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Convergent, Discriminant, and Construct Validity of the ACTeRS and ASCA

Katie Sprouls

Eastern Illinois University

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Convergent, discriminant, and construct validity of the ACTeRS and the ASCA.

Katie Sprouls
Eastern Illinois University
July 8th, 2002
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Abstract

The present study examined the convergent, discriminant, and construct validity of the ADD-H Comprehensive Teacher’s Rating Scale, Second Edition (ACTeRS) and Adjustment Scales for Children and Adolescents (ASCA). Participants included 106 children between in first through sixth grade for the ACTeRS and ASCA comparison of teacher ratings. The children assessed were 53 children meeting DSM-4 criteria for ADHD and 53 randomly matched control group children. Results of this study indicated moderate correlations between similar scales of the ACTeRS and ASCA. Discriminant function analysis and diagnostic efficiency estimates revealed significantly high capabilities for both instruments in accurately differentiating between known groups. Results from the present study were similar to previous studies examining ADHD rating scales. This study provides support for the construct and discriminant validity of the two measures.
Convergent, discriminant, and construct validity of the ACTeRS and the ASCA.

The best procedure for evaluating Attention-Deficit/Hyperactivity Disorder (ADHD) is to objectively quantify opinions and to develop normative data based upon responses (Barkley, 1990). Certainly the three most important components to a comprehensive evaluation of a child with ADHD are the clinical interview, medical examination, and interpretation of rating scales. Diagnosis is regularly based on anecdotal information and the use of well-standardized behavior rating scales completed by parents, teachers, and self reports (Vaughn, Riccio, Hynd, & Hall, 1997). Some clinicians have used laboratory tasks and psychometric measures of impulse control and hyperactivity for diagnoses; however, the primary principal of their work is validating behavioral constructs of ADD (McKinney, Montague, & Hocutt, 1993).

Rating scales are the most common instruments used in the diagnosis of ADHD and conduct disorders. A significant goal in the assessment of ADHD is the determination of the presence or absence of the disorder and the differential diagnosis from other childhood psychiatric disorders (Barkley, 1998). Behavior rating scales have become essential in the evaluation and diagnosis of children with behavior problems. Rating scales provide reliable and valid normative data that are critical regarding a child's behavior in a variety of natural settings in an unobtrusive manner, which is essential for a comprehensive evaluation (Danforth & DuPaul, 1996).
School psychologists often utilize teacher report behavior rating scales as a means to effectively obtain pertinent information about a child's behavior in the classroom and other school settings. Rating scales allow psychologists to successfully assess factors such as inattention, cognition, academics, and behavior in an unobtrusive manner (Schwean, Burt, & Saklofske, 1999). Nevertheless, teacher reports are inevitably subject to rater bias, halo effects, practice effects, and other problems associated with rating scales (Conners, 1986). School psychologists are generally familiar with these sources of error and aware of their effects. Above all, teacher report behavior rating scales attempt to present a thorough and objective depiction of a child's behavior and/or psychopathology.

Teacher completed rating scales are routinely preferred over parent completed rating scales, primarily due to findings based on variability between parents and teachers perceptions of symptomology (Schwean et al., 1999). Parents, specifically mothers, tend not to accurately discriminate between hyperactivity-impulsivity and inattention as accurately as teachers. Teachers tend to be more precise in discriminating among these behaviors because of their ability to compare and analyze behaviors in a classroom population. In addition this distinction in symptoms is likely due to the nature of academic work and the behaviors demanded in a classroom as opposed to home (Barkley 1990; Schwean et al., 1999).

Barkley (1990) reported that reliability of child behavior rating scales could be compromised by numerous problems in
construction, use, and interpretation of data. One source of variation is interpretation of the scales. Clinicians occasionally interpret the data as if it were representative of the child's actual behavior, rather than a sample of the child's behavior. However, many external environmental factors contribute to some degree in the rating obtained for each child (Barkley, 1990).

Notwithstanding the problems inherent in behavior rating scales, they provide many advantages over other measures and are increasingly used to assess psychopathology (Barkley, 1990). For instance, their ability to gather information from informants with experience in diverse populations, settings, and circumstances provides a more comprehensive picture of the problem. They also enable data collection for rare and infrequent behaviors. Additionally, rating scales are cost effective and valuable for their unobtrusiveness. They provide a convenient means of collapsing information about a child across a variety of situations into valuable samples for diagnosis. Situational variables are filtered out; thus the focus is on stable and persistent characteristics of the child. Furthermore, rating scales provide quantitative data concerning a child's statistical deviance from the norm for comparative child behavior rating scales (Barkley, 1990; Danforth & DuPaul, 1996).

There is a growing preference among school and clinical psychologists for objective definitions of problem behavior and psychopathology. Thus a rapid growth in behavioral criteria provides statistical information for classification and
evaluation purposes. Standardized rating scales and checklists offer psychologists the ability to observe and evaluate reasonably alterable behaviors. Additionally, the scales provide psychologists with normative data to compare a child with a reference group (McDermott, 1993).

Within this context, two standardized behavior rating scales have been represented as statistically valid measures of ADHD symptoms and psychopathology. The scales are the ADHD Comprehensive Teacher Rating Scale, Second Edition (ACTeRS; Ullmann, Sleator, & Sprague, 1991) and the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Marston & Scott, 1993).

