



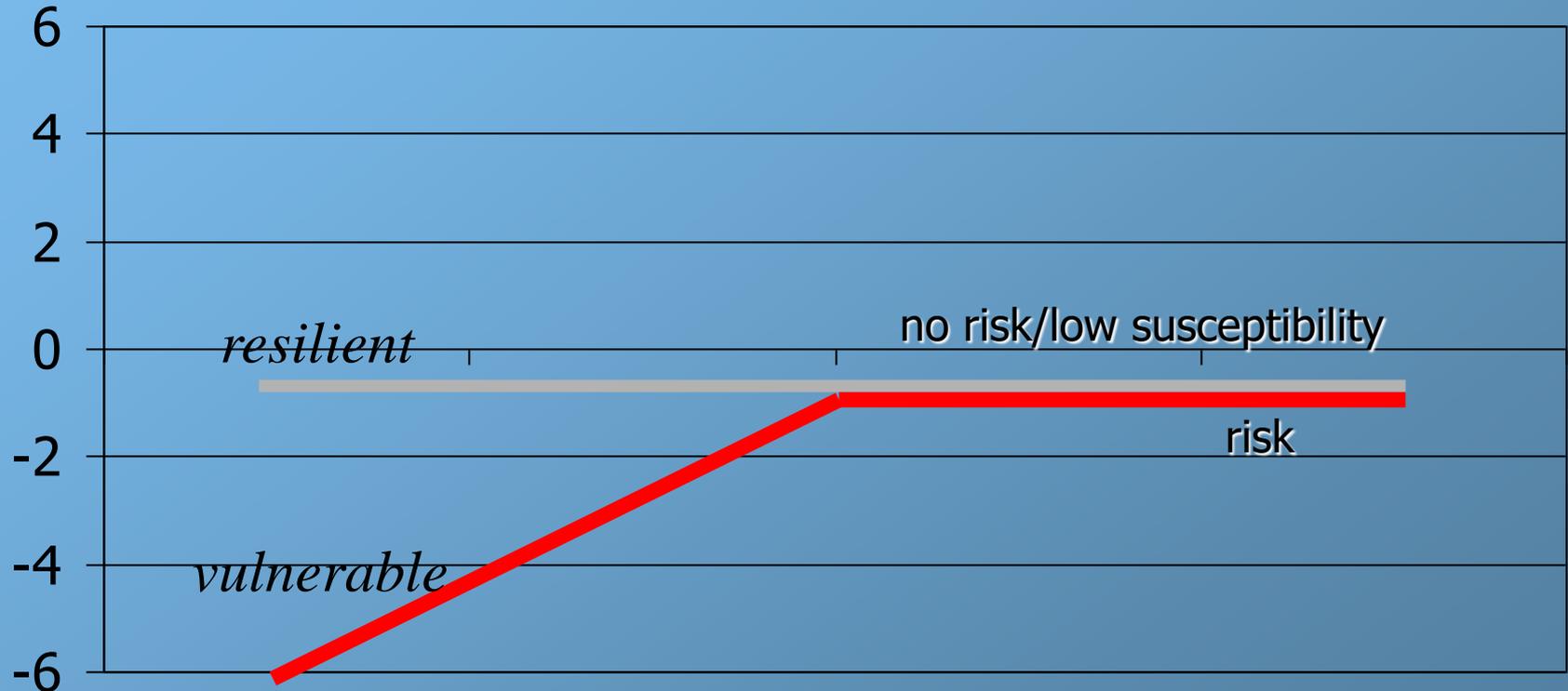
Child-Adolescent Experiences and Exposures Affect Some Children More Than Others: Evidence From The West

Jay Belsky
13 May 2019

One prevailing model of how environmental factors, including those experienced early in development, shapes human development is the dual-risk model of environmental action

DUAL-RISK

Positive
child outcome



Negative
child outcome

negative

→ environment

positive



**GENERAL DEVELOPMENTAL
QUESTION:
WHY WOULD EVOLUTION CRAFT
AN ORGANISM WHOSE FUTURE
FUNCTIONING IS INFLUENCED BY
ITS EARLIER EXPERIENCES?**

The future is
uncertain!



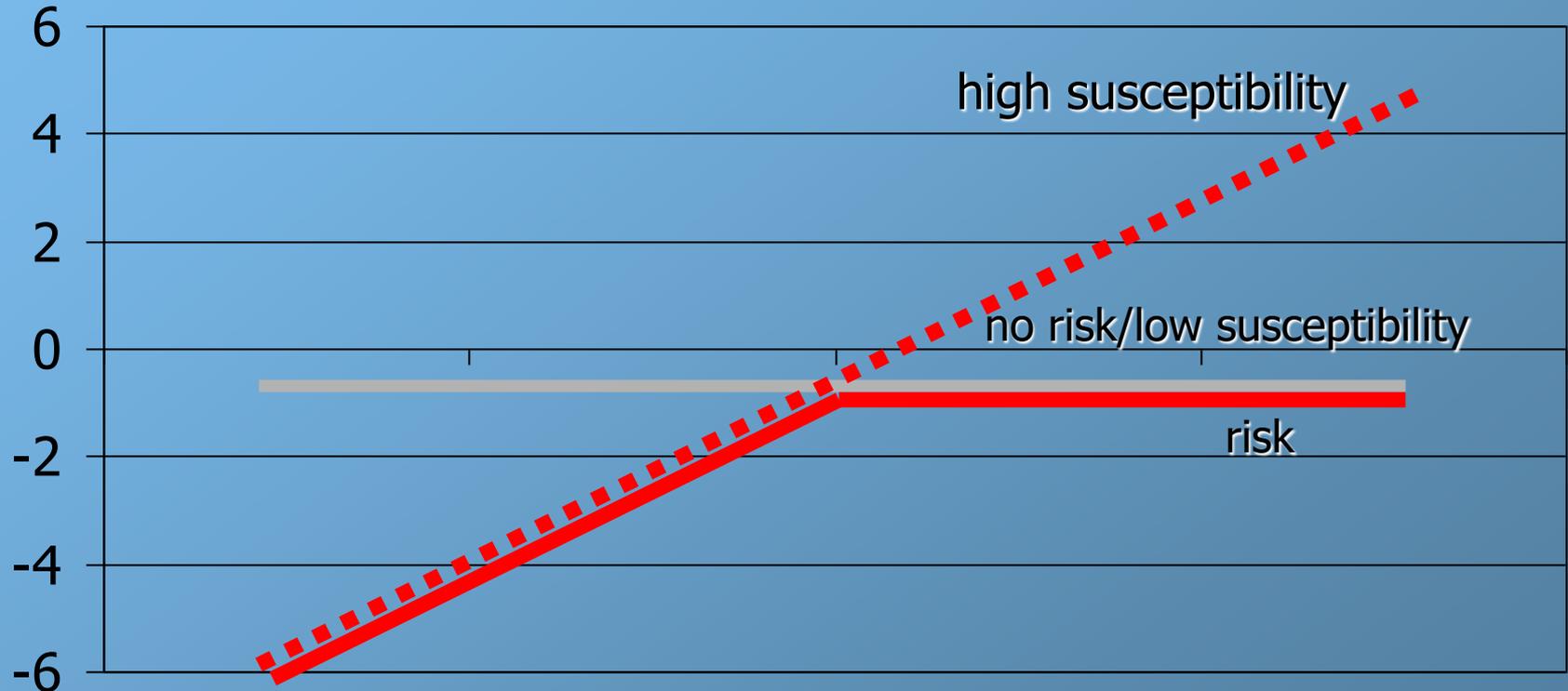
This observation
suggests an alternative
conceptualization of
how child-adolescent
experiences shape
development



HOW DIFFERENTIAL SUSCEPTIBILITY DIFFERS FROM DUAL RISK

Differential Susceptibility vs. Dual Risk

Positive
child outcome



Negative
child outcome

negative

→ environment

positive

OUTLINE



- I. Observational Evidence
 - A. Temperament
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 - 2. Multiple Genes
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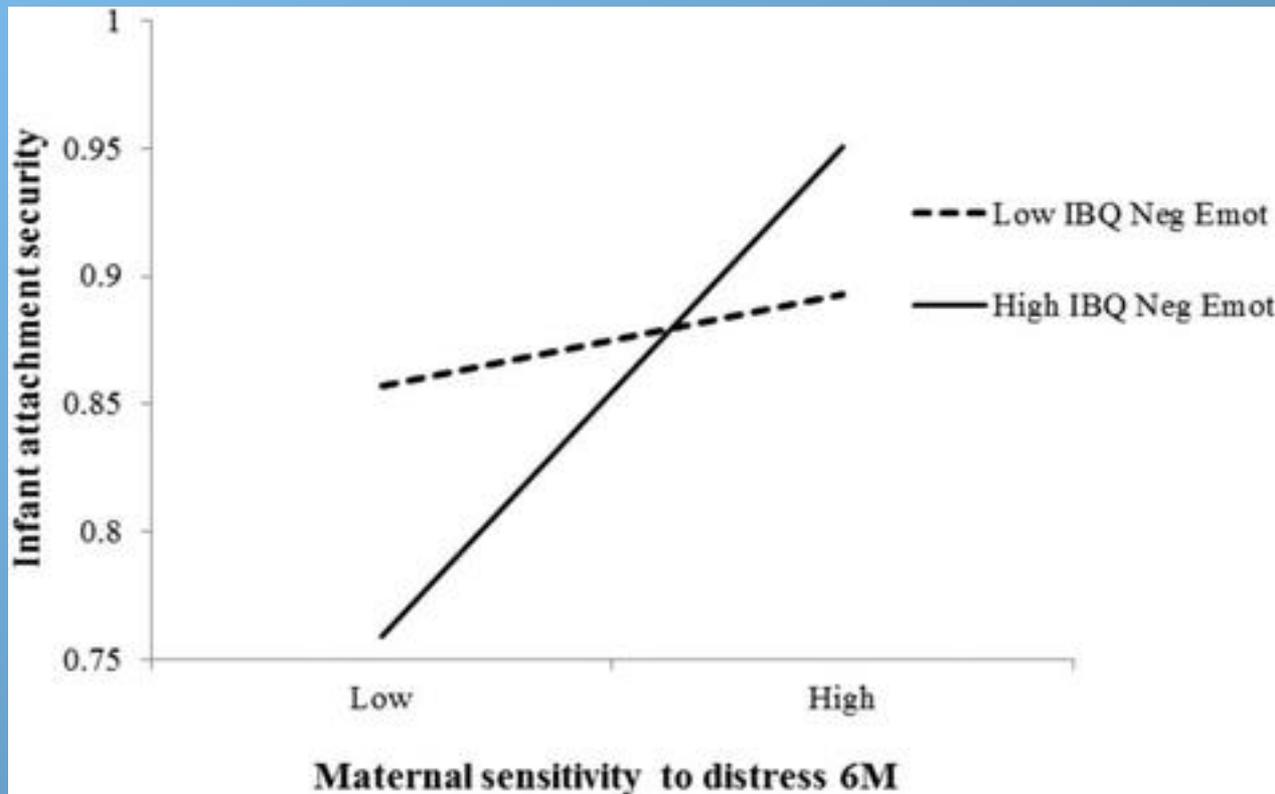
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NEGATIVE EMOTIONALITY
AS A
SUSCEPTIBILITY MARKER

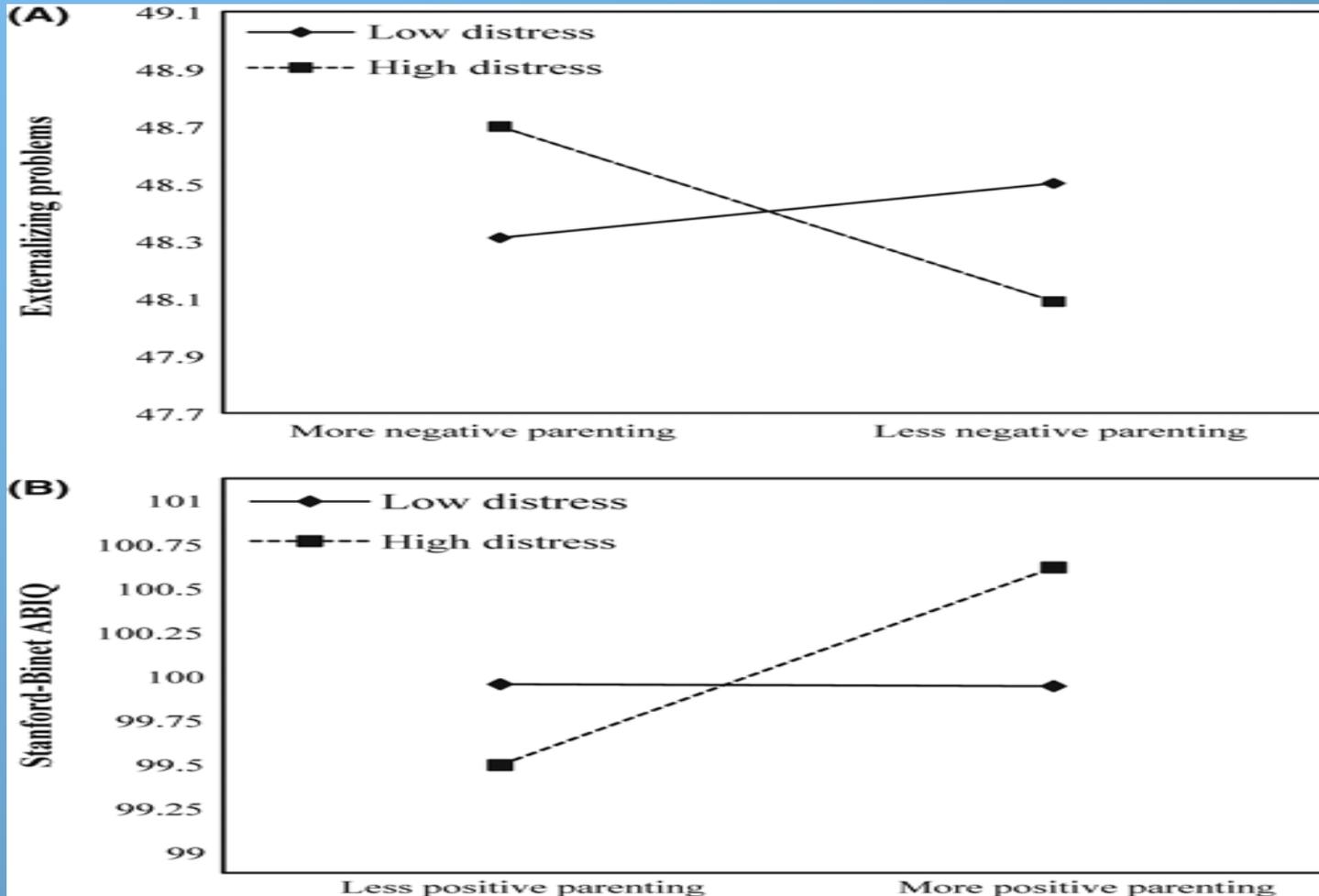


Maternal Sensitivity to Distress (6 mos) and Infant Attachment Security Moderated by Infant Negativity



