

Parenting Interacts with Plasticity Genes in Predicting Behavioral Outcomes in Preschoolers

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Abstract

Background: Public health and pediatric nurses typically focus on supporting parenting to reduce the likelihood of children's behavioral problems. Studies have identified interactions between early exposures to stress in caregiving and child genotype in predicting children's behavioral problems, such that certain genotypes connote greater differential susceptibility or plasticity to environmental stressors. We sought to uncover the interaction between observational measures of parent-child relationship quality and genotype in predicting early-onset behavioral problems in 24-month-olds, using prospective methods.

Methods: We conducted a secondary analysis of data collected on a subsample of 176 women and their infants enrolled during pregnancy in the ongoing Alberta Pregnancy Outcomes and Nutrition (APrON) cohort study. Inclusion criteria required mothers to be ≥ 18 years of age, English speaking and ≤ 22 weeks gestational age at enrollment. Genetic data were obtained from blood leukocytes and buccal epithelial cell samples, collected from infants at three months of age. For each child, the presence of plasticity alleles was determined for BDNF, CNR1, DRD2/ANKK1, DRD4, DAT1, 5-HTTLPR, and MAOA and an overall index was calculated to summarize the number of plasticity alleles present. Observational assessments of parent-child relationship quality (sensitivity, controlling, and unresponsiveness) were conducted at six months of age. Children's internalizing (e.g., emotionally reactive, anxious/depressed, somatic complaint, withdrawn) and externalizing (e.g., aggression, inattention) behaviors were assessed at 24 months of

age. After extracting genetic data, a maximum likelihood method for regressions was employed with Akaike Information Criterion (AIC) for model selection.

Results: When parents were less responsive and children possessed more plasticity alleles, children were more likely to be emotionally reactive, anxious/depressed, report somatic complaints, and withdrawn, while when parents were less responsive and children possessed fewer plasticity alleles, children were less likely to display these internalizing behaviors, in a differentially susceptible manner. Furthermore, when parents were more responsive, and children possessed more plasticity alleles, children were less likely to display internalizing behaviors ($P=0.034$). Similarly, children who possessed either the CNR1-A plasticity allele ($P=0.010$) or DAT1 9-repeat plasticity allele ($P=0.036$) and experienced more/less parental control displayed more/fewer externalizing problems, respectively, in a differentially susceptible manner.

Conclusions: The plasticity index score interacted with parental unresponsiveness in predicting anxiety and depressive behavioral problems in children, while individual genetic variants interacted with parental controlling behavior in predicting aggression and inattention in children, suggestive of differential susceptibility to caregiving. Especially in the context of nursing interventions designed to support childrearing and children's development, nurses need to be aware of the interactions between child genotype and parenting in understanding how well interventions will work in promoting optimal child behavior.

Keywords: Parent-child relationship, sensitivity, responsiveness, control, genotype, differential susceptibility, child behavior, Alberta Pregnancy Outcomes and Nutrition Study