

EPISTATIC EFFECTS OF BDNF, 5HTTLPR AND MAOA IN INTERACTION WITH ENVIRONMENTAL ADVERSITY ON ADOLESCENT CRIMINALITY

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Objectives and aims: Epistatic effects between gene variants of 5-HTTLPR (L=long, S=short), MAOA-VNTR (L=long, S=short), and BDNF Val/Met have been found with regard to behaviour in experimental animals as well as indicated in human samples in relation to neuroticism and depression. In the present study we studied epistatic effects of the above gene variations in an interaction with environmental adversity on adolescent criminality.

Methods: Family maltreatment, sexual abuse and criminality were measured by self-reports in a Swedish adolescent population-based sample (n=1819). Genomic DNA was isolated from saliva and used for genotyping of the BDNF, the 5-HTT and MAOA genes.

Results: BDNF genotype showed a main effect on adolescent criminality. BDNF also showed a two-way interaction with 5-HTT and Family maltreatment. 5HTT showed two-way interactions with MAOA and Family maltreatment. MAOA also showed a two-way interaction with Family maltreatment. Significant three-way interactions were found for; BDNF-5-HTT-Family maltreatment; BDNF-MAOA-Family maltreatment; BDNF-MAOA-Sexual abuse; and 5HTT-MAOA-Family maltreatment. Significant four-way (G*G*G*E) interactions were found for BDNF-5-HTT-MAOA-Family maltreatment and BDNF-5-HTT-MAOA-Sexual abuse, respectively.

Boys showed a stronger effect of environmental adversity compared to girls. However, there were no significant sex-gene interactions. Furthermore, the two most genotypically divergent groups, according to expression levels, showed the highest criminality scores (MAOA-LL + 5-HTT-LL + BDNF Val-Val vs. MAOA S/LS + 5-HTT-S/LS + BDNF Val-Met/Met-Met), when exposed to environmental adversity.

Conclusions: There are significant epistatic effects between 5-HTT, MAOA and BDNF genotypes and environmental adversity for criminal behavior. Two distinct “types” can be recognized with regard to genotype.