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Curb Your Addiction (C-Ya): A Smart-Phone based working memory training intervention for substance use disorder that alters brain structure and function in methamphetamine users in Cape Town, South Africa

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Background: Methamphetamine use disorder (MUD) is associated with decreased control over drug craving and altered brain structure and function in the frontostriatal network. However, the nature of structural and functional changes following a course of psychological intervention including cognitive training (CT) is not yet known. **Methods:** 66 males (41 MA patients, 25 healthy controls, HC) between the ages of 18–50 were recruited, MUD from new admissions to an in-patient drug rehabilitation centre and the HC via public advertisement, both in Cape Town, South Africa. 17 MUD patients received 4 weeks of treatment as usual (TAU), and 24 MUD patients completed TAU plus daily 30-minute CT using a Smart-Phone based working memory training called Curb Your Addiction (C-Ya). Structural and functional magnetic resonance imaging (s/fMRI) at baseline and 4-week follow-up was acquired and SPM8 was used for analysis. Approximately 50% of patients were interviewed 2 years' later. **Results:** TAU was associated with larger bilateral striatum (caudate/putamen) volume, whereas CT was associated with more widespread increases of the bilateral basal ganglia (incorporating the amygdala and hippocampus) and reduced bilateral cerebellum volume coinciding with improvements in impulsivity scores. Furthermore, functional differences were observed in the corticolimbic circuitry in line with core working memory network after CT that corresponded with improvements in impulsivity and self-regulation. At 2-year follow-up there were remaining differences in impulse control measures in a sub-sample of CT versus TAU patients. **Conclusions:** Utilisation of additional working memory training as an adjunct to treatment may further normalize frontostriatal structure and function.

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