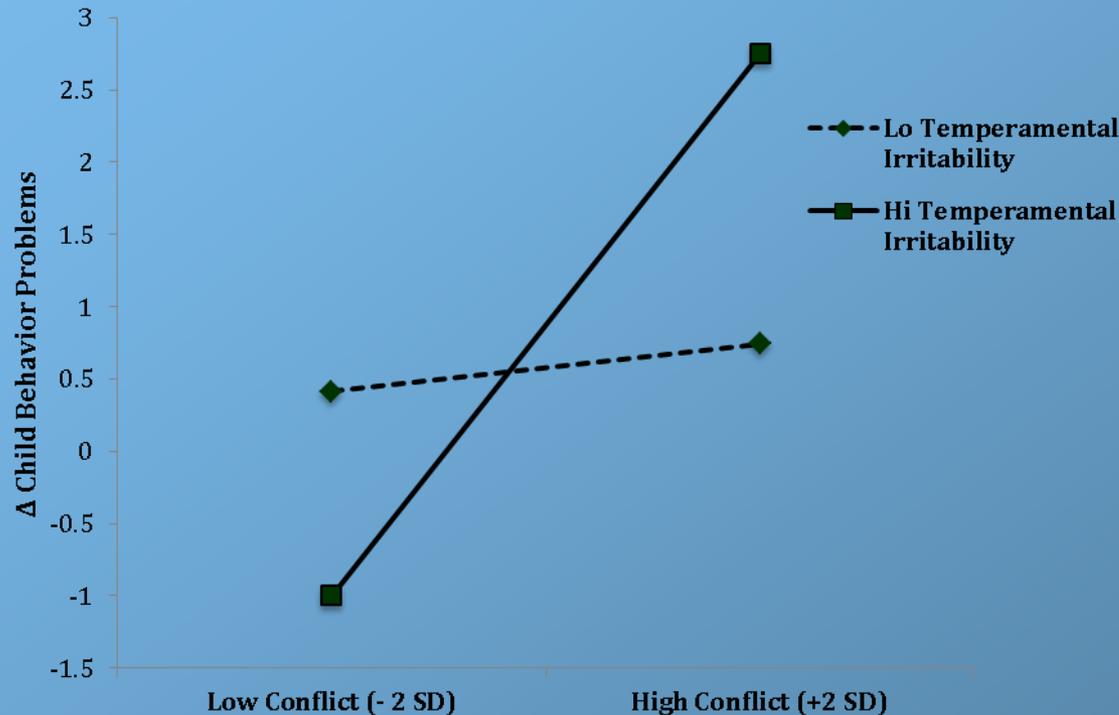


Maternal Positive and Negative Parenting (at 9 months) and Pre-term Infant Externalizing Problems and IQ at 36 Months Moderated by 9 Month Negativity





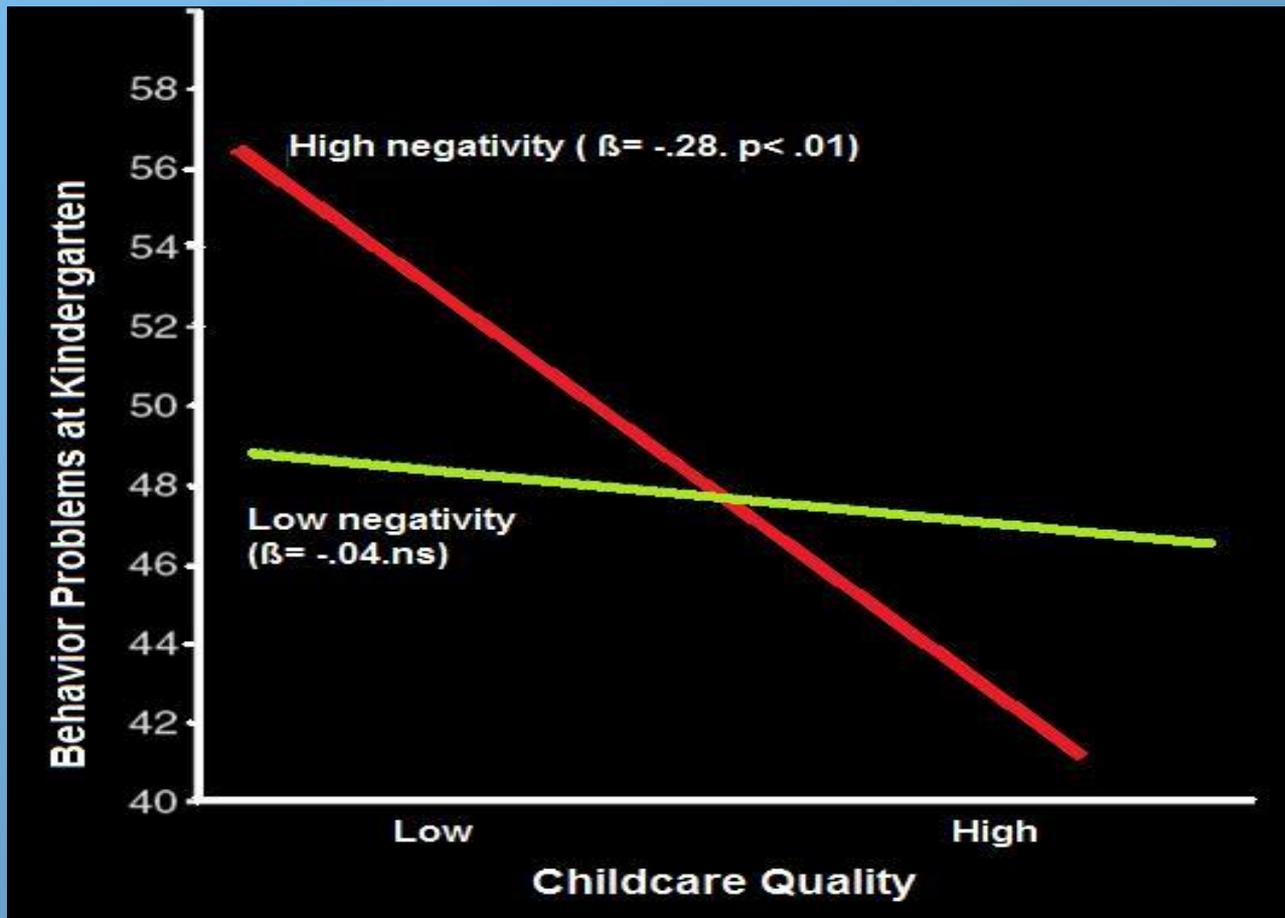
Marital Conflict and Change in Behavior Problems From Age 2-3 Moderated by Temperamental Irritability



Low conflict: constructive approaches to dealing with disagreements.
High conflict: physical violence.



Observed Quality of Child Care and Teacher-Rated Behavior Problems in Kindergarten



Pluess, M., & Belsky, J. (2009). Differential Susceptibility to Rearing Experience: The Case of Childcare. *Journal of Child Psychology and Psychiatry and Allied Disciplines*.

OUTLINE



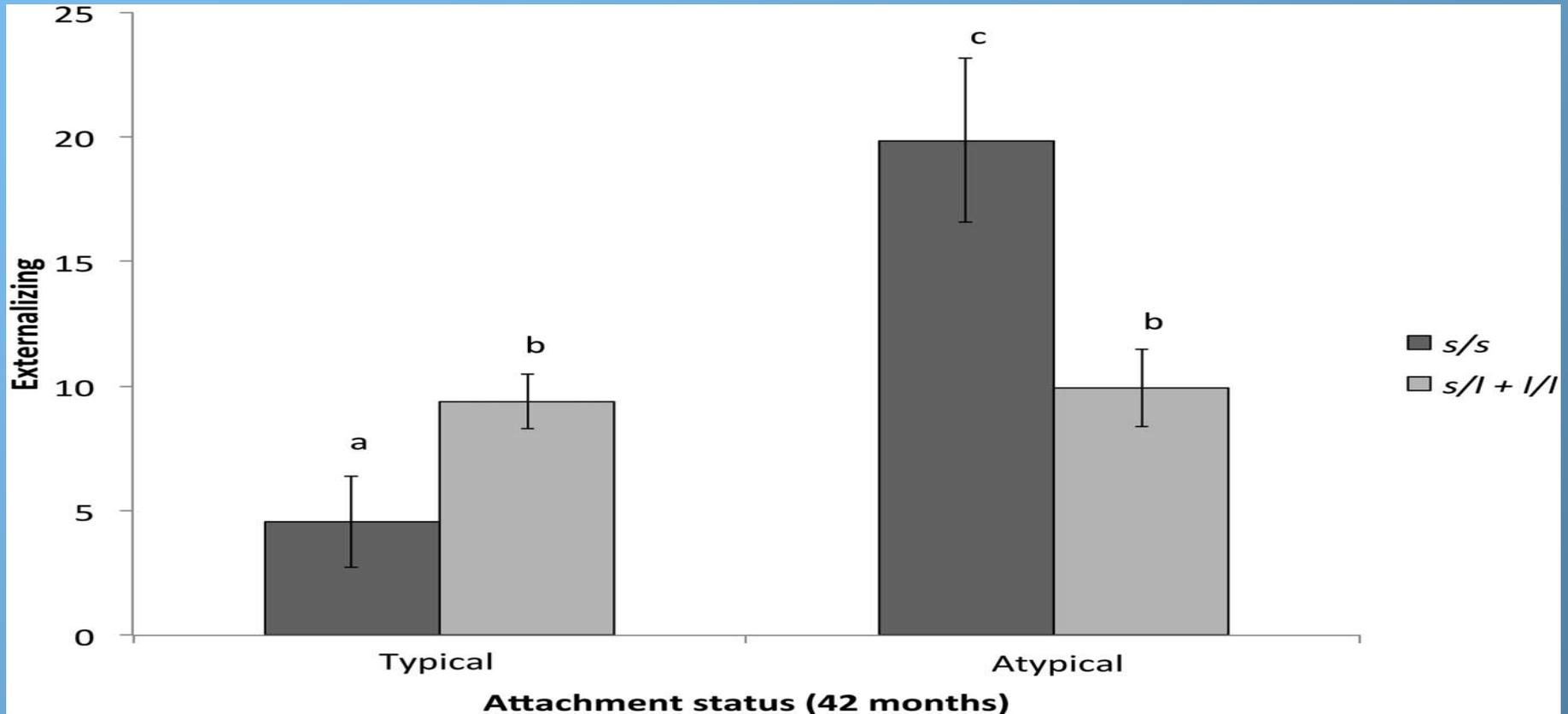
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The 5-HTTLPR Gene

The serotonin-transporter gene (5-HTTP) is a good gene to consider because there is some evidence that infants carrying the short (vs. long) allele are more negatively emotional as newborns (Auerbach et al., 2005). Short alleles have also been linked to depression in females and vulnerability to the depression fostering effects of negative life events in adulthood (Caspi et al., 2003).

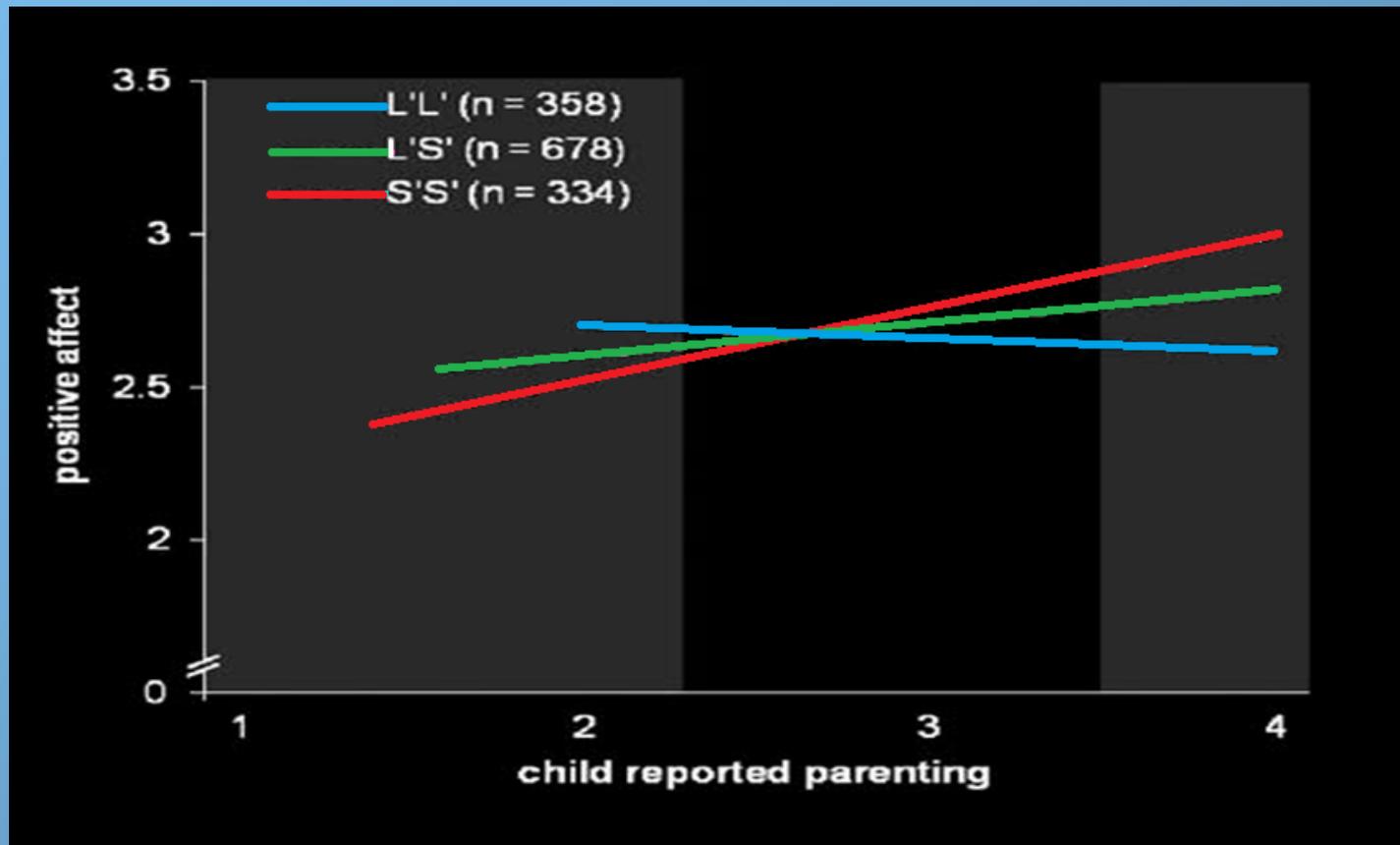
Attachment (42 months) and Externalizing Problems (54 months) Moderated by 5-HTTLPR



Atypical Attachment: Disorganized and Insecure-Other

Humphreys, K.L. et al. (2015). Serotonin transporter genotype (5HTTLPR) moderates the longitudinal impact of atypical attachment on externalizing problems. *Journal of Developmental & Behavioral Pediatrics*.

