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A validity study of three diagnostic screening and assessment instruments for autistic symptomatology.

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A VALIDITY STUDY OF THREE DIAGNOSTIC SCREENING AND ASSESSMENT INSTRUMENTS FOR AUTISTIC SYMPTOMATOLOGY

By

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ABSTRACT

This study primarily examined the criterion-related, and construct validity, as well as the program planning usefulness of three widely used diagnostic screening and assessment instruments for autistic symptomatology. The instruments under study included Rimland's Diagnostic Checklist (Form E-2), the Autism Behaviour Checklist (ABC) and the Childhood Autism Rating Scales (CARS). Sixteen subjects, nine females and seven males, ranging in age from three years, nine months to thirteen years, comprised the research sample. All subjects had received a psychiatric diagnosis of Infantile Autism. The degree of correspondence between the three assessment instruments under study and DSM-III criteria was assessed using chi square, analysis of variance, and content analysis. The correspondence between the DSM-III and the CARS, unlike Form E-2 and the ABC is significant at the .05 level of significance. The results of this study lend further support for the criterion related and construct validity of the CARS. The interrater reliability of the CARS was also found to be quite high. The ABC relative to Form E-2 and the CARS was found to provide the most useful data base for program planning. All three instruments contribute to the clarification and quantification of the autism syndrome. Further investigations into the psychometric properties of all three assessment instruments are warranted.

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CHAPTER 1

Statement of the Problem

From the time of its inception into the scientific literature, the complexity and multifaceted nature of autistic symptomatology, along with the confusion and uncertainty concerning the exact nature of the underlying pathology for autism, has confounded clinical, as well as empirical research efforts. At the present time, there is consensus within the field that autism is best viewed as a behaviourally defined and meaningfully distinct psychiatric syndrome. Nevertheless, the elucidation of definitional, diagnostic classification and program planning issues, remain a challenge and priority for educators and clinicians.

A number of diagnostic screening and assessment instruments have been developed and are in current use for assessing, as well as classifying autistic symptomatology. Some of these assessment measures including various questionnaires, checklists and rating scales have been specifically designed to facilitate educational decision making concerning the most appropriate placement and program planning for autistic children. However, it is essential that the psychometric properties of the available screening and assessment instruments for autism, as well as their educational and clinical application(s) be thoroughly

investigated, if clarification and quantification of the autism syndrome is going to be attained.

The purpose of the present study is to examine the criterion-related and construct validity, as well as the program planning usefulness, of three diagnostic screening and assessment instruments, when applied to the same population of children who have received a clinical diagnosis of autism (in accordance with DSM-III; American Psychiatric Association, 1980; and ICD-9, World Health Organization, 1977). The autism screening and assessment instruments under study include, Rimland's Diagnostic Checklist (Form E-2; Rimland, 1965); the Autism Behaviour Checklist (ABC; Krug, Arick and Almond, 1980); and the Childhood Autism Rating Scales (CARS; Schopler, Reichler, DeVellis and Daly, 1980). It is hypothesized that there exists a significant relationship between clinical psychiatric diagnosis and the ratings/classifications of Autism/Non-Autistic based on Form E-2, the ABC and the CARS.

CHAPTER 2

Review of the Literature

Since Kanner (1943) first formally identified and conceptualized the syndrome of autism, there has existed considerable ambiguity and confusion with respect to the definition, diagnosis and classification of this complex, wide-spectrum disorder. What follows is an overview of the autism syndrome with primary emphasis on the definitional and diagnostic aspects of autism, as derived from clinical investigations, as well as from empirical research studies. In addition, the psychometric status and particularly the validity of three diagnostic assessment instruments for assessing autistic symptomatology are reviewed.

The Syndrome of Autism

A syndrome generally refers to a concurrence of symptoms and signs associated with a morbid process (Stedman, 1982). The complexity of autistic symptomatology, along with the uncertainty concerning the exact nature of the underlying pathology and etiology for autism prompted investigators to view autism as a syndrome. More specifically, Ritvo and Freeman (1978) suggested that characterizing autism as a syndrome might serve as a "theoretical way station" until specific pathological and etiological variables are discovered, and which in turn,

would facilitate the identification of reliable subtypes of autism.

At the present time it is widely acknowledged within the professional and scientific community that autism constitutes a behaviourally-defined and clinically valid psychiatric syndrome. Autism has been clearly differentiated from other developmental disorders, as well as being discontinuous from other childhood emotional and behavioural disorders e.g., schizophrenia (Rutter 1978; Rutter and Gould, 1985). It should be noted, however, that notwithstanding its consensual validation as a meaningfully distinct syndrome, autism can and does co-exist with other disorders and conditions. For example, autism is frequently observed in association with mental retardation (Clark and Rutter, 1979), as well as other seemingly diverse medical conditions, such as congenital rubella (Chess, Korn and Fernandez, 1971); tuberosis sclerosis (Lotter, 1974); and epilepsy (Coleman and Gillberg, 1987), to mention a few. Differential diagnosis and the use of a multiaxial classification scheme for diagnosing autism, therefore, appears warranted. Rutter and Schopler (1987) offer a cogent review of the distinctiveness of the autism syndrome.

