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Shared and Nonshared Symptoms in Youth-Onset Psychosis and ADHD

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Abstract

Objective—We compared ratings of behavior and attention problems between youth-onset psychosis and ADHD, two disorders in which attentional impairments play a key role, and examined the effect of psychostimulant use on age of onset in psychosis.

Method—Parent and teacher ratings of behavioral problems and ADHD symptoms were collected using the Achenbach CBCL, TRF, and SNAP-IV Teacher Rating Scales on 42 participants with psychosis, 36 with ADHD and 57 controls (ages 8-19).

Results and Conclusions—Results suggested that academic, externalizing, and attention problems reflect symptoms shared between the disorders, whereas internalizing, social and thought problems reflect factors that differ between disorders. Furthermore, participants with psychosis who had been prescribed psychostimulants had a younger age of onset of psychotic symptoms than those who had not. This difference could reflect dissimilarities in symptom severity symptom between subgroups or potentially harmful effects of psychostimulants in individuals predisposed to develop psychosis.

Keywords

ADHD; youth-onset psychosis; behavior problems; internalizing; externalizing

Attentional impairment is a central cognitive feature in schizophrenia and in ADHD. A history of ADHD symptoms is common in individuals who develop schizophrenia (Alaghband-Rad et al., 1995; Kumra et al., 1998; Marenco & Weinberger, 2000; McKenna et al., 1994; Niemi, Suvisaari, Tuulio-Henriksson, & Lönnqvist, 2003; Ross, Heinlein, & Tregellas, 2006; Schaeffer & Ross, 2002), and ADHD is diagnosed in a high proportion of children at genetic risk for schizophrenia (Keshavan, Diwadkar, Montrose, Rajarethinam, & Sweeney, 2005). Comparisons between high-risk youth with and without ADHD (Keshavan, Sujata, Mehra, Montrose, & Sweeney, 2002; Öner & Munir, 2005), and adolescents who have schizophrenia with and without ADHD (Elman et al., 1998) show that those with ADHD fare worse on developmental, neurological, cognitive and clinical measures; have a greater probability of developing schizophrenia; and face a worse prognosis.

Yet, there have been few direct comparisons between schizophrenia, or psychoses in general, and ADHD. Almost all of these comparisons have involved youth-onset schizophrenia or “multidimensionally impaired” (MDI) children with psychotic symptoms (McKenna et al., 1994). Youth-onset schizophrenia is a rare, severe and more genetically loaded form of the disorder that does not differ qualitatively from the adult-onset form on

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most of the dimensions examined (e.g., Asarnow et al., 2001; Frazier et al., 2007; Jacobsen & Rapoport, 1998; Nicolson et al., 2003; Ueland, Øie, Landrø, & Rund, 2004).

Parents of offspring with schizophrenia or MDI children are more likely to have schizophrenia-spectrum disorders than parents of offspring with ADHD (Asarnow et al., 2001; Kumra et al., 1998). Parents of children with schizophrenia perform worse than parents of children with ADHD on tests of sustained attention and motor sequencing, but not selective attention (Asarnow et al., 2002). Although there is evidence of thought disorder in both schizophrenia and ADHD, the severity and extent of these deficits are greater in schizophrenia (Caplan, Guthrie, Tang, Nuechterlein, & Asarnow, 2001). Participants with psychosis perform worse than participants with ADHD on certain cognitive tasks, but not all (Karatekin, 2007; Karatekin & Asarnow, 1998a, 1998b, 1999; Karatekin, White, & Bingham; 2008, [2009]; Kumra et al., 1998; Olincy et al., 2000; Øie, Sundet & Rund, 1999; Ross, Harris, Olincy, & Radant, 2000; Rund, Øie, & Sundet, 1996).

What is the nature of the relationship between psychosis and ADHD? One possibility is that those with ADHD constitute a distinct and severe subgroup within psychosis (Elman et al., 1998). Alternatively, the ADHD in psychosis may not be “true” ADHD but simply an index of severity. Individuals who are cognitively and clinically impaired could also have difficulties with attention, disorganization, impulsivity, and feel tense and agitated. These symptoms could make them look like they have ADHD. However, there is evidence pointing to similarities between psychosis and ADHD in cognitive impairments as well as abnormalities in similar neurotransmitter systems and brain regions (Barr, 2001; Karatekin, 2001). If the ADHD symptoms in psychosis are reflecting this overlap, it might be useful to consider ADHD and psychosis under the broader category of attentional disorders. Thus, direct comparisons between these disorders can elucidate the nature of their relationship, determine the extent of specificity at different levels of analysis, delineate their boundaries, and make decisions about diagnosis and treatment.

