

Introduction

- Positive affect (PA) is one of the few temperamental dimensions that shows moderate to high shared environmental influences in behavioral genetic studies (Goldsmith et al., 1997; Goldsmith et al., 1999, Volbrecht et al., 2007).
- Previous quantitative behavioral genetic research of PA, however, has exclusively employed parent-rating measures, which are subjective and may be prone to rater biases.
- Moreover, research on other temperamental domains such as activity level has indicated that different measures of the same trait can tap different genetic and environmental effects (Saudino, 2009). Consequently, measure-specific effects may also apply to other temperamental traits such as PA.

Goals

- The present study aimed to address two questions:
- 1) Would a more objective measure of PA (i.e., behavioral observations) also show shared environmental effects?
- 2) To what extent do behavioral observations and parent ratings of PA tap the same genetic and environmental factors?

Methods

Sample

• 304 same-sex (140 monozygotic, 164 dizygotic) twin pairs assessed within approximately 2 weeks of their 3rd birthday.

Measures

Observational Measure of PA.

- An observational measure of PA was obtained by coding the frequency of smiles/laughter during three episodes (i.e., "Dinky toys", "Snack delay", and "Gift") from the Laboratory Temperament Assessment Battery (LabTAB; Goldsmith et al., 2005).
- Smiling/laughter were rated as either 0 (behavior absent) or 1 (behavior present) for a total of 23 behavioral segments.
- During these episodes, each twin was assessed without his/her co-twin present.

Parent Rating Measure of PA.

- The Pleasure subscale of the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) provided a parent-rating measure of PA.
- This subscale consists of 10 questions regarding the child's frequency of smiling, laughing, or squealing with joy in specific situations (e.g., playing with favorite toys).

Environmental Influences on Positive Affect: Different Measures, Different Results Manjie Wang, PhD and Kimberly J. Saudino, PhD

Boston University



Figure 1. Lab Assessment: Dinky toys



Figure 2. Lab Assessment: Snack Delay



Figure 3. Lab Assessment: Gift

Model-Fitting Analyses

- A bivariate Cholesky model (Figure 4) was fit to the data. The model includes 3 latent factors $(A_1, C_1, and E_1)$ influencing both observed and parent-rated PA, and 3 factors (A_2 , C_2 , and E_2) accounting for residual influences specific to parent-rated PA.
- Using this model we are able to estimate 1) the heritability, and shared and nonshared environmental variance of each domain; 2) genetic and environmental contributions to the phenotypic correlation; and 3) genetic and environmental correlations between observed and parent-rated PA.



Figure 4. Full bivariate Cholesky model. A= genetic factors; C= shared environmental factors; E= nonshared environmental factors.

Table 1 Twin Intraclass Correlations and Cross-Twin Cross-Trait Correlations

Results

Phenotypic Correlation

Observed PA was modestly correlated with the parentrated PA (*r*=.17, *p*< .01).

ariablaa	Twin zygosity			
anables	MZ twins	DZ twins		
bserved PA	.35*	.13*		
arent-rated PA	.69*	.62*		
ross Correlations	.16*	.00		
oto M7-monozvantio: D7-dizvantio *n< 05				

Note. MZ=monozygotic; DZ=dizygotic. **p*<.05.

Twin Intraclass and Cross Correlations (Table 1)

- For both observed and parent-rated PA, MZ intraclass correlations exceeded DZ correlations, suggesting that both were genetically influenced.
- For parent-rated PA, DZ intraclass correlation exceeded one-half the MZ correlation, suggesting that shared environmental effects also influenced parent-rated PA.
- MZ twin cross correlation (i.e., the correlation between Twin A's score for parent-rated PA with Twin B's score for observed PA and vice versa) exceeded DZ twin cross correlation, suggesting genetic influences on the association between observed and parent-rated PA.

Model-Fitting Results

- Figure 5 presents the path estimates from the best-fitting model. Variance components are presented in Table 2.
- Individual differences in observed PA were attributed to moderate genetic and high nonshared environmental factors, but not shared environmental factors.



Figure 5. Path estimates (95% CI) from the best-fitting bivariate Cholesky model

Table 2

Variance

Observe

Parent-r

Covaria Observe Parent-r respectively.

> Our findings imply that different measures of PA can yield distinct patterns of the sources of the individual differences.

The Boston University Twin Project (BUTP) is supported by grants MH062375 and HD068435 to Dr. Saudino. The twins' and families' participation is gratefully acknowledged.

BOSTON JNIVERSITY

 In contrast, shared environmental effects accounted for over half of the variance in parent-rated PA and genetic and nonshared environmental effects were more modest.

The genetic correlation indicated a complete overlap between genetic factors influencing the two measures. It was these overlapping genetic effects that contributed to the phenotypic correlation between the measures. There was no significant overlap in the environmental influences operating on both measures.

Estimates of Genetic and Environmental Variance (95% CI) from the Best Fitting Model

e	h²	C ²	e ²
ed PA	.34 (.20, .47)		.66 (.53, .80)
ated PA	.12 (.04, .23)	.58 (.49,.66)	.30 (.23, .38)
nce	r_g	r _c	r _e
ed PA— ated PA	1.00 (1.00, 1.00)		

Note. h^2 = genetic variance; c^2 = shared environmental variance; e^2 = nonshared environmental variance. r_a , r_c and r_e denote the genetic, shared environmental, and nonshared environmental correlations,

Conclusions

Possible sources of the shared environmental effects on parent-rated PA may stem from emotional contagion effects. Parents usually see twins together, and one twin's positive emotion could induce the same emotion and related behaviors in the other twin; whereas in the laboratory, twins were observed separately and thus their PA would not be influenced by their co-twins.

Alternatively, the shared environmental effects on parent ratings may reflect parents' misattributions of their twins' smiling/laughing or a tendency to view both twins as equally happy. The low correlation between observed and parent-rated PA suggests this may be the case. Researchers should be cautious when drawing inferences from findings with only one method.

Acknowledgements