Autism does not appear to be the result of any single causative agent, nor is there any scientific evidence to suggest that psychosocial factors can lead to autism. In

all probability, autism represents a behaviourally-defined syndrome with multiple and interacting organic etiologies. On the basis of recent neurobiological findings (Gillberg, 1988), it is suspected, however, that some type of, yet to be determined, central nervous system dysfunction, underlies the cognitive, social and communicative impairments, as well as the 'bizarre' behavioural symptomatology, so commonly associated with the autism syndrome.

Males tend to outnumber females in practically all studies of autism at a ratio of approximately 4:1 (Lotter, 1966; Steinhausen and Breinlinger, 1986). Several investigators such as Omenn (1973) have posited that a high male:female ratio in a given medical condition favours a biological or organic cause, perhaps even genetic. Although the exact or definitive cause of autism is unknown, considerable consensus exists that the autism syndrome may represent the cumulative behavioural expression of various contributing etiological and pathological factors.

As a result of the presumed etiological heterogeneity for autism, autistic children may share similar essential and requisite diagnostic behaviours i.e., criteria, but vary with respect to other associative and perhaps more discriminating behaviours (Siegel, Anders, Ciaranello, Bienenstock and Kraemer, 1986). Furthermore, autistic children may also differ with regard to the severity and

full expression of autistic behaviours and other symptomatology associated with the syndrome. The hetereogeneity of the autistic population concomitant with the complexity and variability of the symptomatology associated with autism has prompted researchers to begin delineating and identifying potential subtypes or subgroups of autism.

These discrete typologies are presumed to be reasonably homogeneous, relative to the larger undifferentiated autistic population. The behaviourally-defined and etiologically based subtypes of autism proposed thus far have been derived by means of clinical inference, as well as by the application of multivariate statistical procedures i.e., cluster analysis, to various sorts of empirical data. Some investigators have used such variables as age of onset (Kolvin, 1971); communicative competence (Lockyer and Rutter, 1970); and associated medical conditions including pre-, peri- and post-natal markers (DeMyer, Hingten and Jackson, 1981); as a means of *a priori* subclassification, and *post hoc* examination.

One of the principal intents of subtype analysis is to facilitate the prognostic validity for specific subgroups of the autism syndrome. To date, an autistic child's cognitive functioning level i.e., psychometric intelligence, and language development appear to be the most reliable

predictors of outcome (DeMyer, et al., 1981). In any event, it would appear that advances in our theoretical and conceptual understanding of the autism syndrome, as well as in our clinical applications such as the provision of therapeutic and educational programs are dependent upon the systematic study of the entire spectrum of autism typologies.

In summary, a review of the scientific literature clearly supports the premise that autism constitutes as a behaviourally-defined, meaningfully distinct, valid psychiatric syndrome. Indeed, Rutter and Garmezy (1983, p. 794) emphatically assert, that autism represents the "clearest example of a disease entity in child psychiatry". The American Psychiatric Association (1980), accorded autism official and formal diagnostic status in the third edition of the Diagnostic and Statistical Manual (DSM-III).

However, notwithstanding the consensus that autism constitutes a valid psychiatric syndrome, it should be underscored that the elucidation of definitional, diagnostic and classification issues, remain a significant priority for both researchers and clinicians. Children's mental health practitioners, as well as education specialists are particularly concerned and challenged, as these nosological issues have very important implications for the autistic

child's overall treatment plan, special class placement and educational programming.

Toward A Definition of Autism

Research efforts within the field of autism have been impeded by a number of factors including, the confusing proliferation of diagnostic terms, the use of inconsistent diagnostic criteria and by variations in the definition of autism. Comparative studies and epidemiological investigations of autism, as well as generalizations derived from other clinical and empirical studies, have to some extent, been compromised and confounded. At the very least research progress is dependent upon the employment of explicit and reliably descriptive syndrome definitions.

Unfortunately, however, a clear-cut and truly operational definition of autism has not yet emerged. Existing definitions have been criticized for their lack of descriptive validity and their failure to take into account developmental changes (Denckla, 1986). Investigators are encouraged (Ritvo and Freeman, 1978; Rutter, 1978; Demyer et al, 1981; Denckla, 1986; Volkmar, 1987; and Cohen, Paul and Volkmar, 1986) to define operationally the diagnostic criteria employed in their studies, and in addition, thoroughly describe other significant sample characteristics such as age, sex, age of onset, level of psychometric intelligence, to mention a few.

Nevertheless, there exists reasonably conclusive clinical and empirical evidence to suggest that the most salient and pathognomonic diagnostic criteria for autistic children include, significant social and communicative impairments, as well as the presence of repetitive, stereotypical or ritualistic behaviours. It should also be noted that these characteristics are not simply defined in terms of developmental delay, even more important, they are defined with respect to their degree of deviance, qualitatively and/or quantitatively, from the norm. These diagnostic behaviours or in other words, pathognomonic signs, however, have been typically difficult to operationalize.

The American Psychiatric Association (1980) in the third edition of the Diagnostic and Statistical Manual (DSM-III) define autism as a pervasive developmental disorder which has an early onset and is characterized by disturbances of multiple psychological functions that are involved in the development of attention, perception, reality testing, language, social skills and motor movement. The term 'pervasive' is intended to refer to the widespread distortion and disruption of normal developmental processes involving cognition, social interaction and communication.