Both instruments have common and unique subscales pertaining to ADHD symptoms. As a result, construct and convergent validity should be more thoroughly evaluated. In order to demonstrate construct validity, it must be shown not only that a test correlates highly with other measures with which it should theoretically correlate (convergent validity), but also that it does not correlate significantly with measures from which it should differ (divergent validity). Additionally, discriminant validity of an instrument is crucial when assessing ADHD children as a means of identifying the most efficient method for differentiating between ADHD and normal children. Discriminant validity is defined here as the ability of a scale to correctly identify or discriminate between known groups.

The ADD-H Comprehensive Teacher’s Rating Scale, Second Edition (ACTeRS), was developed to help identify Attention
Deficit Disorder, with or without hyperactivity in children (Ullmann et al., 1991). The ACTeRS is a short, concise, teacher report behavior rating scale that has become a practical tool for school psychologists in the assessment of children with Attention Deficit Disorder. It consists of 24 items relevant to classroom behavior and is available in microcomputer or paper-and-pencil format. Classroom teachers complete the ACTeRS by rating overt behaviors associated with ADHD. The rating scale may be used for children in kindergarten through eighth grade (Ullmann et al., 1991).

The twenty-four items on the ACTeRS are gender neutral; yet the measure provides two profile forms, one for girls and one for boys. Because ratings for boys and girls were found to differ considerably, separate norms have been provided. The items consist of short statements, typically from two to eleven words. The teacher completing the rating scale is instructed to read each statement and then rate the child’s behavior accordingly. Behaviors are recorded on a five-point Likert scale. A teacher responds to each item by rating 1= almost never to 5= almost always. The items collapse into one of four factors, which are Attention, Hyperactivity, Social Skills, and Oppositional Behavior. (Danforth & DuPaul 1996; Ullmann et al., 1991).

The ACTeRS was initially normed on 1,339 children in kindergarten through fifth grade in the early 1980’s. In 1989 restandardization and norm expansion data were collected on 3,636 students in grades K-8 from Illinois (Ullmann et al., 1991). The restandardization provided support for reliability with the
normative sample of the children, however it is not representative of the United States population.

"The instrument was designed with three important goals. These were (1) to put the appropriate emphasis on attention; (2) to be useful to clinicians for diagnosis of ADD and monitoring of treatment effects; and (3) to reveal individual differences in the behavior of children who manifest a deficit in attention, both before and during treatment" (Ullmann et al., 1991, p.1).

The ACTeRS yields scores for four factors which are salient in the diagnosis and treatment of attention deficit and hyperactivity. The factors include Attention (six items), Hyperactivity (five items), Social Skills (seven items), and Oppositional Behavior (six items). Oppositional behavior (or conduct disorder) and poor social skills are often present in ADHD children. Thus, determining the presence of these characteristics is helpful in the understanding of the child’s difficulties.

A series of statistical analyses were completed when deciding the final factors. Correlations among the items were factor analyzed to examine the factor structure. Factor pattern values, factor structure values, and factor intercorrelations for the final scales yield the four subscales. Correlations among the factors range from .30 to .69. Additionally, factor loadings for the four areas ranged from .52 to .91. Thus, the measure is factor pure by acceptable standards (Ullmann et al., 1991). The
factor purity of the items in the scale makes it possible to discriminate precisely among the behavioral dimensions of ADHD.

The raw scores are transferred to the gender appropriate profile for each of the four behavioral syndromes. For a valid interpretation, raw scores are converted to normalized T scores and percentiles. Percentiles are normally satisfactory for interpretative and clinical practice. The manual provides separate T score tables for males and females. Ullman et al., (1991) purports that ADD is justifiable if the child’s score falls at or below the 10th percentile. However, the T score must be in the 10th percentile in the Attention subscale, which is not necessary for the three others. Furthermore, if a child obtains a T score between the 10th and 25th percentile in the Attention subscale they would be identified as handicapped. However, the three other subscales must be considered if the score happened to fall in this range (Ullmann et al., 1991).

According to the authors Hyperactivity, Social Skills, and Oppositional Behavior subscales with T scores below the 25th percentile are indicative of a “major deficit.” Percentiles between the 25th and 40th are identified as a “moderate problem.” Whereas, T scores raging from the 40th to 50th percentile may indicate a “mild problem.” Lastly, T scores above the 50th percentile indicate no problem at all (Ullmann et al., 1991).

The reliability for the ACTeRS is reported as interrater, internal consistency (alpha), and test-retest. Ullmann, et al., (1991) reported interjudge reliability data for the Attention factor at .61, the Hyperactivity factor at .73, the Oppositional
factor at .59, and the Social Skills factor at .51. Teacher opinion, lack of experience, and the format of the scale may contribute a considerable amount of error variance in the rating scale.

Danforth and DuPaul (1996) replicated the previous results by correlating teacher-rating scales for interrater reliability of similar rating scales for ADHD. Their findings revealed interrater agreements very similar to Ullmann, et. al. (1991). The interrater reliability for the factors was as follows: Attention .65 (p <.01), Hyperactivity .74 (p <.001), Social Skills .67 (p <.001), and Oppositional .62 (p <.01). Rates of agreement on individual items were not reported, thus the purpose was to investigate the scores practitioners actually use, the domain and total scores.

The test-retest reliability ranged from .51 to .82 (Attention r = .78, Hyperactivity r = .81, Social Skills r = .51, and Oppositional r = .82). Additionally, the test-retest correlation for the Attention subtype alone was .78 resulting in a standard error of measurement of 4.42. Similarly, the internal consistency (alpha) was found to be very high. The reliability coefficients all exceeded .90 (Attention \( r_a = .97 \), Hyperactivity \( r_a = .95 \), Social Skills \( r_a = .92 \), Oppositional \( r_a = .95 \)) (Ullmann, et al., 1991).

