Discrepancies in Parent and Teacher Ratings of Social-Behavioral Functioning of Children With Chromosome 22q11.2 Deletion Syndrome: Implications for Assessment

Vandana Shashi, Emily Wray, Kelly Schoch, Kathleen Curtiss, and Stephen R. Hooper

Abstract

Children with 22q11.2 deletion syndrome exhibit high rates of social-behavioral problems, particularly in the internalizing domain, indicating an area in need of intervention. The current investigation was designed to obtain information regarding parent and teacher ratings of the social-emotional behavior of children with 22q11DS. Using the Child Behavior Checklist (CBCL), the sample included 67 children with 22q11DS and 59 control subjects. Results indicated significant differences in social-behavioral functioning of children with 22q11DS, as compared to a control group, based on rater type. Specifically, parents reported more difficulties with internalizing problems, withdrawal, and social problems in children with 22q11DS. In contrast, teachers perceived few differences between children with 22q11DS and unaffected children. Correlational analyses indicated weak concordance between parent and teacher reports, with no significant correlations on any of three summary scales. The findings support the use of multiple methods of assessment and multiple informants when collecting information regarding the social-behavioral functioning of children with 22q11DS, and that interpretations based on only one informant/setting need to be made cautiously.

Key Words: 22q11 deletion syndrome; velocardiofacial syndrome; DiGeorge syndrome; behavior; social skills

Chromosome 22q11.2 deletion syndrome (22q11DS), also known as velocardiofacial syndrome, or DiGeorge syndrome, is estimated to affect approximately 1 in 1,600 to 4,000 individuals (Shprintzen, 2008; Tezenas Du Montcel, Mendoza, Ayme, Levy, & Phillip, 1996). The medical problems commonly associated with 22q11DS include cardiac anomalies, velopharyngeal incompetence, cleft palate, immune deficiencies, and characteristic facial features (McDonald-McGinn et al., 1997; McDonald-McGinn et al., 1999; Shprintzen, 1978). In addition to these physical disabilities, research involving children and young adults with 22q11DS have revealed neuropsychological deficiencies including impaired intellectual abilities and executive functioning, and a higher incidence of psychiatric disorders. Cognitive abilities of children with 22q11DS extend from the moderately impaired range to the low average range with a mean IQ ranging from 70 to 89 (Lajiness-O’Neill et al., 2006; Moss et al., 1999; Niklasson, Rasmussen, Öskarsson, & Gillberg, 2001; Niklasson, Rasmussen, Öskarsson, & Gillberg, 2002; Sobin, Kiley-Brabeck, Hadley Monk, Khuri, & Karayiorgou, 2009; Swillen et al., 1997; Woodin et al., 2001). In addition, numerous reports have documented discrepancies among cognitive domains, with better performance on tasks of verbal IQ than tasks of performance IQ (Lajiness-O’Neill et al., 2006; Moss et al., 1999; Niklasson et al., 2002; Swillen et al., 1997). This cognitive profile is often described as a nonverbal learning disability (NVLD; Moss et al., 1999), although the exact alignment with the 22qDS cognitive profile has been questioned (De Smedt et al., 2007; Schoch...
et al., in press). Numerous studies have also reported that individuals with 22q11DS are at increased risk for developing psychotic disorders in adulthood, particularly affective bipolar disorders and schizophrenia (Gothelf & Lombroso, 2001; Murphy, Jones, & Owen, 1999; Niklasson et al., 2002; Papolos et al., 1996; Shprintzen, Goldberg, Golding-Kushner, & Marion, 1992).

Social-Behavior Difficulties in Children With 22q11DS
Children with 22q11DS often exhibit psychiatric and behavioral challenges that negatively impact their learning and social development. Although parents of affected children report fewer concerns regarding the presence of externalizing symptoms, internalizing problems are quite common (Jansen et al., 2007; Woodin et al., 2001). Previous investigations by our team and others have reported that the behavior difficulties reported in the 22q11DS population appear to be largely unrelated to individuals' intellectual abilities and medical complications, suggesting the presence of a behavioral phenotype of the disorder (Jansen et al., 2007; Shashi et al., 2011). Common psychiatric conditions comorbid in children with 22q11DS include attention deficit/hyperactivity disorder (ADHD), withdrawal, specific phobias, anxiety disorders, depressive disorders, obsessive-compulsive features, and features of autism, with ADHD and anxiety disorders being the most prevalent (Lewandowski, Shashi, Berry, & Kwapis, 2007; Sobin et al., 2009; Swillen et al., 1997; Woodin et al., 2001). Additionally, children with 22q11DS have been reported to experience weaker social competence and more social problems than their unimpaired peers (Shashi et al., 2011; Sobin et al., 2009; Swillen et al., 1997; Woodin et al., 2001). Unfortunately, few affected children appear to be receiving treatment for their psychosocial challenges. In a prior report examining the rate of utilization of mental health services in children and adolescents with 22q11DS, we demonstrated that out of 72 participants, 67% met diagnostic criteria for at least one psychiatric condition based on parent report of symptoms, with ADHD and anxiety disorders being the most common. However, only 38% of those with ADHD and 19% of those with anxiety disorders were receiving treatment, rates that were significantly lower than typical children (Young, Shashi, Schoch, Kwapis, & Hooper, 2011).