It is important to note, however, that although autism generally affects a broad range of developmental processes,

some aspects of development may be unimpaired. For example, a small percentage of the autistic population i.e., approximately ten to twenty percent, have measured performance IQ scores within the normal range as assessed by the Wechsler Intelligence Scale for Children-Revised (WISC-R). This finding should not preclude the fact that essentially all autistic children have significant neuropsychological deficits. The point that should be underscored though is the necessity for differential diagnosis and the employment of a comprehensive and multiaxial classification system for diagnosing autism.

Diagnostic Classification Systems For Autism

Diagnostic classification systems serve a variety of purposes and functions. To begin with they provide a structured framework and context, which in turn, serves to enhance the organization and synthesis of informational data. Communication amongst scientists and clinical practitioners is thereby, facilitated. From a heuristic viewpoint, taxonomic schemes also serve to stimulate theoretical and empirical research investigations.

Ideally, and from a more applied clinical perspective, diagnosis and classification should additionally serve to provide information relative to the etiology, likely course, and prognosis of a disorder, and further, to facilitate

decision-making concerning the most effective treatment intervention, school placement and education programming.

DeMyer et al (1981), as well as Rutter (1985) have reported that intensive structural behavioural approaches, in conjunction with special educational placement programming appear to be the most therapeutic forms of intervention for autistic children. The assignment of a reliable and valid diagnostic classification therefore, seems imperative, if these children and their caregivers are to procure the appropriate services and resources, in order to adequately meet the autistic child's comprehensive and special programming needs. Morgan (1984) further suggests that the identification of long term needs and subsequent future program planning e.g., vocational programs, for the autistic individual, is also influenced by an accurate diagnostic classification.

A review of the literature on the diagnosis and classification of autism reveals that investigators have utilized varying diagnostic classification schemes. The most frequently cited in the research literature include DSM-III (American Psychiatric Association, 1980); ICD-9 (World Health Organization, 1977); the original Kanner criteria (Kanner, 1943); Rutter's criteria (Rutter, 1978) and the National Society of Autistic Children (NSAC) criteria (Ritvo and Freeman, 1978). Although these

diagnostic classification systems overlap on the major characteristics of autism they also represent significant differences. This is not surprising as these diagnostic schemes were developed for different purposes (e.g., scientific synthesis, shape social planning policy, educational funding) and were also conceived in accordance with the originator's theoretical conception of the autism syndrome.

Notwithstanding the theoretical and/or methodological limitations of these diagnostic classification systems, Kendall (1982) recommends that researchers should be encouraged to describe the "goodness of fit" or overlap between the diagnostic system employed in their studies with other diagnostic schemes when describing research subjects. This suggestion is especially pertinent for epidemiological investigations of autism. The prevalence rate for autism, when incorporating DSM III criteria, is approximately four or five children in every 10,000 children (APA, 1980). However, some investigators, for example, Vicker and Monahan (1988), propose that there may be significant under-identification of autism, possibly related to the variability in diagnostic practices and low reliability of diagnostic procedures for autism.

DSM-III represents one of the most recent comprehensive diagnostic schemes for autism and is perhaps, as speculated

by Morgan (1985), the most frequently utilized. The actual diagnostic criteria outlined in DSM-III is based on Kanner's (1943) original description as modified by subsequent research (Rutter, 1968), and is also compatible with another widely used diagnostic scheme, namely, ICD-9. DSM-III, however, would appear to be more methodologically refined (i.e., diagnostic criteria are explicitly specified), then ICD-9, and thus more conducive to contemporary clinical practice. Nevertheless, together these two diagnostic classification systems represent a significant advancement in child psychiatry (Werry, 1985). For a more detailed review and critical evaluation of both systems i.e., DSM-III and ICD-9, the reader is referred to Rutter and Shaffer (1980); Werry (1985); Cohen, Volkmar, and Paul (1986); and Volkmar (1987).

One of the most conceptually important and clinically meaningful advantages of DSM -III is its employment of a multiaxial classification scheme i.e., a number of descriptive and distinct statements about a child's presenting condition are expressed. In DSM-III children are evaluated on each of fives axes. Axis I is mostly confined to clinical psychiatric syndromes while Axis II is reserved for specific developmental disorders. Axis III is for physical disorders and conditions thought to be relevant to Axis I and Axis II. Axis IV comprises a global rating on a

seven point scale of the severity of recent psychosocial stressors. Finally, Axis V represents the highest level of adaptive functioning within the past twelve months, using a seven point scale.

Cohen, Paul and Volkmar (1987) have advanced a number of noteworthy recommendations towards refining the multiaxial approach incorporated in DSM-III. Two of these proposed guidelines, in particular, have important clinical and research ramifications and thus, will be briefly presented.

Since all developmental disorders presumably entail some degree of central nervous system involvement. Cohen et al., (1987) suggest a tripartite subdivision on Axis III. This would indicate whether the disorder was 1)idiopathic - no signs or symptoms suggestive of central nervous system dysfunction; 2)stigmatic - associated with 'soft' neurological findings (e.g., equivocal EEG findings) but nondiagnostic of central nervous system dysfunction; or 3)syndromic - a clearly recognized central nervous system dysfunction (e.g., chromosome anomaly).

