Department of Psychiatry and Psychotherapy

Division of Child and Adolescent Mental Health

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Research focus

- Prenatal and early risk factors for child development: FRANCES – Franconian Cognition and Emotion Studies
- Neural processing of emotional and disorder specific stimuli in girls with eating disorders
- Parenting stress in the context of mental health treatments for children and adolescents
- Therapeutic interventions - Clinical effects and underlying mechanisms
- Prenatal trauma and fetal programming in a mouse model

Structure of the Division

Professorship: 1
Personnel: 156

- Doctors (of Medicine): 27
- Scientists: 4 (thereof funded externally: 0)
- Graduate students: 14

Clinical focus areas

- Attention deficit/hyperactivity disorder (ADHD)
- Tic and obsessive-compulsive disorders
- Anxiety and depressive disorders
- Posttraumatic stress disorders
- Eating disorders
- Autism spectrum disorders
- Reduced intelligence with psychiatric comorbidity
- Regulation, feeding, and behavior disorders in early childhood

Research

The aims of the scientific projects of the Division of Child and Adolescent Mental Health are to contribute to a better understanding of the developmental processes and the neurobiological basis of emotional and behavioral disorders in children and adolescents and to learn more about the neuronal mechanisms of therapeutic interventions.
The main topics addressed by the research unit, headed by PD Dr. H. Heinrich and PD Dr. O. Kratz, are described below.

Prenatal and early risk factors for child development: FRANCES – Franconian Cognition and Emotion Studies

PI: Dr. A. Eichler
A longitudinal study, including 250 families, conducted in cooperation with the Departments of Obstetrics and Gynecology and of Psychiatry and Psychotherapy, examines the long-term effects of prenatal risks (including alcohol consumption, depression, stress) on child adaption aged between 6-9 (data collection 2012-2015) and 11-13 years (data collection since 2019). Child developmental status is operationalized in a multi-level design (cognitive, emotional, social factors): In addition to neuropsychological (e.g. intelligence testing) and neurophysiological measures (e.g. event-related cortical potentials), neurobiological markers are of interest, too, (e.g. alcohol metabolites in the meconium of the newborn; saliva/hair cortisol concentrations; epigenetic data from buccal cells; blood immune markers). The results indicate that even 'subliminal' alcohol consumption has negative effects on child brain development and that prenatal depressive symptoms affect a child's stress system which seems to be partly mediated by epigenetic changes in the DNA.
In cooperation with the Division of Pediatric Cardiology and supported by the Robert Enke Foundation, we have added a sample of children with a risk factor of early life stress, children with a congenital simple Ventricular Septal Defect, which was surgically corrected in infancy, to compare their developmental status with the FRANCES cohort. Deficits in language development were observed, which were moderated by positive parenting behavior. The mothers of affected children showed increased concentrations of the stress hormone cortisol in saliva.
Furthermore, again in cooperation with the Departments of Obstetrics and Gynecology and of Psychiatry and Psychotherapy and supported by the BMBF, we investigate in a randomized controlled study the effects of an app-based mindfulness-based program during pregnancy - designed to reduce the prenatal risks of maternal stress and substance use - on self-regulation, developmental status, and mental health in one year-old children.
Funding: Robert-Enke-Foundation, BMBF

Neural processing of emotional and disorder specific stimuli in girls with eating disorders

PI: Dr. S. Horndasch
In girls and women with eating disorders (anorexia nervosa, bulimia nervosa) versus typically developing girls and an adult control group, gaze behavior and central nervous and peripheral physiological responses were studied when viewing body scheme pictures of underweight, normal weight, and overweight women. Patients with eating disorders showed a visual attentional bias (measured via eye-tracking) towards body shape-related information and enhanced motivated attention (measured via EEG event-related potentials) following pictures of strongly underweight women. fMRI data reflect differential neural processing of food and body stimuli in patients with anorexia nervosa versus control participants and in adolescents versus adults.
Our current study is looking at neural reaction patterns of anticipation (when looking at food pictures) and actual consumption (when eating high and low calory food) via resting state fMRI.

Parenting stress in the context of mental health treatments for children and adolescents

PI: Dr. V. Irlbauer-Müller
Psychiatric disorders in children and adolescents are associated with a higher level of parenting stress. The affective-cognitive characteristic of parents has a negative impact on the observable parenting behavior, increasing the probability of dysfunctional parent-child-interaction and influences the child-/adolescent-reported internalized representation of the parent-child-relationship. Additional negative consequences for the child's/adolescent's psychological health and the parent-child-interaction are possible. Therefore psychiatric/psychotherapeutic support for children and adolescents has to include evidence-based interventions for both, the individual and for the family, especially for the parents. The current study compares different parent-specific interventions focusing the effects on the self-reported parenting stress and the child-/adolescent-reported internalized representation of the parent-child-relationship.