Intercorrelations between the factors on the ACTeRS do not indicate strong factorial validity. The Attention and Social Skills factors were more highly correlated than the other factors. Additionally, the Hyperactivity and Oppositional
behavior subscales were more highly correlated (Ullmann et al., 1991). These findings suggest some convergent validity within the factors associated with ADD-H.

Raggio and Pierce (1999) compared ACTeRS to The School Performance Rating Scale, which has not yet been standardized. The instrument is designed to assess academic behavior of children with attention deficit disorder. The findings indicated a modest relationship between the measures on the subscales Attention and Social Skills.

Ullmann (1985) analyzed the utility of the ACTeRS in discriminating learning disabled children from attention deficit disordered children. Multivariate analysis of variance (MANOVA’s) and analysis of variance (ANOVA’s) were completed with the ACTeRS, for group (LD vs. ADHD referred), sex, and grade differences. Regular education and special education teachers were informants for each child. Factor analysis revealed that the Attention and Social Skills factors were closely related for ADHD and learning disabled children. The ADHD sample obtained significantly higher hyperactivity scores than normal children and children with a learning disability. Additionally, the students with a learning disability scored significantly higher on the Oppositional factor, which may be the result of academic frustration common among students with a learning disability. Regression analyses were performed on the ratings done by regular classroom teachers of children in the LD sample compared with children in the ADHD referred sample. Also, t-tests were used to compare LD with the ADD children on raw scores. The findings
suggested that the ACTeRS is reliable and useful for screening ADHD students and children with learning disabilities (Ullmann, 1985). The research indicates that the ACTeRS is a practical and efficient measure for discriminating between children with learning disabilities and those with ADD-H.

McLaren (1989) utilized the ACTeRS as a means to differentiate between a group of normals, children with attention deficit disorder, and children with attention deficit disorder exhibiting oppositional behavior. McLaren used the 20th percentile as a criterion for classification of ADHD. The findings indicated a significant difference between the groups. The two groups with attention deficit disorder were more distracted on vigilance tasks, especially those with oppositional behavior.

Attention deficit disorder has a continuum of symptoms that closely resemble many other psychological disorders. Research on child psychopathology in general, not just ADHD, has endlessly attempted to discriminate between disorders (Barkley 1990). Many children with ADHD have co-morbidity with one or more other disabilities. Rating scales often provide an ambiguous interpretation of a child’s behavior, which may be due to considerable overlap between measures. This is often noted with ADHD, Oppositional Defiant Disorder, Conduct Disorder, and learning disabilities (Ullmann 1985: Barkley 1990). Differences in approaches to defining ADHD also contribute to difficulty in evaluating ADHD as a distinct clinical syndrome. Additionally, co-morbidity may also be the result of a scale not being able to
differentiate among several disorders. Thus, a means to
differentiate between ADHD and other disorders, as well as
measure common variables, may contribute noteworthy information
for future ADHD evaluations.

Another teacher report behavior rating scale that provides
diagnostic information for children with disabilities, and
includes an attention-deficit hyperactivity syndrome, is the
Adjustment Scales for Children and Adolescents (ASCA; McDermott,
Marston, & Scott, 1993). The ASCA is a standardized teacher
report behavior rating scale designed to assess multi-situational
syndromes of behavior pathology. The ASCA is a rather short,
behaviorally specific and inexpensive objective behavioral
assessment instrument. The ASCA requires the classroom teacher
to choose from observable symptomatic or normal behaviors across
multiple situations, and syndromes generalize across age, gender,
and ethnicity (McDermott, 1994).

The ASCA may be used to assess students five through
seventeen years of age (grades K-12). There are 97 problem and
26 positive behavior descriptors relating to "29 specific social,
recreational, or learning situations" (McDermott, 1994, p. 3).

Rather than measuring frequency or intensity of behaviors,
the ASCA requires teachers to choose from observable symptomatic
or normal behaviors (from six core syndromes and two
supplementary syndromes). The scale provides symptomatic
descriptions to determine if the problem behaviors are isolated
or present in multiple environments. The items present specific
academic, social, and play examples that the teacher could observe in a variety of situations (McDermott, 1994).

The core syndromes on the ASCA include Attention-Deficit Hyperactive (ADH), Solitary Aggressive-Provocative (SAP), Solitary Aggressive-Impulsive (SAI), Oppositional Defiant (OPD), Diffident (DIF), and Avoidant (AVO). The supplementary syndromes are Delinquent (DEL) and Lethargic (Hypoactive) (LEH). The DEL syndrome is reliable and scored for all youths except females under age of 12. Likewise, the LEH syndrome is reliable and scored for all youths under the age of 12 (McDermott, 1994).

The ADH, SAP, SAI, and OPD syndromes are combined to form an overall Overactivity (OVR) adjustment scale, which is similar to the Externalizing dimension, frequently found in child psychopathology literature (Achenbach & Edelbrock, 1983). Additionally, the AVO and DIF syndromes are combined to form the Underactivity (UNR) adjustment scale, which is similar to the Internalizing dimensions found in child psychopathology (McDermott, 1994).

The ASCA provides gender specific rating forms, however, the only difference is the gender reference. The norm sample for the measure included 700 males and 700 females (N = 1400). The standardization was designed to represent youth's aged 5 to 17 (grades K-12) attending school in the United States between 1988 and 1990. The sample was stratified for age, gender, grade level, race/ethnicity, parent education, family structure, national region, community size, and handicapping conditions. Additionally, the ASCA was co-normed by the Psychological
Corporation with the Differential Abilities Scale (DAS; Elliot, 1990).