All reports on the behavior problems in 22q11DS thus far have relied solely on parent behavior ratings, which may only provide a partial picture of the child’s overall behavior and functioning. Little is known about how the behavioral difficulties of children with 22q11DS are manifested across settings. Collecting information on children’s functioning from multiple informants is a critical component of diagnostic assessments and treatment decision-making (Sattler & Hoge, 2006; Tasse & Lecavalier, 2000). Parents are valuable respondents because they observe their child’s behaviors across multiple settings. In contrast, teachers have the unique ability to compare one child’s functioning with that of a large group of age-matched peers. Based on the literature in the general population, however, it is evident that clinicians often have difficulty integrating reports from multiple informants due to inconsistent results. In addition, clear guidelines for interpreting discrepant results are not available, which may deter clinicians and researchers from obtaining reports from multiple sources (Cai, Kaiser, & Hancock, 2004; Verhulst & Akkerhuis, 1989). Across studies, most research teams have documented low to moderate agreement between parent and teacher behavior ratings, with parents typically reporting more problems than teachers. Similar concordance rates have been documented between parent and teacher ratings of children with intellectual and developmental disabilities (Tasse & Lecavalier, 2000). Furthermore, teachers have been shown to identify externalizing behaviors more frequently than internalizing problems (Cai, Kaiser, & Hancock, 2004; Verhulst & Akkerhuis, 1989; Youngstrom, Loeber, & Stouthamer-Loeber, 2000). Since children with 22q11DS often exhibit internalizing symptoms, teacher ratings may overlook the presence and/or the severity of internalizing behaviors. Although examined in the general child population, agreement between parent and teacher behavior ratings has not been investigated within the 22q11DS population. Developing a greater understanding of children’s behavior, as measured by parent and teacher reports, could indicate how the social-behavioral phenotype of 22q11DS may be impacting children’s learning and social-emotional development. This information could have implications for treatment of emotional and behavioral problems in 22q11DS by guiding intervention efforts in targeted settings.
In that regard, the current investigation was designed to obtain information regarding parent and teacher ratings of the social-emotional behavior of children with 22q11DS, compared with their unimpaired peers. Two specific questions were examined. The first investigates the degree to which parents and teachers report social-behavioral difficulties of children with 22q11DS relative to age-matched controls. It was hypothesized that parents and teachers of children with 22q11DS would be more likely to report the presence of internalizing forms of social-behavioral difficulties than parents or teachers of typical children. Second, since the focus of the study was children with 22q11DS, we also examined the relationship between parent and teacher ratings of social-behavioral functioning within the 22q11DS group. Based on results from the general population, we hypothesized that agreement between respondents would be weak to moderate, with higher concordance between parents and teachers on externalizing types of behaviors than on internalizing behaviors.

Methods

Participants

The participants in the present study were included as part of a larger comprehensive study investigating the neuropsychological and psychiatric functioning of children with 22q11DS. The current investigation included 67 children and adolescents with 22q11DS and 59 control children who were recruited at Duke University Medical Center and Wake Forest University Baptist Medical Center. All subjects with 22q11.2DS had a molecularly confirmed deletion of the 22q11.2 region. Those with a history of psychosis, bipolar illness, or major depression at the time of enrollment were excluded, as the ultimate goal of the larger study was to determine the antecedents of major psychiatric illnesses in these children. Control participants were recruited through pediatric practices in the community and the public school system and were age- and gender-matched to the 22q11DS subjects. Control children were excluded if they had a severe neurodevelopmental disorder (e.g., autism), or a personal or family history (first-degree relative) of psychosis, bipolar disorder, or major depression. They were not excluded based on the presentation of ADHD. As they were recruited for an investigation of risk for psychosis, none of the subject or control participants presented with psychosis at the time of the evaluation. Specific sociodemographic characteristics of the sample can be seen in Table 1.

