

# GROEI!

A new look at how parenting affects children's stress reactivity and disruptive behavior

**Sarphati**  
amsterdam research for  
healthy living

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**OPGROEIEN** in  
amsterdam

## Aim

The main aim of GROEI! is to examine whether dysfunctional parenting predicts methylation (gene silencing) in a glucocorticoid gene pathway in children that is responsible for their heightened stress reactivity, leading to disruptive behavior.

## Background & scope

Temporary or stable disruptions in stress response are one characteristic of almost all forms of psychopathology—ranging from depression and anxiety disorder to Attention Deficit Hyperactive Disorder.

Infancy (0-3 years) marks a period of huge maturation of the child's neuroendocrine system involved in coordinating stress response. Recent research suggests that poor parenting quality may reduce the expression of genes that are involved in children's stress-system functioning. However, actual empirical support for this notion is limited to animal studies and cross-sectional or retrospective studies involving humans (often adults).

In this prospective study we, therefore, aim to investigate whether poor parenting quality of mothers and fathers during the first three years precedes changes in methylation of stress system genes, which in turn leads to poorer stress-regulation and disruptive behavior in children.

## Research participants and design

Parents who take part in the Sarphati Cohort are asked to fill out the 'Opvoedingsbelasting vragenlijst' (OBVL-k, Praktikon, 2019) when their infants turn 12 months old. A 75th percentile cut-off on the OBVL-k will be used to select parents that may be potentially at-risk for having high levels of parenting stress and for the development of dysfunctional parenting behavior.

Six measurement waves are planned to occur at regular six-month intervals, with recruitment and inclusion beginning in February 2020 (see Figure 1).

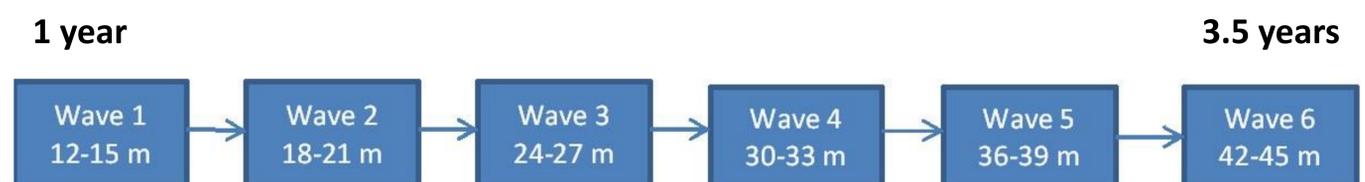


Figure 1. Timeline of the GROEI! study

During each measurement wave, families will be visited at home to assess: a) parenting behavior and attitudes, b) children's epigenotypes associated with stress-regulation, c) children's physiological and behavioral stress-regulation, d) children's self-regulation and e) internalizing and externalizing behavior of children.

- Parenting is assessed with self-report questionnaires and through home observations of parent-child interactions during free-play and challenging situations (e.g., parents are instructed to prevent their child from playing with certain toys).
- DNA is collected by collecting saliva samples with the OGR-collection kit (Genotek, 2019). This collection kit assists collection for donors unable to spit independently 0.75 ml saliva using multiple sponges and is, therefore, optimal for use with young children.
- Stress-regulation is assessed by measuring behavioral response, heart rate variability and skin conductance during rest and stress-eliciting tasks (LAB-tab assessment; Goldsmith and Rothbart, 1996).
- Children's self-regulation is measured with parent-report questionnaires and through observing children's inhibition of dominant responses during two tasks that elicit effortful control (Kochanska, 1996)
- Child behavior problems are measured with multiple parent-report questionnaires (e.g., CBCL; Achenbach, 2000)

## Hypotheses

- H1.1: Poor parenting quality leads to differential methylation of the glucocorticoid genetic pathway in children.
- H1.2: Methylation of the glucocorticoid genetic pathway leads to hyper-regulated stress reactivity in the ANS and HPA axis.
- H1.3: Hyper-regulation of stress in the ANS and HPA axis leads to increases in children's disruptive behavior.
- H1.4: Methylation patterns modulate genetic moderation of dysfunctional parenting effects on children's disruptive behavior.
- H1.5: Children's disruptive behavior reinforces dysfunctional parenting which further increases the risk of developing hyper-regulated stress reactivity.

## Significance

Findings from this study will lead to a better understanding of family-system influences on the development of stress-related behavior problems and mental health disorders. Specifically, with this study we will be able—as a first research team worldwide—to identify whether parenting can prospectively predict methylation changes in the glucocorticoid system, and through these changes affect children's likelihood of developing disruptive behavior