Goals of the Current Study

We had two goals for the current study. Our first goal was to examine the relationship between youth-onset psychosis and ADHD on behavioral measures. In the only previous comparison of behavioral problems between youth-onset psychosis and ADHD (Øie et al., 1999), average ratings for Total Behavior Problems on the Achenbach Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) were similar between schizophrenia and ADHD. However, subscale scores were not reported. Thus, our goal was to compare in greater detail parent and teacher ratings of behavior problems and ADHD symptoms between participants with youth-onset psychosis and ADHD (Combined subtype) on.

Our second aim was to examine the effect of ADHD on youth-onset psychosis. We first investigated the effects of psychostimulant use for ADHD symptoms. A history of treatment with psychostimulants is widespread in psychosis samples. For example, in a review of case histories of 17 youth with psychoses, Schaeffer and Ross (2002) found that 77% had been exposed to psychostimulants. Although some individuals with psychosis benefit from psychostimulants, the majority show a worsening of symptoms (Barch & Carter, 2005; Barr, 2001; Curran, Byrappa, & McBride, 2004). Furthermore, the FDA (2007) has issued a warning that psychostimulants can cause hallucinations and delusions in ADHD. Although these psychotic episodes tend to be brief, there are reports of children suffering for longer periods and being rediagnosed with bipolar disorder or schizophrenia (Ross et al., 2006). Psychostimulants might have especially severe adverse effects for children with a genetic predisposition to psychosis (Ross et al., 2006; Schmidt & Freidson, 1990). In adolescents with bipolar disorder, psychostimulants worsen symptoms and are associated with a younger

age of onset (DelBello et al., 2001). Thus, we predicted that age of onset of psychosis in the current study would be lower for participants who had been exposed to psychostimulants than those who had not. Finally, we examined the effect of ADHD symptoms on behavioral ratings by comparing participants with and without ADHD symptoms within the psychosis sample.

Method

Participants

Table 1 lists participants' demographic and clinical characteristics. Participants with psychosis were recruited from inpatient and outpatient clinics at the University of Minnesota, mental health professionals in the community, and flyers distributed at regional mental health conferences. One participant was an inpatient at the time of the study, three were in day treatment, and one was in residential treatment. The rest were living at home. Participants in the control and ADHD groups were recruited from advertisements in the local community, and friends of families who had participated in the study. Participants in the ADHD group were also recruited from parent support groups for ADHD.

Potential participants were excluded if they were not fluent in English or were color blind, if they had been premature by more than 4 weeks, had a history of significant neurological conditions (e.g., seizures, severe concussions), or an IQ of lower than 70. Potential participants were excluded from the ADHD and control groups if they had been adopted, or had first-degree biological relatives with schizophrenia. Potential participants were excluded from the ADHD group if they were taking psychoactive medications other than psychostimulants, if their parents were not willing to discontinue psychostimulants for 24 hours prior to cognitive testing, if they had been diagnosed with or suspected of having a pervasive developmental disorder, or if they had never met criteria for the Combined subtype. However, we included two adolescents who currently met criteria for the Inattentive subtype, but who had previously met criteria for the Combined subtype and scored above 60 on the Attention Problems scale of the Achenbach Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). Potential controls were excluded if they had ever taken psychoactive medications, been diagnosed with a major psychiatric disorder or met criteria for a current disorder, had attention problems for which they had sought help, or had first-degree biological relatives with ADHD.

Diagnoses were made using *DSM-IV* criteria (American Psychiatric Association, 1994), and were based on semistructured interviews (Kiddie-Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version, K-SADS-PL; Kaufman, Birmaher, Brent, Rao, & Ryan, 1996) conducted separately with participants and at least one parent/guardian. The interviews were conducted by child and adolescent psychiatrists, a PhD level clinical psychologist, advanced PhD students in counseling psychology, and a trained BA level researcher. A licensed psychologist with a master's degree in counseling psychology supervised the diagnostic assessments of 42 of the participants in the control and all but four of the participants in the ADHD group. The assessments of the remaining participants in the control and ADHD groups and all of the participants in the psychosis group were supervised by one of the coauthors, a child, and adolescent psychiatrist (TW).

In addition, parents filled out questionnaires on their children's developmental and medical history. The questionnaires included items from the Yale Children's Inventory (Shaywitz, Schnell, Shaywitz, & Towle, 1986) that focus on early development, social and academic functioning, and the module on pregnancy, delivery and infancy complications from the Diagnostic Interview for Children and Adolescents-Parent version (DICA-P; Herjanic & Campbell, 1977; Herjanic & Reich, 1982). Parents also rated their children on behavioral

symptoms (CBCL; Achenbach, 1991a; Achenbach & Rescorla, 2001). Questionnaires (Achenbach Teacher Report Form; Achenbach, 1991b, Achenbach & Rescorla, 2001; SNAP-IV; Swanson, Nolan, and Pelham Teacher and Parent Rating Scale; Swanson, 1992) were sent to teachers to ensure that diagnoses were based on reports from multiple informants familiar with participants' behavior in different settings. Participants with psychosis were also administered the Scales for the assessment of negative and positive symptoms (SANS/SAPS; Andreasen, 1983, 1984).

