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ABSTRACT

Children with attention deficit hyperactivity disorder (ADHD) who are referred for clinical evaluation commonly meet diagnostic criteria for other behavioral or emotional disorders or poor academic performance. Occasionally, the symptoms of two disorders are very similar, and the clinician must determine which disorder the patient actually has. Because emotional and behavioral disorders generally respond best to certain types of treatment and the presence of multiple problems greatly complicates clinical management, it is very important to accurately determine the type of disability a youngster is experiencing. It can be extremely difficult for parents to obtain comprehensive school, psychological and medical evaluations for their child because they simply do not have the financial resources to do so. Clinicians are also limited in the amount of time they can spend with patients given the costs associated with providing health care. One potential solution to this problem is a screening device for the symptoms of emotional and behavioral disorders that can be used to identify children who may require a more in-depth evaluation. Such a screening device has been developed based on research and clinical experiences evaluating comorbidities in children who were referred to a child psychiatry outpatient service. The Symptom Inventories contain separate instruments for three age groups: ages 3-6, 6-12, and 12-18. A brief overview is given of instruments found useful in screening children for ADHD. Contains 16 references. (TS)

ASSESSING COMORBIDITIES IN CHILDREN WITH ADHD

Kenneth D. Gadow, Ph.D. and Joyce Sprafkin, Ph.D.

ASSESSING COMORBIDITIES IN CHILDREN WITH ADHD[1]

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Children with ADHD who are referred for clinical evaluation commonly meet diagnostic criteria for other behavioral or emotional disorders or poor academic performance. In fact, it is these other problems that generally prompt parents and teachers to seek help in the first place. The term *comorbidity* refers to the presence of two or more disorders in the same individual. Occasionally, the symptoms of two disorders are very similar, and the clinician must determine which disorder the patient actually has; this is known as *differential diagnosis*. Because emotional and behavioral disorders generally respond best to certain types of treatment and the presence of multiple problems greatly complicates clinical management, it is very important to accurately determine the type of disability a youngster is experiencing. Although the logic of this statement is self-evident, it can be extremely difficult for parents to obtain comprehensive school, psychological, and medical evaluations for their child because they simply do not have the financial resources to do so. Clinicians are also limited in the amount of time they can spend with patients given the costs associated with providing health care. One potential solution to this problem is a screening device for the symptoms of emotional and behavioral disorders that can be used to identify children who may require a more in-depth evaluation. We have developed such an instrument based on our research and clinical experiences evaluating comorbidities in children referred to a child psychiatry outpatient service. This is not intended to be a comprehensive review of this topic, but rather a brief overview of instruments that we have found to be useful.

Twelve years ago we began a program of research to develop behavior rating scales to be completed by parents and teachers that contained the symptoms of the most common emotional and behavioral disorders. We were initially inspired by the research of Bill Pelham and his colleagues (1982) and used as our starting point the symptoms listed in the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1980). Because they were often phrased in a way that only mental health professionals could completely understand, we decided to rewrite them to be more easily understood by parents and teachers. These rating scales later became known as the SYMPTOM INVENTORIES (Gadow & Sprafkin, 1994, 1995; Sprafkin & Gadow, 1996). To date, there are separate instruments for three age groups: *Early Childhood Inventory-4* (ages 3 to 6), *Childhood Symptom Inventory-4* (ages 6 to 12), and the *Adolescent Symptom Inventory-4* (ages 12 to 18). The SYMPTOM INVENTORIES differ from more conventional (dimensional) behavior ratings scales in that they assess the symptoms of specific disorders, which are grouped together to facilitate structuring a clinical interview, scoring, and interpretation of results. Cutoff scores are based on the number of symptoms indicated as being necessary for a clinical diagnosis. Conversely, cutoff scores for dimensional behavior rating scales are determined from normative data and the degree to which an individual's score deviates from his/her peers. In every day clinical settings, there are advantages and disadvantages associated with each approach to assessment, but since they address different aspects of clinical decision making, the information they generate complements each other. In clinical settings, some of the more commonly used dimensional scales for the assessment of behaviors associated with

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ADHD and other emotional and behavioral disorders are the *Child Behavior Checklist* (Achenbach, 1991) and the *Teacher's Report Form* (Achenbach, 1991), the *ADD-H: Comprehensive Teacher's Rating Scale* or ACTeRS (Ullmann et al., 1994), and the *Conners' Parent Rating Scales* and *Conners' Teacher Rating Scales* (Conners, 1990).

