Teaming up to understand individual development

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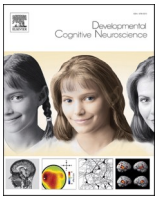

Teaming up to understand individual development

1. Rationale

Some children thrive and others don't, but why? This question is as important for science as it is for parents, educators and society at large. More specifically, children who fail to thrive are at risk of developing behavioral, emotional, and cognitive problems in spite of the almost unprecedented level of prosperity in today's Western society. Both early prediction and possibilities for adequate interventions of problem behaviors can alleviate the burden for society, parents, and last but not least the children themselves, providing them with a much better starting position in life. Behavioral Control (BC) and Social Competence (SC) are two key components for healthy child development and successful functioning in society. Child development, including behavioral control and social competence, is affected by biological and psychological child characteristics as well as social environmental factors, such as family, peers, and neighbourhood. These factors are not independent, but how they covary and interact in predicting child development, and behavioral control and social competence specifically, is poorly understood. To date, in-depth insight into these processes have been hampered by traditional boundaries of the research areas involved.

2. Objective

The Consortium on Individual Development (CID; https://individualdevelopment.nl) is an interdisciplinary Dutch consortium that unites developmental researchers from six Dutch universities and a wide range of behavioral and social science disciplines, including behavioral genetics, developmental (neuro)biology, psychiatry, neurocognition, developmental psychology, pedagogical sciences, communication science, and methodology & statistics. CID aims to build a comprehensive model of how developmental differences between children arise as a result of the interplay between child characteristics and (social) environmental factors (see Fig. 1). First, on brain development by employing state-of-the-art imaging techniques from birth to adolescence in a cohort starting in (1) early pregnancy and (2) before the onset of puberty (i.e., the YOUth study). Second, on environmental influences by a rigorous longitudinal intervention design in two cohorts of young twins starting in early childhood (3–4 y.o) and middle childhood (7–8 y.o) (i.e., the Leiden-CID [L-CID] study). Third, on intergenerational processes by capitalizing on the existence of multiple generation longitudinal cohort data across the Netherlands (i.e., the Generation-R, the Research on Adolescent Development and Relationships [RADAR], the TRacking Adolescents Individual Live Survey [TRAILS], and the Netherlands Twin Register [NTR] studies). Fourth and final, to complement cohort studies in these three areas, animal models and statistical expertise are explicitly part of CID.

3. Aims

CID aims to understand and predict how the interplay of child characteristics and (social) environmental factors results in individual differences in the development of behavioral control and social competence of children. Specifically, the aims are:

- To understand brain development as a mechanism underlying the associations between environmental effects and child characteristics.
- To understand how changes in development are dependent on individual differences in susceptibility to environmental influences.
- To understand transmission of behavior across generations, and the role of parenting and genetic factors herein.
- To predict long-term interactive effects between individual and environmental factors on developmental outcomes through animal and mathematical models.

4. Overview

This Special Issue describes the rationale and setup of CID. It presents the human and animal (working) models of behavioral control and social competence that we developed as guiding CID concepts as well as the methodology needed to ultimately understand and predict individual differences in child development of behavioral control and social competence. Vink et al. (2020) give a comprehensive overview of the current literature on the development of behavioral control and an outline of a conceptual framework providing a much needed foundation for research that focuses on an integrated approach with longitudinal data. Junge et al. (2020) present a contemporary model on the development of social competence. This model specifies how development of underlying skills and a variety of social-interaction contexts are building blocks of social competence development. In addition, Junge et al. clearly describe how each cohort and work package (WP) in CID contributes to such a model. Both papers are also a background for the studies in WP1.

Separate papers describe the theoretical scope and approach of the other different work packages in CID. The scope of WP2, in combination with outcomes of the L-CID study, is described by Crone et al. (2020) in an overview paper reflecting on the development of self and other-oriented social evaluation in childhood and early adolescence, and on the differential susceptibility to environmental enrichment. In a comprehensive review of four large longitudinal CID cohorts, and focussing on WP3, Branje et al. (2020) discuss methodological advances

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and challenges in disentangling genetic and non-genetic mechanisms of intergenerational transmission that shapes parenting behavior and psychopathology into the next generation.

Two papers cover advanced modelling of longitudinal effects in animal models of social and adaptive behavior as part of WP4. Van der Veen et al. (2020) and Kentrop et al. (2020) describe the important role and usefulness of rodent models for our understanding of adolescent development. The study by Kentrop et al. (2020) describes the application of a promising innovative task to assess prosocial decision-making in rats. Van der Veen et al. (2020) introduce a comprehensive overview of the application of rodent models in human cohorts, and highlight the added value of a controlled experiment allowing investigation of the mechanism underlying proposed relationships in human - and in particular - adolescent development. By presenting a unique comprehensive overview, the paper by Hamaker et al. (2020) inspires developmental scientists to critically reflect on the consistency between proposed research goals (descriptive, predictive, and explanatory) and research design/analysis. Moreover, after analyzing this (mis)match in 100 published studies within CID, this paper introduces some interesting 'novel' techniques for developmental scientists to consider in future research.