ASCA scores are interpreted using three different methods. For a valid interpretation raw scores are converted to normalized T scores. The cut-score interpretation method indicates that T scores below 60 are regarded as "adjusted", 60 to 66 are identified as "At Risk", and those who receive a 67 or greater are classified as "maladjusted". Percentile ranks are also provided (McDermott, 1994).

The Syndromic Profile Interpretation method compares the youth's core syndrome T scores to 22 behavioral profiles by the use of a generalized distance score (GDS). The youth's profile is classified as being most similar to the type with the smallest GDS. The Discriminant Classification interpretation method classifies a youth's profile as either normal or seriously emotionally disturbed, based on regression formulae (McDermott, 1994; McDermott, Watkins, Sichel, Weber, Keenan, Holland, & Leigh, 1995).

The ASCA manual offers extensive information regarding reliability and validity. Psychometric studies indicate that the ASCA is a psychometrically sound behavior rating scale. The internal consistency estimates for the core syndromes were between .67 and .91. In addition, the Overactivity and Underactivity scales internal consistency estimates were .92 and .82 respectively (McDermott, 1994).

Reliability was also investigated by calculating interrater agreement and short-term stability. The interrater reliability
for the global adjustment scales ranged from .81 and .84. The interrater agreement for the subscales ranged from .65 to .85. There were no significant mean differences detected between raters (McDermott, 1994; Watkins & Canivez, 1997). The test-retest reliability was reported between .66 to .91. Furthermore, there were no significant differences identified between the mean test and retest scores (Canivez, Perry, & Weller, 2001; McDermott, 1994).

Convergent and divergent validity was analyzed comparing the ASCA to the Conners Teacher Rating Scale (CTRS; Trites, Boulin, & Laprade, 1982) and parent ratings on the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983). The ASCA Overactive scales were moderately correlated with the CTRS and CBCL externalizing scales. Also, the ASCA Underactive scales correlated higher with internalizing scales of the other measures. Higher correlations were identified between the CTRS Hyperactivity and Conduct Problem factors and the ASCA Overactive scales (.78 - .80). ASCA Overactivity syndromes also correlated more highly with hyperactive, aggressive, and externalizing dimensions of the CBCL (.42 - .75). Additionally, when comparing the Underactive and Overactive syndromes on the ASCA, CTRS, and CBCL near-zero correlations were found. Thus, correlations suggest a valid convergent and divergent relationship across various syndromes (McDermott et al., 1995).

The ASCA has been the center of attention for several validity studies comparing the ASCA to various behavior-rating scales. Furthermore, studies concentrating on convergent and
divergent validity with the ASCA and the Behavior Assessment System for Children-Teacher Rating Scale (BASC-TRS) have revealed significant correlations among the measures. The ASCA and BASC TRS displayed convergent validity with significant correlations, specifically Hyperactivity (Ingles, 1999; Keusch, 1998; Scroggs, 2001).

In order to examine ASCA’s discriminant validity a sample of 1,400 severely emotionally disturbed (SED) and non-handicapped students were matched on variables of age, grade, and ethnicity. Discriminant function analysis, cross-validation, validity generalization, and differential classification studies were conducted. The ASCA’s accuracy rate for differentiating between the groups was approximately 80%. Furthermore, using the cut score method the ASCA was able to accurately differentiate SED from learning disabled, communication impaired, gifted, and random normals. These findings indicate that the SED sample obtained considerably higher T scores on the ADH, OPD, SAP, and SAI syndromes, which indicates greater problem behaviors. Underactivity syndromes provided little discriminatory effects between groups (McDermott et al., 1995). In summary, the ASCA appears to be practical and psychometrically sound instrument. The measure demonstrates strong reliability and validity.

Statement of the Problem

The ASCA and ACTeRS both have similar dimensions that assess prominent problems in childhood, specifically attention and hyperactivity. Results suggest the ACTeRS and ASCA demonstrate good discriminant validity in child psychopathology (McDermott,
1994; Ullman et al., 1991). Despite the fact that the ACTeRS and ASCA may not measure exactly identical syndromes or pathologies, many similarities are present and should be examined. There is a need for further research that examines the validity of rating scales assessing ADHD. The purpose of the present study was to examine the psychometric relationship between the two instruments. Specifically, convergent, discriminant, and construct validity with a random sample of ADHD children and a random matched control group. Diagnostic accuracy of the ACTeRS and ASCA was assessed in differentiating ADHD from a random and matched control group, based upon the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) criteria assessed using the National Institute of Mental Health (NIMH) Diagnostic Interview Schedule for Children-Forth Edition (DISC-IV). Discriminant validity of the rating scales was analyzed in differentiating the two groups.

It was predicted that the ACTeRS and ASCA would correlate highly because of the similar constructs assessed on the rating scales. Additionally, the discriminant validity was predicted to be moderate to high. The present study investigates three forms of construct validity for the ACTeRS and ASCA; similar results from previous studies of the measures are expected.

Method

Participants

The participants of the study were 106 children in first through sixth grade from school districts in a large southwestern metropolitan area. Seventy-six of the participants of the study
were male and 30 were female. The demographic characteristics are presented in Table 1. There were fifty-three children identified as ADHD and 53 matched control children. Forty-eight (45%) of the participants were Caucasian, 46 (43%) were Hispanic/Latino, and 12 (11%) were African-American. Seventy-two (68%) of the participants were presumed normal and did not receive special education services under any category, 24 (25%) were classified as Specific Learning Disability, 6 (6%) Speech/Language Impaired, and 1 (2%) was classified under an other category. The mean age for both groups was 9.1 (SD = 1.5).

