronic unpredictable stress model (CUS) to induce stress in adulthood in mice through a combination of physical and psychological stressors. 3) We have successfully imported the genetically modified mouse lines necessary to generate the forebrain specific overexpression mice.
Recently we have shown that increased MR functionality partially prevents chronic-stress induced reductions in hippocampal memory and structural plasticity in male mice (Kanatsou et al., 2015). Moreover overexpression of MRs protects against the consequences of early life stress on spatial memory, cell maturation and synaptic function in the dentate gyrus in male mice (Kanatsou et al., in preparation). Based on these findings, it is important to further explore the genetic resilience of MRs on behavioral and structural domains in a combined model of stress early in life and later in adulthood.

Jiska Kentrop, PhD student, Jul/14 – Jul/18

The effects of early life stress on social competence; possibilities for intervention
Van der Veen, Joëls, Bakermans-Kranenburg; UMC Utrecht, Brain Center Rudolf Magnus (BCRM)

Aim: Previous studies have shown that prolonged exposure to high levels of corticosteroids early in life affects stress-sensitivity, cognitive functioning and brain structure. Both early life and adolescence are sensitive periods, where environmental influences can have a critical influence on further brain development. Studies in animal models will help us to better understand the adverse effects of early life stress (specifically on social competence and behavioral control) and explore the possibilities of manipulation of the stress system in an attempt to counteract the effects of early life challenges.
The aims of the project are 1) to determine the effects of early life stress on behavioral control, social competence and pro-social behavior in rats in adolescence and adulthood and 2) to investigate the possibility of reversing these behavioral effects using either environmental or pharmacological interventions in early adolescence.
Methods: Rats were exposed to 24h maternal deprivation (MD) on postnatal day 3. At postnatal day 26 rats underwent a pharmacological or a non-pharmacological intervention. The pharmacological intervention consisted of a 3-day treatment with Mifepristone, a glucocorticoid receptor antagonist. The non-pharmacological intervention consisted of housing the rats in a complex environment (Marlau™ cages). In adolescence, social play behavior was

observed and in adulthood social competence was tested with the three-chamber social approach task and behavioral control and attention were tested with the 5-choice serial reaction time task.
Progression up to now:
Behavioral control: Adult male rats that were reared in a complex environment from postnatal day 26 onwards showed impairments in behavioral control and improved attention, as measured with the 5-choice serial reaction time task (published in Van der Veen et al., 2015), but there were no effects of MD. However, in a second experiment, MD male rats did show impairments in behavioral control, yet only after the rats also received a 3-day vehicle injection treatment in early adolescence, which might have been a second hit (published in Kentrop et al., 2016). Early adolescent Mifepristone treatment did not counteract the effects of early life stress.
Social competence: MD decreased social play, while the complex housing intervention increased social play in adolescent males. However, there was no significant interaction between MD and complex housing. MD and complex housing did not affect social play in adolescent females. In adulthood, MD impaired social discrimination in both males in females. That is, compared to non-deprived controls, maternally deprived rats were less able to discriminate between an unfamiliar and familiar rat. Unfortunately, complex housing was not able to moderate the effects of MD. Data on the effects of MD and mifepristone are currently being analyzed.
Conclusions: Early life stress in the form of maternal deprivation seems to have negative effects on behavioral control and social competence, though the effects are rather small and in some cases only emerge in combination with a putative second hit. Moreover, as complex housing was not able to moderate the effect of MD in any of the measured behaviors thus far, complex housing cannot be regarded as an effective intervention strategy for the negative effects of early life stress.

Jelle Knop, PhD student, Apr/16 – Apr/20

Testing the differential susceptibility theory in mice
Van IJzendoorn, Joëls; Leiden University, Child and Family Studies and UMC Utrecht, Brain Center Rudolf Magnus
Aim: The early life environment is of crucial importance for development of an individual, in particular for those who are genetically more susceptible. Recent evidence suggests that this gene x environment interaction is important for both the negative effects of early-life stress, as well as the positive effects of a stimulating and supporting rearing environment. This *for better and for worse* principle is proposed in the differential susceptibility theory. However, neurobiological underpinnings of differential susceptibility are poorly understood, highlighting the need of novel approaches that allow for thorough examination of neurobiology.
Therefore, the aim of this project is to establish an animal model to study the differential susceptibility theory in mice. Once established, this model will be used to study the underlying neurobiological mechanisms of differential susceptibility in greater spatiotemporal detail.
Methods: Heterozygous knockout mice of the Mineralocorticoid Receptor and Dopamine Receptor D4 are compared to wildtype siblings. After birth, litters will be exposed to either a negative, control of positive environment during postnatal day 2-9. The negative environment consists of a limited nesting/bedding model, resulting in chronic stress in pups via alterations in maternal care. The positive environment is created by a communal nesting paradigm in which two mothers and litters are co-housed, increasing maternal care. Offspring is then tested on several developmental measures and later-life behavior and neurobiology.
Progress up to now: The communal nesting model is established and the first large experiment using Mineralocorticoid receptor knockout mice is almost finished. The different conditions show expected results for body weight gain during early development. Male mice are being tested on puberty onset and fear conditioning performance. Female mice are scored on puberty onset and maternal care towards their own offspring.