To obtain estimates of intellectual and academic functioning, we administered the Vocabulary and Block Design subtests from the *Wechsler Intelligence Scale*, 3rd ed. (WISC-III; Wechsler, 1991), the *WISC-IV* (Wechsler, 2003), or the *Wechsler Adult Intelligence Scale*, 3rd ed. (Wechsler, 1997), and the Reading and Spelling subtests from the Wechsler Individual Achievement Test (1992). An IQ estimate was obtained from 56 participants in the control, 32 in the ADHD, and 37 in the psychosis group. Estimated IQs are reported in Table 1.

Participants' diagnoses are listed in Table 2. In the psychosis group, average age of onset of psychotic symptoms was 12.2 years (*SD* = 3.2, range = 6-18). Of the 13 participants with psychosis not otherwise specified (NOS), 6 could have been in the prodromal phase, and 6 had psychotic symptoms in the context of a complex clinical picture (these subgroups were not mutually exclusive). Two participants might have met criteria for "multidimensionally impaired disorder" (McKenna et al., 1994). Two had psychotic and affective symptoms but did not meet criteria for a disorder. Most of these 13 participants reported hallucinations, delusions, or showed evidence of formal thought disorder.

The *DSM-IV* (American Psychiatric Association, 1994) requires a diagnosis of ADHD to be made only if "the symptoms do not occur exclusively during the course of … Schizophrenia or other psychotic disorder and are not better accounted for by another mental disorder" (p. 85). In the case of youth-onset psychosis, it is often difficult to determine when the course of the psychotic disorder began and its relationship to ADHD symptoms. Therefore, we categorized participants as having "ADHD symptoms" if they had a past diagnosis of ADHD on the K-SADS-PL, if there was any mention in the chart of their having been suspected of or diagnosed with ADHD, treated with psychostimulants, or if they met ADHD criteria during the current evaluation when the hierarchical rule was ignored. By this definition, 27 participants had ADHD symptoms, 14 did not, and there was not enough information about one.

Interrater reliability was assessed by having a PhD level psychologist, blind to participants' final diagnosis, review the videotaped interviews, questionnaires, and IQ and achievement scores of 11 participants in the control and 11 in the ADHD group randomly selected from the larger sample. Cohen's kappa was .91 for ADHD (reliability was not measured in the psychosis group due to practical constraints). Consensus diagnoses were assigned in cases of disagreement.

Most participants were administered cognitive tasks over two sessions, and some underwent neuroimaging. Results of these analyses are reported in other manuscripts (53 control participants were included in Karatekin, Marcus, & White, 2007; 11 control and 9 ADHD participants were included in Karatekin, 2006; 10 control and 9 psychosis participants were included in White et al., 2007; 33 control, 15 ADHD, and 11 psychosis participants were included in Karatekin et al., 2008; and 34 control, 14 ADHD, and 11 psychosis participants were included in Karatekin et al., 2009).

Families were provided with monetary compensation for participation. Most families were also provided with a diagnostic report.

The study was approved by the University of Minnesota Institutional Review Board, and informed consent and assent were obtained.

Measures

CBCL and TRF—The CBCL and TRF (Achenbach, 1991a, 1991b; Achenbach & Rescorla, 2001) are measures of general behavioral problems for 6- to 18-year-olds. Items are rated on a 3-point scale (0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very true or often true*). The CBCL and TRF include 113 items on behavioral problems.

Sixteen parents and 11 teachers in the psychosis group, and 10 parents and nine teachers in the control group were administered the 1991 version of these questionnaires. Because correlations between the 1991 and 2001 versions range from .87 to .99 for scales used in the current study (Achenbach & Rescorla, 2001), data were combined across versions.

To compare groups, we used the Total Competence scale (rated by parents), the Adaptive Functioning scale (rated by teachers), the Internalizing and Externalizing scales, and the Social, Thought and Attention Problems subscales (rated by both). These subscales were analyzed because they are not included in the Internalizing or Externalizing scales.

The Total Competence scale is based on the number and quality of activities, sports, and chores the child performs, his or her social behavior, and a general index of academic problems. The Adaptive Functioning scale assesses the degree to which the child is perceived as behaving appropriately, learning, hard working, and happy compared to his or her peers. The Internalizing scale is based on the Anxious/Depressed, Withdrawn/Depressed, and Somatic Complaints subscales. The Externalizing scale is based on the Rule-Breaking and Aggressive Behavior subscales.

On both questionnaires, participants were compared to the normative sample for the CBCL and TRF, and analyses were conducted on *T*-scores. Two 19-year-olds in the psychosis group were compared to 18-year-olds.

The SNAP-IV Teacher Rating scale—The SNAP-IV (Swanson, 1992) assesses symptoms of ADHD on items based directly on the DSM-IV. Items are rated on a 4-point scale (0 = *not at all*, 1 = *just a little*, 2 = *quite a bit*, and 3 = *very much*). Inattention was assessed by calculating average scores for Items 1 to 9 and Hyperactivity/Impulsivity was assessed by calculating average scores for Items 11 to 19.