Instruments

**ADD-H Comprehensive Teacher Rating Scale (ACTeRS).** The ACTeRS is a standardized teacher rating scale designed to assess attention-deficit disorder, with or without hyperactivity. The measure may be used for children in grades K-8. There are 24 Likert type items that yield scores for four factors that are salient in the diagnosis and treatment of attention deficit and hyperactivity. The factors include Attention (six items), Hyperactivity (five items), Social Skills (seven items), and Oppositional Behavior (six items). The ACTeRS teacher form raw scores are converted to normalized T scores for each of the four behavioral syndromes. Percentile ranks are also available. Reliability and validity information suggests that ACTeRS is a practical and effective measure for evaluating ADD children with and without hyperactivity (Ullman & Sleator, 1985).

**Adjustment Scales for Children and Adolescents (ASCA).** The ASCA is a standardized teacher report behavior rating scale that
assesses student behavior and psychopathology across multiple situations. The instrument is used for children ages 5 through 17 (grades K-12). It contains 156 behavioral descriptions that are based on 29 specific social, recreational, and learning situations. Six core syndromes include Attention-Deficit Hyperactive, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), Oppositional Defiant, Diffident, and Avoidant. Two supplementary syndromes, Delinquent and Lethargic (Hypoactive) are also provided. The core syndromes are converted to two broad syndromes, Underactivity and Overactivity. The reliability and validity for the ASCA is moderate to high and acceptable for diagnostic use (Canivez, 2001).

NIMH Diagnostic Interview Schedule for Children Version IV. The DISC-IV is a comprehensive structured interview that encompasses 36 mental health disorders for children and adolescents, using DSM-IV criteria. The DISC-IV is sufficiently developed and tested to stand independently for AD/HD diagnostic use (Shaffer, Fisher, Lucas, Dulcan, Schwab-Stone, 2000). The measure is a widely used and studied mental health interview that has been tested in both clinical and general populations. The DISC-IV was designed to assess psychiatric diagnoses that occur in children and adolescents using an interview format with the parents or knowledgeable caretaker. The questions are short and simple addressing such things as time spans and symptoms. The responses are limited to yes or no, with some open-ended responses discussing duration (Johnson, Barrett, Dadds, Fox, & Shortt, 1999; Shaffer, Fisher, Lucas, Dulcan, Schwab-Stone, 2000).
Procedure

Principals of each school were contacted in order to receive permission to carry out the study in the schools. Teachers who were willing to participate were told to refer children to the Behavior Support Team if there was a child in their classroom that was suspected of having ADHD. The Behavior Support Team is multi-disciplinary group of professionals designated on each campus to address and assess behavior issues in the classroom. Once a child was referred for ADHD screening, their parents were contacted and a meeting was conducted with the team. The screening process was explained and informed consent was obtained. The parents or primary caregiver were then privately administered the interview format of the DISC-IV by a certified school psychologist and/or a school psychologist intern. The DISC-IV was administrated using the interview format with the parents or primary caregiver of the ADHD group. The Attention Deficit Hyperactivity-Disorder section was the only domain administered. Data from the responses were entered into computer-assist software by the interviewing psychologist, which was then analyzed to determine if the child met the criteria for ADHD, based on the DSM-IV criteria. If the referred child met the criteria for ADHD, the primary classroom teacher was asked to complete the ACTeRS and ASCA for data collection. The teacher of the referred child was instructed to rate the behavior of the child and that of a randomly selected and matched student in the classroom. The ADHD and control groups were matched with respect to age, gender, race, and disability status. Students were then
rated on the ACTeRS and ASCA by their classroom teacher in counterbalanced order to control for possible order effects. The completed scales were collected from the teachers by the researcher. To assist in participation, the teachers were eligible to win one of three $50 gift certificates.

Data Analysis

Pearson product moment correlations were calculated between the ACTeRS and ASCA to assess the convergent validity. Multivariate analyses of variance and subsequent univariate analyses of variance were used to examine differences on the ACTeRS and ASCA between students meeting DISC-IV criteria for ADHD and control group students. Effect size estimates (Glass' Δ; Glass & Hopkins, 1996) were used to determine the meaningfulness of mean differences between ratings. Discriminant validity was assessed using discriminant function analyses (DFA) followed by standard diagnostic efficiency statistics (Canivez, 1994; Kessel & Zimmerman, 1993; Watkins & Canivez, 1997).

Results

Convergent Validity

Correlations between similar ACTeRS and ASCA scales were statistically significant and supported the convergent validity for similar dimensions of each scale. The ACTeRS Attention subscale and the ASCA Attention Deficit-Hyperactivity (ADH) syndrome were significantly correlated ($r = - .63, p < .0001$), as were the ACTeRS Hyperactivity subscale and ASCA ADH syndrome ($r = - .66, p < .0001$). The ACTeRS Oppositional Behavior subscale and
the ASCA Oppositional Defiant (OPD) syndrome were also
significantly correlated \((r = -.55, p < .0001)\).