Manila Loi, PhD student, Sep/13 – Sep/15

Intervention at puberty after early life adversity
Joëls, van IJzendoorn; UMC Utrecht, Dept. of Translational Neuroscience, Brain Center Rudolf Magnus (BCRM)

Aim: Early life adversity is a risk factor for the development of psychopathology in humans. The aim of this project was to understand *how* early life stress in a well-controlled rodent model affects various cognitive domains and whether this can be reversed by pharmacological intervention applied during a critical peri-pubertal developmental stage.
Methods: Wistar rat pups were removed from the mother for 24 h on postnatal day (PND) 3. Weaning was at PND21. Between PND26 and 28 the pups were treated twice daily with a glucocorticoid receptor antagonist (mifepristone), since this receptor is known to exacerbate damage to the brain. In adulthood (after PND90), rats were tested for spatial memory and decision-making.
Progression up to now: We observed that particularly in male rats (much more than in females), cognitive function

was disturbed by maternal deprivation. This was normalized by brief peri-pubertal treatment with mifepristone. A very similar pattern was observed for glutamatergic transmission in key areas involved in these behaviors. Given the rapid but lasting reversal due to mifepristone treatment, we tested the possibility that this compound works through epigenetic programming. Indeed, the efficacy of mifepristone to restore cognitive function disturbed by maternal deprivation was hampered by co-treatment with a methyl-donor and facilitated by a histone deacetylase inhibitor infused into the area of interest.

Carien Mol, PhD student, Oct/15 – Jun/18

Twitter evolution: Comparative linguistics of birdsong and child language acquisition
Bolhuis, Kemner; UU Faculty of Social and Behavioral Sciences

Aim: Both human language and birdsong involve complex, patterned vocalizations, implying that human infants and songbirds must solve common tasks, such as segmenting sounds into 'chunks' and pattern recognition. The aim of this study is to investigate the role of specific acoustic features in birdsong memory and recognition. A secondary aim is to develop methods to improve behavioral analysis of birds during experiments.
Methods: We will use zebra finches as model species for human speech and language. Firstly, song recognition will be studied by exposing adult zebra finches to their father's song and an unfamiliar song in auditory discrimination tests. A behavioral response difference of the birds towards these songs will imply recognition of the father's song. The role of specific acoustic features for song recognition will be studied by systematically manipulating the songs. We assume that if certain features are important for recognition, the behavioral response of the birds will change towards the manipulated songs. Secondly, we will develop methods to be able to analyse the behaviour of the birds with more detail, and hence, more subtle differences in the behaviour of the birds will be detectable.
Progression up to now: We wrote a review of the parallels between birdsong and human speech, and proposed that future comparative research should expand its focus to include prosody, i.e. the temporal and melodic properties that extend over larger units of song (co-authors Aoju Chen, René Kager and Sita ter Haar). Furthermore, we developed an experimental set-up to conduct auditory discrimination tests. Also, the first tests are conducted and, at the moment, we are writing a research paper about the results of these tests. Lastly, we developed a more detailed plan to improve the methods of analyzing the behavior of birds during the experiments.

