

# Neurotransmitters in Young People with Internet and Smartphone Addiction: A Comparison with Normal Controls and Changes after Cognitive Behavioral Therapy

Thursday 10:30-10:40 AM | SSQ16-01 | Room: N229

## PURPOSE

To reveal changes in neurotransmitters in internet and smartphone addicted youth compared with normal controls and after cognitive behavioral therapy, and to identify the correlations between neurotransmitters and affective factors related to addiction.

## METHOD AND MATERIALS

Institutional review board approved this prospective study and informed consents were obtained. Nineteen young persons with internet and smartphone addictions consisted of 9 males and 10 females and their mean age was  $15.47 \pm 3.06$  years. Nineteen gender and age-matched healthy controls were also included. Nine weeks cognitive behavioral therapy was administered to 12 addicts ages 11 to 17 years. MEGA-press MRS was used to measure GABA and glutamate-glutamine (Glx) levels in the anterior cingulate cortex. GABA and Glx levels in the addicted group were compared to controls and after 9 weeks of cognitive behavioral therapy. GABA and Glx levels were correlated to clinical scales of internet and smartphone addictions, impulsiveness, depression, anxiety, insomnia and sleep quality.

## RESULTS

Brain-parenchymal and gray-matter volume adjusted GABA to creatine ratios ( $p=0.028$  and  $0.016$ ) and GABA to Glx ratios ( $p=0.031$  and  $0.021$ ) were significantly increased in internet and smartphone addictions. After 9 weeks of cognitive behavioral therapy, brain-parenchymal and gray-matter volume adjusted GABA to creatine ratios ( $p=0.034$  and  $0.026$ ) and brain-parenchymal volume adjusted GABA to Glx ratio ( $p=0.05$ ) were significantly decreased. Glx was not statistically significant. Most brain-parenchymal and gray-matter volume adjusted GABA to creatine ratios and GABA to Glx ratios were significantly correlated with clinical scales of internet and smartphone addictions, depression and anxiety.

## CONCLUSION

The increased GABA level and disrupted balance between GABA and glutamate in the anterior cingulate cortex may contribute to understanding the pathophysiology of and treatment for internet and smartphone addictions. Correlations between neurotransmitters and psychology tests in internet and smartphone addictions may reveal the relation and solution to their psychological comorbidities.

## CLINICAL RELEVANCE/APPLICATION

The increased GABA in internet and smartphone addicted youth and its decrease after cognitive behavioral therapy will be useful to reveal the neurobiology of comorbidities and treatment.