The CBCL (Achenbach, 1991) was used to measure eight behavioral and emotional syndromes. Three syndrome scores known to distinguish CBCL-JBD were selected – Attention Problems (AP), Aggressive Behavior (AGG), and Anxious/Depressed (A/D). The items from the AP, AGG, and AD subscales were first truncated to create dichotomous variables with either 1 (“sometimes true”) or 2 (“often true”) considered as positive responses and 0 (“not true”) considered as a negative response.

### Data Analyses

Latent class analysis was performed using Latent Gold. Participant response profiles on the 44 items were placed into the analysis with different discrete latent classes in ADHD (Todd et al., 2003). We questioned whether use of LCA with items from the subscales that define the CBCL-JBD phenotype (AP, A/D, and AGG) would yield an endophenotype that could be identified as the CBCL-JBD phenotype and further questioned whether use of this endophenotype would show evidence of heritability using a twin-study design.

To examine the latent structure of the CBCL AP, A/D, and AGG subscales in combination to determine if a CBCL-JBD endophenotype emerges and to examine the heritability of that endophenotype.

#### Questions

1) Does the latent class structure of the CBCL include a CBCL-JBD endophenotype?
2) Is there evidence of heritability within endophenotypes?
3) What other endophenotypes emerge and what are their implications for child psychopathology?

#### Results

A 7 class model fit the females best while an 8 class model fit the males. The most common classes for boys or girls was one with no symptoms. The CBCL Bipolar phenotype was the least common – about 4% of the boys and 5% of the girls.

Differences between the sexes were a primarily anxious-depressed class in the girls that did not show up in boys. In boys there was a class that showed increased item endorsement probabilities on AP and AGG with and without the violent items (fights, attacks people, etc.). These violent items were only endorsed with increased probabilities in the girls who had the CBCL-Bipolar phenotype.

### Rationale

We have shown that the CBCL-Juvenile Bipolar Disorder (CBCL-JBD) phenotype is distinguishable from severe ADHD and is heritable (Hudziak et al., in review).

Todd and his colleagues have demonstrated that different genotypes are associated with different discrete latent classes in ADHD (Todd et al., 2005). We questioned whether use of LCA with items from the subscales that define the CBCL-JBD phenotype (AP, A/D, and AGG) would yield an endophenotype that could be identified as the CBCL-JBD phenotype and further questioned whether use of this endophenotype would show evidence of heritability using a twin-study design.

To examine the latent structure of the CBCL AP, A/D, and AGG subscales in combination to determine if a CBCL-JBD endophenotype emerges and to examine the heritability of that endophenotype.

#### Objective

To examine the latent structure of the CBCL AP, A/D, and AGG subscales in combination to determine if a CBCL-JBD endophenotype emerges and to examine the heritability of that endophenotype.

### Measures

The odds ratios for across class comparisons were calculated and showed very high ratios for within class comparisons and markedly lower ORs across classes. Comparing MZ to DZ twins showed a markedly higher odds ratios for within class comparisons for the MZ twins, especially for the extreme CBCL-JBP endophenotype. Much higher MZ as opposed to DZ odds ratios suggest the presence of within endophenotype heritability.

#### Odds Ratios – Boys

<table>
<thead>
<tr>
<th>Class</th>
<th>No Symptoms</th>
<th>Attention Problems</th>
<th>Aggressive Behavior</th>
<th>Anxious/Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>MZ</td>
<td>0.21 0.39</td>
<td>0.00 0.00</td>
<td>0.09 1.27</td>
<td>0.00 0.00</td>
</tr>
<tr>
<td>DZ</td>
<td>0.32 0.84</td>
<td>0.51 0.61</td>
<td>1.08 0.74</td>
<td>0.75 2.65</td>
</tr>
</tbody>
</table>

#### Odds Ratios – Girls

<table>
<thead>
<tr>
<th>Class</th>
<th>No Symptoms</th>
<th>Attention Problems</th>
<th>Aggressive Behavior</th>
<th>Anxious/Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>MZ</td>
<td>0.12 0.84</td>
<td>0.32 0.57</td>
<td>1.40 0.93</td>
<td>0.55 1.41</td>
</tr>
<tr>
<td>DZ</td>
<td>0.18 0.55</td>
<td>0.11 0.17</td>
<td>0.07 0.41</td>
<td>0.58 1.12</td>
</tr>
</tbody>
</table>

### Discussion

The CBCL-JBP endophenotype emerges from LCA of the component items of the AP, AGG, and AD subscales of the CBCL using a large population-based twin sample.

There is evidence of heritability within endophenotypes, as evidenced by higher odds ratios for MZ twins than DZ twins within the latent classes.

Other classes that emerge support the idea that attention problems, anxious-depressive symptoms, and aggressive symptoms rarely occur in isolation in children, but appear in combinations that have not had the benefit of receiving their own name.

There are reasons to consider the use of LCA in genotyping studies as a way to further refine phenomena when searching for genetic relationships and gene x environment interactions in JBD.