Secondly, Cohen et al. (1987) recommend the employment of a well standardized and developmentally derived adaptive behaviour assessment instrument to supplement the apparently subjective rating of adaptive functioning for Axis V. The revised Vineland Adaptive Behaviour Scales (Sparrow, Balla,

Cicchetti, 1984) could admirably serve this purpose. In short, both the above mentioned suggestions would enhance research sample descriptions, as well as facilitate the interpretation of empirical investigations.

DSM-III broadly classifies autism i.e., Infantile Autism (IA) as a Pervasive Developmental Disorder (PDD). This classification also includes the following related disorders: Childhood Onset Pervasive Developmental Disorder (COPDD), Atypical Pervasive Developmental Disorder (APDD) and Residual Autism. The diagnostic criteria for (COPDD) and (APDD) differ from the criteria for (IA) primarily with regard to age of onset and the overall profile of developmental impairment. Residual Autism, on the other hand, can be diagnosed in older individuals who once met the necessary and sufficient criteria for (IA), but no longer do so.

Infantile Autism (IA) as described in DSM-III is an early onset (before 30 months) pervasive developmental disorder characterized by: 1)pervasive lack of responsiveness to other people; 2)gross deficits in language development; 3)peculiar speech patterns, if speech is present at all; 4)bizarre responses to various aspects of the environment; and 5)an absence of delusions, hallucinations and loosening of associations. In sum, DSM-III delineates both inclusive and exclusive diagnostic

criteria and expanded descriptions of the diagnostic criteria. Important information relative to other associative and clinical features of the syndrome can be found in the manual.

The elaboration of specific diagnostic criteria and the use of a multiaxial classification approach are generally regarded as advantages of DSM-III. Disadvantages include: 1)the lack of truly operational diagnostic definitions/ criteria; 2)incorporating age of onset as a primary and essential criterion; and 3)inadequate attention to changes in the expression of the disorder during development (Volkmar, 1987). Clearly, DSM-III is not an objective, quantifiable diagnostic tool. Nevertheless, DSM-III has facilitated research, as well as the delivery of clinical services, particularly with respect to autistic children and their families. It is also important to note that modifications in DSM-III have already been made and are incorporated in DSM-III Revised (DSM-III-R, 1987). DSM-III-R thus represents a more methodologically refined diagnostic scheme and will likely enhance the clinical diagnostic process. DSM-III-R was not utilized in this study as the research data was compiled before the publication of DSM-III-R. A critique of DSM-III including problems with the DSM-III scheme can be found in Volkmar, Stier, and Cohen (1985) and Volkmar, Cohen, and Paul (1986).

Ornitz and Ritvo (1976) claim that an exhaustive medical and neurological evaluation is imperative for establishing a diagnosis of autism. However, it is also acknowledged by clinicians and educational personnel that there exists an overriding need to employ functional assessment and screening instruments for autism, which are accurate, easily and quickly administered, as well as facilitate the development of an individualized program plan comprising multidisciplinary intervention. Arick and Krug (1978) also posit that the employment of functional assessment screening instruments for autism, may serve to facilitate placement of autistic children into educational programs with specialized curricula and reduced pupil-teacher ratios. The use of standardized rating scales, questionnaires and diagnostic checklists represent another approach to the diagnosis and classification of the autism syndrome.

Diagnostic Assessment and Screening Instruments For Autism

A number of assessment measures and screening instruments have been developed specifically for use with the autistic population (Polan and Spencer, 1959); Rimland, 1965; Ruttenberg, Kalish, Wenar and Wolfe, 1974; Schopler, Reichler, DeVellis and Daly, 1980; and Krug, Arick and Almond, 1979, 1980). These diagnostic assessment/screening

instruments are purported to provide a more objective and quantitative assessment of autistic symptomatology. The majority of them are primarily based on parental retrospection and/or structured behavioural observations of the child.

At first glance, these various assessment and screening instruments for autism appear to have several pragmatic advantages, however, they are also characterized by a number of conceptual and methodological limitations. Parks (1983) in her review and examination of the psychometric status of five commonly used diagnostic assessment/screening instruments for autism, clearly emphasized that the reliability and validity of these measures remain to be addressed. A review of the research literature concerning the diagnostic assessment and classification of autism, reveals that very few studies have systematically examined the reliability and validity of these multifarious diagnostic rating scales and checklists.

One of the most widely circulated autism assessment instruments is Rimland's (1965) Diagnostic Checklist (Form E-2). Form E-2 is a 80 item multiple choice questionnaire which is to be completed by a child's parents or primary caregiver. The form consists of questions about a child's life through age five years, on topics such as birth

history, motor development, general appearance, speech characteristics, social relations and physiological data.

Form E-2 is essentially a diagnostic tool which is intended to identify from the larger undifferentiated autistic population certain homogeneous subgroups of autistic children, that may be etiologically different from the rest of the autistic population. More specifically, Form E-2 is purported to identify cases of classical early infantile autism i.e., Kanner's syndrome. Form E-2 is not designed to evaluate the autistic child's level of current functioning or discriminate autistic children from 'normal' children, or from other exceptional children.