Positive Parenting and 8-12 Year Old Positive Affect Moderated by 5-HTTLPR



Hankin, B. et al. (2011). Differential susceptibility in youth: evidence that 5HTTLPR x positive parenting is associated with positive affect 'for better and worse'. *Translational Psychiatry*, 1, e44.



Perceived Racial Discrimination and Conduct Problems Moderated by 5-HTTLPR

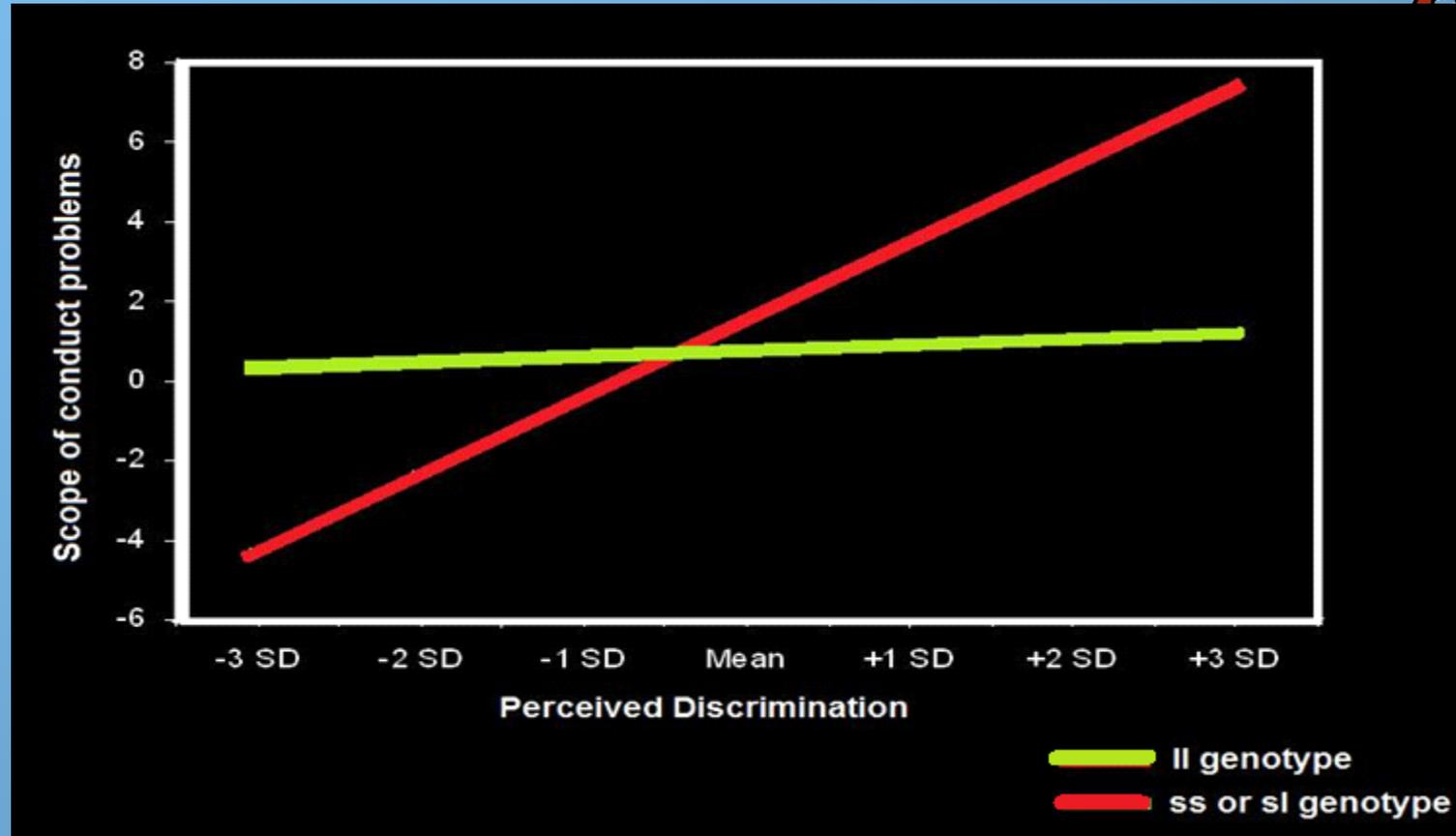
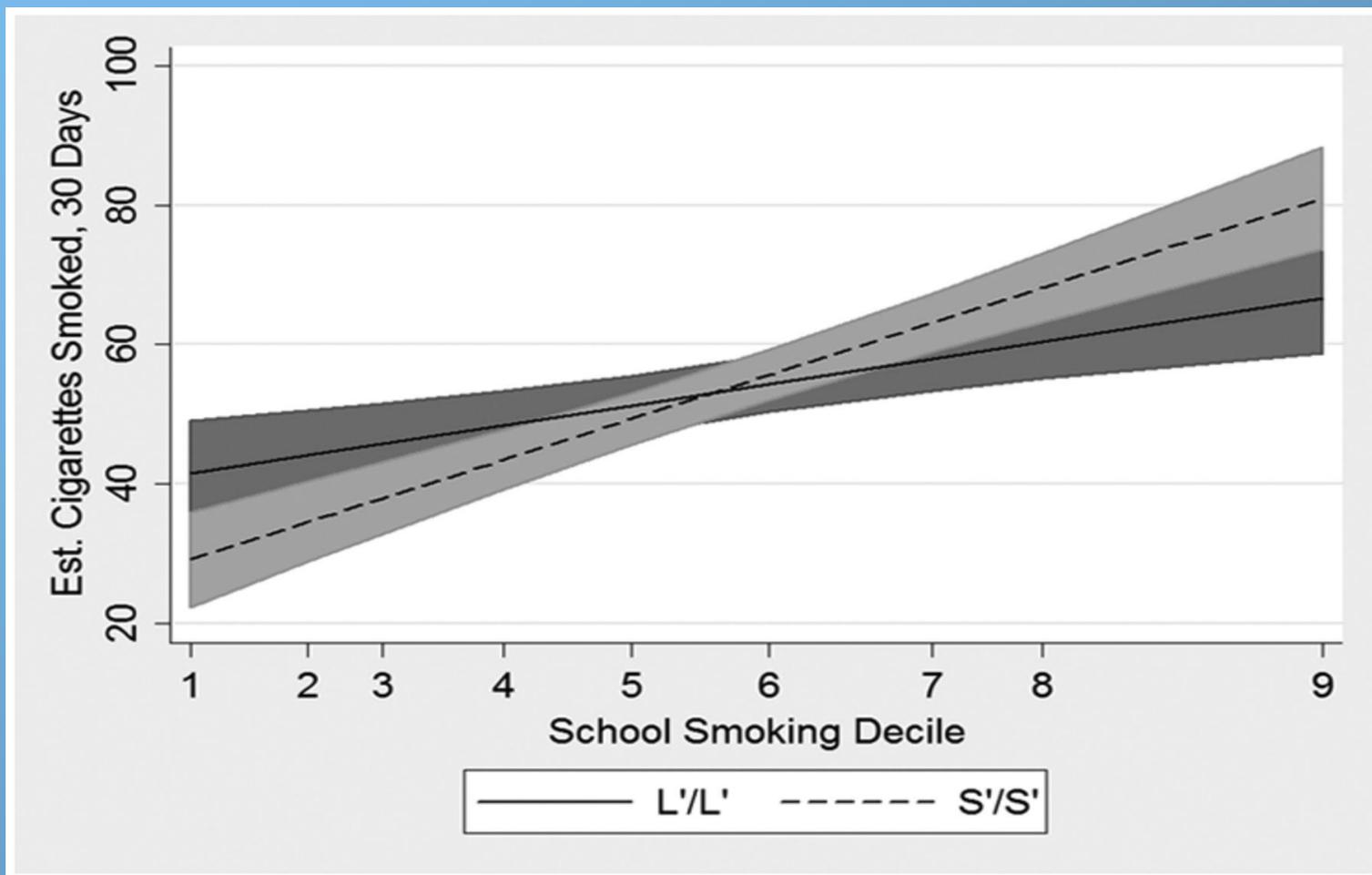


Figure 2. Results of the analysis for male youths only. Slopes of conduct problems for levels of perceived discrimination, ranging from -3 to +3 standard deviations from the sample mean, plotted separately for male youths with the *ll* genotype and male youths with the *ss* or *sl* genotype.

Brody, G.H., et al. (2011). Perceived discrimination, serotonin transporter linked polymorphic region status, and the development of conduct problems. *Development & Psychopathology*, 23, 617-627.



School-Level Smoking and Adolescent Smoking Moderated by 5-HTTLPR



Daw, J. et al. (2013). Genetic sensitivity to peer behaviors: 5HTTLPR, smoking and alcohol consumption. *Journal of Health and Social Behavior*.

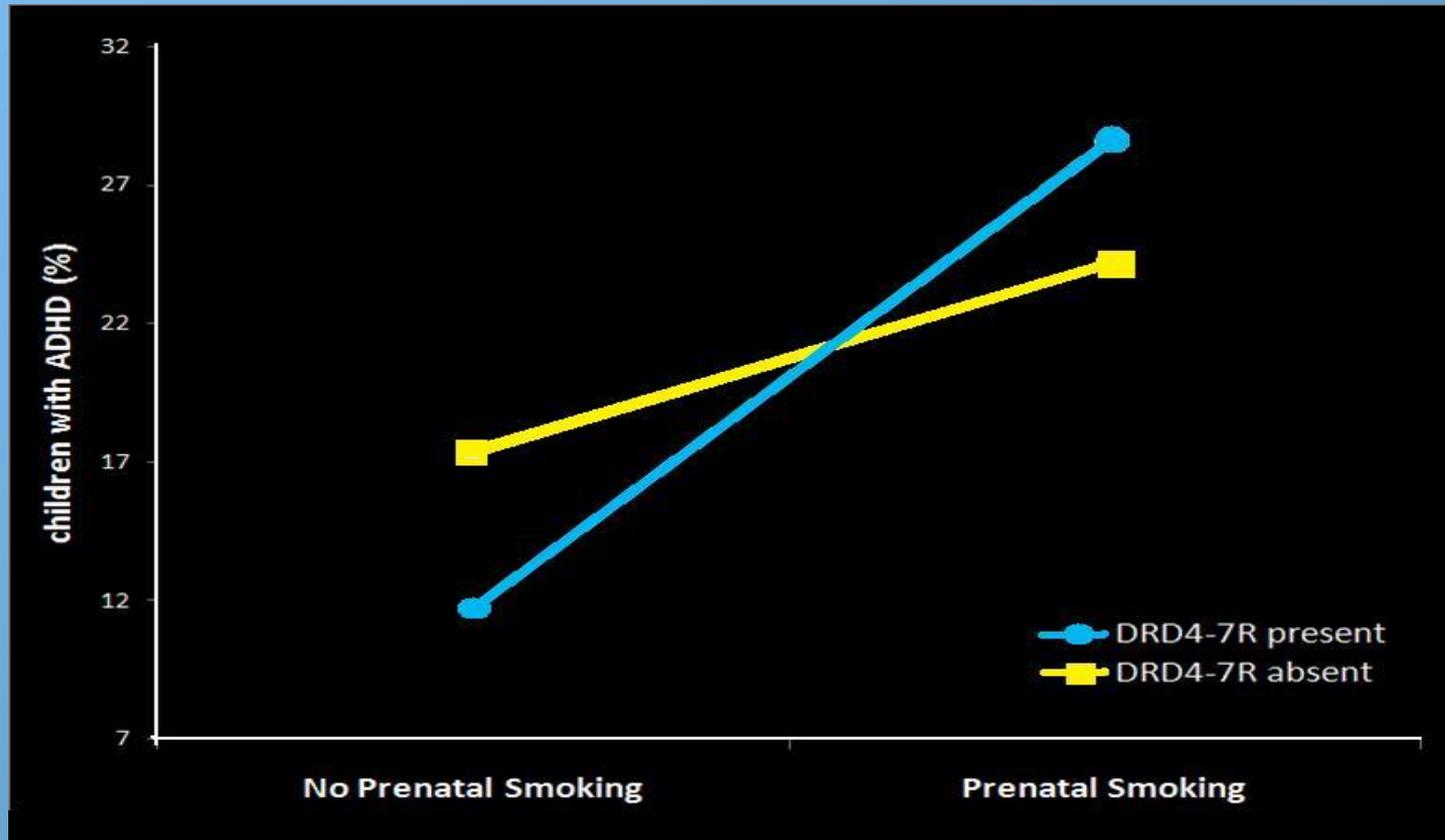


GXE: The DRD₄ Gene

The *DRD₄* gene codes for a type of dopamine receptor, with the dopaminergic system involved in attentional, motivational, and reward mechanisms in the brain. One variant of this gene, the 7-repeat *DRD₄* allele, has been linked to lower dopamine reception efficiency, and thus to ADHD and externalizing problems in children, as well as behavioral difficulties, including substance abuse and aggression, in adulthood, .