**Group Differences and Diagnostic Efficiency: ACTeRS**

A one-way (group) between subjects multivariate analysis of
variance was performed on the four ACTeRS scales (Attention, Hyperactivity, Social Skills, and Oppositional) and the combined
dependent variables were statistically significant, Wilks \(\Lambda = .21, \ F = 94.06, p < .0001\). One-way (group) between subjects
univariate analyses of variance were then conducted with the
ACTeRS in order to determine the extent to which the ADHD group
and the matched control group differed on the four ACTeRS scales.
Results indicated that the groups differed significantly on the
Attention, \(F(1,104) = 191.34, p < .0001, \eta^2 = .65\); Hyperactivity,
\(F(1,104) = 204.28, p < .0001, \eta^2 = .66\); Social Skills, \(F(1,104) =
158.64, p < .0001, \eta^2 = .60\); and the Oppositional Behavior scales,
\(F(1,104) = 44.41, p < .0001, \eta^2 = .30\). Mean differences between the
groups and effect sizes are presented in Table 2. In each case,
scores on the ACTeRS were significantly lower for the ADHD group
than the matched control group indicating greater problem
behaviors. Table 2 presents the descriptive statistics, \(F\) values,
and effect sizes by group for each comparison.

**Discriminant Function Analysis**

Fisher's linear discriminant function coefficients from
direct discriminant function analysis are presented in Table 3.
The discriminant function analysis was statistically significant,
(Wilks \(\Lambda = .21, \chi^2(4) = 158.40, p < .0001\)). The diagnostic
efficiency statistics presented in Figure 1 indicate that the ACTeRS demonstrated a high degree of sensitivity (.94), which is the ratio of children correctly identified as ADHD. The specificity, which is the ratio of children correctly identified as not possessing ADHD was equally high (.98). The positive predictive power (.98) of the ACTeRS confirmed a significant amount of the children positively identified as having ADHD. Likewise, the negative predictive power (.95) identified a significant number of the children as accurately not having the disorder. The false positive rate (.02) for the ACTeRS was very low and identified a small number of control group children identified as having ADHD. Similarly, the false negative rate was very low (.05) and revealed a small number of ADHD children identified as normal.

The overall correct classification (hit) rate was .96. The kappa coefficient, which is the agreement beyond chance, was statistically significant \((k = .92, Z = 9.53, p < .0001)\) (Canivez, 1994, Watkins & Canivez, 1997) and indicated near perfect agreement. Figure 2 presents discriminant function all groups stacked histogram, which visually displays the near perfect separation of the two groups.

**Group Differences and Diagnostic Efficiency: ASCA**

A one-way (group) multivariate analysis of variance was performed on the six ASCA core syndromes and the combined dependent variables were statistically significant \((\text{Wilks } \Lambda = .23, F = 52.45, p < .0001)\). Subsequent univariate analyses of variance were conducted to establish the degree to which the ADHD
group and the matched control group differed on the separate core syndromes. Results of the univariate analyses revealed statistically significant group differences were present for the ASCA Attention Deficit-Hyperactivity syndrome, $F(1,104) = 134.42$, $p < .0001$, $\eta^2 = .56$; ASCA Solitary Aggressive (Provocative), $F(1,104) = 74.88$, $p < .0001$, $\eta^2 = .42$; ASCA Solitary Aggressive (Impulsive), $F(1,104) = 94.69$, $p < .0001$, $\eta^2 = .48$; ASCA Oppositional Defiant $F(1,104) = 26.20$, $p < .001$, $\eta^2 = .20$; and ASCA Avoidant, $F(1,104) = 10.99$, $p < .001$, $\eta^2 = .10$ syndromes. No statistically significant group differences were observed on the ASCA Diffident syndrome, $F(1,104) = .79$, $p < .376$, $\eta^2 = .01$). In all instances the ADHD group had higher ASCA syndrome scores than the matched control group (Table 2) indicating greater problem behaviors.

**Discriminant Function Analysis**

Fisher's linear discriminant function coefficients from direct discriminant function analysis are presented in Table 4. The discriminant function analysis was statistically significant (Wilks $\Lambda = .24$, $\chi^2(6) = 144.44$, $p < .0001$). The diagnostic efficiency statistics presented in Figure 3 indicate that the sensitivity (true positive rate) for the ASCA was very high (.98), as was the specificity (true negative rate) (.95). The positive predictive power (.94) and the negative predictive power (.98) rates were also very high. The false positive rate (.05) for the ASCA was very low and identified a small number of
control group children identified as having ADHD. Similarly, the false negative rate was very low (.01) and revealed a small number of ADHD children identified as normal.

The overall correct classification (hit) rate was .96, and the kappa indicated significant agreement beyond chance ($k = .92$, $Z = 9.52, p < .0001$) and indicated near perfect agreement. Figure 4 shows impressive distinct group separation with a discriminant function all groups stacked histogram.

Discussion

The purpose of this study was to examine the construct validity of the ACTeRS and ASCA and to examine the diagnostic efficiency of these assessment methods for correctly discriminating children meeting DISC-IV ADHD criteria from a random and matched control group. The behavior rating scales used were the ADD-H Comprehensive Teacher's Rating Scale (ACTeRS) and the Adjustment Scales for Children and Adolescents (ASCA). Establishment of convergent and discriminant validity is vital in the validation of any psychological measurement assessing ADHD or other pathologies. Significant differences in the manner in which instruments assess ADHD can lead to potential differences in diagnosis and treatment. This study provided additional support for the construct validity of both scales.

Results of the present study examined the convergent validity for the similar scales on the ACTeRS and ASCA. As expected, correlations between similar syndromes were moderately high and significant. The ACTeRS Attention subscale ($r = -.63$) and the ACTeRS Hyperactivity subscale ($r = -.66$) were moderately
associated with the Attention Deficit Hyperactivity syndrome on the ASCA indicated convergent validity. Similarly, the ACTeRS Oppositional subscale and the ASCA Oppositional Defiant syndrome were significantly and moderately correlated. Thus these two measures display convergent validity with significant correlations between like scales.