Preliminary data analyses revealed no differences between the 22q11DS and control groups on socioeconomic status (SES), t (109) = −1.03, p = .31; chronological age, t (123) = −1.60, p = .12; or gender, Fisher’s exact test (FET) p = .725. The groups were significantly different on Full Scale IQ, t (121) = −11.12, p = .000, with the control group being higher; and ethnicity, χ² (4) = 18.53, p = .001, where there was a higher proportion of African Americans in the control group. This finding regarding ethnicity likely reflects the demographics of the population in the area around Duke University Medical Center, one of the two sites of the study.

Regarding educational and psychiatric factors, the two groups were not significantly different when looking at the number of children taking psychotropic medications (FET = .374; 22q11DS = 13 children; Controls = 14 children). Of the 27 children who reported taking prescribed medications, 11 of the 22q11DS children and all 14 controls were being prescribed stimulant medication. The two groups were significantly different, however, in their educational placement, χ² (4) = 17.93, p = .001, with more children in the 22q11DS group being placed in some form of special education classes at school (64% vs. 18%), and psychiatric diagnosis at evaluation, χ² (1) = 6.33, p = .012, with more children in the 22q11DS group (68%) meeting criteria on the Clinical Data Interchange Standards Consortium for psychiatric diagnoses than those in the control group (45%). Table 1 illustrates the demographics of the samples in our study.

Measures

Data were collected regarding parent and teacher perceptions of children’s social-emotional functioning through the use of two complementary behavior rating scales, the Child Behavior Checklist (CBCL) and the Teacher Report Form (TRF). Both instruments have well-established psychometric properties, including good reliability and validity, particularly for the Total Problem, Internalizing and Externalizing composites (Achenbach, 1991a; Achenbach, 1991b; Sattler & Hoge, 2006). Both instruments are widely used in research and clinical practice (Gothelf et al.,
as reported in the participants section, results of the comparisons between groups revealed significant differences in ethnicity and full scale intelligence quotient (FSIQ). in subsequent analyses, the two groups were covaried on ethnicity. the need to statistically control for the significant difference in IQ between the two groups posed an interesting decision, however. given the lower intelligence scores due to the genetic microdeletion in individuals with 22q11DS, Dennis et al. (2009) have argued that controlling for IQ would eliminate some of the variance inherent in the disorder, thus minimizing or eliminating potential important group differences. in contrast, a number of studies have documented the importance of level of functioning, as defined by intelligence, to subsequent behavior (Rutter, Graham, & Yule, 1970). Consequently, controlling for differences in intelligence would be essential to determine the presence of group differences in social-behavioral functioning. Since we were interested in how the 22q11DS group would compare to the controls on the parent ratings of social-behavior, we conducted the subsequent analyses examining the data without IQ as a covariate, and then conducted secondary analyses, including IQ as a covariate.

To address the first research question, which compared parent and teacher ratings for participants with 22q11DS and control participants, we employed two separate multiple analyses of covariance (MANCOVA) for parent and teacher scales. With a significant MANCOVA, follow-up
univariate procedures were conducted. Selected covariates were included in the analyses.

For the second question examining the concordance between parent and teacher ratings, we conducted Pearson product moment correlations between the two scales for the 22q11DS sample, with medication status and the type of teacher that completed the rating (regular education vs. special education) as covariates. Additionally, we utilized Bland-Altman plots for significant correlations in order to determine the level and pattern of correlations between the different raters.

**Results**

**Parent Ratings**

**CBCL Parent summary scales.** Controlling for ethnicity, the MANCOVA showed an overall significant group difference in parental reports of the social-emotional behavior of children with 22q11DS as compared to controls, $F(3, 121) = 17.12, p = .000$. As can be seen in Table 2, follow-up univariate comparisons showed that parents of children with 22q11DS reported significantly greater Internalizing problems, $F(1, 123) = 19.11, p = .000$, and Total problems, $F(1, 123) = 27.78, p = .000$, than did parents of control children. Medium and large effect sizes were present for both findings. There was no significant difference between the groups on the CBCL Externalizing Problems scale, $F(1, 123) = 2.88, p = .092$.

A second MANCOVA was conducted, which included the same variables as the original analysis; however, IQ was added as a covariate. The results did not change when IQ group differences were accounted for. When controlling for ethnicity and IQ, the MANCOVA again showed a significant group difference for the CBCL parent summary scales, $F(3, 117) = 5.33, p = .002$. As in the original analysis, follow-up univariate comparisons showed the 22q11DS and control groups to be significantly different on the Internalizing problems scale, $F(1, 119) = 8.53, p = .004$, and the Total problems scale, $F(1, 119) = 6.25, p = .014$. There was no difference between the groups on the CBCL Externalizing Problems scale, $F(1, 119) = 0.11, p = .744$.