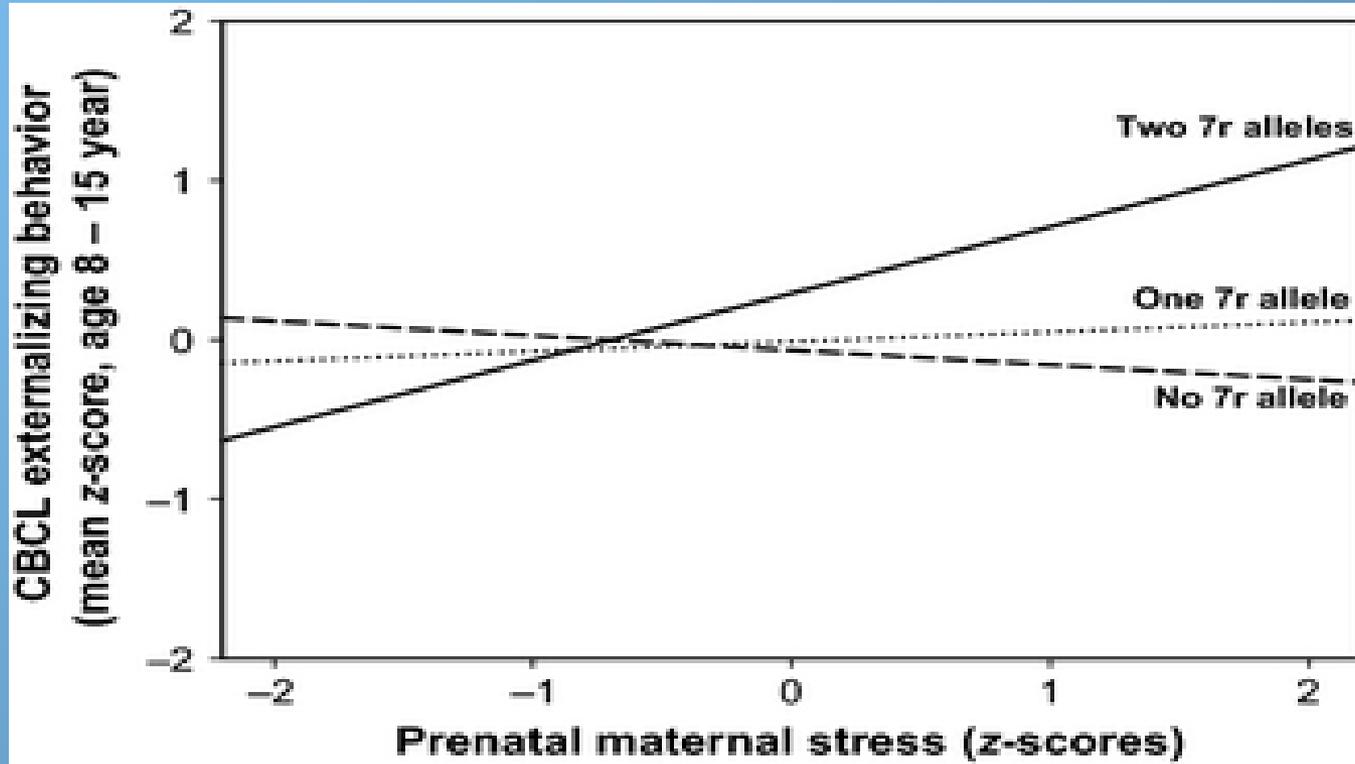


Prenatal Smoking & ADHD



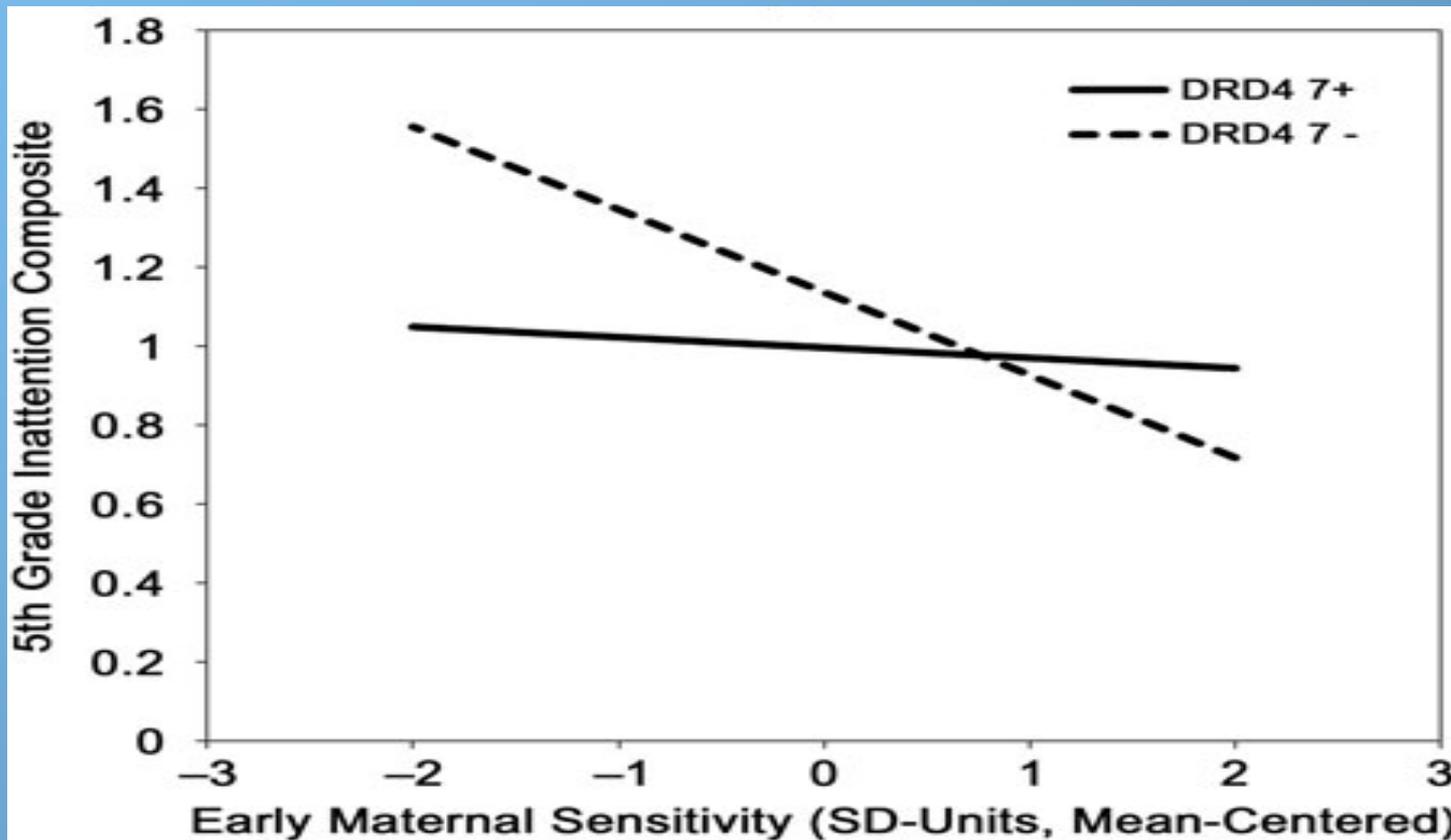
Pluess, M., Belsky, J., & Neuman, R.J. (2009). Prenatal Smoking and ADHD: DRD4-7R as a Plasticity Gene. *Biological Psychiatry*, 66, e5-e6.

Prenatal Stress and Children's Anti-Social Behavior Moderated by DRD₄



Zohsel, K. et al. (2014). Mothers' prenatal stress and their children's antisocial outcomes—a moderating role for the Dopamine D₄ Receptor (DRD₄) gene. *Journal of Child Psychology and Psychiatry*, 55, 69-76..

Early Maternal Sensitivity (6-36 mos.) and 5th Grade Inattention Moderated by DRD4



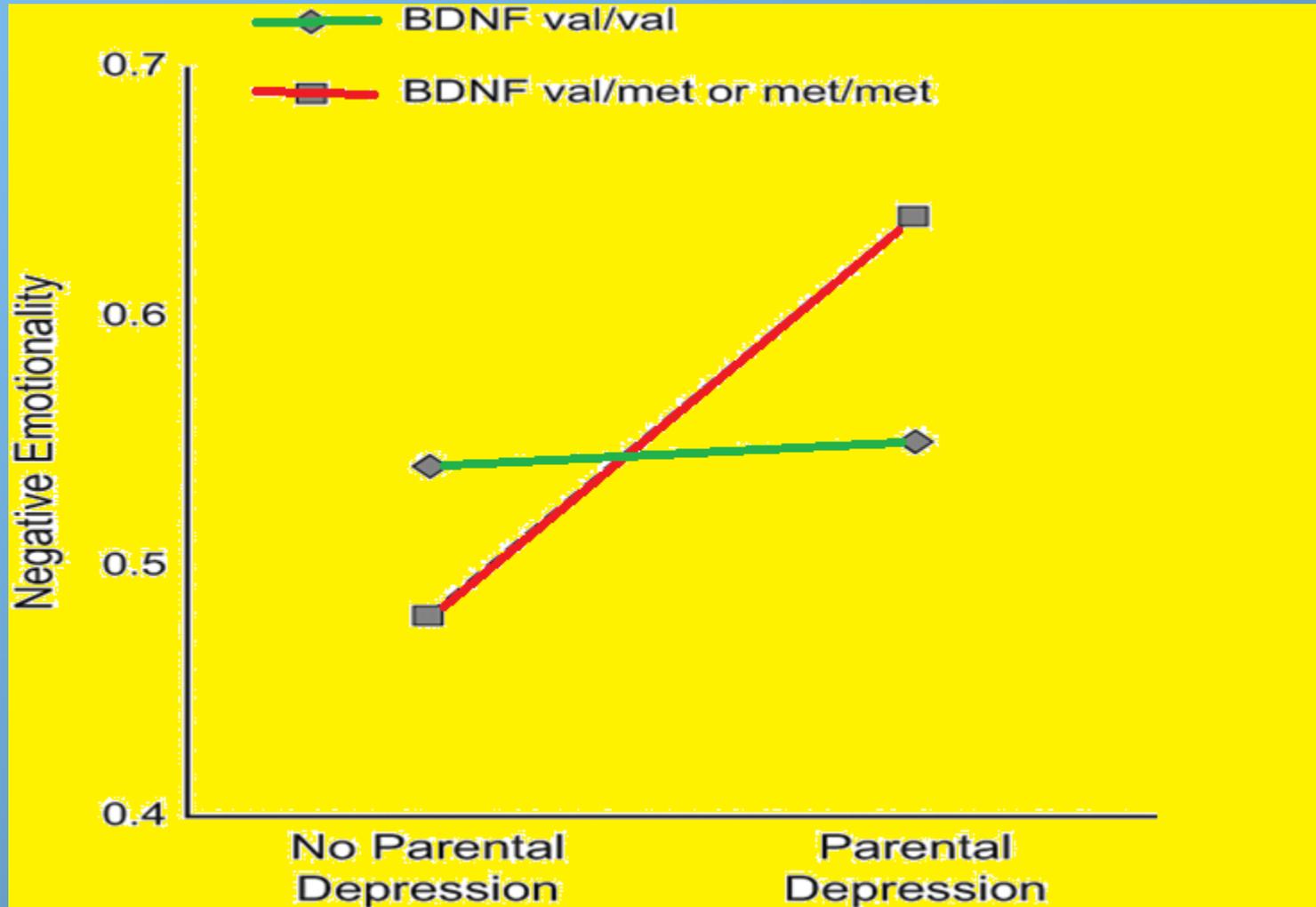
Berry, D. et al. (2013). Gene-environment interaction between dopamine receptor D4 7-repeat polymorphism and early maternal sensitivity predicts inattention trajectories across middle childhood. *Development and Psychopathology*, 25, 291-306.



BDNF

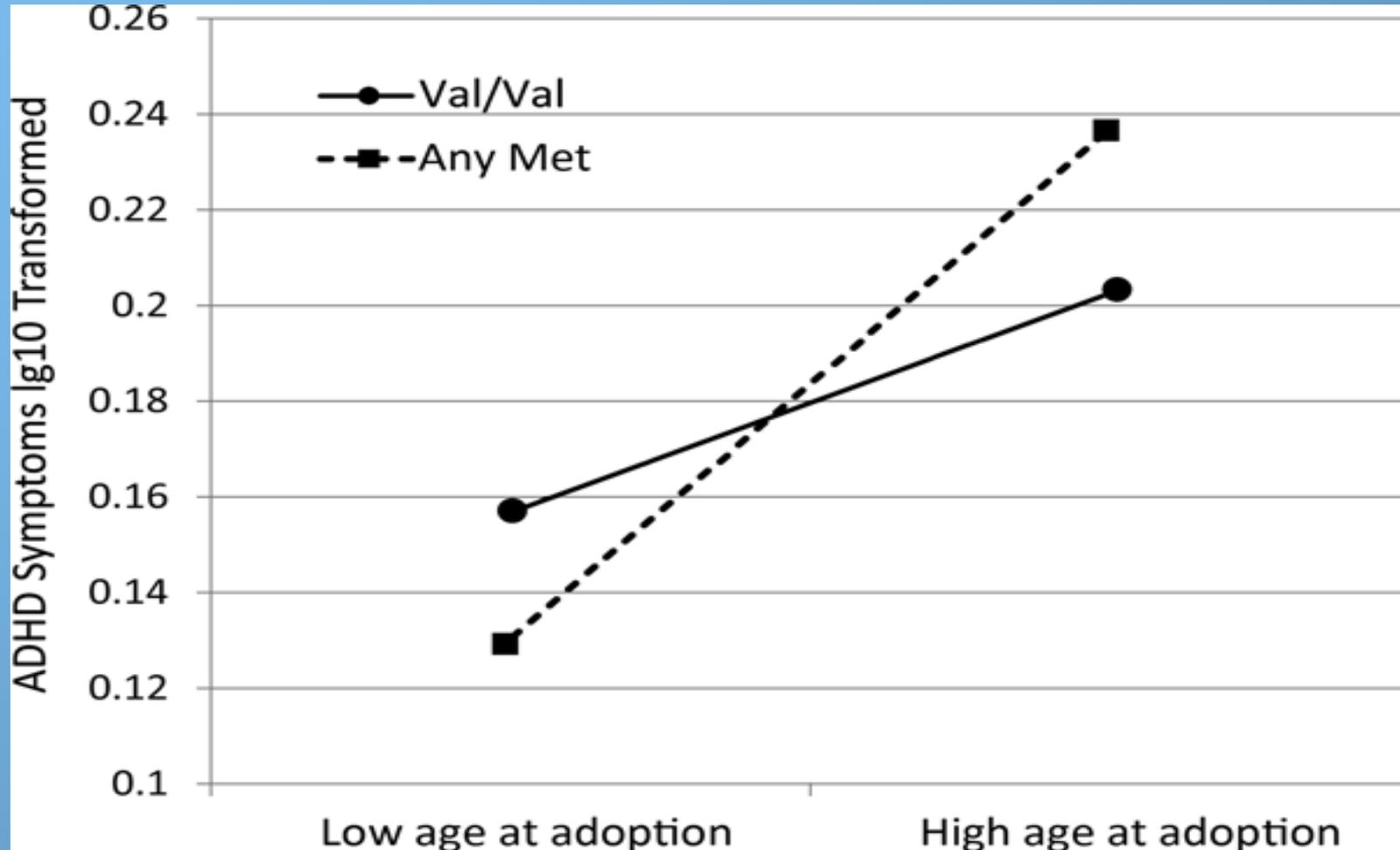
Brain Derived Neurotrophic Factor (BDNF) has also been implicated in the etiology of depression, with evidence linking the Methionine (Met) allele of BDNF Val66Met polymorphism to anxiety in humans and mice