Form E-2 is scored as if it is a test. A plus point is given for each response characteristic of autism i.e., Kanner's criteria, and a minus point is assigned for each response that is noncharacteristic of autism. Two scores including a Behaviour score and a Speech score are initially derived and calculated. These scores, in turn, are summed and a total autism score is obtained. Total Form E-2 scores range from - 40 to +45. Scores between +20 and +45 are diagnosed as cases of early classical infantile autism. Scores between +10 and +20 are considered equivocal. Form E-2 is scored by the Institute for Child Behavior Research in San Diego, California. According to Rimland (1971), approximately ten percent for whom a Form E-2 has been

completed i.e., over 2,000 received a score of +20 or higher.

Rimland's Form E-2 despite its widespread usage has a number of methodological drawbacks, including its sole reliance on parental report, failure to incorporate direct behavioural observations of the child, as well as not providing the respondent with operational and objective definitions of the variables the respondent is requested to rate. Rimland's Form E-2 and its methodological issues are thoroughly reviewed and critiqued by Master and Miller (1970). Parks (1983) has also reviewed Rimland's Diagnostic Checklist and claims that basic questions and issues about the checklist's reliability and validity have yet to be researched. DeMyer, Churchill. Pontius and Gilkey (1971) suggests that Form E-2 be employed only as a screening instrument.

The Autism Behaviour Checklist (ABC; Krug et al, 1979, 1980) represents another diagnostic instrument for assessing autistic behaviours and symptomatology. The ABC is actually one component of the Autism Screening Instrument for Educational Planning (ASIEP). The other components of the ASIEP include standardized observation tools for assessing vocal skills, social interactions, educational status and learning rate.

The ASIEP was designed primarily as a functional educational assessment instrument that would be easy to use and score, quickly administered and provide reliable and valid information for the educational placement of autistic children. The ABC is purported to facilitate the decision-making process concerning the classification of a student as autistic without involving the expense and lengthy time consumption, generally associated with extensive medical diagnostic procedures.

The ABC basically consists of 57 observable behavioural descriptions, which are grouped into five symptom areas: Sensory, Relating, Body/Object Use, Language, and Social/Self-help. The behavioural descriptions/questions comprising the ABC were selected from various sources including Rimland's Diagnostic Checklist, the nine points of the British Working Party (Creak, 1964), the Behaviour Rating Instrument for Autistic Children -- BRIAC; (Ruttenberg, Drutman, Fraknoi and Wanar, 1966) and Kanner's criteria. Some of the descriptions relate to historical data e.g., age of onset, while others pertain to the child's current functioning.

The ABC can be completed by teachers, or others who are familiar with the child's daily activities and behaviours. It is suggested by Krug et al (1980), however, that parents can provide significant information and assistance, and so,

should contribute to the assessment process as much as possible. The administration of the ABC is approximately twenty minutes.

The behavioural descriptors of the ABC are assigned weighted values from 1 to 4 on the basis of a chi-square analyses of 1,049 checklists and reviewed by internationally renowned experts within the field of autism. The sums of the weighted scores can be plotted on a profile chart relative to the child's chronological age. The sums of the weighted scores can also be used to operationally differentiate autistic children from non-autistic children, and also from other handicapped populations such as the mentally retarded, deaf/blind and the emotionally disturbed. The ABC is predominantly based on a deviance model, such that higher scores reflect more deviance and/or impairment.

Children obtaining a total score of 67 or more on the ABC have a "high probability" for the classification of autism. Ninety per cent of the standardization group who received a score of 68 or higher on the ABC had a previous diagnosis of autism. Total scores that fall within the 54 to 66 range are equivocal, and as such, children who obtain a score within this equivocal range are considered only potentially autistic. Children who obtain scores less than 53 on the ABC are unlikely to be considered or classified as autistic. Ninety five percent of the ABC standardization

sample receiving scores of 53 or less were not diagnosed as autistic. Incidentally, the mean total score of the autistic sample in the ABC standardization group was 77 with a standard deviation of 20.01.

The ease of administration and straightforward scoring procedures make the ABC an apparently useful and pragmatic instrument. The ABC lists all 57 behavioural descriptors on a standard page along with their weight and symptom area. If a child exhibits the behaviour described, the rater simply circles the number following the descriptor in one of the five columns.

The ABC is standardized for individuals ages three to thirty-five. Because of the ages involved and ongoing developmental changes, the ABC takes into account the "age factor" by providing separate profile charts for different age spans. This particular attribute of the ABC represents one of its most significant strengths. The provision of a clear-cutoff score for probably autism with a mean and standard deviation, is also generally regarded as a important quantitative advantage of the ABC over other assessment instruments.

Notwithstanding the above mentioned strengths of the ABC, caution is warranted before the ABC is embraced as a reliable and valid diagnostic assessment/screening instrument. Parks (1983) in her review and evaluation of

assessment instruments for autistic children criticized the standardization procedures employed for the ABC. More specifically, she reported that although the interrater reliability for the ABC was very high i.e., 95% agreement (Krug et al., 1980), the sample from which this figure was based on was too small. The interrater reliability coefficient was based on 42 independent raters of 14 children. No other procedural information was provided. Parks (1983) also questioned the criterion-related validity study by Krug et al., (1980) and recommended that more objective and independent research be conducted on the reliability and validity of the ABC.