**CBCL Parent clinical scales.** Initial examination of the $T$-scores for the clinical scales showed the 22q11DS group to have scores that were elevated more than one standard deviation past the mean on five of the eight scales (Table 2). For the CBCL clinical scales, again controlling for ethnicity, the MANCOVA showed a significant overall group difference, $F(8, 116) = 8.81, p = .000$. As can be seen in Table 2, the 22q11DS group received significantly higher ratings (i.e., more symptoms) on all of the CBCL clinical scales, except Delinquent and Aggressive. For the scales with significant differences, the effect sizes ranged from small (Attention, Anxious/Depressed) medium (Withdrawn, Somatic, Thought Problems) to large (Social Problems).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Group Comparisons on the Parent CBCL Rating Scale Controlling for Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBCL scale</td>
<td>22q11DS ($n = 67$)</td>
</tr>
<tr>
<td>Summary Scales</td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>59.81 (12.86)</td>
</tr>
<tr>
<td>Externalizing</td>
<td>52.91 (9.24)</td>
</tr>
<tr>
<td>Total Problem Score</td>
<td>61.18 (9.66)</td>
</tr>
<tr>
<td>Clinical Scales</td>
<td></td>
</tr>
<tr>
<td>Anxious/Depressed</td>
<td>59.66 (9.18)</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>61.00 (8.89)</td>
</tr>
<tr>
<td>Somatic</td>
<td>62.18 (9.08)</td>
</tr>
<tr>
<td>Social Problems</td>
<td>64.21 (8.64)</td>
</tr>
<tr>
<td>Thought Problems</td>
<td>61.67 (9.77)</td>
</tr>
<tr>
<td>Attention</td>
<td>64.78 (9.85)</td>
</tr>
<tr>
<td>Delinquent</td>
<td>54.57 (4.90)</td>
</tr>
<tr>
<td>Aggressive</td>
<td>56.13 (6.77)</td>
</tr>
</tbody>
</table>

Notes. CBCL = Child Behavior Checklist. Medium and large effect sizes are in bold.
Entering ethnicity and IQ into the MANCOVA as covariates produced a significant group difference, $F(8, 112) = 2.73, p = .009$. Follow-up group comparisons showed the 22q11DS group to receive higher (i.e., more symptoms) ratings on Somatic Problems, $F(1, 119) = 7.46, p = .007$; and Social Problems, $F(1, 119) = 8.61, p = .004$. The Attention Problems scale showed a trend towards significance, $F(1, 119) = 3.84, p = .052$, but was ultimately not significant in this analysis. None of the other parent clinical scales showed group differences.

**Teacher Ratings**

Since we collected teacher rating scales from fewer subjects (22q11DS = 50 and controls = 42) than those who provided parent CBCL reports, we further examined the within-group demographics of the subjects with and without teacher forms. Within the 22q11DS group, there were no significant differences between those with and without teacher report forms on SES, age, level of education, ethnicity or gender. This was also true when comparing those in the control group with and without teacher report forms, with the exception of ethnicity. There was a significant difference for ethnicity between those in the control group who were able to obtain teacher forms and those who were not, $\chi^2(3) = 10.26, p = .016$. Looking more specifically at the data, there was a significant difference in the ethnic distribution of African American participants without teacher forms and Caucasian participants without teacher forms. Of the African American participants, 56% did not return teacher forms compared to only 19% of Caucasian participants. It should be noted, however, that this may be an artifact of sample size (18 African American control participants vs. 38 Caucasian). There were also not enough subjects in the Hispanic or biracial ethnic categories to make reliable comparisons.

Within group comparisons regarding teacher forms were also made on the presence of a psychiatric diagnosis at time of evaluation as measured by the CDISC, or being prescribed a psychotropic medication. Kids in the 22q11DS group with teacher ratings were not significantly different than kids in the 22q11DS group without teacher ratings in the presence of a CDISC psychiatric diagnosis (FET = .793) or being prescribed psychotropic medications (FET = .779). The same was true of the control group, with no differences in CDISC diagnosis (FET = .09) or prescription of psychotropic medications (FET = 1.00) between those with and those without teacher forms.