SENSITIVITY AND SPECIFICITY

Our research on the SYMPTOM INVENTORIES has focused primarily on their ability to identify the same children with specific disorders as would be identified using a structured psychiatric interview or a battery of assessment instruments in combination with clinical interview and observation (*data-based clinical diagnosis*). Two types of errors that can be made when using the SYMPTOM INVENTORIES are the identification of children as having a particular type of disorder when in fact they do not (*false positive*) and the failure to identify children who do in fact have the disorder (*false negative*). In statistical jargon, the degree to which a screening instrument identifies correctly individuals who do in fact have the disorder (i.e., minimizes false negatives) is referred to as *sensitivity*. For example, if an instrument has a sensitivity index of .90 for a particular disorder, this means that it identified correctly 90% of cases (as defined by another method). The degree to which a screening instrument identifies correctly individuals who do not have the disorder (i.e., minimizes false positives) is referred to as *specificity*. For example, when an instrument's specificity index is .85 for a particular disorder, this means that it correctly identifies 85% of individuals who do not have the disorder. It is our belief that a screening instrument should minimize to as great a degree as possible false negatives. Therefore, our suggestions with regard to the utility and interpretation of the SYMPTOM INVENTORIES' screening scores (based on research findings) is more heavily oriented toward identifying all possible children who may have a particular disorder. Children who are incorrectly screened as having a particular disorder (false positive) should be identified as such during a careful and thorough clinical evaluation.

Disruptive Behavior Disorders

Research by our laboratory and others has shown that all of the SYMPTOM INVENTORIES are useful in identifying youngsters with ADHD diagnosed either by a structured psychiatric interview or data-based clinical diagnosis. For example, the parent version of the *Early Childhood Inventory* identified 83% of preschoolers with ADHD, and when the teacher version of the checklist was also considered, the two instruments correctly identified 100% of the children with ADHD, without sacrificing specificity (specificity index = .84). The parent version of the *Childhood Symptom Inventory* correctly identified 77% of the child psychiatry inpatients and 86% of the outpatients with ADHD (specificity indices = .70 and 1.00, respectively). The parent version of the *Adolescent Symptom Inventory* correctly identified 53% of the adolescents with ADHD, but this figure increased to 84% when the teacher version was added to the screening process (specificity index = .79).

The most common disruptive behavior disorder that co-occurs with ADHD is oppositional defiant disorder (ODD). Children with ODD exhibit a developmentally inappropriate level of argumentative, hostile, and defiant behavior towards authority figures, typically parents and teachers. Such youngsters are frequently noncompliant with adult requests and seem stubborn and uncompromising. Upwards of 65% of children with ADHD also meet the criteria for ODD (Barkley, 1990). The Symptom Inventories provide a fairly good screen for ODD, particularly when parent and teacher ratings are considered together. The parent version of the *Early Childhood Inventory* correctly identified 76% of preschoolers with ODD (specificity index = .74), and the sensitivity rate increased to 95% when the teacher checklist was added. The parent version of the *Child Symptom Inventory* correctly identified 93% of children with ODD (specificity index = .61), whereas the parent version of the *Adolescent Symptom Inventory* correctly identified 63% of youths with a diagnosis of ODD, but the rate rose to 81% when teacher ratings were also considered (specificity index = .70).

The other disruptive behavior disorder that co-occurs with ADHD (particularly during adolescence) is conduct disorder, a term used to describe youngsters who persistently violate the rights of others or rules appropriate to their age. It is a pattern of behavior that tends to be exhibited at home, in school, and in the community and includes such acts as physical aggression (e.g., physical cruelty to people or animals, bullying others, initiating fights), destruction or violation of property (e.g., fire setting, vandalism, breaking and entering into private property), stealing, both with (e.g., robbery) and without (e.g., shoplifting) confrontation with the victim, and a disregard for age-appropriate rules (e.g., playing hookey, staying out at night past their curfew or overnight). Between 20% and 30% of preadolescent children with ADHD meet criteria for conduct disorder, and these figures increase to 40% to 60% for adolescents (Barkley, 1990). Data from our child psychiatry outpatient clinic (Carlson, 1996) indicates that approximately one third of children with ADHD are also diagnosed with either oppositional defiant disorder or conduct disorder. The parent version of the SYMPTOM INVENTORIES correctly identified 93% of children with conduct disorder (specificity index = .70) and almost three-quarters of adolescents with a psychiatric diagnosis of conduct disorder (specificity index = .80).