Therapeutic interventions – Clinical effects and underlying mechanisms

PI: Dr. P. Studer
Neurofeedback involves a brain-computer interface which enables to learn self-control over specific aspects of neural (EEG) activity. While our earlier multi-center studies were essential in

demonstrating the clinical effectiveness of neurofeedback (theta/beta and slow cortical potential training) for children with ADHD, our recent meta-analysis indicated in addition that neurofeedback effects (compared to non-active control treatments) lasted longer after the end of treatment. Our recent studies („short-term studies" with less training session) aim at how to optimize neurofeedback training and learn more about the mechanisms underlying a successful training („neuroplasticity").
Special light concepts are used to stabilize circadian rhythms in patients with psychiatric disorders. In our recently established light laboratory, we observed positive effects of blue versus red light on attention in 'healthy' adolescents (increased performance, reduced reaction time variability) and obtained first hints for improved sleep according to actigrahy measures after red versus blue light.
Further studies are planned to evaluate the effectiveness of light therapy in adolescents with psychiatric disorders.
Funding: ELAN-Fonds

Prenatal trauma and fetal programming in a mouse model

PI: Dr. S. Frey
We applied our mouse model of prenatal trauma to investigate molecular and epigenetic consequences for fetal brain development. Timing and their underlying mechanisms are of special interest. Prenatal trauma may cause decreased weight, increased HPA-axis activity, and behavioral symptoms of fear in the affected pups. Expression and methylation of Crhr1 changed postnatally in the dorsal hippocampus and prenatally in the hypothalamus. Our findings support the hypothesis that trauma-induced neuroendocrine and behavioral alterations are associated with stable changes of methylation and expression of stress-related genes from *in utero* time point on.

Teaching

The Division of Child and Adolescent Mental Health is involved in compulsory and elective courses in the curriculum of the degree program Medicine.
MD theses as well as Bachelor's and Master's theses (mainly in psychology) are supervised.

Selected publications

Van Doren J, Heinrich H, Bezold M, Reuter N, Kratz O, Horndasch S, Berking M, Ros T, Gevensleben H, Moll GH, Studer P. Theta/beta neurofeedback in children with ADHD: Feasibility of a short-term setting and plasticity effects. Int J Psychophysiol. 2017 Feb;112:80-88

Irlbauer-Müller V, Eichler A, Stemmler M, Moll GH, Kratz O. [Parenting stress and the reliability of parental information in the diagnostics of children and adolescents with symptoms of psychiatric and behavioral disorders]. Z Kinder Jugendpsychiatr Psychother. 2017 Jul;45(4):303-309

Heinrich H, Grunitz J, Stonawski V, Frey S, Wahl S, Albrecht B, Goecke TW, Beckmann MW, Kornhuber J, Fasching PA, Moll GH, Eichler A. Attention, cognitive control and motivation in ADHD: Linking event-related brain potentials and DNA methylation patterns in boys at early school age. Sci Rep. 2017 Jun 19;7(1):3823

Eichler A, Hudler L, Grunitz J, Grimm J, Raabe E, Goecke TW, Fasching PA, Beckmann MW, Kratz O, Moll GH, Kornhuber J, Heinrich H. Effects of prenatal alcohol consumption on cognitive development and ADHD-related behaviour in primary-school age: a multilevel study based on meconium ethyl glucuronide. J Child Psychol Psychiatry. 2018 Feb;59(2):110-118

Horndasch S, Kratz O, Van Doren J, Graap H, Kramer R, Moll GH, Heinrich H. Cue reactivity towards bodies in anorexia nervosa - common and differential effects in adolescents and adults. Psychol Med. 2018 Feb;48(3):508-518

Stonawski V, Frey S, Golub Y, Rohleder N, Kriebel J, Goecke TW, Fasching PA, Beckmann MW, Kornhuber J, Kratz O, Moll GH, Heinrich H, Eichler A. Associations of prenatal depressive symptoms with DNA methylation of HPA axis-related genes and diurnal cortisol profiles in primary school-aged children. Dev Psychopathol. 2018 Apr 2:1-13

International cooperations

Prof. L. Gabel, Lafayette College, Easton, Pennsylvania: USA

Dr. M. Arns, Brainclinics, Nijmegen: The Netherlands