Developmental coordination disorder in children: towards a more precise evaluation of the clinical picture and the underlying mechanisms

Summary / Zusammenfassung


Untersuchungen zeigen, dass 5% aller Kinder im Schulalter an einer umschriebenen Entwicklungsstörung motorischer Funktionen (UEMF, ICD-10 F82) leiden. In diesem Projekt wird die UEMF im Detail beschrieben und seine zugrundeliegenden Mechanismen mit neurophysiologischen Methoden genauer untersucht.

Developmental coordination disorder (DCD) is one of the most prevalent developmental disorders in school-age children (prevalence rate 5%). According to recently published interdisciplinary clinical practice guidelines, DCD is defined as movement skill performance below expected levels given the child’s chronological age. Furthermore, the disorder must significantly interfere with activities of daily living or academic achievement and the impairment should not be explainable by a medical or neurological disorder. Recent studies suggest that DCD children show underlying deficits in visual-motor translation of movements, adaptive postural control, and visuomotor learning.

The guidelines point to major gaps in the current research agenda. In particular, the significance of motor overflow, motor abilities, perceptual functions, visuomotor learning and brain plasticity processes remains unclear and requires further investigations with reliable quantitative methods and measures. We hypothesize that children with DCD show more motor overflow and poorer motor abilities than healthy controls. Consequently, these measures may be used as indicators of the severity of DCD. Furthermore, we suggest that different subtypes of DCD can be identified on the basis of motor and cognitive functions. We will also examine the contributions of different forms of visuomotor learning (model-based adaptation and model-free skills) in order to understand the underlying mechanisms of DCD. In fact, we speculate that impaired motor adaptation (i.e., poor modification of learned movements in response to changes of the environment) is an important mechanism of DCD. The impairment of motor adaptation may be related to compromised neural plasticity processes (as measured by the EEG power in specific frequency bands of the waking EEG). Thus, children with DCD may show differences in EEG markers of neural plasticity in the brain regions involved in motor adaptation compared to healthy control children.

A sample of 120 children with suspected DCD and 120 healthy controls between 7 – 9 years will be examined with standardized and reliable test instruments: the Movement-ABC (movement skill performance), the Zurich Neuromotor Assessment (motor overflow and abilities), the Wechsler Intelligence Scale for Children (fluid intelligence), and the Developmental Test of Visual Perception. To examine visuomotor learning and brain plasticity processes, a subsample of 30 children with suspected DCD and 30 healthy controls will perform a visuomotor learning task with baseline and rotation condition including adaptation learning. In addition, simultaneous EEG recordings of the waking EEG will be acquired that allow the study of brain topography. The project will include classical statistical analyses such as correlations between various outcome measures, more sophisticated methods such as dimension reduction techniques and clustering methods, and up to date topographic EEG spectral analysis.

We propose novel and original approaches for a more precise evaluation of DCD and for understanding basic disorder mechanisms (i.e., visuomotor learning and brain plasticity processes) by using up to date statistical techniques, applying a model of two different processes of motor
learning and recording simultaneous brain activity with state of the art neuroimaging techniques. The project may provide new insights into the mechanisms of DCD, one of the most frequent developmental disorders during childhood.

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