Mood and Anxiety Disorders

Almost one third of our clinic patients with ADHD also have a diagnosis of mood or anxiety disorder (Carlson, 1996). Diagnosis is complicated by the fact that some anxiety symptoms (e.g., fidgeting, difficulty concentrating) may be mistaken for ADHD (differential diagnosis). The SYMPTOM INVENTORIES contain categories for a number of different anxiety disorders including generalized anxiety disorder (excessive worries particularly about one's adequacy and competence in a variety of areas), separation anxiety disorder (excessive anxiety when anticipating or experiencing a separation from parents), and social phobia (intense and persistent fear of social situations with unfamiliar children), and research has shown that these disorders can be reasonably well screened by using the SYMPTOM INVENTORIES. For example, the parent version correctly identified 71% of children with separation anxiety disorder and 86% of children with generalized anxiety (overanxious) disorder. For all three age groups, the SYMPTOM INVENTORIES often signal the presence of an anxiety disorder, which can then be clarified with a focused clinical interview. They also indicate the presence of anxiety symptoms in youngsters who have a depressive disorder.

The depressive disorders include major depressive disorder and dysthymic disorder. Both are characterized by a sad and/or irritable mood, low sense of self-worth, difficulties with sleep and appetite, fatigue, and difficulty thinking. The major distinction between the two disorders is the time frame in which the symptoms occur. Major depressive disorder refers to a discrete episode lasting about 2 weeks, whereas dysthymic disorder must last at least a year. Because several symptoms of depression (primarily those involving inattention or poor concentration) overlap with ADHD, differential diagnosis is a clinical consideration. The SYMPTOM INVENTORIES have been shown to be moderately to very good at detecting the presence of depressive disorders, depending on the method used as the standard and perhaps the age of the youngster being evaluated. The parent version of the *Child Symptom Inventory* correctly identified 90% of children with a depressive disorder based on a structured psychiatric interview (specificity index = .87). In another study, the parent version of the *Adolescent Symptom Inventory* identified only 54% of adolescents with major depressive disorder (specificity = .81).

When evaluating anxiety or depressive symptoms, it is essential to also obtain information from the child about how he or she feels in various situations and more generally about mood states. Although this can be done in an interview or through various activities (e.g., playing, drawing), many mental health professionals have found various self-report instruments to be useful for assessing these symptoms. In our clinic, we have found the *Revised Children's Manifest Anxiety Scale* (Reynolds & Richmond, 1985) and the *Children's Depression Inventory* (Kovacs, 1992) to be very useful in this regard. Correlations between these instruments and scores on the anxiety and depression categories

of the *Child* and *Adolescent Symptom Inventories* (parent version) are significant but of low magnitude (range = .30 to .50), which further demonstrates that parents often do not know how and to what degree their children experience feelings of anxiety and depression. The correlations are even lower for the teacher-completed Symptom Inventories.

Other Disorders

Research findings suggest that at least one third of children with ADHD also have a tic disorder. We have found that the tic items in both the SYMPTOM INVENTORIES and the *Child Habits and Tics Questionnaire* (Gadow, 1991) are very useful for eliciting information about tics. It is important to know whether tics are present before initiating a drug trial because the exacerbation or reemergence of preexisting tics is often mistakenly attributed to medication.