An evaluation study of the ABC was recently conducted by Volkmar, Cicchetti, Dykens, Sparrow, Leckman and Cohen, (1988). These investigators reported that the ABC produced both false positive and false negative diagnostic classifications, when the results of the ABC were compared with clinical diagnosis i.e., in accordance with DSM III criteria. These researchers, therefore, question the diagnostic validity of the ABC especially for higher functioning autistic persons, but suggest, however, that the ABC does appear to have some merit as a screening tool. Independent studies of reliability and validity of all assessment instruments for the autistic population is very much needed (Volkmar et al., 1988).

The Childhood Autism Rating Scales -- CARS; (Schopler et al., 1980) is another widely used diagnostic instrument for assessing and classifying autistic symptomatology. The CARS was initially constructed by Reichler and Schopler (1971) and has since been modified and elaborated by Schopler, Reichler and Renner (1986) in such a way as to allow for consistent continuity of use from the first version.

The CARS is a fifteen item behavioural rating scale and is intended to identify children with autism, as well as to distinguish them from other developmentally handicapped children. The CARS is also purported to classify autistic children on a continuum of autism ranging from Mild to Severe Autism.

The fifteen scale items of the CARS include: I Relating to People; II Imitation; III Emotional Response; IV Body Use; V Object Use; VI Adaptation to Change; VII Visual Response; VIII Listening Response; IX Taste, Smell and Touch Response and Use; X Fear of Nervousness; XI Verbal Communication; XII Nonverbal Communication; XIII Activity Level; XIV Level and Consistency of Intellectual Functioning; and XV General Impressions.

The rationale for the use of the aforementioned fifteen scales is based primarily on consensual diagnostic criteria for autism as reported by the British Working Party (Creak,

1964); Rutter (1978); Kanner (1943); and the National Society for Autistic Children (NSAC, 1978). It is noteworthy to point out that the fifteen scales of the CARS incorporates the diagnostic criteria of the major diagnostic classification systems, including DSM III.

According to Schopler et al., (1986) the CARS ratings can be derived from several different sources including direct contemporaneous observations of the child during testing or classroom participation; from parental interview and from historical/clinical records. The CARS authors advise that any of the above mentioned sources can be employed, as long as they include the information required for rating all the individual scales.

When employing the CARS the child's behaviour is compared with that of a 'normal' child of the same age. When behaviours are observed which are abnormal for a child of the same chronological age, the peculiarity, frequency, intensity and duration of these behaviours are considered. To score the CARS, each of the fifteen scale items is assigned a rating from 1 (i.e., within normal limits for a child that age), to 4 indicating that the child's behaviour is severely abnormal for that age. Schopler et al., (1986) provide explicit and operational scoring criteria and other assessment considerations in the CARS manual. After the child has been rated on each of the fifteen scale items, a

total score is computed by summing the fifteen individual ratings.

Scoring criteria for the CARS is based on the comparison of CARS scores with the corresponding expert clinical assessments of over 1,500 children (Schopler et al., 1986). Total CARS scores may range from a low of 15 to a high of 60. Children who obtain scores below 29 are classified as non-autistic. Scores ranging from 30 to 36 are classified as mild to moderate autism, while scores above 37 are indicative of severe autism.

The CARS has several apparent strengths as an assessment instrument for autistic children. First, the CARS is applicable to children of all ages and consideration is given to the influence of the child's age, when rating a particular scale item. Second, the multifarious diagnostic criteria incorporated in the CARS fifteen scale items, reflect the broadened definition of the autism syndrome which has evolved in accordance with empirical research findings (Schopler et al., 1986). Third, the CARS employs empirically derived scoring criteria which are based on objective and quantifiable ratings. Most often the CARS ratings are based on direct contemporaneous behavioural observations of the child.

Parks (1983) reviewed the psychometric status of the CARS and commented favourably on most of the strengths

discussed above. A number of reliability and validity studies on the CARS have also been conducted. For example, inter-rater reliability of the CARS has been assessed using two independent raters observing 280 children (Schopler et al., 1980). The overall average correlation coefficient was reported to be .71.

Schopler et al., (1980) also report the results of criterion-related validity study. Total CARS scores were compared with clinical ratings of autism, resulting in a correlation, r=.84. However, Parks (1983) criticized the study for not fully describing the procedures used in the investigation and further, recommended that additional and independent investigations of the CARS criterion related validity be studied.

Summary

This chapter presents a succinct overview of the autism syndrome, with particular emphasis assigned to diagnostic and classification issues. It is evident from reviewing the scientific literature, that since its inception, autism has generated a significant degree of uncertainty and controversy, concerning its definition, diagnosis and classification.

Autism at the present time has been afforded consensual validation as a clinically distinct, behaviourally-defined,

wide-spectrum. psychiatric syndrome. However, the enormous complexity and multifaceted nature of the disorder has given impetus to subtype analyses of the syndrome. In accordance with empirical research findings, the definition of the autism syndrome has been expanded, as well as refined.