**Teacher rating form summary scales.** The MANCOVA showed no significant overall group difference, $F(3, 95) = 2.13, p = .102$. Furthermore, none of the summary scales were significantly elevated. Table 3 presents the differences in teacher ratings of the social-emotional behavior of children with 22q11DS relative to controls. As with the parent ratings, the teachers’ ratings were also examined with and without IQ as a covariate. When analyzing the sample controlling for IQ, the MANCOVA continued to be nonsignificant, $F(3, 93) = 1.02, p = .386$; consequently, no follow-up univariate comparisons were conducted.

**Teacher rating forms clinical scales.** Initial examination of the individual clinical scales for the 22q11DS group showed only one to have a significant rating that was more than one standard deviation above the mean (Social Problems). The MANCOVA showed a significant difference between the groups on the TRF clinical scales, $F(8, 89) = 5.51, p = .000$. As can be seen in Table 3, the follow-up univariate analyses revealed the groups to be significantly different on two scales: Withdrawn Problems, $F(1, 96) = 6.48, p = .013$, and Social Problems, $F(1, 96) = 24.07, p = .000$. While a small effect size was present for Withdrawn Problem, $\eta^2_p = .06$, a large effect size was seen for Social Problems, $\eta^2_p = .20$. None of the other TRF clinical scales showed significant differences between children with 22q11DS and unimpaired peers.

When IQ was entered into the model as a covariate, there was a significant difference between groups on the MANCOVA, $F(8, 87) = 2.32, p = .026$. When examining the follow-up univariate comparisons, however, none of the individual clinical scales were significantly different between the groups, with all of the effect sizes falling within the small range.

**The Relationship Between Parent and Teacher Ratings of Social-Behavioral Functioning**

Table 4 presents the partial correlations between parent and teacher CBCL summary scores and Table 5 for the clinical scales. In these analyses it was decided to control for medication status and type of teacher (i.e., regular education or special...
The effect of teacher type on the findings was controlled as it was found that special education teachers were more likely to report problematic behaviors in our study. When examining the magnitude of the correlations, teacher and parent reports of social-behavioral functioning of children with 22q11DS were largely discordant (Table 4). No significant inter-rater correlations were found for any of the three summary scales; however, significant moderate correlations occurred for parent and teacher reports on Withdrawal, \( r(40) = 0.48, \ p = 0.001 \); Thought Problems, \( r(40) = 0.43, \ p = 0.005 \); and Anxious/Depressed, \( r(40) = 0.34, \ p = 0.026 \). These results indicated that, for these domains, teachers and parents were identifying similar patterns of behavior for children with 22q11DS. Furthermore, when the T-scores for each of these three scales were examined, both parents and teachers were reporting mild to moderate concerns for these scales (i.e., the same severity levels). Interestingly, teacher report of thought problems was also significantly correlated with a number of other parent report scales, including Rule Breaking/Delinquent Behavior, \( r(40) = 0.42, \ p = 0.006 \) and Aggressive Behavior, \( r(40) = 0.35, \ p = 0.025 \). Of note, correlations between teacher and parent report for summary and clinical scales were considerably stronger for children in the control group than for those with 22q11DS (Table 5).

In addition to calculating partial correlations between respondents’ ratings of behavior, agreement between raters on significant CBCL scales for both groups was calculated using Bland-Altman plots. These results are presented in Figure 1A–D. In contrast to measures of correlation that reflect which variables are moving in the same direction,