Parental Depression and Negative Emotionality in 3-Year Olds: Moderated by BDNF



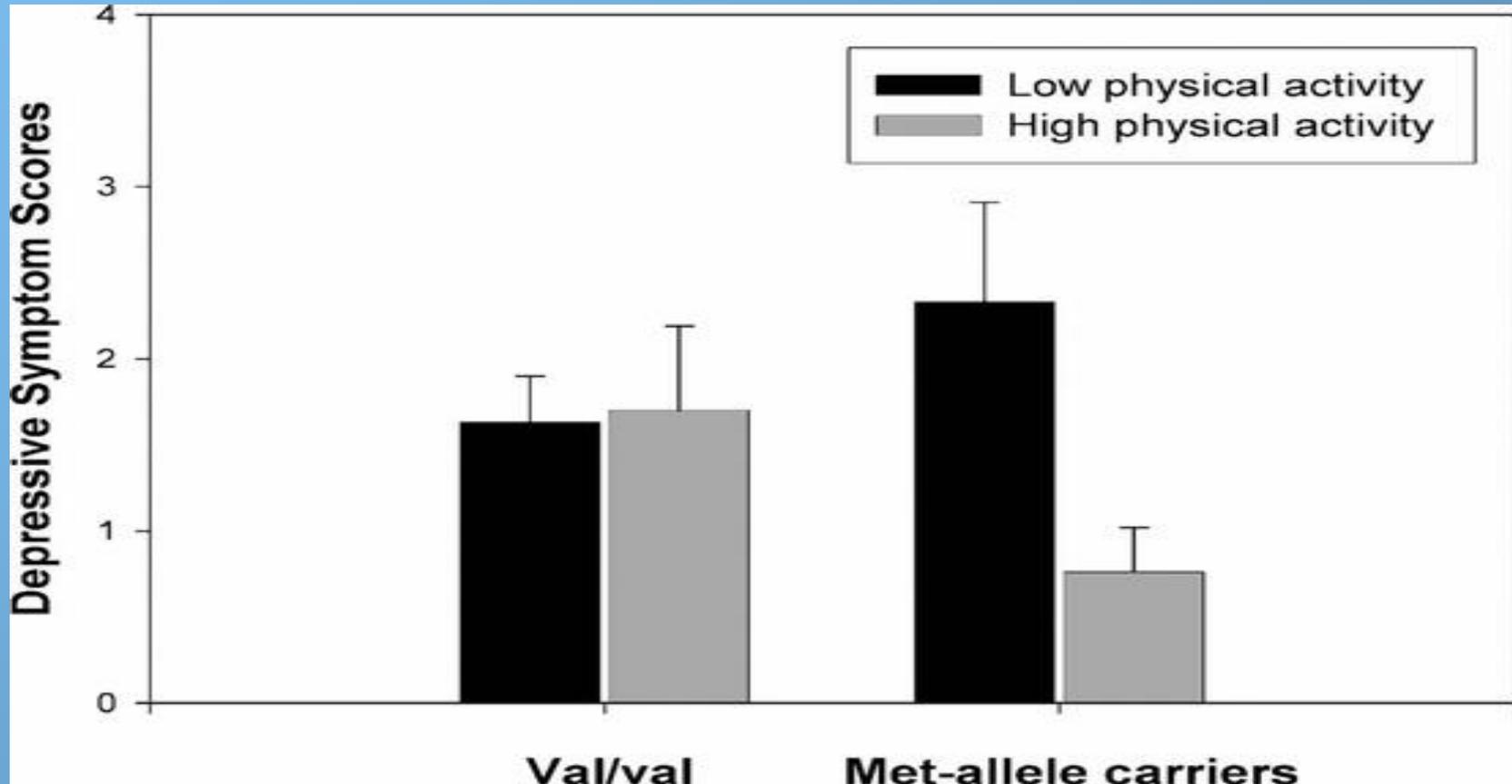


Early Deprivation/Institutionalization Effects on Attention Problems at age 10-12 Years Moderated by BDNF





Physical Activity by Adolescent Girls and Depression Moderated by BDNF



Mata, J., Thompson, R. J., & Gotlib, I. H. (2010). BDNF genotype moderates the relation between physical activity and depressive symptoms. *Health Psychology, 29*(2), 130-133. doi:10.1037/a0017261

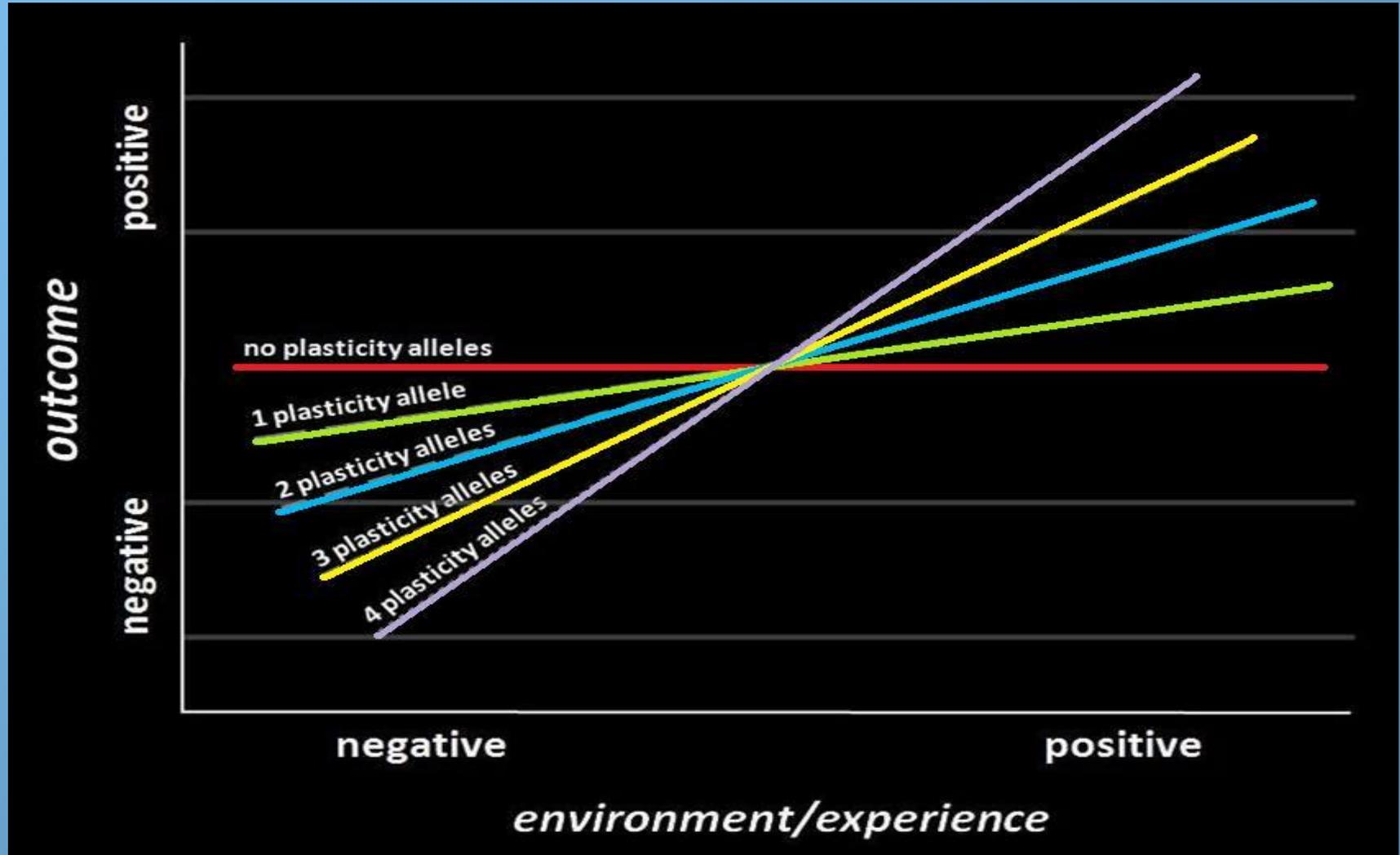
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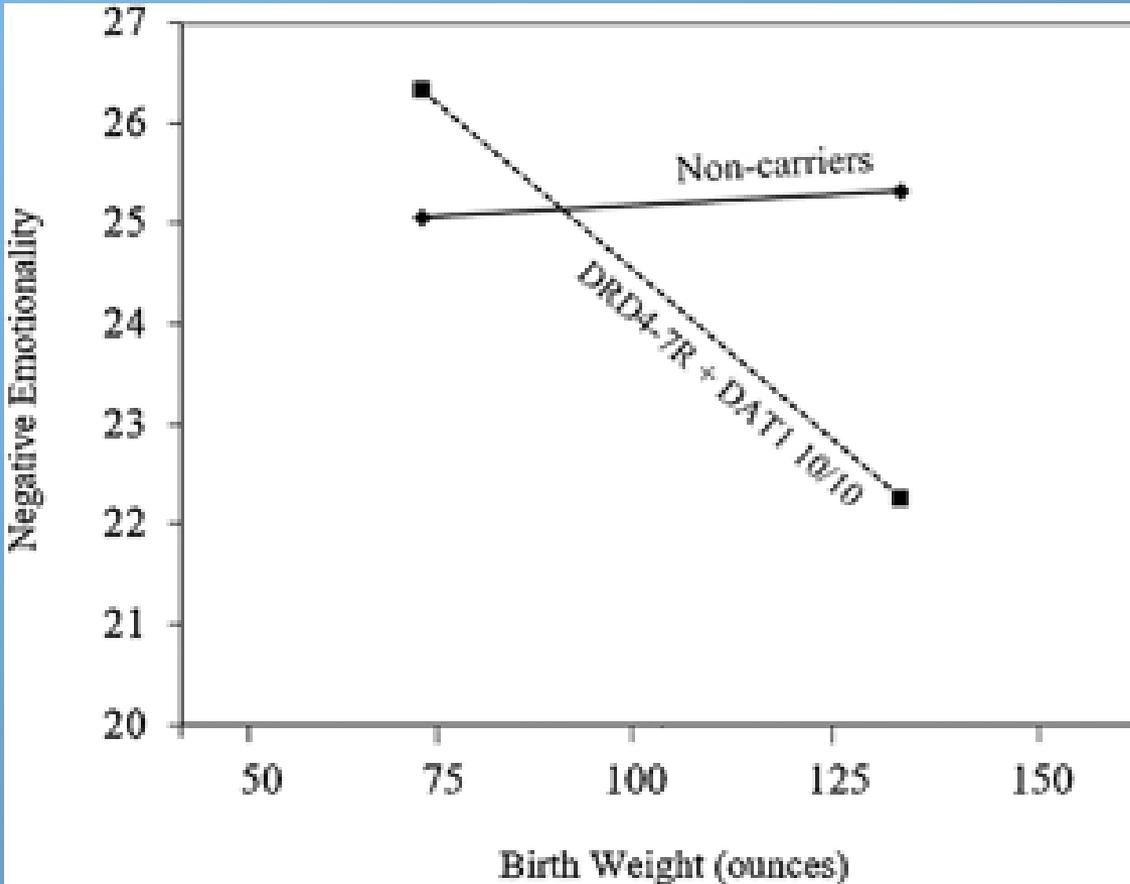