These findings are similar to previous studies of the ASCA, however the ACTeRS currently has limited supporting validity research. The ACTeRS subscales have been assessed analyzing relationships with the School Performance Rating Scale, yielding somewhat notable results (Raggio & Pierce, 1999). Positive correlations were identified on the ACTeRS Social Skills (.67) and Attention (.83) subscales when compared to the School Performance Rating Scale. The Hyperactivity (-.33) and Oppositional (-.38) subscales on the ACTeRS indicated low to moderate correlations.

The ASCA has been the subject of significantly more validity studies than the ACTeRS. The results of the present study are similar to various comparisons with similar syndromes on the ASCA. McDermott (1994) provided support for the convergent and divergent validity the ASCA, the revised Conners Teacher Rating Scale (CTRS; Trites, et al., 1982), and the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983). When comparing ASCA and the Conners Teacher Rating Scales (CTRS) McDermott (1994) reported the highest correlations to be between ASCA Attention-Deficit Hyperactivity and CTRS Hyperactivity Index ($r = .75$), which is slightly higher than the present findings.
However, the correlations with the CBCL were somewhat lower than the current findings (.35-.52). In a similar study the Behavior Assessment System for Children (BASC) revealed high correlations between the ASCA ADH syndrome and BASC-TRS Hyperactivity subscale (Ingles, 1999; Keusch, 1998; Scroggs, 2001), which are comparable to the ACTeRS correlations (.55 to .66). These findings support the convergent validity on like syndromes.

In addition to the convergent validity, validity was also assessed through distinct group differences. The mean differences and effect sizes (Table 2) revealed that the scores on the ACTeRS were significantly lower for the ADHD group than the matched control group, which indicated greater problem behaviors. The largest effect size was with the Attention subscale. Large effect sizes were also identified in the subscales of Hyperactivity, Social Skills, and Oppositional Behavior. Likewise, the ASCA revealed similar significant findings on five of six syndromes. Thus the appropriate scales on the ACTeRS and ASCA indicated that the groups differed significantly.

Ullmann (1985) examined group differences on the ACTeRS between children with a learning disability and children with attention deficit disorder. Similar to the current study, the findings indicated that the Hyperactivity subscale revealed significantly lower scores for the ADHD group, which indicates greater problem behavior. The Attention subscales revealed a modest difference with the ADHD group presenting more problem behaviors. Additionally, the Oppositional and Social Skills
subscales yielded moderately higher scores for the learning disabled group.

McClaren (1989) found similar results as the current study. The ACTeRS was used to assess differences between a group of normal children, a group of attention disordered children, and children with ADHD exhibiting oppositional behavior. Significant differences were indicated between the ADHD groups and the normal children in the Attention subscale. The attention disordered group resulted in a significantly lower scores indicating greater problem behavior. The findings were especially true for the group of attention disordered children also exhibiting oppositional behavior. However, the determination was based on percentiles and not discriminant function analyses, which would have provided more meaningful statistical information.

Group differences for the ASCA were examined to determine the degree to which the ADHD and matched controls differed. Statistically significant group differences were identified on the Attention-Deficit Hyperactivity, Solitary Aggressive (Provocative), Solitary Aggressive (Impulsive), Oppositional Defiant, and Avoidant syndromes. The groups did not significantly differ in the Diffident syndrome. Effect sizes were moderate to large.

Discriminant validity was assessed to determine the accuracy of the ASCA when differentiating between groups. According to the Discriminant Function Analysis, which is a linear combination of all scales, the ASCA Attention-Deficit Hyperactivity scale provided the greatest differentiation between the groups. High
Discriminant capabilities were also identified on the Diffident, Solitary Aggressive (Impulsive), and Solitary Aggressive (Provocative) syndromes. The Oppositional Defiant and Avoidant syndromes indicated modest discriminating capabilities between groups.

McDermott and Schaefer (1996) identified that with preadolescents the ADH, SAP, and SAI syndromes tend to have a pattern of elevated scores and decreased during adolescence. The Avoidant syndrome shows the opposite pattern. Similarly McDermott et al., (1995) assessed group differences and the discriminant validity with the ASCA. A sample of seriously emotionally disturbed children was differentiated from random normals by considerably elevated scores on the ADH, OPD, SAP, and SAI syndromes. Classification analysis indicated the ASCA was accurate on approximately 80% of the sample. The ASCA had an overall accuracy rate of 80.7% correctly identifying Emotionally Disturbed children in a sample, which is lower than the findings in the present study.

Discriminant validity and group differences were analyzed with the ACTeRS and ASCA to determine their accuracy in differentiating ADHD from matched students. Based upon the ADHD criteria set forth by the NIMH Diagnostic Interview Schedule for Children-Fourth Edition (DISC-IV), the ACTeRS and ASCA predicted and group membership for ADHD and matched controls provide significant support for the diagnostic efficiency of both instruments.
Validity assessment procedures and proportional accuracy rates are quantified in terms of sensitivity and specificity (Kessel & Zimmerman, 1993). In this instance, sensitivity refers to the rating scale’s ability to correctly identify children with ADHD from controls. On the contrary, specificity refers to the ability of the rating scale to correctly identify children not exhibiting ADHD symptomology.

In the current study the overall correct classification rate for the ACTeRS and ASCA is considerably higher than those found in previous studies (McDermott et al, 1995). As presented in Figures 1 and 3, both the ACTeRS and ASCA achieved an overall correct classification rate of 96% when differentiating ADHD children from matched controls. More specifically the ACTeRS was able to accurately identify the ADHD children in 94.3% of the cases, as did the ASCA 98% of the time. As for identifying matched controls the ACTeRS revealed 98.1% accuracy, and 94.5% accuracy on the ASCA (Canivez, 1994).