The syndrome of autism is broadly classified as a pervasive developmental disorder which is primarily characterized by communicative impairments, social impairments and repetitive behaviours. Concomitant with these essential diagnostic criteria, are a wide array of associative features. It is generally agreed within the professional community that a comprehensive clinical assessment incorporating a multiaxial approach, including the employment of adjunctive medical diagnostic procedures, is strongly warranted for establishing a diagnosis of autism.

Within educational settings, however, there exists an overriding need to utilize functional and pragmatic instruments for assessing and classifying autistic symptomatology. These diagnostic assessment/screening instruments are intended to facilitate specialized educational placement and the development of an individualized program plan for autistic children. As a result of this priority need, the major diagnostic classification schemes for autism have been supplemented

with many diagnostic rating scales, questionnaires and checklists.

The diagnostic classification systems for autism, as well as the diagnostic assessment/screening instruments for assessing autistic behaviours and symptomatology are both characterized by a number of theoretical and methodological limitations. The psychometric status including reliability and validity issues, of all the various diagnostic assessment/screening instruments are especially in question, and requires further study.

The research literature is replete with recommendations for independent investigations of the reliability and validity of the instrumentation employed for assessing autistic children. In the present study, the criterion-related and construct validity along with the program planning usefulness of three widely used diagnostic assessment/screening instruments, including Rimland's Form E-2, the ABC and the CARS are examined.

CHAPTER 3

Method

One of the criticisms that is frequently cited in the research literature on autism is the lack of specific information concerning the reliability and validity of the observation procedures as related to sample characteristics and methodological procedures employed in empirical investigations. This chapter presents a detailed description of the research sample for this particular study. Relevant sample characteristics including age, sex, age of onset, mental age, social-communicative competence and educational placement are delineated. In addition, the diagnostic assessment procedures and statistical-analytical procedures employed in this investigation are described. Finally, pertinent reliability and validity issues are addressed.

Subjects

Sixteen autistic children (7 Males and 9 Females) comprised the sample. Ages ranged from 3 years, 9 months to 13 years of age with a mean age of 8 years, 4 months. All subjects in the sample had received a psychiatric diagnosis of autism (i.e. Infantile Autism). All children were actively involved in a treatment program for autistic children, affiliated with a children's mental health center.

Parental consent was obtained and parents were informed of the nature of the study.

Each subject received a comprehensive multidisciplinary evaluation which included assessments of the child's developmental milestones, cognitive functioning, adaptive behaviours, speech and language and autistic symptomatology. The majority of the children in the sample functioned in the mental retardation range of intelligence, assessed by various standardized, individually administered tests including the Bayley Scales of Infant Development, (Bayley, 1969), Leiter International Performance Scale (Arthur, 1950) and the Wechsler Intelligence Scale for Children -Revised (WISC-R; Wechsler, 1974). The sample ranged from the profound and severely retarded to those with average intelligence (See Appendix A). The mean mental age of the sample was 3.9 years.

The parents of the autistic children comprising the sample served as the respondents for the administration (i.e., semi-structured interviews) of the Vineland Adaptive Behaviour Scales (VABS) - Expanded Form. The VABS (Sparrow et al, 1984) is organized into four domains and several subdomains: Communication (receptive, expressive, and written), Daily Living Skills (personal, domestic, and community), Socialization (interpersonal, play and leisure time, and coping skills), and Motor Skills (gross and fine

motor activities). These domains are combined to form an Adaptive Behaviour Composite score which is purported to be reflective of an individual's general level of adaptive functioning.

The general level of adaptive functioning for all the children in the sample was significantly below chronological-age expectations. More specifically, the mean Adaptive Behaviour Composite standard score for the sample was 37. The mean social competence and communicative competence standard scores for the sample were 45 and 39 respectively. This compares with a mean of 100 and a standard deviation of 15 for "normal" subjects.

Six children in the sample use verbal speech to communicate while the remaining ten children in the sample were predominantly non-verbal in their mode of communication. These children relied on sign language, gestures and other motoric means for expressing basic wants and needs.

All subjects were enrolled in some type of specialized educational program, ranging from full time placement in a self-contained classroom to regular classroom placement with part-time resource withdrawal. (Refer to Appendix A for a more detailed discription of sample characteristics)

Diagnostic Assessment Procedures Used

All children in the sample had received a psychiatric diagnosis of Infantile Autism, in accordance with the diagnostic criteria specified in DSM III and ICD-9. Clinical diagnosis was assigned by one of two child psychiatrists on the basis of parent and child interview, observation, and review of all available historical and clinical information.

As part of a comprehensive evaluation referred to earlier, the parent(s) of the autistic children comprising the sample were asked to complete Rimland's Diagnostic Form E-2 Checklist. (Refer to Appendix B for a copy of Rimland's Form E-2). Since the scoring criteria for Rimland's Form E-2 has not been published, the completed questionnaires were forwarded to the Institute for Child Behaviour Research, San Diego, California for scoring and analysis.