THEORETICAL MODEL OF GENETIC-PLASTICITY GRADIENT



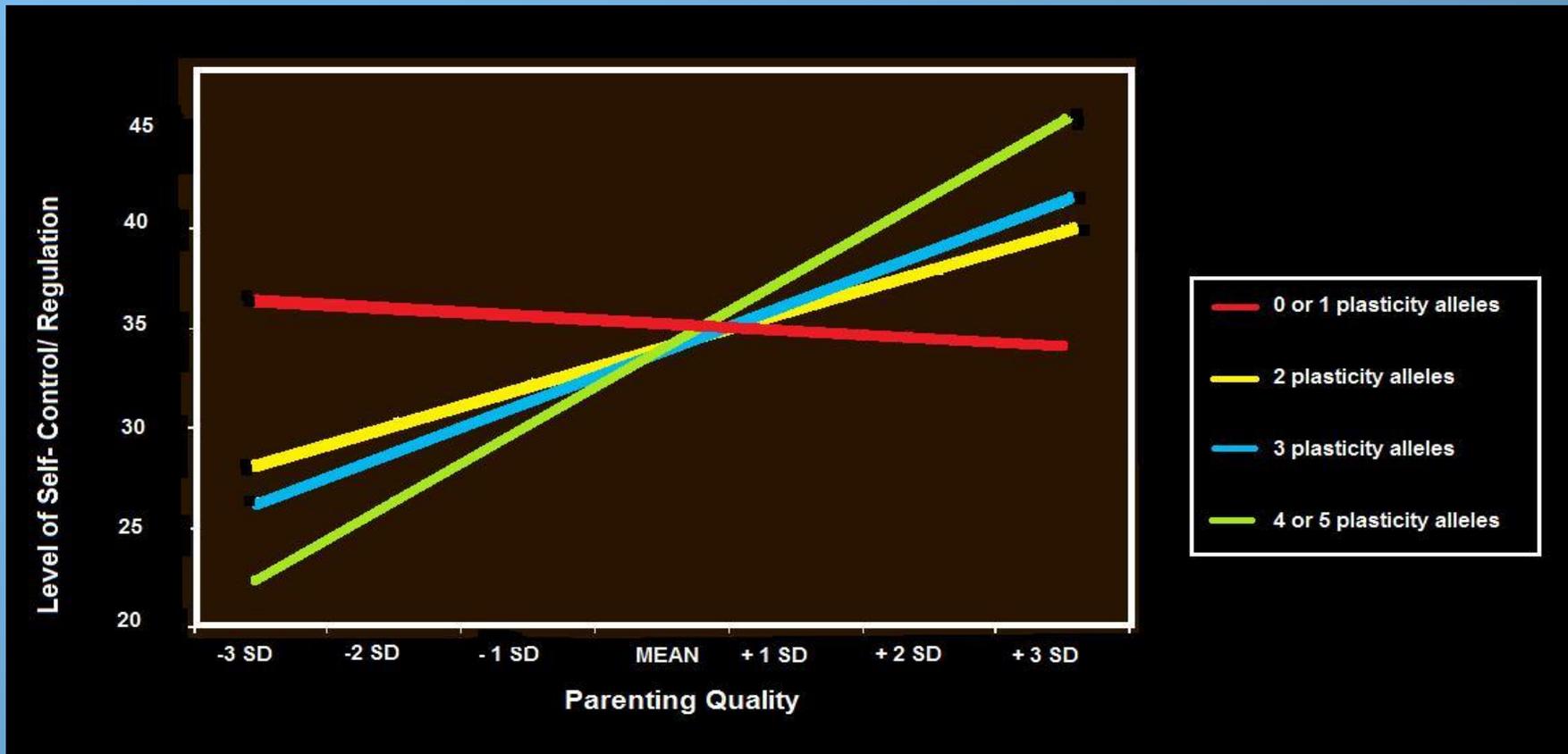


Birthweight/Prenatal Stress and Negative Emotionality Moderated by DRD4+DAT1



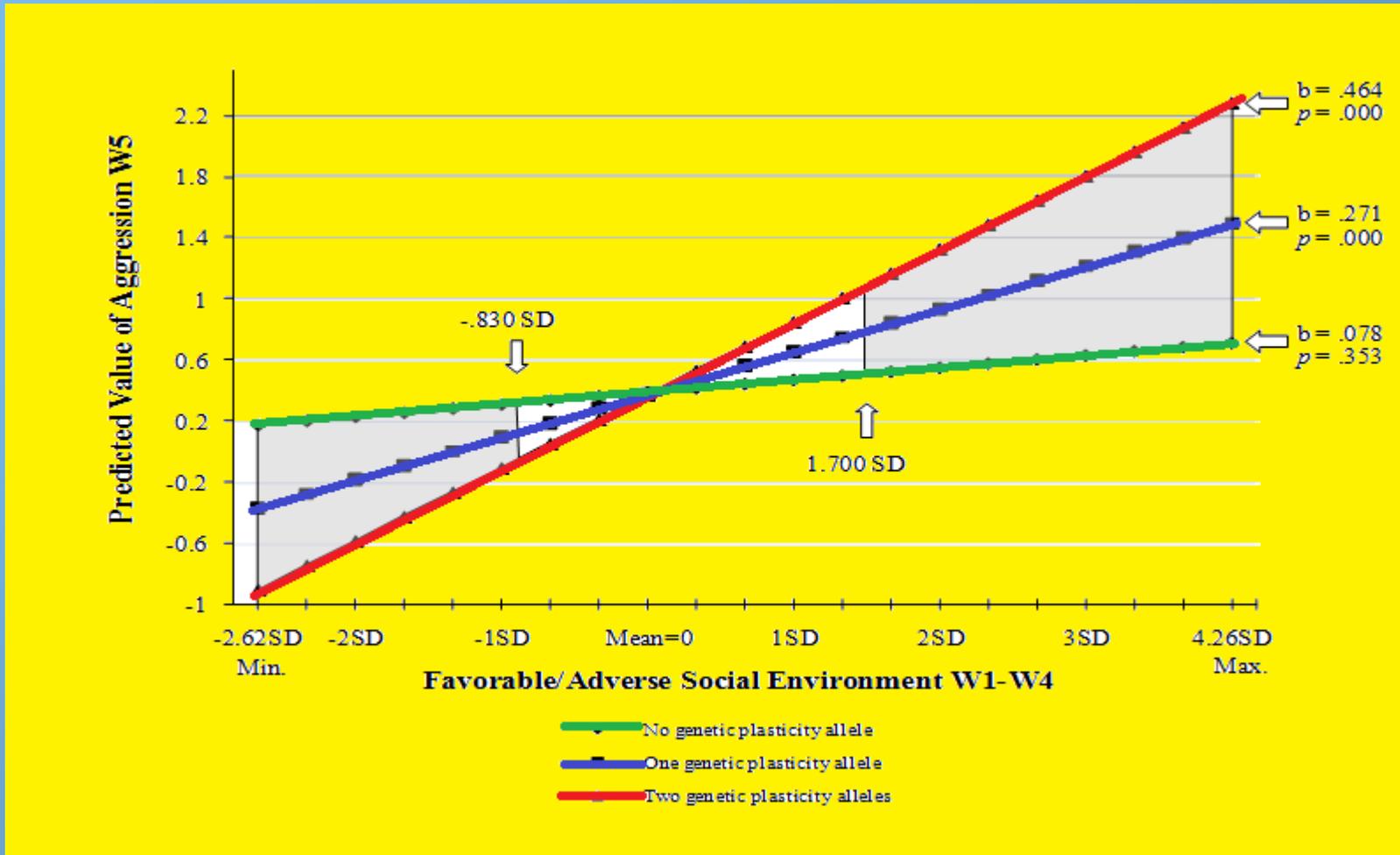
Tung, I., et al (2017). Prenatal programming of postnatal plasticity for externalizing behavior: Testing an integrated developmental model of genetic and temperamental sensitivity to the environment. *Developmental Psychobiology*, , 50,, 984-996.

Parenting and Adolescent Boys' Self-Control Regulation Moderated by Cumulative Genetic Plasticity (DAT₁, DRD₂, DRD₄, 5HTTLPR, and MAOA)



Belsky, J., & Beaver, M. (2011). Cumulative-Genetic Plasticity, Parenting and Adolescent Self-Control/Regulation. *Journal of Child Psychology & Psychiatry*.

Social Environment and Aggression Moderated by Cumulative Genetic Plasticity (5-HTTLPR and DRD4)

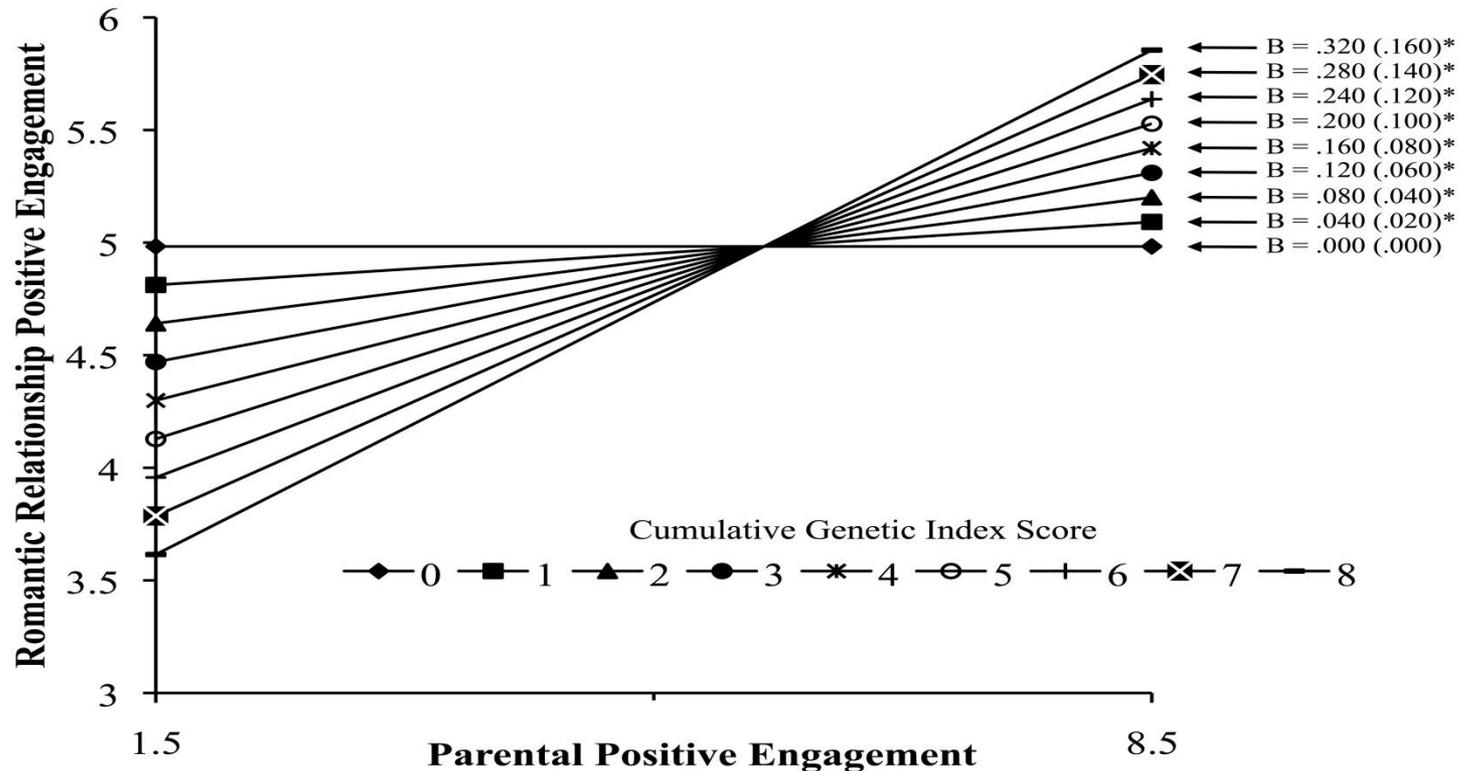


Simons, R.L. et al. (2011). Social environmental variation, plasticity genes, and aggression: Evidence for the differential susceptibility hypothesis. *American Sociological Review*, 76, 883-912.

Parenting in Adolescence and Positive Romantic Relations in Young Adulthood Moderated by Cumulative Genetic Plasticity (5HTT, ANKK/DRD2, DRD4, DAT, COMT)



Panel B



Masarik, A.S. et al. (2014). For better and for worse: Genes and parenting interact to predict future behavior in romantic relationships. *Journal of Family Psychology*.

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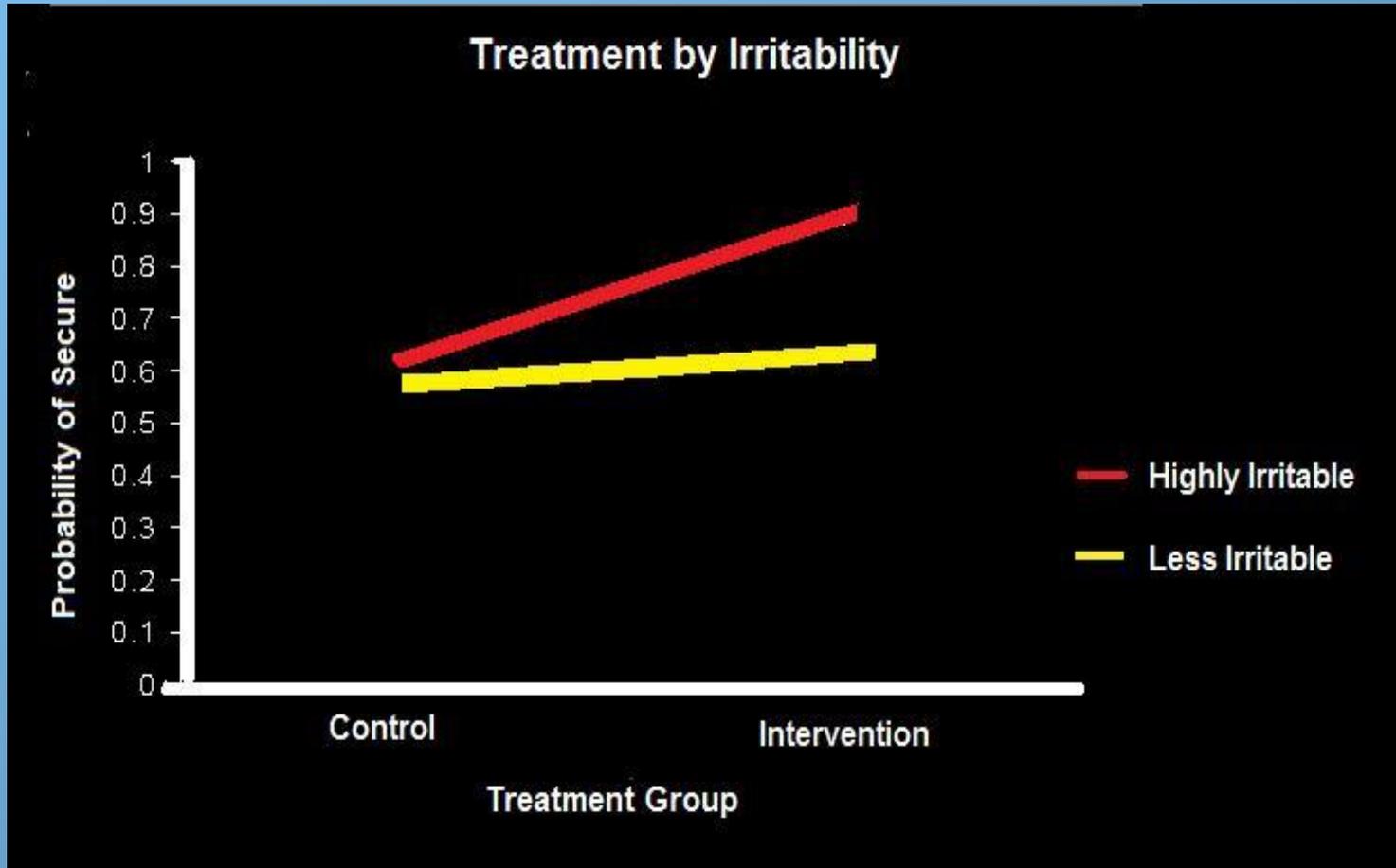
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Experimental Enhancement of Maternal Sensitivity via Circle of Security: Effects on Attachment Security

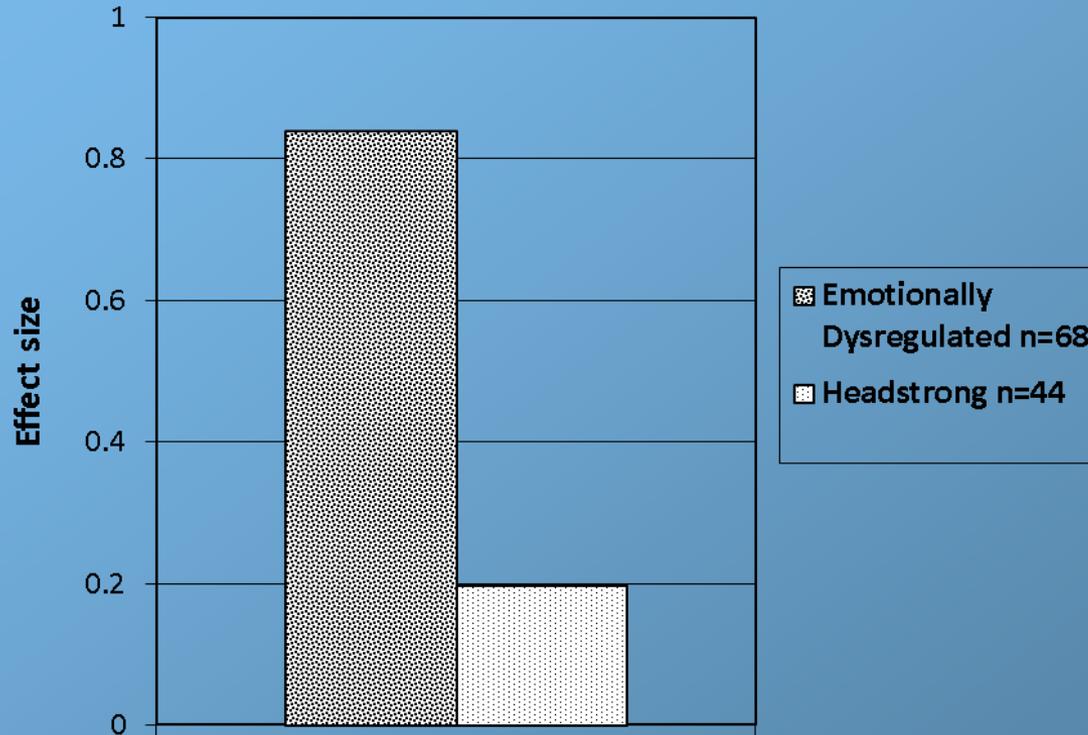


Cassidy, J., et al. (2011). Enhancing infant attachment security: An examination of treatment efficacy and differential susceptibility. *Development and Psychopathology*.