### Table 3
**Group Comparisons on the Teacher TRF Rating Scale**

<table>
<thead>
<tr>
<th>TRF Scale</th>
<th>22qDS11 (n = 54)</th>
<th>Control (n = 44)</th>
<th>F-Value</th>
<th>p-Value</th>
<th>Partial eta square</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary Scales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>57.96 (11.02)</td>
<td>53.73 (10.7)</td>
<td>3.7</td>
<td>.06</td>
<td>.03</td>
</tr>
<tr>
<td>Externalizing</td>
<td>52.39 (9.76)</td>
<td>53.23 (9.50)</td>
<td>.14</td>
<td>.7</td>
<td>.001</td>
</tr>
<tr>
<td>Total Problem Score</td>
<td>57.7 (10.29)</td>
<td>55.86 (8.91)</td>
<td>.88</td>
<td>.35</td>
<td>.009</td>
</tr>
<tr>
<td><strong>Clinical Scales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious/Depressed</td>
<td>58.91 (8.27)</td>
<td>57.09 (8.02)</td>
<td>1.20</td>
<td>.28</td>
<td>.01</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>59.65 (8.64)</td>
<td>55.09 (9.03)</td>
<td>6.48</td>
<td>.01</td>
<td>.063</td>
</tr>
<tr>
<td>Somatic</td>
<td>55.85 (7.24)</td>
<td>54.16 (6.04)</td>
<td>1.53</td>
<td>.22</td>
<td>.016</td>
</tr>
<tr>
<td>Social Problems</td>
<td>62.89 (8.27)</td>
<td>55.16 (7.07)</td>
<td>24.07</td>
<td>.000</td>
<td><strong>200</strong></td>
</tr>
<tr>
<td>Thought Problems</td>
<td>56.57 (8.68)</td>
<td>53.73 (5.95)</td>
<td>3.42</td>
<td>.07</td>
<td>.034</td>
</tr>
<tr>
<td>Attention</td>
<td>59.61 (8.15)</td>
<td>58.07 (6.92)</td>
<td>0.99</td>
<td>.32</td>
<td>.10</td>
</tr>
<tr>
<td>Delinquent</td>
<td>53.59 (5.05)</td>
<td>54.39 (6.76)</td>
<td>0.44</td>
<td>.507</td>
<td>.005</td>
</tr>
<tr>
<td>Aggressive</td>
<td>55.74 (5.77)</td>
<td>55.82 (8.62)</td>
<td>0.003</td>
<td>.96</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Notes. TRF = Teacher Report Form. Medium and large effect sizes are in bold.*

### Table 4
**Parent-teacher Correlations of Summary Scale Reports in Children with 22q11DS and Controls**

<table>
<thead>
<tr>
<th>Parent ratings</th>
<th>Internalizing 22q11 Controls</th>
<th>Externalizing 22q11 Controls</th>
<th>Total problems 22q11 Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internalizing</td>
<td>0.14 (.63)**</td>
<td>0.02  .42*</td>
<td>0.06  .54**</td>
</tr>
<tr>
<td>Externalizing</td>
<td>0.04  .17*</td>
<td>0.18  0.22</td>
<td>0.04  0.15</td>
</tr>
<tr>
<td>Total Problems</td>
<td>0.14  .50**</td>
<td>0.15  0.28</td>
<td>0.1   .41*</td>
</tr>
</tbody>
</table>

*Notes. Correlations were calculated controlling for Type of Teacher and Medication Status.*

\*\*\*\(p < .001\), \*\*\(p < .01\), \*\(p < .05\).
Bland-Altman Plots illustrate how similar the respondents were in what they were reporting. Thus, agreement is often considered to be a more reliable indicator of concordance between multiple measures. Regarding the Internalizing problems summary scores, Bland-Altman found modest agreement between parent and teacher responses for 22q11DS participants, with 8.6% of the variance in teacher report being explained by parent report ($R^2 = 0.086$; Figure 1A). Agreement was stronger for teacher and parent Withdrawn scores, explaining 28% of the variance ($R^2 = 0.279$; Figure 1B). When rating control participants, teacher and parent agreement was moderate for the Internalizing problems summary scale ($R^2 = 0.412$; Figure 1C) and the Withdrawn clinical scale ($R^2 = 0.324$; Figure 1D).

**Discussion**

This study is the first to evaluate and compare parent and teacher perceptions of the behavior and social-emotional functioning of children with 22q11DS and their unimpaired peers. Previous research has shown that children with 22q11DS are at increased risk for internalizing symptoms, such as anxiety, depression, withdrawal, obsessions, compulsions, and social skill impairments (Jansen et al., 2007; Shashi et al., 2011; Woodin et al., 2001). Results of the present study provide further evidence for this, particularly in the areas of internalizing behavior, social problems, and thought problems. This was especially true in the home setting where parents of children with 22q11DS were significantly more likely to report internalizing problems than were parents of control children. In contrast, teachers indicated perceiving few significant differences between the functioning of 22q11DS children and their typically developing classmates. Teacher responses did corroborate significant difficulties with social problems and withdrawal in children with 22q11DS, as compared to their typical peers; however, teachers did not note significant differences between 22q11DS and control groups regarding thought problems or overall internalizing problems.

The discordancy noted between parent and teacher reports in our study is consistent with similar findings in the general population (Cai et al., 2004; Verhulst & Akkerhuis, 1989; Youngstrom, Loebel, & Stouthamer-Loebel, 2000), and among children with intellectual disabilities.
Indeed, correlational analyses in the present study concluded that parents and teachers are providing disparate reports about the emotional and behavioral functioning of children with 22q11DS. In fact, within the 22q11DS group, teacher and parent reports were discrepant for all three summary scales of the CBCL: Internalizing problems, Externalizing problems, and Total problems. The only areas of agreement between teacher and parent report were withdrawal, thought problems, and anxious/depressed.