Pervasive developmental disorder or PDD is characterized by a very restricted range of interests and activities, repetitive and stereotypic behaviors, impairment of cognitive skills (e.g., score in the mental retardation range on standardized intelligence tests), severe social skills deficits, and difficulties in using speech and understanding spoken language. Technically, PDD cannot be a comorbidity in children with ADHD because, by DSM-IV definition, a child cannot have both disorders. However, inattention, impulsivity, and distractibility symptoms are occasionally reported for high functioning children with PDD. Differential diagnosis in these cases is very important because it has implications for treatment, education, and prognosis. The SYMPTOM INVENTORIES have been shown to serve as an extremely valuable tool with respect to detecting the presence of PDD. For example, when the parent and teacher versions of the *Early Childhood Inventory* were used, 91% of the children with PDD diagnosed by a child psychiatrist in an outpatient sample were correctly identified (specificity = 1.00). In another outpatient sample, 13 out of 15 children diagnosed with PDD by a child psychiatrist were identified correctly by the parent *Child Symptom Inventory*, and all 15 were identified correctly when the teacher version of the *Child Symptom Inventory* was added. False positives were negligible.

Lastly, many children with ADHD meet criteria for learning disability, which is defined in federal law as a significant discrepancy between ability (best determined with an individually administered intelligence test) and academic achievement (best determined with an individually administered achievement test). Between 19% and 26% of children with ADHD have a learning disability in math, reading, or spelling (Barkley, 1990), and in our clinic, 46% of school-referrals with ADHD also have a learning disability (Carlson, 1996). Because attention deficits are associated with both learning disabilities and ADHD, differential diagnosis is both complex and critical to effective clinical management.

DIMENSIONAL BEHAVIOR RATING SCALES

In response to the long tradition of using dimensional scales to assess children's behavior, we have adopted a second approach to evaluating the validity of the Symptom Inventories, which is to compare them with dimensional behavior rating scales in common clinical use today. These scales measure many of the behavioral, emotional, and cognitive characteristics that define child psychiatric disorders. Comparisons with relevant scales provide further evidence for the convergent validity of the SYMPTOM INVENTORIES. One of the most popular parent-completed behavior rating scales is the *Child Behavior Checklist* or *CBCL*, which has been used with thousands of youngsters and studied in hundreds of investigations. Most relevant to the disruptive behavior disorders are the Externalizing factor and the subscales called Attention Problems, Delinquent Behavior, and Aggressive Behavior. Another parent-completed instrument used in clinical research for evaluating children with disruptive behavior disorders is the *Mothers' Method for Subgrouping* or *MOMS* checklist (Loney, 1984). The two subscales of this

instrument, the Hyperactivity scale and the Aggression scale, have been shown to be relatively pure measures of hyperactivity/inattention and oppositional behavior, respectively.

Dimensional scales of teachers' ratings of children's behavior have also been widely used. One popular instrument is the *Teacher Report Form*, which is parallel to the *Child Behavior Checklist*. Another teacher measure is the *IOWA Conners Teacher's Rating Scale* (Loney & Milich, 1982), which has been shown to differentiate between the behavioral dimensions of hyperactivity and negativistic behavior. The Inattention-Overactivity scale is significantly correlated with chart ratings of hyperactivity symptoms (but not aggression) and off-task behavior in a laboratory academic seatwork activity. The Aggression scale correlates significantly with chart ratings of aggression (but not hyperactivity) and direct observations of oppositional and aggressive behaviors in school settings.

Disruptive Behavior Disorders

Correlations between the ADHD category of the SYMPTOM INVENTORIES and relevant dimensional scales are highly significant and of moderate to high magnitude. For example, scores from the parent version of the SYMPTOM INVENTORIES' AD/HD category are significantly correlated with the Attention Problems scale of the *CBCL* for children ranging in age from preschool ($r = .65$, $p < .0001$) to adolescents ($r = .54$, $p < .0001$). Scores for the more global Externalizing Factor of the *CBCL* correlated highly with AD/HD category scores of the *Child Symptom Inventory: Parent Checklist* ($r = .72$, $p < .001$). Scores from the *MOMS* Hyperactivity Scale correlated moderately with the AD/HD category scores of the parent versions of the *Early Childhood Inventory* ($r = .48$, $p < .01$), *Child Symptom Inventory* ($r = .69$, $p < .0001$), and *Adolescent Symptom Inventory* ($r = .59$, $p < .0001$). Scores from the *IOWA Conners Teacher's Rating Scale* Inattention-Overactivity scale were highly correlated with the AD/HD category scores of the teacher version of the *Early Childhood Inventory* ($r = .83$, $p < .0001$), *Child Symptom Inventory* ($r = .86$, $p < .0001$), and *Adolescent Symptom Inventory* ($r = .88$, $p < .0001$).