In a study of factors influencing teachers' perceptions of children's behaviors (Stevens, Quittner, & Abikoff, 1998), internal consistencies for the SNAP-IV Inattention, Hyperactivity/Impulsivity and Oppositional Defiant Disorder (ODD) scales were between .84 and .95. In the current study, internal consistencies (calculated with Cronbach's alpha) for the Inattention and Hyperactivity/Impulsivity scales were .75, and .88, respectively in the controls; .89, and .93 in the ADHD group, and .90 and .92 in the psychosis group.

History of treatment with psychostimulants—History of psychostimulant use in the psychosis group was obtained from the interviews conducted with the parents, questionnaires completed by the parents prior to their visit, and medical or psychiatric records of the participants when available.

Statistical Analyses

Statistical analyses were conducted with SPSS 14.0 and MacAnova 5.06 (an open-source cross-platform statistics program available for Windows, Macintosh, and Linux at http://www.stat.umn.edu/macanova/).

Appropriate transforms of responses to achieve normality and constant variance were sought among the Box-Cox family of distributions. These are equivalent to power transformations $y \rightarrow y^p$, except that $y \rightarrow \log(y)$ when $p = 1$. The power was selected to be close to the maximum likelihood estimate of p using a graphical procedure (Box & Cox, 1964). The control data were extremely skewed on CBCL and TRF Social, Thought, and Attention Problems, and SNAP-IV Inattention and Hyperactivity/Impulsivity. Data transformations did not improve the distributions adequately across groups. Because our main goal was to compare the clinical groups to each other, and because data transformations involving categorical scales would reduce the statistical power of these comparisons, we compared only the psychosis and ADHD groups on these scales. On the TRF, the question asking teachers how well they knew the participant was treated as a categorical variable, with 1 and 2 as *not well*, and above 2 as *well*.

Continuous demographic variables (age, SES, IQ) were analyzed with univariate ANOVAs, and significant findings were followed up with Tukey tests. Categorical demographic variables (gender, ethnicity) were analyzed with X^2 tests, followed up with 2×2 X^2 tests. Correlations between parent and teacher ratings were calculated using Pearson productmoment correlation coefficients. Differences in age and age of onset between subgroups of participants were calculated with independent-samples *t* tests.

Repeated-measures Type III ANCOVAs, with age as the covariate, were used to examine the effects of diagnosis and age on the questionnaire ratings. Type III SS were used because they test the same hypotheses as post hoc tests computed from the same ANOVA model. The covariate was modified by subtracting the mean age of all participants from each participant's age. Each ANCOVA tested linear and quadratic trends for age. We examined quadratic trends in addition to linear trends because age trends were clearly nonlinear in some cases, and a quadratic trend is among the simpler alternatives to a linear trend. Models were selected by backward elimination of nonsignificant terms involving age, starting with the highest order interactions. When the quadratic trend on age was significant, the linear trend was not reported. IQ and SES were not used as covariates because controlling for these variables would have reduced variance due to the disorders. Huynh-Feldt adjustments to *df*s were used to compute *F*-statistic *p* values, and Huynh-Feldt-adjusted *df*s were reported where applicable.

Post hoc analyses of ANCOVA results were conducted using custom macros for MacAnova. Main effects or interactions were generally not followed up when there were higher-order interactions involving the same variables. Between-subjects contrasts involved pairwise comparisons between groups. Within-subjects contrasts involved comparison of parent and teacher ratings within each group. Tests of between- and within-subject contrasts and slopes were based on appropriate *t* statistics. To protect against multiple testing, *p* values were Bonferroni corrected, that is, multiplied by the appropriate number of simultaneous tests. When the contrast involved a between-subjects contrast, Tukey-Kramer *p* values based on the Studentized range were computed and then, where appropriate, Bonferroni corrected by the number of intrasubject contrasts being considered simultaneously.

To calculate effect size, we used a measure similar to Cohen's *d* but that took into account the age differences among groups. Specifically, we divided the difference of the group means (age adjusted as appropriate) by the square root of the MS_e term for the between-subjects analysis section of the ANCOVA. In cases where there was an interaction between group and age, the value reflects the size of the effect at the average age for the whole sample.

Findings are reported as significant if $\alpha \leq .05$.

Results

CBCLs were obtained for all but one participant in the psychosis group. At least one TRF was obtained for 44 participants in the control, 27 in the psychosis, and 28 in the ADHD group. TRFs were obtained from at least two teachers for 15 participants in the control, 4 in the psychosis, and 8 in the ADHD group. SNAP-IVs were obtained from at least two teachers for 5 participants in the psychosis and 9 in the ADHD group. In these cases, data were averaged across teachers.