Dr. Angela Sarabdjitsingh, Postdoc, Nov/13 – Feb/18

Genetic resilience to early life stress effects on the behavioral trajectory in mice
Joëls; UMC Utrecht, Dept. of Translational Neuroscience, Brain Center Rudolf Magnus (BCRM)

Aims: The general aim of this project is to model the neurodevelopmental aspects of behavioral and cognitive domains after early life stress (ELS) in male and female mice. Mineralocorticoid receptor (MR) function is considered important in mediating stress resilience. We therefore aim to study the contribution of high/low brain-specific MR expression to ELS and the behavioral trajectory.
Methods: We have used a novel approach for developmental behavioral analysis in which mice are assessed at different developmental stages on a series of behavioral tasks (behavioral control) measuring general health, neurological reflexes, locomotor activity, anxiety, short- and long-term memory and cognitive flexibility (Molenhuis et al., 2014). We use this longitudinal testing battery to assess the effects of early stress in males and females. Additionally we look at the contribution of changed MR expression in the brain.
Progression up to now: 1) We have established and validated (neuroendocrine and behaviorally) the limited nesting and bedding model to induce chronic early life stress in mice through fragmented mother care. 2) We have successfully imported the genetically modified mouse lines necessary to generate the forebrain-specific MR knockout and overexpression mice (6 lines in total). We have now started to breed the experimental animals and maintain the colonies. 3) We have experimentally validated the longitudinal test battery. Preliminary data show that early life stress affects social and cognitive domains in male mice. Besides continuing the current experiments, we now have the opportunity to address the behavioral developmental trajectory in females and in our genetic mouse models in which the expression of MR is either increased or decreased.

Dr. Rixt van der Veen, Assistant professor, Oct/13 – Oct/20

Influence of early life environment on later life social behavior in animal models
Joëls, van IJzendoorn, Bakermans-Kranenburg; Dpt. Translational Neuroscience, UMC Utrecht, Dpt. of Psychology, Education and Child Studies, Erasmus University Rotterdam and Dpt. of Child and Family Studies, Leiden University

Aim: In this project we bridge WP2 (human) and WP4 (animal models) by trying to capture in animal models the early life influences on the development of the social brain, as observed in human studies.
Methods: To this end, we have developed two approaches: The first is a rat model of neglect (maternal deprivation) in which we test outcome on several aspects of social behavior, both in adolescence and adulthood. The rat is the species of choice for testing (pro)-social behavior. In this study we use both an environmental and a pharmacological intervention during adolescence to possibly counteract negative early life influences. The second approach is a mouse model of genetic differential susceptibility in which we provide both an impoverished (providing limited bedding/nesting material) and an stimulating (communal nesting) early life environment and we test outcome on maternal care and behavioral flexibility. We use mineralocorticoid (MR) and dopamine receptor D4 (DRD4) heterozygous knock-out animals to study gene-early life environment interactions.
Progression up to now: The maternal deprivation (MD) protocol in our rat line let to impairments in social discrimination in adulthood (manuscript in progress). Effects on adolescent social play and behavioral inhibition only became visible after an extra challenge in adolescence. That is, only the MD group that received placebo infusion in adolescence showed impairments in behavioral control in adulthood (Kentrop et al. 2016) and differences in play behavior were only observed after a 24h social isolation prior to the play session, and not after the standard 3h (manuscript in progress). We however found a major influence of complex housing on behavioral inhibition and attention (van der Veen et al. 2015), play behavior and social interest (manuscript in progress). We are currently piloting a pro-social task for rats. In the mouse model, we have now set-up the conditions for impaired and stimulated early life environments and are in the middle of testing the effects of these conditions on maternal care behavior in heterozygous MR knock-out mice.

Mariëlle A.J. Zondervan-Zwijnenburg, PhD student, Jul/14 – Mar/19

Formalization and evaluation of prior knowledge based on prior/posterior predictive inference
Hoijtink, van Berkum; UU Faculty of Social and Behavioral Sciences

Aim: The aim of this project is to develop and evaluate methods with which formalized knowledge (i.e., prior information) derived from animal studies, completed waves of cohorts, or expert elicitation can be compared to new data, and answer the question: to what degree are the new data supported by the prior information? When the prior information and new data provide coherent information, they can be combined by means of Bayesian statistics to arrive at an updated conclusion about the current state of knowledge. We illustrate and apply the models developed to CID data whenever possible.
Methods: A simulation study for comparison of methods. Furthermore, we program our methods in R and R Shiny to make them accessible.
Progression up to now: We published papers on guidelines in formalizing knowledge based on literature and expert knowledge. We are revising a paper on evaluating the coherence between prior knowledge based on a previous study and new study (i.e., replication). Related to that paper is the R-package ANOVAreplication and the online application at https://utrecht-university.shinyapps.io/anovareplication/. We have submitted a paper on the performance of estimation methods with and without formalized knowledge. We are developing the process of evaluating the replication of studies beyond the ANOVA model. Furthermore, we are working to make a case that shows how to test the comparability of results found in animal and human studies.

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