Intervention for Children with Conduct Disorder

(Emotionally Dysregulated: loses temper, angry, touchy;
Headstrong: Argues, defiant annoys, blames)



Change in conduct symptoms in children allocated to parenting intervention compared to controls, by conduct disorder subtype

Scott, S. & O'Connor, T.G. (2012). An experimental test of differential susceptibility to parenting among emotionally dysregulated children in a Randomized Controlled Trial for Oppositional Behavior. *Journal of Child Psychology and Psychiatry*, 53, 1184-1193.

OUTLINE

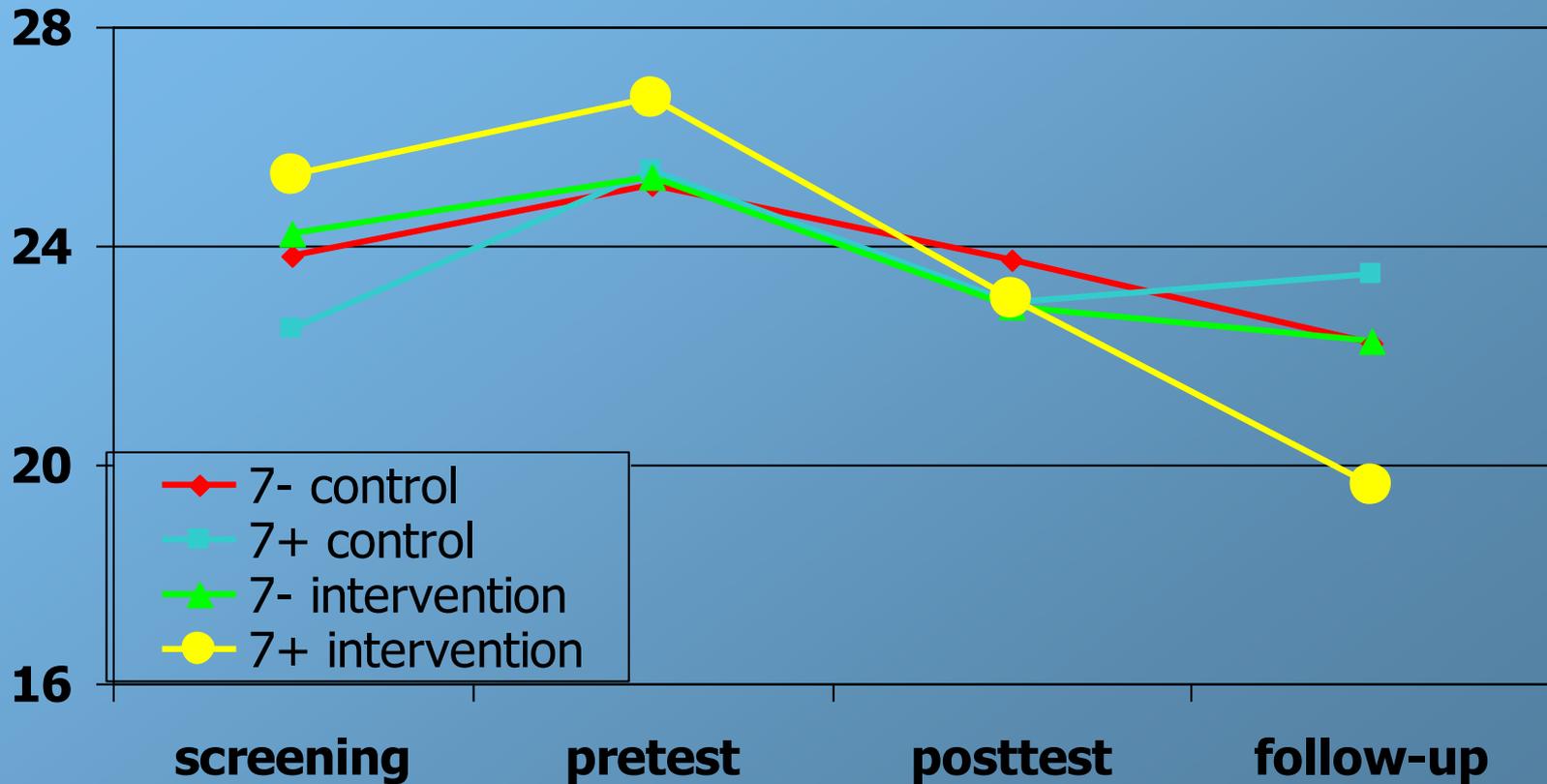


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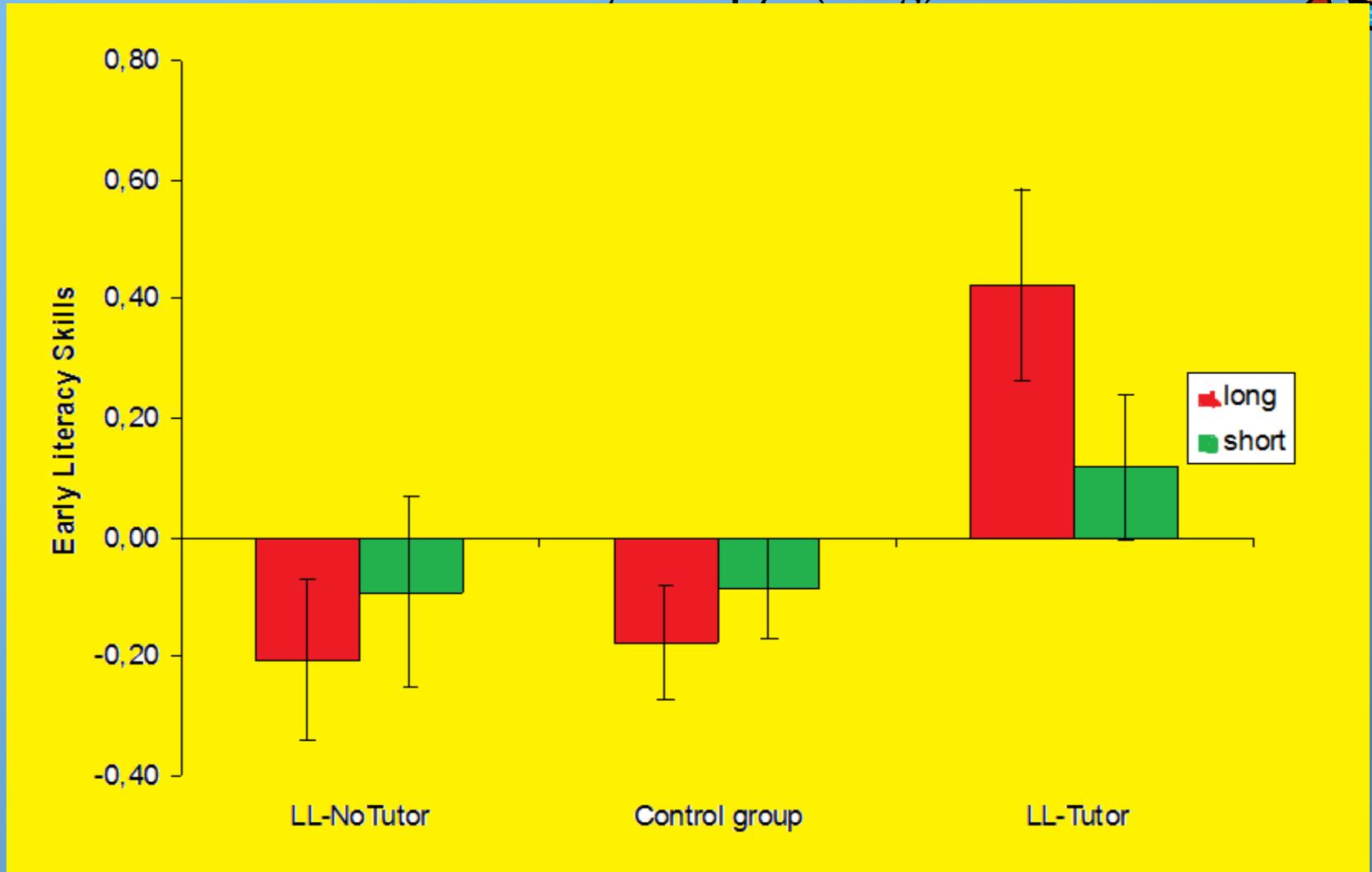
Development of Externalizing Behavior for Intervention and Control Groups By DRD47-Repeat Allele

CBCL Externalizing



Bakermans-Kranenburg et al. (2008). Experimental evidence for differential susceptibility: Dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized controlled trial. *Developmental Psychology*, 44, 293-300.

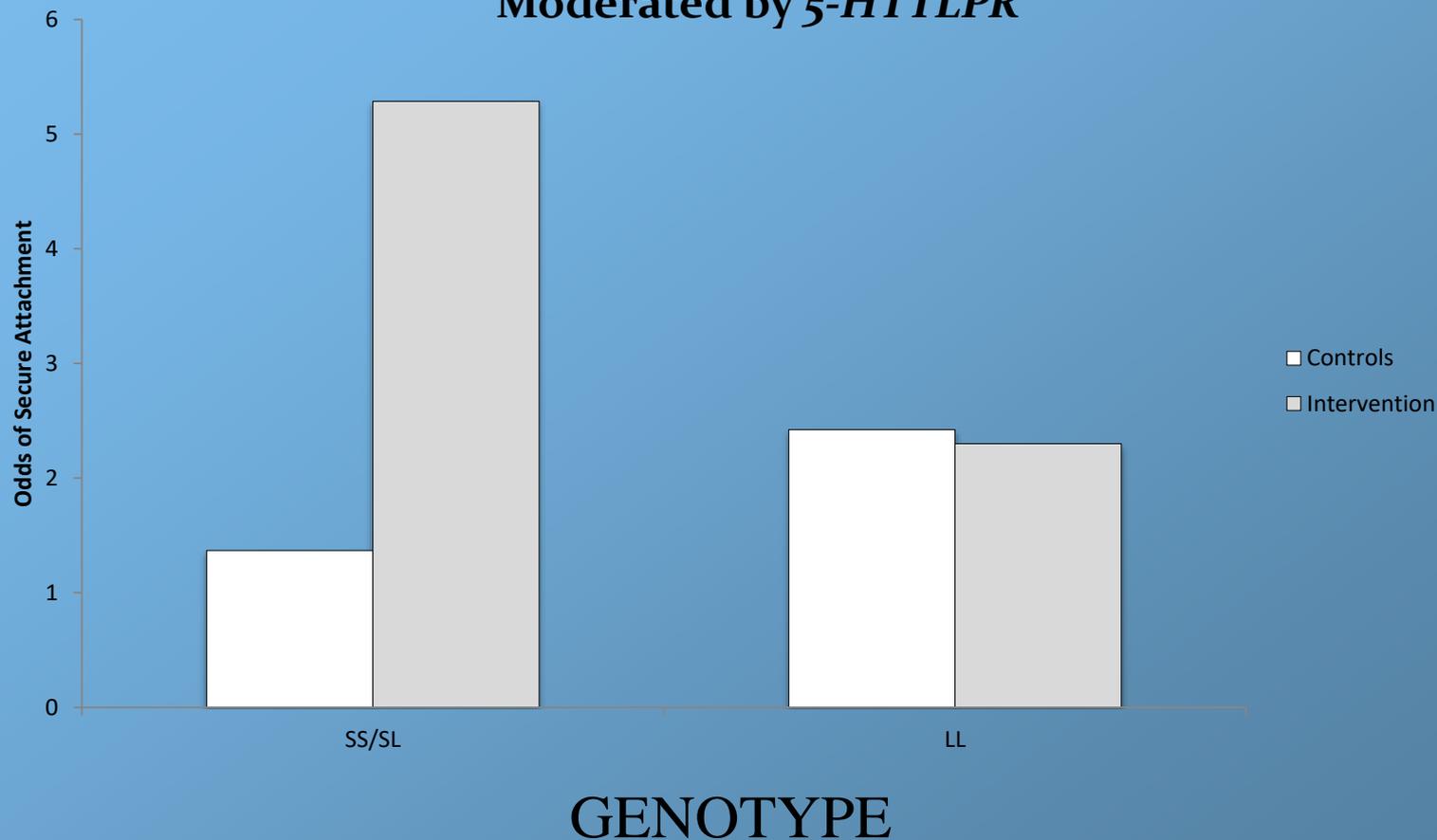
Effect of Computerized Literacy Instruction Emphasizing PHONEMIC AWARENESS on Emergent Literacy Skills Moderated by DRD4-7R (Long)



Kegel, C., Bus, A. & Van IJzendoorn, M. (2011). Differential susceptibility in early literacy instruction through computer games: The role of Dopamine D4 Receptor Gene (DRD4). *Mind, Brain, and Education*, 5, 71-79