Comparisons with dimensional scales corroborate the convergent validity of the ODD category of the SYMPTOM INVENTORIES. Most relevant is the Aggression subscale of the *CBCL*, which correlated highly with the ODD category from the parent version of the *Early Childhood Inventory* ($r = .72$, $p < .0001$) and the *Adolescent Symptom Inventory* ($r = .76$, $p < .0001$). The Aggression subscale of the *MOMS* also overlaps many behaviors from the ODD category, and it correlated highly with the parent responses to the *Early Childhood Inventory* ($r = .60$, $p < .0001$), *Child Symptom Inventory* ($r = .71$, $p < .0001$), and the *Adolescent Symptom Inventory* ($r = .70$, $p < .0001$). Scores for the Aggression scale of the *IOWA Conners Teacher' Rating Scale* correlated highly with ODD category scores from the teacher version of the *Early Childhood Inventory* ($r = .82$, $p < .0001$), *Child Symptom Inventory* ($r = .81$, $p < .0001$), and the *Adolescent Symptom Inventory* ($r = .89$, $p < .0001$).

The Conduct Disorder category of both the parent and teacher versions of the *Early Childhood Inventory* are moderately correlated with the Delinquency subscale of the *CBCL* and *Teacher Report Form* ($r = .68$ and $r = .62$, respectively, $p < .0001$ for both), suggesting that similar behaviors are being evaluated. This convergence is also apparent for teenagers, in that Conduct Disorder category scores from the parent *Adolescent Symptom Inventory* are highly correlated with Delinquency scale scores from the *CBCL* ($r = .75$, $p < .0001$).

Mood and Anxiety Disorders

The co-occurrence of anxiety and depressive symptoms is reinforced by the structure of many dimensional behavior rating scales, which were based on the factor analyses of the data from thousands of children. For example, in the most recent version of the *CBCL*, there is a single scale, Anxious/Depressed, which contains items that measure both anxiety (fearful, nervous, worries) and

depression (sad, cries, lonely). Not surprisingly, when one correlates the scores of the anxiety and depressive disorder categories from the parent SYMPTOM INVENTORIES with scores for the Anxious/Depressed scale of the *CBCL*, the correlations are significant and in the moderate range ($r = .44$ to $r = .70$).

Regardless of how sensitive the SYMPTOM INVENTORIES are at identifying children with an anxiety or depressive disorder, it is essential to also obtain information from the youngster about how he or she feels in various situations and more generally about mood states. Although this can be done in an interview or through various activities (e.g., playing, drawing), many mental health professionals have found various self-report instruments to be useful for assessing anxiety (e.g., *Revised Children's Manifest Anxiety Scale*) and depression (e.g., *Children's Depression Inventory*). We have found that correlations between these instruments and scores for the anxiety and depression categories of the parent *Child Symptom Inventory* and the *Adolescent Symptom Inventory* are significant but of low magnitude (range: $r = .30$ to $r = .50$), which further demonstrates that parents often do not know how and to what degree their children experience feelings of anxiety and depression.

SUMMARY

Although the SYMPTOM INVENTORIES can be very useful as screening instruments for identifying the symptoms of emotional and behavioral disorders in children and adolescents, we strongly emphasize the fact that a rating scale or checklist cannot be the sole basis for making a diagnosis. In clinical settings, the SYMPTOM INVENTORIES can be used to structure an interview with parents during which their responses can be reviewed and clarified. The interview should also include questions about the onset of symptoms in terms of the child's age and possible family/environmental (e.g., parents divorce, family moved) or intrinsic (e.g., illnesses) factors that may be associated with the emergence of symptoms. Finally, the degree of impairment in various areas of functioning (e.g., relationships with parents, teachers, and peers; academic performance) needs to be evaluated by the clinician.

Aside from interviewing the parents about their responses to the SYMPTOM INVENTORIES, there are many other areas that need to be examined. A thorough diagnostic evaluation includes assessment of developmental, medical, family, and educational histories. In addition, previously administered psychological testing should be reviewed and perhaps new testing conducted. Furthermore, a mental status examination of the child is crucial, particularly for the internalizing disorders (e.g., mood and anxiety disorders) and disorders characterized by odd thinking or behavior (e.g., schizophrenia, pervasive developmental disorders).

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