Information on Teachers

On the TRF, all the teachers in the control, 26 in the ADHD, and 15 in the psychosis group indicated that they taught regular or advanced courses. The remaining teachers taught special education classes. Average duration of time they had known the participants ranged from 10 to 18 months across groups. An ANCOVA on number of months did not yield a group effect. In contrast, a X^2 test on how well the teachers knew the participant, on a scale of 1 to 3, showed a diagnosis effect, X^2 (2) = 7.43, p = .024. Post hoc 2 × 2 X^2 tests indicated that teachers in the psychosis group rated their knowledge of the participants higher than teachers in the ADHD group. The difference is likely to be due to the fact that more participants in the ADHD group were in regular, and larger, classes.

Correlations Between Parent and Teacher Ratings

In all groups, parent and teacher ratings were correlated more highly for externalizing than for internalizing problems (Table 3). Furthermore, parent–teacher correlations were as high, or higher, in the psychosis than in the ADHD group. It should be noted that the low correlations in the ADHD group for Social and Thought Problems reflect range restriction. Fisher's *r*-to-*z* transformations were used to test if the magnitude of the correlations differed between groups. None of the differences reached significance.

Group Effects on Parent and Teacher Ratings

Table 4 lists parent and teacher ratings on the CBCL and TRF. As shown in this table, there was only one interaction between diagnosis and respondent: In controls, teacher ratings of externalizing problems were higher than parent ratings, whereas parent and teacher ratings did not differ in the clinical groups. Thus, parent and teacher ratings pointed to identical conclusions for the two clinical groups.

Compared to the ADHD group, the psychosis group was rated as functioning more poorly on CBCL Total Competence, and Internalizing, Social, and Thought Problems. In contrast, the ADHD and Psychosis groups did not differ on Adaptive Functioning, Externalizing, and Attention Problems. Although the ADHD group was rated higher on SNAP-IV Inattention and Hyperactivity/Impulsivity than the psychosis group, the difference did not reach significance for either scale.

Effect of ADHD Symptoms Within the Youth-Onset Psychosis Sample

As expected, participants in the psychosis group who had been exposed to psychostimulants had a younger age of onset of psychotic symptoms (M = 11.2 years, SD = 3.0) than those who had not (M = 13.7, SD = 2.8), t (31) = 2.48, p = .019, Cohen's d = 0.81.

Next, we compared behavioral ratings of participants with ADHD to participants in the psychosis group with or without ADHD symptoms (see Table 5). The two psychosis subgroups did not differ on negative, disorganized or psychotic symptoms on the SANS/SAPS. As shown in Table 5, participants in the psychosis group with and without ADHD symptoms did not differ from each other on any other variable. Participants with both

psychosis and ADHD symptoms were rated lower than participants with ADHD on Total Competence, and higher on Internalizing, Social, and Thought Problems. The two subgroups did not differ on attention problems on either questionnaire.

Discussion

Comparison of Behavior Ratings and ADHD Symptoms Between the Clinical Groups

Compared to participants with ADHD (Combined subtype), participants with youth-onset psychosis were rated by both parents and teachers as functioning more poorly on CBCL Total Competence and on Internalizing, Social and Thought Problems scales. It is not surprising that youth with psychosis are more impaired than youth with ADHD on these domains. What is more surprising is the similarity between disorders in other domains despite differences in clinical presentation and severity. That is, the groups were not reliably different on TRF Adaptive Functioning, CBCL and TRF Externalizing and Attention Problems scales. Effect sizes for these scales were small to medium, so our failure to find significant differences may have been due, in part, to lack of statistical power. It is important to note, however, that on the SNAP-IV Inattention and Hyperactivity/Impulsivity Scales, ratings for the ADHD group were higher than those for the psychosis group. Although the groups did not differ on either scale, results nevertheless suggest that the SNAP-IV may have some specificity to ADHD and that it is not simply tapping general behavioral problems or the clinical severity of a disorder.

The elevated scores of both clinical groups on Thought Problems and the higher scores of the psychosis compared to the ADHD group are consistent with Caplan et al. (2001), who found more severe and extensive thought disorder in childhood-onset schizophrenia than in ADHD. However, unlike a previous study that found no difference in CBCL Total Behavior Problems between adolescents with schizophrenia or ADHD (Øie et al., 1999), we did find a difference. Although scores of the ADHD groups were similar between that study (M = 60, SD = 18) and the current study (M = 61, SD = 7), scores of the psychosis group were higher in the current study (M = 69, SD = 9) compared to the prior study (M = 62, SD = 33). The discrepancy between these results could be due to the fact that the previous psychosis group was on average 3 years older and had extremely high variability in their scores.

A possible reason for the lack of specificity of the Adaptive Functioning, Externalizing and Attention Problems scales is that they may not be sensitive enough to detect small group differences. However, results are also consistent with research showing no differences on cognitive measures between youth with psychosis and ADHD or between their parents, as listed in the Introduction. This overlap could reflect common characteristics between the disorders, such as environmental risk factors and neurobiological substrates. Conversely, the greater impairment of the psychosis group on Total Competence, Internalizing and Thought Problems might reflect factors that differ between the disorders.