As CID focuses on development from birth to adolescence, large-scale longitudinal cohort studies, a method for which the Netherlands has a strong reputation, are at the core of all work packages. The cohorts within CID are characterised by an extensive range of measurements (e.g., from advanced gene sequencing and neural connectivity analyses to interviews and diary-assessments of parental behavior), covering an extended period of time (i.e., from prenatally up to 18 years of age, and/or spanning several generations). CID unites all existing Dutch cohorts on socio-emotional child and adolescent development, which together encompass data from tens of thousands of youth: RADAR, Generation-R, TRAILS, and NTR. In addition, two large new cohorts were set up that include extensive neurocognitive measurements (the YOUth cohort and L-CID). This Special Issue describes assessment protocols for the YOUth cohort. The paper by Onland-Moret et al. (2020) describes the design, population, determinants, measures and outcomes of the YOUth cohort, which will help greatly in facilitating replication and collaboration with other cohorts. In addition, the paper by van der Velde and Junge (2020) addresses a number of important issues regarding how infant characteristics and the testing environment impact data loss in the EEG studies conducted in the YOUth cohort. In a separate paper, a detailed and transparent description of the MR acquisition protocols in the YOUth cohort is described, but this paper by Buimer et al. (2020) also includes test-retest reliability of the included MR acquisitions in a group of adults. This information is valuable to the field at large as well as for researchers aiming to adopt protocols or reuse the data collected in the YOUth cohort. Moreover, the importance of data management is emphasised by a paper on how we incorporated the FAIR Data Principles to make data findable, accessible, interoperable and reusable for the YOUth cohort. Zondergeld et al. (2020) describe technical, organizational and financial challenges that go along the production and safe storage of FAIR and high-quality data for sustainable science. Methodological issues that arise when applying eye-tracking, a much used neurocognitive measure in child research, are discussed in the paper by Hessels and Hooge (2019). A fine balance of possible pitfalls and suggestions to handle these issues are covered in this overview paper

Finally, a series of empirical papers is presented that demonstrate the possibilities of the large (integrated) experimental and longitudinal datasets in combination with advanced methods.

Fakkel et al. (2020) show that weighing scores for social-economic status (SES) in six CID cohorts did not influence normative estimates of social competence and behavioral control. Fakkel and colleagues carefully weigh this finding against the level of missing data in SES indicators, and against their important finding that in almost all CID cohorts lower SES groups are severely underrepresented. By presenting initial evidence for genetic and environmental contributions in middle childhood to structure of the "social brain" on the one hand and prosocial behavior and empathy on the other hand, Van der Meulen et al. (2020) address the important issue of potential overlapping genetic factors in brain structure and behavior. Zondervan-Zwijnenburg et al. (2020) utilize the Bayesian research synthesis method to analyze longitudinal data from multiple cohorts with data on self-control measured with different instruments to provide insight in the change in behavioral control across development. Furthermore, the Bayesian research synthesis of multi-informant child self-control data from four cohorts within CID by Kevenaar et al. (2021) presents an inspiring integration of diverse data from different studies within a Bayesian framework. The latter two papers not only introduce developmental scientists to the

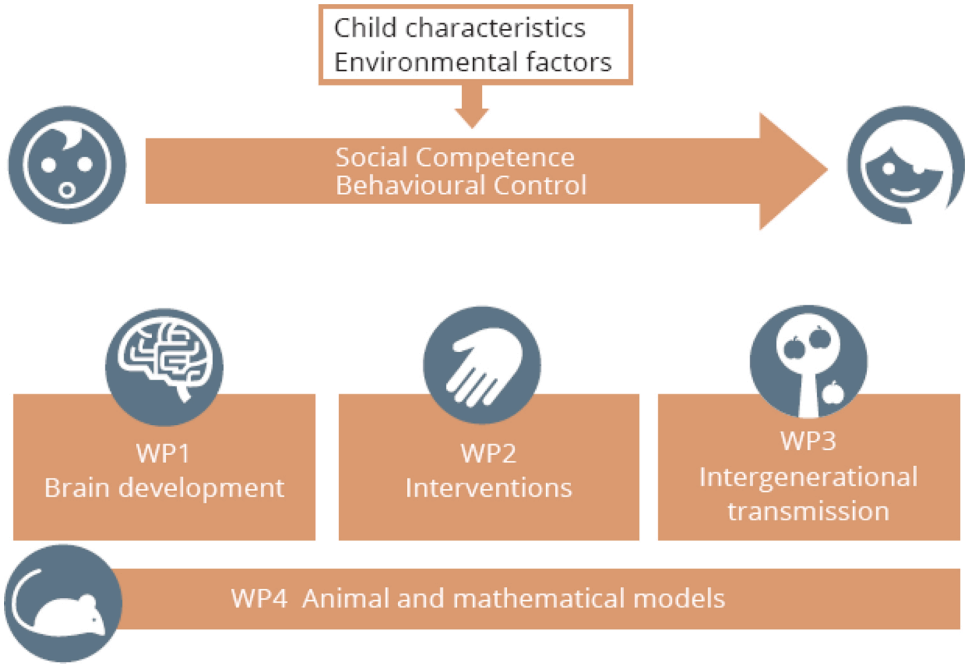

Fig. 1. CID examines how the environment and child characteristics affect the development of social competence and behavioral control. Social competence and behavioural control are central measures and a common thread in CID research. Within this joint focus, our four work packages (WPs) work on specific aspects of development: The role of brain development (WP1), Effects of interventions (WP2), The role of generational transmission in families (WP3), Animal and mathematical models of development (WP4).

Bayesian research synthesis method, but also illustrate more generally how different information from different studies may be combined to reach more robust conclusions.

We are proud this CID special issue presents what we have achieved by working together as a consortium in the past seven years. It is a privilege that the CID consortium was given the opportunity to really integrate, and benefit from, our diverse research fields to examine the question "Why some children thrive, and others do not".

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