Diagnostic efficiency was examined with the ACTeRS and ASCA. The instruments revealed significant capabilities to predict group membership for ADHD from random and matched students. The positive predictive power or the proportion of children accurately identified as ADHD on the ACTeRS (.98) and the ASCA (.94) provided significant support for the diagnostic efficiency of the measures. Likewise the capability for the ACTeRS (.95) and ASCA (.98) to accurately identify the matched controls in the sample was substantial.
In summary, ACTeRS and ASCA display convergent validity with significant correlations between like scales. Results from this study were generally as hypothesized, the significant findings regarding the discriminant validity and diagnostic efficiency of the instruments were an impressive revelation. The discriminant validity provided significant statistical support for the ACTeRS and ASCA's capabilities to accurately discriminate between the groups.

The most impressive of the results of this study are the instruments diagnostic efficiency estimates. The positive and negative predictive power, specificity, and sensitivity all exceeded .90. These results support the strength of these scales.

Given the equal diagnostic efficiency, the ASCA would be preferred as it assesses wider range of syndromes and has substantially better norms. Diagnostic efficiency in other areas of research, which assess biological processes, has not always provided results such as those revealed in this study. Neuropsychological tests attempting to discriminate ADHD children from normals have resulted in limited discriminating ability at various cutoff scores (Doyle, Biederman, Seidman, Weber, & Farone, 2000).

The ASCA and ACTeRS are based on teacher's observations and indicated greater ability to correctly identify group membership between children with ADHD and a matched random group. The present study provides construct validity support for the ACTeRS a relatively new instrument, and further support for the ASCA.
Additional research is needed to better establish the validity of the ACTeRS.

Limitations of the present study center around the participants. The sample in the present study had a significant proportion of Hispanic children. This sample was not representative of the entire population for which the instruments may be used. However, there was a good Caucasian and Hispanic representation, but poor for other racial/ethnic groups. A larger sample size and wider range of ethnicity and socioeconomic status would provide stronger evidence for the validity of the scales and better generalizability.

Further research should be dedicated to assessing the technical adequacy of behavior scales in psychological measurement in identifying children with Attention Deficit Hyperactivity Disorder. Additional exploratory and confirmatory research is needed to establish more definite conclusions about the symptomology and course of the disorder. Improved understanding of these scales would be advantageous in the identification, planning of interventions, and monitoring medication of children with Attention Deficit Hyperactivity Disorder in the schools.
References


Table 1
Demographic Characteristics of the Samples

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Note. SLD = Specific Learning Disability, SLI = Speech and Language Impairment, Other = any other special education category under IDEA.
Table 2
Descriptive statistics, F values, and effect sizes by group

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Note: ACTeRS = ADD-H Comprehensive Teacher's Rating Scale, ATTEN = Attention, HYPER = Hyperactivity, SOSKIL = Social Skills, OPPOS = Oppositional, ASCA = Adjustment Scales for Children and Adolescents, ADH = Attention Deficit Hyperactive, SA(P) = Solitary Aggressive (Provocative), SA(I) = Solitary Aggressive (Impulsive), OPD = Oppositional Defiant, DIF = Diffident, AVO = Avoidant, DEL = Delinquent, LEH = Lethargic (Hypoactive), OVR = Overactivity, UNR = Underactivity.

*p < .05, **p < .01, ***p < .001
Table 3
Fisher's linear discriminant function coefficients for the ACTeRS for ADHD and Control Group

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Table 4
Fisher’s linear discriminant function coefficients for the ASCA for ADHD and Control Group

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Figure 1
ACTeRS Diagnostic Efficiency Statistics

### Diagnostic Efficiency Table

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<td>Total</td>
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### Results

- **Sensitivity (True Positive Rate)** = 0.9434
- **Specificity (True Negative Rate)** = 0.9811
- **Positive Predictive Power** = 0.9804
- **Negative Predictive Power** = 0.95
- **False Positive Rate** = 0.0189
- **False Negative Rate** = 0.0566
- **Overall Correct Classification (Hit) Rate** = 0.9623
- **Observed Agreement Po** = 0.9623
- **Chance Agreement Pc** = 0.5
- **Kappa** = 0.9246
- **Standard Error of Kappa** = 0.097059406

Significance Test for Kappa

- **Ho: k = 0**
- **Z** = 9.526124618
- **p < 0**:
  - **two-tail test**
  - **one-tail test**

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Figure 2
All-groups Stacked Histogram Canonical Discriminate Function for ACTeRS

1 = Normal
2 = ADHD (DISC-4)
### Figure 3
ASCA Diagnostic Efficiency Statistics

#### Diagnostic Efficiency Table

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<td>Total</td>
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<td>51</td>
<td>55</td>
<td>106</td>
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</table>

#### Results

- **Sensitivity (True Positive Rate)** = 0.9804
- **Specificity (True Negative Rate)** = 0.9455
- **Positive Predictive Power** = 0.9434
- **Negative Predictive Power** = 0.98
- **False Positive Rate** = 0.0545
- **False Negative Rate** = 0.0196
- **Overall Correct Classification (Hit) Rate** = 0.9623
- **Observed Agreement Po** = 0.9623
- **Chance Agreement Pc** = 0.5
- **Kappa** = 0.9246
- **Standard Error of Kappa** = 0.097059406

**Significance Test for Kappa**

Ho: \( k = 0 \)

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<td>9.526124618</td>
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Figure 4
All-groups Stacked Histogram Canonical Discriminant Function for ASCA

1 = Normal
2 = ADHD (DISC-4)