Effect of ADHD Symptoms Within Youth-Onset Psychosis

Consistent with other studies (Alabaghand-Rad et al., 1995; Kumra et al., 1998; Marenco & Weinberger, 2000; McKenna et al., 1994; Niemi et al., 2003; Ross et al., 2006; Schaeffer & Ross, 2002), a majority (66%) of the participants with psychosis had clinically significant ADHD symptoms. Also consistent with the high rates of psychostimulant use in other youth-onset psychosis samples (e.g., Schaeffer & Ross, 2002), 59% of the psychosis participants in the current study had been prescribed psychostimulants. As expected, psychosis participants who had been prescribed psychostimulants had a younger age of onset of psychotic symptoms than those who had not. Unfortunately, there are only a handful of studies on the effects of psychostimulants on the course and prognosis of

individuals at risk for, or with, youth-onset psychosis (Ross et al., 2006). Thus, although psychostimulants are more likely to be prescribed to children with severe symptoms, clinicians should nevertheless be careful about prescribing psychostimulants to youth with psychoses or at genetic risk for psychosis.

When psychosis participants with and without ADHD symptoms were compared on behavioral ratings, results yielded no significant differences. This result does not support the hypothesis that individuals with psychosis and ADHD symptoms form a distinct and severe subgroup (Elman et al., 1998). Nevertheless, it is possible that although the two subgroups start out on different paths, they may converge after the illness takes effect.

Developmental Trends

We found only one interaction between diagnosis and age for parent and teacher ratings of behavior problems: externalizing problems decreased linearly with age in the psychosis but not in the other groups. This differential decrease is probably due to the fact that the severity of externalizing problems in younger participants with psychosis was particularly high. With the caveat that this was not a longitudinal study, results indicate that the groups did not differ in terms of age-related changes in the other behaviors assessed in this study. In future research, it would be informative to compare developmental trajectories of ADHD symptoms in youth-onset psychosis (or at risk for psychosis) and ADHD on more sensitive measures and to determine if there are qualitative differences in symptom presentation at different ages.

Credibility of Parent Reports in the Psychosis Group

Achenbach and Rescorla (2001) reported that parent–teacher correlations ranged from .18 to .44 for scales reported in Table 4 for children in mental health and special education settings and in a national survey. The correlations we observed in the psychosis group are higher than those in the manual for all scales, perhaps because severe behavior disturbance leads to increased agreement in the behaviors observed by parents and teachers. In any case, these findings suggested that parent reports of behavior problems of children with psychosis are consistent with those of teacher reports.

Limitations

Limitations of the study include a relatively small sample size and limited power to test differences between psychosis subgroups, recruitment of the psychosis and ADHD groups from different sources, and differences in gender composition. In addition, floor effects on the CBCL and TRF, and ceiling and floor effects on the SNAP-IV could have prevented us from detecting differences.

Although teachers were instructed to rate participants' behavior off medications, some teachers' ratings for both the ADHD and psychosis groups were based on medicated behavior only, as they did not have the opportunity observe participants off medications. This constraint on the ratings may have reduced group differences.

As shown in Table 1, IQs were about 0.5 to 1 *SD* above average in both the ADHD and control groups, further limiting the generalizability of the results. It should be noted, however, that the control and ADHD groups did not differ significantly on IQ. In addition, average IQ in the psychosis group, although lower than that in the other groups, was well within the normal range.

The current study was part of a larger study that included two cognitive testing sessions for all and brain imaging for some participants. This procedure likely excluded severely

impaired participants and chaotic, dysfunctional or low-SES families who were unable or unwilling to invest the necessary time to participate in the study, limiting generalizability of the results.

Youth with internalizing problems may have been under-represented in the ADHD group. Potential participants with ADHD were excluded if they were taking psychoactive medications that could not be discontinued. Of the 49 participants excluded from the ADHD group based on phone screening, 6 (12%) were excluded because they were taking atomoxetine, and 17 (35%) were excluded because they were taking antidepressant or antianxiety medications. However, as shown in Table 2, a sizable minority of participants in the ADHD group had histories of mood and anxiety disorders. In addition, *T*-scores of participants with ADHD on the CBCL Internalizing scale and its subscales range from the mid-50s to the low 60s in other studies that did not exclude participants on medications (Biederman et al., 2001;Connor et al., 2003) and scores of the ADHD group in the current study are in the mid-50s. As shown in Table 4, the scores in the psychosis group were in the high 60s. Therefore, even if we had a more representative ADHD sample, group differences on Internalizing Problems might still have been significant.