Bland-Altman plots revealed significantly high levels of agreement between parents and teachers on withdrawn scores and less agreement on the internalizing symptoms in the 22q11DS group. This result suggests that parents and teachers rarely reported similar concerns for the same child.

The lack of significant correlations between parent and teacher report on the three summary scales of the CBCL in the 22q11DS group is consistent with previous research in the general population and among children with disabilities.
This discordance is strikingly apparent for internalizing symptoms, such as anxiety (Cai et al., 2004; Verhulst & Akkerhuis, 1989), and is particularly consistent with studies of parent and teacher ratings of children with autism spectrum disorders (ASD) (Kanne, Abbacchi, & Constantino, 2009, Jepson, Gray, & Taffe, 2012). In a study of 177 children ages 3–18 years with ASD and their siblings, Kanne et al. (2009) found low correlations between parent and teachers for the children with ASD on the Internalizing scales and moderate correlations for all of the other CBCL domains. Parent and teacher ratings were more discordant for the children with ASD than their unaffected siblings and teacher ratings were lower overall. Similar results were reported by Jepson et al. (2012) in their study of children with ASD, finding low to moderate correlations between parent and teacher ratings on the majority of the CBCL scales, with the exception of Internalizing Problems, Anxious/Depressed Problems, Somatic Complaints, and Thought Problem scales, which were not significantly correlated. As a large number of ASD children also have difficulties with internalizing disorders, this finding has particular relevance to the emotional/behavioral assessment of children with 22q11DS, as they are more likely to experience internalizing than externalizing difficulties. Consequently, similar to findings in the ASD population, teachers and parents may be particularly discordant in evaluating the behavior of children with 22q11DS.

There is no clear explanation for the discrepancy between parent and teacher behavior ratings in the 22q11DS group; however, there are many potential factors that could contribute. These differences may be explained by situational factors in children’s behavior, such as exhibiting greater behavioral problems in the home setting than in the classroom (Cai et al., 2004; Verhulst & Akkerhuis, 1989), perhaps due to differing behavioral contingencies across settings. It could also be that the child genuinely experiences higher levels of internalizing behaviors at home due to family conflict or stress. In the classroom, a teacher with many students who demonstrate challenging behaviors may underreport a child’s social-emotional difficulties, particularly given the internalizing nature of the behavior displayed by most children with 22q11DS. This may suggest a need for ongoing education for teachers and school professionals regarding detecting features of emotional and behavioral challenges in children with developmental disabilities such as 22q11DS.

A further explanation comes from an interesting finding in the present study, in which teachers’ reports of thought problems were significantly correlated with parent report of rule breaking/delinquent behavior and aggressive behavior. As measured by the CBCL, thought problems may include exhibiting strange or repetitive behaviors, difficulty getting one’s mind off of a topic, having strange ideas, and seeing things that others cannot. This relationship suggests that children with 22q11DS who are exhibiting problematic externalizing symptoms at home, such as disobeying rules, noncompliance, and aggression, are seen as exhibiting thought problems in the classroom. This trend may result from the likelihood that children’s behavior is less inhibited in the home setting compared to the classroom, such that children who are exhibiting unusual behaviors in school demonstrate more salient externalizing features, such as disobedience and aggression, at home. Thus, parents and teachers may be identifying similar behavioral challenges, with variations in presentation based on the setting.

Interestingly, agreement was higher between teachers and parents for internalizing symptoms in the control group, reflecting our findings of better correlations between parents and teachers for the control group. Although the latter finding may be reflective of a restricted range of ratings for the control group, it raises concerns for how social-behavioral assessments are conducted for children with intellectual and developmental disabilities, including those with 22q11DS. In general, the need for multi-raters in multiple settings using multiple instruments is critical for a thorough clinical assessment. Otherwise, in cases where eligibility for treatment or educational services is decided solely based on one reporter’s experience of the child’s behavior, a full picture of the child’s functioning goes unseen, potentially resulting in denial of necessary interventions. Indeed, access to interventions is an area of need in this population. Young and colleagues (2011) have reported that, despite compelling evidence that children with 22q11DS display social-emotional deficits that exceed those of their unimpaired peers, they are less likely to receive intervention (both medical and behavioral) for these challenges.

