

## **DELTA-TRAIN: Training and Cognitive Restoration in Adolescents and Young Adults After Chronic Substance Use**

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**Abstract:** Adolescence is a critical developmental phase marked by increased academic and emotional stress, which can contribute to substance use and, ultimately, substance use disorders (SUD). Chronic substance use can lead to persistent cognitive impairments, such as difficulties with memory and impulse control, which hinder therapy success and social reintegration. To address these challenges, the "Dresden Multimodal Therapy Program for Adolescents with Chronic Substance Use" (DELTA) was developed, integrating cognitive-behavioral therapy (CBT), motivational interviewing, and contingency management. As an extension, DELTA-Train incorporates Neuronation, a science-based cognitive training app shown to enhance working memory focusing on cognitive domains such as attention, speed, and deductive thinking. The ongoing study uses a mixed between- and within-subject design. Adolescents with SUD receive DELTA therapy alongside Neuronation training (16 weeks, three sessions/week, 20 minutes each), while a healthy control group participates in Neuronation training alone. Data are collected pre- and post-intervention to assess substance use symptoms, comorbidities, biomarkers or methylation analysis, and cognitive performance. Conducted at the Dietrich Bonhoeffer Clinic in Ahlhorn and in collaboration with the University of Oldenburg, this study explores the feasibility and efficacy of the intervention.

Preliminary results from a feasibility study revealed high dropout rates but positive participant feedback, indicating enjoyment of group therapy and cognitive training. It is hypothesized that DELTA-Train will lead to reduced substance use symptoms, lower tobacco consumption, improved cognitive performance, and decreased cortisol levels, promoting long-term recovery and social reintegration.

**Keywords:** adolescence, substance use disorder, cognitive training, DELTA-Train, Neuronation, multimodal therapy, cognitive-behavioral therapy