Effects of chronic methamphetamine administration on the striatal functional connectivity in Cynomolgus monkeys: a preliminary study

Jihye Choi, Ji-Won Chun, Jin-Young Kim, Kyu-Tae Chang, Han-Na Kim, Kang-Jin Jeong, Sang-Rae Lee, Dai Jin Kim, Arom Pyeon

Department of Functional Genomics, University of Science and Technology, Daejeon, Republic of Korea

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Jihye Choi, Ji-Won Chun, Jin-Young Kim, Kyu-Tae Chang, Han-Na Kim, Kang-Jin Jeong, Sang-Rae Lee

Laboratory of Addiction, Department of Psychiatry, Seoul St. Mary’s Hospital, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea

Department of Primate Research Center (NPRC), Korea Research Institute of Bioscience and Biotechnology (KRIBB), Cheongju, Republic of Korea

Department of Functional Genomics, University of Science and Technology, Daejeon, Republic of Korea

Abstract

It is reported chronic methamphetamine (MA) use has repercussions for the behavioral and neuropsychological aspects. The repeated MA use is associated with altered activation and decreased dopamine concentrations in the striatum, which may contribute to addiction. The aim of the current study is to investigate the changes of the resting-state functional connectivity (RSFC) of the striatum as consequences of chronic administration of MA in nonhuman primates.

To induce the chronic MA exposure, eight Cynomolgus monkeys, macaca fascicularis, administered 0.9% saline for the first 4 weeks and then MA for the following 8 weeks (5–8 week, 0.1-0.75mg/kg; 9–11 week, 0.75mg/kg). Monkeys underwent resting-state functional magnetic resonance imaging (fMRI) at 9 time points (baseline, every week from 4 to 11 weeks). We used a seed-based correlation analysis to generate the functional connectivity maps, and the caudate nucleus (CN) and putamen were chosen as seeds. A paired t-test was used to examine the changes of the RSFC according to the duration of the MA administration (P_uncorrected < 0.005, k > 10).

The RSFC of the left CN to the supplementary motor area (SMA) decreased steadily over the 11-week administration of MA, which may lead to the loss of motor control observed in the drug addicts. In addition, the putamen exhibited decreased RSFC to the anterior cingulate cortex, a key region of the reward-related limbic system.

This result of altered functional connectivity of the monkey striatum as consequences of the chronic exposure to MA may provide an insight into the neural mechanisms underlying behavioral abnormality and dependence on the drug induced by the long-term MA exposure.

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Altered functional connectivity related smartphone overuse in adolescent.

Dai-Jin Kim, Jin-Young Kim, Arom Pyeon

Department of Addiction, Department of Psychiatry, Seoul St. Mary’s Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

Department of Biomedicine & Health Science, The catholic University of Korea College of Medicine, Seoul, South Korea

Abstract

The recent development of smartphone has brought about a radical change in the social life. These changes have brought enormous convenience to the modern society, but considering that smartphones are sharing most aspects of the Internet, the addiction to smartphones is highly likely to cause physical and psychosocial problems as well as Internet addiction. The aim of this study is to investigate altered brain functional connectivity in adolescent who overuse their smartphones (SUD) compared with normal control adolescents (NC).

20 male adolescents with smartphone addiction (mean = 13.45 ± 0.94) and 22 age-matched normal controls (mean = 13.47 ± 1.00) were recruited for fMRI experiments. The groups were classified according to Smartphone Addiction scale (SAS) and The SAS consists of 15 items, which are four-point Likert scale (1: Not at all to 4: Always).

A high-resolution T1-weighted MRI data set was obtained from subjects using a Siemens MAGNETOM Verio 3.0T MRI scanner with an 8-channel SENSE head coil. For the resting state fMRI scanning, subjects were asked to fixate a cross during resting state without movement for 6 minutes 40 seconds. 200 EPI images were acquired and 5 images were discarded for equilibrium. For the spatial preprocessing of the EPI images, we applied realigning, coregistering, normalizing and smoothing one by one. In addition, temporal band-pass filtering to the smoothed data, detrending the globally increasing tendency and regressing out the motion parameters and the effects from the white matter and cerebral spinal fluid are applied. Then, we analyzed the functional connectivity based on the inferior parietal lobule (IPL) by calculating the Pearson’s correlation coefficients of the time series.

In the result, Inferior parietal lobule showed different functional connectivity with two groups. Compared with NC, adolescents with SUD showed decreased functional connectivity in the anterior insula and primary motor cortex.

Error! Reference source not found. These results suggest that SUD adolescents’ brain was functionally altered from NC adolescents’ brain in the resting state.

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Untargeted Global Metabolomics Reveals Metabolites Associated with Acamprosate Treatment Outcome

Ada Ho, David Hinton, Victor Karpyak, Sun Choi, Dutta Tumpa, Mark Frye, Joanna Biernacka, Doo-Sup Choi

Department of Molecular Pharmacology and Experimental Therapeutics, Department of Psychiatry and Psychology, Mayo Clinic, Rochester, Minnesota, USA

Abstract

Untargeted global metabolomics revealed that acamprosate treatment leads to metabolic alterations in rats with voluntary alcohol consumption. This study aims to evaluate whether acamprosate treatment alters the serum metabolome of alcohol-dependent patients. Blood samples were collected from patients before and after 7 weeks of acamprosate treatment. The metabolome was analyzed using UPLC coupled to tandem mass spectrometry (MS/MS). The data were analyzed using a combination of statistical methods, including principal component analysis, partial least squares-discriminant analysis, and permutation testing. The results showed that acamprosate treatment significantly altered the serum metabolome, with changes in a number of metabolites associated with acamprosate treatment outcome. These findings provide a basis for further investigation of the mechanisms underlying acamprosate treatment efficacy in alcohol-dependent patients.