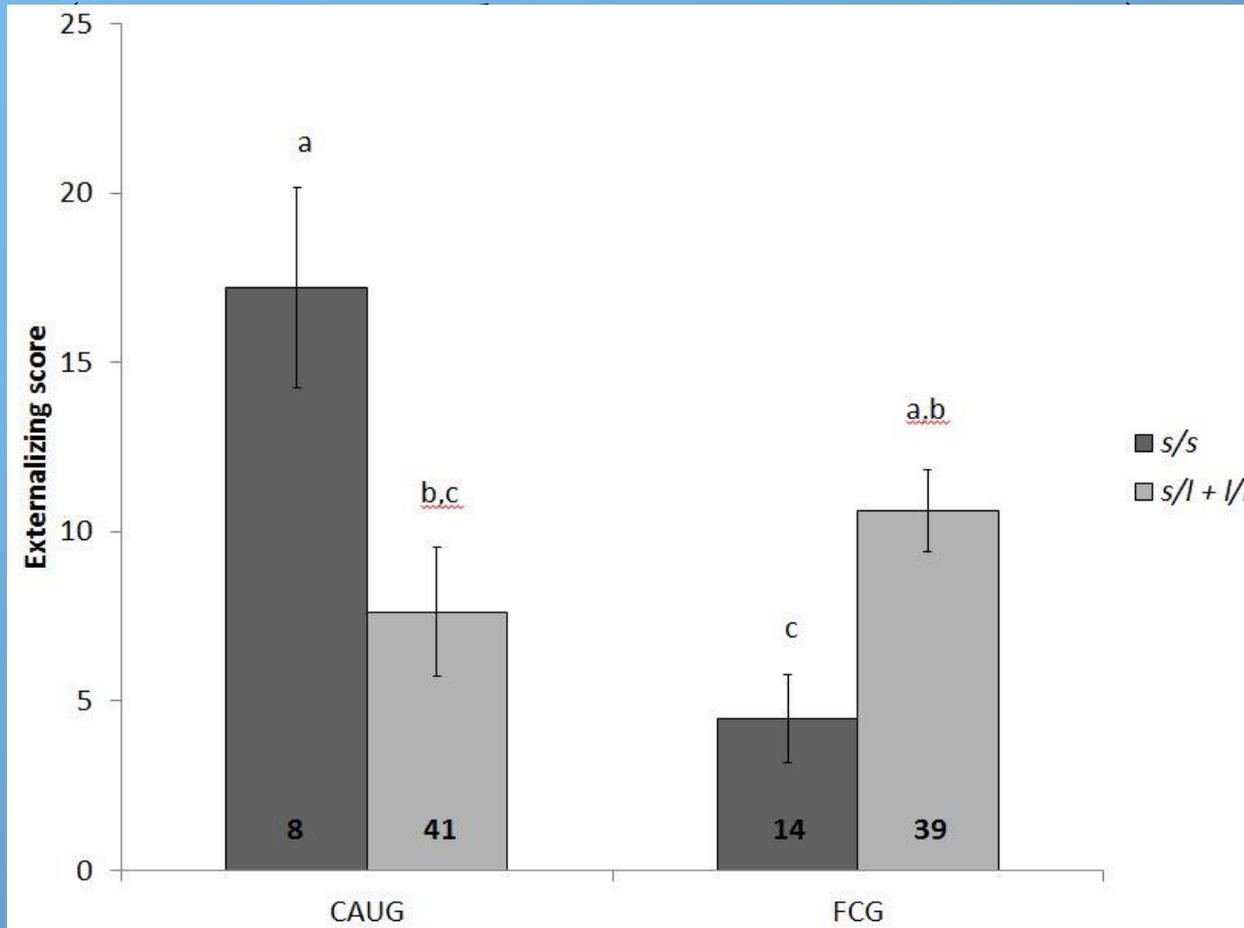


Experimental Enhancement of Maternal Sensitivity Via Home Visiting In South Africa from Pregnancy to 6 mos.: Effects on Attachment Security Moderated by 5-HTTLPR



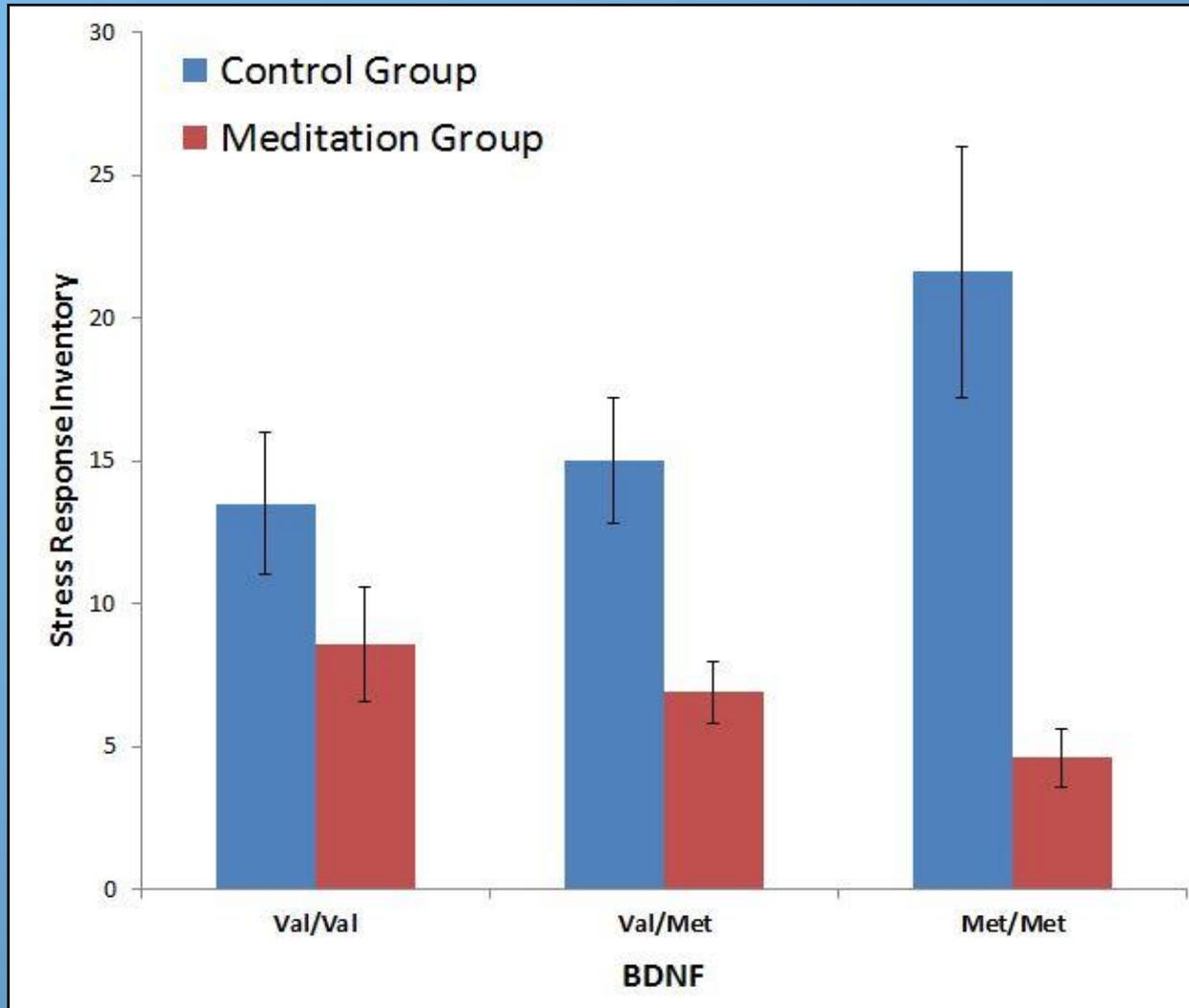


Foster-Care Intervention Effects on Externalizing Behavior at 54 Months Among Institutionalized Romanian Children Moderated by 5-HTTLPR



Brett, Z.H. et al. (in press). *5HTTLPR* genotype moderates the longitudinal impact of early caregiving on externalizing behavior. *Development and Psychopathology*.

Effects of Meditation on Perceived Stress Moderated by BDNF



Jung, Y. et al. (2011). Influence of brain-derived neurotrophic factor and catechol O-methyl transferase polymorphisms on effects of meditation on plasma catecholamines and stress. *Stress*.

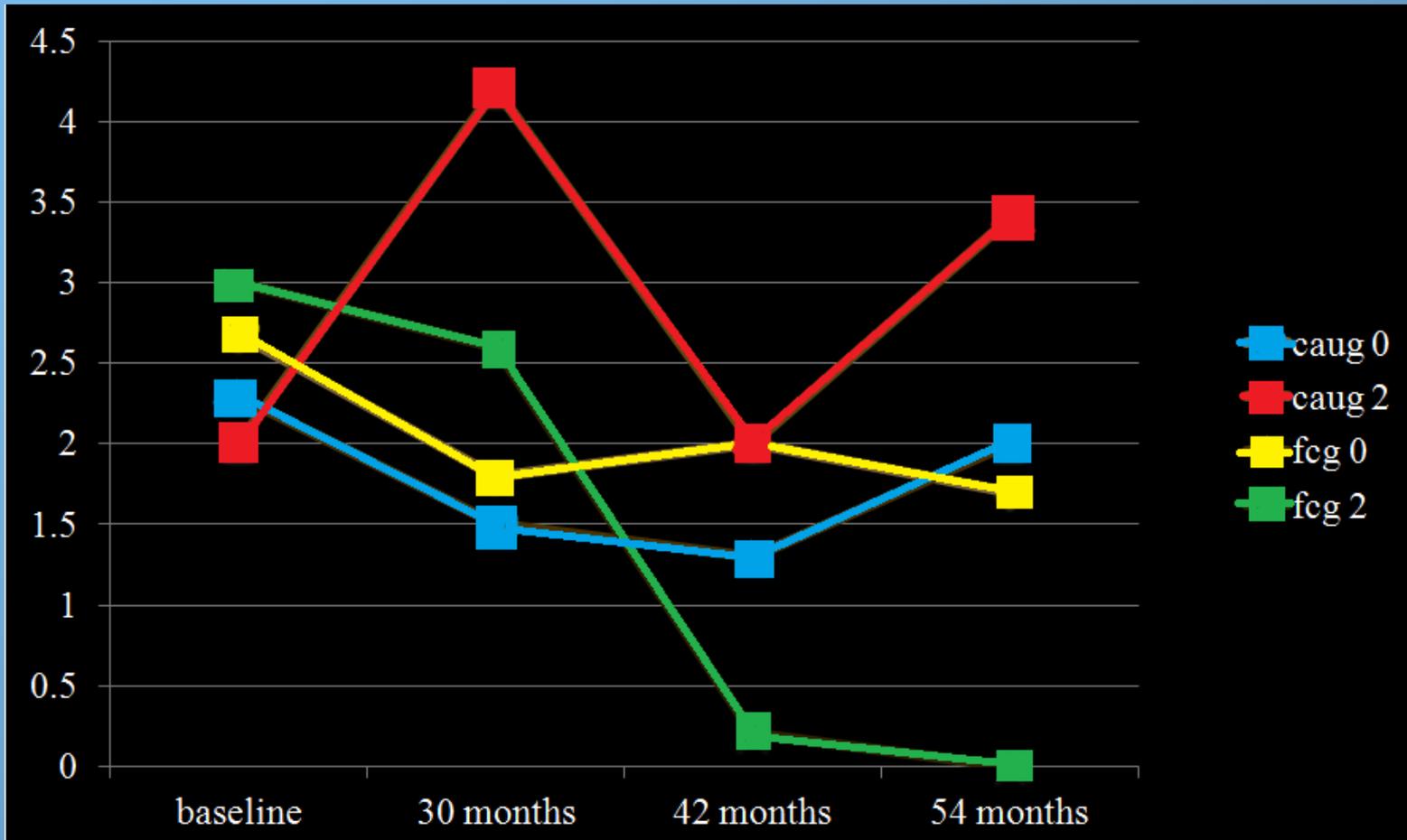
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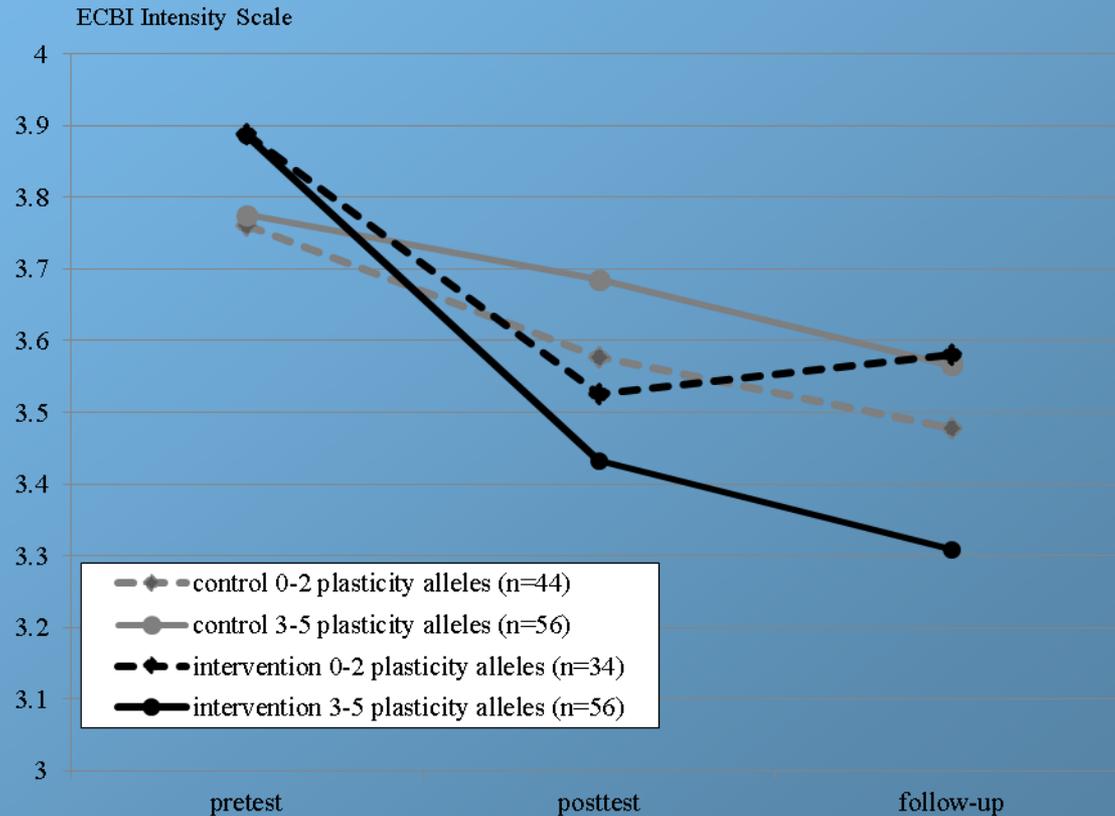
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Intervention Effects on Indiscriminant Social Behavior Among Institutionalized Romanian Children Moderated by Cumulative Genetic Plasticity: 5-HTTLPR *and* BDNF
(CAUG: Care as Usual Group; FCG: Foster Care Group)



EFFECTS OF INCREDIBLE YEARS ON REDUCTION IN BOYS' EXTERNALIZING MODERATED BY POLYGENIC DOPAMINERGIC INDEX (*DRD4*, *DRD2*, *DAT1*, *MAOA*, and *COMT*)





CONCLUSIONS

- Language for “upside plasticity”?
- Domain specific or domain general?
- Implications for Intervention: Efficacy vs. Equity?