ASSOCIATIONS BETWEEN CBCL OCS AND CBCL AP

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Introduction

Using data from the Childhood Behavior Checklist (CBCL) we have developed a scale that can be used to identify children with OCD. In our earlier work (Nelson et al., 2001), we used factor analysis to test and derive an Obsessive Compulsive Scale (OCS). A single factor accounted for 40.0% of the variance and, after simplification of the solution, consisted of 8 items. We then compared CBCL weighted factor scores for a cohort of pediatric OCD patients who had been diagnosed as having DSM-IV OCD with scores from clinically ascertained and general population controls. We demonstrated that the OCS from the CBCL had moderate sensitivity and high specificity to detect clinical OCD, with positive predictive value (PPV) ranging between 70.5% - 83.3% and negative predictive value (NPV) ranging between 88.2% - 91.6%. The utility of the OCS as a screen for OCD has subsequently been replicated in both its original (Geller et al. 2006) and a revised form (Storch et al. 2006).

Subsequently, we have shown that a simple addition of the items placed into the analysis using a Receiver Operating Characteristic (ROC) curve analysis allowed for similar characteristics. Using a CBCL-OCS cutpoint of 5 demonstrated an Area Under the Curve (AUC) of 0.88 with high sensitivity (92%) and moderate specificity (67%) compared to clinical controls. Compared to the general population controls, the AUC was 0.96 with high sensitivity (92%) and specificity (89%) (Hudziak et al, 2006). We have also shown using structural equation modeling that the OCS is influenced by genetic factors (~55%) and unique environmental factors (~45%) at ages 7 and 10 with common environmental influences at age 12 (Hudziak et al, 2004). We have shown its stability in terms of longitudinal course and heritability (van Grootheest et al, 2007).

Questions

1) Because of a reportedly higher incidence of ADHD in OCD probands, we questioned whether there would be similar relations between CBCL-defined OCS and the Attention Problems (AP) scale.
2) We questioned whether the twin-twin correlations of the two measures, CBCL-OCS and CBCL-AP would be higher between monozygotic (MZ) than dizygotic (DZ) twins as an indication of a genetic mechanism for their co-occurrence.

Sample

The sample consisted of 10-year-old twins from the Netherlands Twin Registry. The NTR currently has CBCL data about more than 30,000 twin pairs from age 3 to 30. 3562 10-year-old twin pairs had CBCL data available for analysis. Of these, 2995 twin pairs had all variables of interest coded. The sample consisted of 503 MZ male, 458 DZ male, 647 MZ female, 448 DZ female and 929 DZ opposite sex pairs.

Measures

The CBCL (Achenbach, 1991) was used to measure eight behavioral and emotional syndromes. Items from the OCS were extracted. For the continuous measure analysis, these items were summed, as were items from the AP scale. For Latent Class Analysis, items were truncated such that scores of 1 or 2 were considered "present" and 0 was considered "absent". The items of the OCS are (as numbered by the CBCL):

9. Can't get his/her mind off certain thoughts; obsessions
31. Feels he/she might think or do something bad
32. Feels he/she has to be perfect
52. Feels too guilty
66. Repeats certain acts over and over; compulsions
84. Strange behavior
85. Strange ideas
112. Worries

Data Analyses

Latent Class Analysis was performed on the truncated responses using the program Latent Gold. Models were fitted by means of an EM algorithm. To calculate the best fitting model, we compared class solutions using the change in the Bayesian Information Criterion (BIC), the sample-size adjusted BIC, and the Consistent Akaike Information Criterion (CAIC), goodness-of-fit indices that consider the rule of parsimony.

Examination of the percentage of the sample meeting criteria for the OCS or AP scales was performed using a cutpoint of 5 on the OCS or using LCA-determined classes and examining the AP scores within those groups using a one-way ANOVA in SPSS.

Results

LCA revealed a 4-class solution consisting of a no symptoms group, a "worries and has to be perfect" mild symptoms group, an "obsesses and worries" moderate symptoms group, and a "severe OCS" group. Scores on the Attention Problems scale was significantly higher in the group that was positive on the OCS than in the group that was negative on the OCS. This difference was more pronounced in boys and when population-defined LCA classes were used (Tables 1 and 2).

Table 1. Mean CBCL Attention Problem scores are higher in 10-year-old twins who score positive on the CBCL-OCS scale

	Male		*Female*	
	OCS <5	OCS >=5	OCS <5	OCS >=5
Twin 1				
N	1415	50	1465	55
mean AP score	**3.19**	**8.28***	**2.26**	**6.11***
95%CI	(3.03 - 3.34)	(6.95 - 9.61)	(2.13 - 2.38)	(5.04 - 7.18)
Twin 2				
N	1345	41	1543	56
mean AP score	**3.10**	**8.07***	**2.13**	**6.16***
95%CI	(2.94 - 3.26)	(6.78 - 9.37)	(2.01 - 2.24)	(5.14 - 7.18)

***p<0.001**

Table 2. Mean CBCL AP scores are higher in 10-year-old twins who are in the Severe Class compared to the No Symptoms (No Sx) Class

	Male		*Female*	
	No Sx Class	Severe Class	No Sx Class	Severe Class
Twin 1				
N	1185	16	1198	28
mean AP score	**2.80**	**9.56***	**1.93**	**6.82***
95%CI	(2.66 - 2.96)	(6.71 – 12.41)	(1.81 – 2.06)	(5.21 - 8.43)
Twin 2				
N	1116	14	1310	20
mean AP score	**2.68**	**9.64***	**1.88**	**5.55***
95%CI	(2.52 - 2.83)	(7.10 - 12.18)	(1.77 - 2.00)	(3.92 - 7.18)

***p<0.001**

Results (cont.)

Because the genetic models of AP and OCS yield different genetic structure (with genetic dominance present in AP, but additive genetic and shared environmental effects in OCS), fit of a full bivariate analysis with all components (ACDE) has proved difficult. We have performed preliminary analysis examining the correlations between AP and OCS across twin type. Correlations between AP and OCS is higher between MZ than DZ twins, suggesting that there are common genetic factors associated with the co-occurrence of the two phenotypes (Table 3).

Table 3. Higher OCS-AP Pearson Correlation in MZ twins

		Twin 1	
		AP	OCS
		MZ	
Twin 2	AP	.739	**.298**
	OCS	**.333**	.580
		DZ	
	AP	.237	**.232**
	OCS	**.244**	.294

Discussion

These data suggest that the characteristics of the CBCL OCS continues to fall in line with emerging data on the co-occurrence of attention problems and obsessive-compulsive behavior. While clearly the OCS does not capture the breadth of symptoms necessary to fully characterize OCD, it does allow for population-based analysis of the co-occurrence of OC behavior and other child pathologies. The next steps here will be to fit a bivariate genetic design to study how much of the heritability of the individual phenotypes are attributable to genetic factors that are shared between the syndromes.

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