Bios

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Table 1

Demographic and Clinical Characteristics of the Participants

	Control	Psychosis	ADHD	Results of Statistical Tests
N	57	42	36	
M:F, *N* (%)	26:31 (46%:54%)	26:16 (62%:38%)	28:8 (78%:22%)	X^2_2, p = .008; C ≠ ADHD
Age in months (SD)	152 (30)	167 (41)	152 (31)	ns
Age range	105-226	101-238	106-224	
Socioeconomic status (Hollingshead, 1975)	53 (9)	40 (14)	50 (10)	$F(2, 126) = 15.75$, $p < .001$; (C = ADHD) > Psychosis
Estimated IQ (SD)	114 (13)	99 (15)	108 (13)	$F(2, 122) = 14.87$, $p < .001$; (C = ADHD) > Psychosis
SANS/SAPS				
Negative symptoms		2.7 (1.0)		
Psychotic symptoms		1.9 (0.9)		
Disorganized symptoms		2.3 (1.3)		
Medications, *N* (%)				
Antipsychotic	0	28 (67%)	0	
Psychostimulant	0	10 (24%)	23 (64%)	
Antidepressant	0	10 (24%)	1 (3%)	
Mood stabilizer	0	9 (21%)	0	
Benzodiazepine	0	5 (12%)	1 (3%)	
Anti-histamine	0	4 (10%)	0	
Alpha-adrenergic	0	3 (7%)	2 (6%)	
Ethnicity, N (%)				X^2_6, p = .044, pairwise comparisons between groups ns
Caucasian	50 (88%)	28 (67%)	31 (86%)	
African American	1 (2%)	4 (10%)	4 (11%)	
Asian	1 (2%)	3 (7%)	0	
Hispanic	0	0	0	
Mixed/Other	5 (9%)	7 (17%)	1 (3%)	

Note: ns = *not significant*. Medications taken by fewer than 5% of participants in the ADHD and psychosis groups are not reported.

Table 2

Frequency (and Proportions) of Major Lifetime Diagnoses in Each Group

	Control	Psychosis	ADHD
Schizophrenia		22 (52%)	
Schizophreniform		3 (7%)	
Schizoaffective		4 (10%)	
Psychosis not otherwise specified		13 (31%)	
ADHD			
Combined			34 (94%)
Inattentive (with history of combined)			2 (6%)
Mood disorders	2 (4%)	7 (17%)	7 (20%)
Anxiety disorders	2 (4%)	6 (14%)	5 (14%)
Oppositional defiant disorder/conduct disorder	0	8 (19%)	14 (39%)
Substance use/abuse	0	3 (7%)	2 (6%)
Tic disorder	0	1 (2%)	2 (6%)

Note: All diagnoses in controls refer to past diagnoses.

Table 3

Correlations Between Parent and Teacher Ratings

	Controls (*N* = 44)	Psychosis (*N* = 26)	ADHD (*N* = 28)
Internalizing problems	.02 (.906)	.27 (.180)	.03 (.865)
Externalizing problems	.40 (.007)	.56 (.003)	.44 (.018)
Social problems		.59 (.001)	.21 (.274)
Thought problems		.29 (.146)	.13 (.526)
Attention problems		.36 (.071)	.37 (.055)

Note: Numbers in parentheses refer to *p* values.

Table 4

Means and Standard Deviations (in Parentheses) of Scores on the CBCL, TRF, and SNAP-IV

	Control *M* (*SD*)	Psychosis *M* (*SD*)	ADHD *M* (*SD*)	Effect Size	ANCOVA Results	Post-hoc Tests/ Group difference
CBCL Total Competence	57 (8)	32 (7)	44 (8)	1.68	Diagnosis: $111.61_{2,120}$ $p < .001$	C > ADHD > Psychosis
TRF Adaptive Functioning	56 (6)	44 (9)	42 (7)	0.20	Diagnosis: $41.76_{2,91}$ $p < .001$	C > (ADHD = Psychosis)
					Linear increase with age: $6.61_{1,91}$ $p = .012$	
Total behavior problems						
CBCL	41 (8)	69 (9)	61 (7)	0.95		
TRF	43 (7)	65 (10)	59 (7)	0.65		
					Diagnosis: $146.10_{2,94}$ $p < .001$	C < ADHD < Psychosis
					Linear decrease with age : $6.27_{1,94}$ $p = .014$	
					[a]Age (linear) × respondent: $4.06_{1,94}$ $p = .020$	
Internalizing problems						
CBCL	45 (7)	69 (10)	55 (10)	1.34		
TRF	45 (7)	67 (10)	53 (7)	1.62		
					Diagnosis: $108.88_{2,94}$ $p < .001$	C < ADHD < Psychosis
					[b]Age (linear) × respondent: $6.84_{1,94}$ $p = .010$	
Externalizing problems						
CBCL	42 (7)	62 (12)	60 (9)	0.46		
TRF	46 (5)	58 (11)	58 (8)	0.31		
					Diagnosis: $65.21_{2,92}$ $p < .001$	C < (ADHD = Psychosis)
					Linear decrease with age: $10.89_{1,92}$ $p = .001$	
					[c]Diagnosis × age (linear): $6.09_{2,92}$ $p = .003$	
					[d]Respondent × diagnosis: $7.95_{2,92}$ $p < .001$	

