Do Oxytocin Receptor Gene Moderate the Effect of Maternal Sensitivity on Prosocial Orientation in Childhood and Adolescence?

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Introduction

- Being able to empathize, share and cooperate with others, as well as to establish close-emotional ties, including attachments, are regarded as central developmental tasks.
- Well appreciated is that there is great variation among children in their prosocial and affiliative orientations (Eisenberg, Fabes, & Spinrad, 2007).
- Also widely acknowledged is that such individual differences are shaped by the quality of early relationships (Leerkes, Blankson, &O'Brien, 2009) and genetic make-up (Krueger et al., 2012).

The current study

- The current report examines the effect of maternal sensitivity and the oxytocin receptor gene (*OXTR*) – and their interaction – on individual differences in prosocial orientation, affiliation with and attachment to parents.
- Specifically, we examined the role of two well-known *OXTR* polymorphisms (rs2254298, rs53576) in moderating the influence of maternal sensitivity on children's prosocial development and relationship functioning.
- We also sought to determine (a) whether any such GXE interaction would prove more consistent with a diathesis-stress or differential-susceptibility model and (b) which, if any, allele functions as the "risk" or "plasticity" gene.

Methods

- Data for this research comes from the NICHD Study of Early Child Care and Youth Development (N = 573 for rs2254298; N = 562 for rs53576).
- Composited maternal sensitivity was obtained by averaging the standardized mother-child free-play and the Home Observation for Measurement of the Environment (HOME; Caldwell, & Bradley, 1984) across 5 measurement occasions from 6 to 54 months.
- OXTR was obtained at age 15 via buccal swabs.
- A variety of OXTR-related social functioning from kindergarten to adolescence was selected and then factor analyzed for data reduction (e.g., teacher-reported cooperation [SSRS, Graham & Elliot, 1990], and self-reported social skills [SSRS, Graham & Elliot, 1990]), resulting in three dependent variables: Cooperation, Peer Prosocial and Adolescence Positive Social Relations.

Results

Table 1

Regression Estimates and Differential Susceptibility/ Diathesis-stress Indices.

	Regression estimates				Roisman et al. diagnostics				
	b0	b1	b2	b3; XZ ΔR^2; *p*- value	RoS X Low, Up	Crossover Point on X	PoI	PA	X^2 or ZX^2
rs2254298									
Cooperation	.215	.434 **	-.005	-.081;.000; .619	--	--	--	--	--
Peer Prosocial	.173	.061	.007	.387; .015; .002**	-.41; .47	0.012	.49	.50	Yes
Adolescence Positive Social Relation	-.092	.021	.026	.085; .000; .624	--	--	--	--	--
rs53576									
Cooperation	-.120	.248	.093 *	.117; .001; .398	--	--	--	--	--
Peer Prosocial	.168	.451 **	-.015	-.225; .004; .122	--	--	--	--	--
Adolescence Positive Social Relation	.161	-.064	-.029	.171; .002; .250	--	--	--	--	--

Results

- **OXTR rs53576**
  - Main effect of genotype on cooperation, in that GG allelic group scored higher on Cooperation than AA individuals, but not significantly higher than the AG group
  - Great maternal sensitivity was linked to higher Peer Prosocial score
  - No significant GXE interaction emerged
- **OXTR rs2254298**
  - Greater maternal sensitivity was associated with better Cooperation
  - The GXE interaction proved significant only in the case of Peer Prosocial
  - Single slope analysis indicated that greater maternal sensitivity was predictive of more Peer Prosocial, but only for the individuals homozygous for the G allele.
  - Further tests involving methods proposed by Roisman et al. (2012) indicated that the interaction between OXTR rs2254298 genotype and maternal sensitivity was more consistent with the differential-susceptibility pattern, such that GG homozygotes score higher on Peer Prosocial when early parenting was especially sensitive, but lower when parenting proved particularly insensitive, with no similar parenting-social functioning relation emerging in the case of other genotypes.

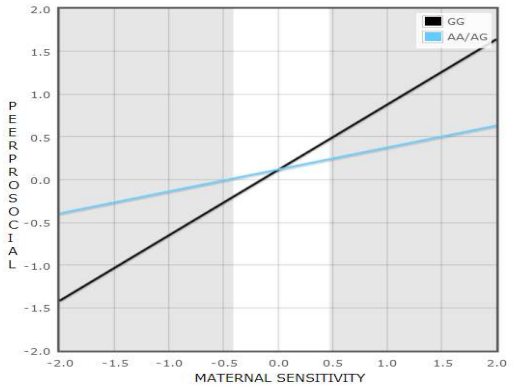

Figure 1. Genetic marker(OXTR rs2254298) by environment (maternal sensitivity) interactions for teacher-reported childhood peer prosocial.

Conclusion

- The purpose of this investigation was to examine the role of two common OXTR polymorphisms in moderating environmental influences on children's prosocial development and relationship functioning, particularly the putative (causal) effect of maternal sensitivity.
- Beyond just evaluating whether there was genetic moderation of an apparent environmental influence, we sought to determine whether any such GXE interaction would prove more consistent with a diathesis-stress or differential-susceptibility model of person-X-environment interaction.
- The results of the current study revealed that OXTR rs2254298—but not rs53576—functioned in this inquiry as a plasticity rather than risk/vulnerability factor, interacting with maternal sensitivity in predicting peer prosocial behavior.
- OXTR rs2254298 GG homozygotes appeared to score high on the index of Peer Prosocial when early parenting was especially sensitive, but low when early parenting proved particularly insensitive, with no similar relation between parenting and social functioning emerging in the case of other genotypes.

References

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