In order to maximize access and participation in treatment by this group of children,
clinicians assessing the needs of individuals with 22q11DS should collect behavioral data from multiple informants using multiple methods. Specifically, semi-structured interviews, classroom and home observations of behavior, projective testing, and other sociometric scales of behavior can be used to increase the reliability and validity of emotional and behavioral assessments. Unfortunately, factors such as limited time and financial resources and lack of communication between school staff and external clinicians may deter examiners from collecting data from multiple sources. Also, uncertainty regarding methods of integrating discrepant results may lead clinicians to rely solely on a single source of behavioral information (Carter et al., 2004; Verhulst & Akkerhuis, 1989). However, this oversight is inconsistent with current guidelines for best practices in the assessment of children’s behavior (Carter et al., 2004; Sattler & Hoge, 2006). More comprehensive evaluations of the psychosocial functioning of children with 22q11DS could guide treatment planning by better capturing the range of emotional and behavioral challenges faced by this group. Valid assessment results will inform clinicians about appropriate treatment goals and strategies, including medication and behavioral methods.

Lastly, the current study results are relevant to the assessment and prevention of psychosis in individuals with 22q11DS. Given the high prevalence rates of psychosis in this population, particularly schizophrenia and schizophrenia spectrum disorders, numerous research studies have attempted to identify early risk factors associated with the development of psychosis later in life. Gothelf and colleagues (2007) assessed the psychiatric and adaptive functioning of children with 22q11DS and matched controls at baseline. At the five-year follow-up, 32.1% of 22q11DS participants had developed psychotic disorders, as compared with 4.3% of control participants. Among affected individuals, baseline symptoms of anxiety or depression predicted 61% of the variance in severity of psychosis at follow-up. These findings further emphasize the importance of accurately assessing internalizing features, such as anxiety and depression, in youth with 22q11DS.

**Limitations**

Results of the current study should be interpreted within the framework of a few limitations inherent to the research design and methodology. In particular, the primary data collection instruments were parent and teacher behavior rating scales. As such, they measure only those behaviors and abilities that are represented by the scales. A semi-structured interview may have allowed the investigators to assess for a wider range of social-emotional challenges, while concurrently obtaining more specific information about setting events for problematic behaviors and the specific nature of fears and anxieties. This type of information, in part, may have increased the explained inconsistencies between parent and teacher reports. It would also have been interesting had children been asked to complete a self-report regarding their own perception of their internalizing and externalizing behaviors. Furthermore, the medication status of the participants may have contributed to disparities in behavior ratings, as psychotropic medication effects may subside over time, resulting in higher symptom frequency at home than at school. The investigators attempted to account for this likelihood by including medication status as a covariate.

Furthermore, the control group that was included in the investigation did not exclude children with ADHD. Because attention deficits are also particularly common in the 22q11DS population, it is likely that a large degree of overlapping behavioral symptoms were present across groups, making it difficult to detect group differences in emotional/behavioral functioning. However, despite this, we were still able to identify significant differences in emotional and behavioral functioning between the two groups.

Lastly, preliminary analyses indicated that special education teachers in the sample were more likely to report problem behaviors than were general education teachers. However, not every child receiving special education services was rated by his/her special education teacher. Therefore, the data collected may underestimate the behavioral difficulties of children with 22q11DS who were receiving educational support.

**Conclusion**

The current investigation provides compelling evidence that parents are more likely to report emotional/behavioral problems in children and adolescents with 22q11DS than for their unaffected peers. In particular, parents reported elevated internalizing problems, such as withdrawal, social...
problems, and thought problems. In contrast, teachers perceive few significant differences in the social-emotional functioning of 22q11DS children, as compared with their unaffected classmates and there is little concordance between parent and teacher reports in the 22q11DS group as compared to the control group. This report provides a first exploration of the differential perception between parents and teachers of the social-emotional problems in children with 22q11DS. Ongoing education of teachers and other professionals on the features of the disorder appear warranted. Further, it will be important for evaluators to use multiple methods of social-behavioral assessments across different settings and informants to increase the chances of identifying specific problems in children and adults with 22q11DS.

References


Parent and Teacher Ratings of Childhood Functioning in 22q11DS
ERRATUM

The author order in the article “Discrepancies in Parent and Teacher Ratings of Social-Behavioral Functioning of Children With Chromosome 22q11.2 Deletion Syndrome: Implications for Assessment,” printed in the September issue (Vol. 118, No. 5 article, pp. 339-352) was incorrect. The authors are correctly listed as follows: Emily Wray, Vandana Shashi, Kelly Schoch, Kathleen Curtiss, and Stephen R. Hooper. We apologize for any confusion that may have arisen as a result of this error.