	Control *M* (*SD*)	Psychosis *M* (*SD*)	ADHD *M* (*SD*)	Effect Size	ANCOVA Results	Post-hoc Tests/ Group difference
Social problems						
CBCL	51 (2)	67 (10)	59 (9)	0.82		
TRF	52 (3)	63 (8)	57 (6)	0.96		
					Diagnosis: $18.64_{1,51}$ $p < .001$	ADHD < Psychosis
					Linear decrease with age: $5.96_{1,51}$ $p = .018$	
					Respondent: $4.22_{1,51}$ $p = .045$	Parents > Teachers
Thought problems						
CBCL	51 (2)	74 (10)	60 (8)	1.57		
TRF	50 (2)	69 (13)	57 (7)	1.10		
					Diagnosis: $39.47_{1,52}$ $p < .001$	ADHD < Psychosis
					Respondent: $6.54_{1,52}$ $p = .014$	Parents > Teachers
Attention problems						
CBCL	51 (3)	72 (13)	68 (9)	0.46		
TRF	51 (2)	61 (7)	62 (9)	0.18		
					Respondent: $28.42_{1,52}$ $p < .001$	Parents > Teachers
SNAP-IV Inattention	0.20 (0.4)	1.29 (0.7)	1.65 (0.7)	0.33	Linear decrease with age: $7.46_{1,47}$ $p = .009$	
SNAP-IV H/I	0.12 (0.2)	0.59 (0.7)	1.08 (0.8)	0.48	Linear decrease with age: $6.58_{1,48}$ $p = .013$	

Values refer to *T*-scores for CBCL and TRF. On the SNAP, items are rated on a 4-point scale (0 = *not at all*, 1 = *just a little*, 2 = *quite a bit*, and 3 = *very much*). On CBCL Competence and TRF Adaptive Functioning, higher scores indicate better functioning. On all other scales, higher scores indicate worse functioning. Effect sizes refer to the psychosis-ADHD difference. ADHD = Attention-Deficit/ Hyperactivity Disorder. Calculation of effect sizes was based on ANCOVAs involving only the psychosis and ADHD groups. C = Control. H/I = Hyperactivity/Impulsivity. ns = not significant.

[a] The difference between parent and teacher ratings was greater in the psychosis than in the control group.

[b] Parent ratings of internalizing problems decreased linearly with age, whereas teacher ratings did not.

[c] Externalizing problems decreased with age in the psychosis group, but not in the other two groups.

[d] Teacher ratings of externalizing problems were higher than parent ratings in the control group, but there were no differences between respondents in the clinical groups.

Table 5

Means and Standard Deviations (in Parentheses) of Scores on the CBCL, TRF and SNAP-IV of Participants with ADHD and Psychosis Participants with (P-ADHD) and without ADHD Symptoms (P)

	P	P-ADHD	ADHD	ANCOVA Results	Group Differences
CBCL total competence	35 (9)	30 (5)	44 (8)	Diagnosis: $25.36_{2,64}$ $p < .001$	ADHD > (P-ADHD = P)
TRF adaptive functioning	47 (12)	44 (8)	42 (7)		
Total problems					
CBCL	66 (8)	71 (10)	61 (7)		
TRF	62 (13)	66 (8)	59 (7)		
				Diagnosis: $10.72_{2,48}$ $p < .001$ Quadratic decrease with age: $4.03_{1,48}$ $p = .050$	ADHD < P-ADHD
Internalizing problems					
CBCL	67 (8)	69 (11)	55 (10)		
TRF	65 (13)	68 (8)	53 (7)	Diagnosis: $22.00_{2,\ 50}$ $p < .001$	ADHD < (P-ADHD = P)
Externalizing problems					
CBCL	60 (12)	63 (13)	60 (9)		
TRF	56 (13)	59 (10)	58 (8)		
Social problems					
CBCL	63 (8)	69 (10)	59 (9)		
TRF	61 (11)	63 (7)	57 (6)	Diagnosis: $6.61_{2,\ 50}$ $p = .003$	ADHD < P-ADHD
Thought problems					
CBCL	71 (9)	76 (10)	60 (7)		
TRF	70 (15)	68 (13)	57 (7)	Diagnosis: $18.22_{2,\ 50}$ $p < .001$	ADHD < (P = P-ADHD)
Attention problems					
CBCL	63 (9)	76 (13)	68 (9)		
TRF	59 (9)	61 (6)	62 (9)		
SNAP-IV Inattention	0.94 (1.0)	1.41 (0.5)	1.65 (0.7)		
SNAP-IV H/I	0.24 (0.5)	0.71 (0.7)	1.08 (0.8)		

Note: Only the significant main effects and interactions involving.