The reliability, including interrater reliability, of parental reports on Rimland's Form E-2 has never been directly assessed (Parks, 1983). This may be due in part to the unavailability (i.e. unpublished) of the scoring criteria. Prior and Bence (1975) also question whether Form E-2 is actually reflecting the observed behaviour of a child or rather just simply the impressions of their child up til age five. The interrater reliability of Form E-2 was not

specifically addressed in this present study, as this method of assessment does not lend itself to such an analysis.

The parents were also interviewed by the same examiner with the Autism Behavior Checklist (ABC) and were encouraged along with the examiner to rate their child on all 57 behavioural descriptors. (Refer to Appendix C for a copy of the ABC). The parents were requested to provide concrete examples of autistic behaviours and/or symptomatology they assigned to their child, so as to maximize the accuracy of their responses and thus to minimize reliability concerns. The parents and examiner, of course, were aware of the child's previous and/or current diagnostic classification.

All subjects were observed and rated by two examiners utilizing the Childhood Autism Rating Scales (CARS). (Refer to Appendix D for a copy of the CARS form). The CARS ratings were made on the basis of both structured and unstructured behavioural observations. Inter-rater reliability was established between the two examiners. Agreement was determined according to the following formula: agreements/agreements + disagreements x 100 = %. Mean scores were calculated for each of the fifteen scale items. This averaged score was used for statistical analysis. The data for all sixteen subjects was collected over an eighteen month period.

Statistical and Analytical Procedures Used

The major types of validity include: content, criterion-related and construct (APA, 1974). This study primarily investigates the criterion-related validity, as well as the construct validity of Rimland's Form E-2, the Autism Behaviour Checklist (ABC) and the Childhood Autism Rating Scale (CARS). In addition the program planning usefulness of these three diagnostic assessment instruments for autistic symptomatology is examined.

Criterion related validity, demonstrated by correlating test scores with external criteria or variables considered to measure the attribute in question (Cronbach, 1984) was statistically analyzed by comparing a child's previously recorded psychiatric diagnosis of Infantile Autism with the child's rating and/or classification of Autism on Form E-2, the ABC and the CARS. A psychiatric diagnosis of Infantile Autism or Non-Autistic was treated as a dichotomous form of data and percentage of agreements were analyzed by chi square analysis.

Since chi square analysis only indicates whether variables are independent or related, an analysis of variance was performed on the data, in order to determine the strength of the relation. To control for the Type I Experiment Wise Error rate, a Scheffe' Test was subsequently

conducted. The Scheffe method enables multiple comparisons among treatment means.

Acccording to Kerlinger (1973), construct validitation represents one of the most significant advances of measurement theory and practice, as if attempts to integrate psychometric with theoretical constructs. In essence, studies of construct validity examine the theoretical and conceptual basis underlying a particular test or procedure. Its preoccupation with theory and subsequent empirical inquiry involving the testing of hypothesized relations between variables, distinguishes it from other types of validity.

In the present study, construct validity is examined by determining the degree to which the diagnostic criteria (i.e. theoretical constructs) specified in DSM III account for the children's performances or ratings on Form E-2, the ABC and the CARS. Specifically, each of the three diagnostic assessment instruments is assessed using content analysis in accordance to its overlap with the theoretical constructs, comprising the DSM III system.

The provision of program planning information by assessment instruments is not as well documented or as established in the scientific literature to the extent that criterion-related and construct validity are. Program planning usefulness for the purposes of this study, refers

to the degree to which an assessment instrument serves to provide a data base to facilitate the delivery of educational services. Educational placement options and programming prioritics for teaching any children are of critical importance for educational planners and parents.

In the present study, the program planning usefulness of Form E-2, the ABC and CARS is examined, by comparing, albeit on a qualitative basis, how well each of the three diagnostic assessment instruments addresses the needs and requirements of educators and other treatment planners. In particular, the usefulness of these instruments for planning specific behavioural objectives for each child's individualized education plan are considered. The areas of concern include the child's: 1) Cognitive Functioning Level, 2) Communicative Skill Level, 3) Social-Interaction Skill Level, 4) Level of Self Independence and 5) Intensity and Frequency of Non-Adaptive Behaviours. Other educational requirements by which the three assessment will be briefly compared involve useability and include: ease of administration, administration time, qualifications required of the tester/examiner, ease and objectivity of scoring procedures and accuracy.

CHAPTER 4

Results

The data analysis of the reliability and validity of all three diagnostic assessment instruments including, Form E-2, the ABC, and the CARS is presented below. The results are based on both statistical, as well as qualitative analytical procedures.

Interrater Reliability

Interrater reliability for Form E-2 and the ABC were not specifically examined in this study, for reasons cited in the previous section. Although there is no reliability data for Form E-2, preliminary reports of interrater reliability for the ABC appear quite high. With a small sample of 14 children rated by 42 independent raters, an interrater reliability agreement score of 95% was obtained (Krug et al., 1980).

The interrater reliability of the CARS has also been previously assessed using two independent raters observing 280 children (Schopler et al., 1980). An average interrater reliability of .71 was obtained. Regression coefficients for each of the CARS 15 scales as determined by Schopler et al. (1980) is presented in Table 1.

In the present study, two experienced raters of sixteen children achieved an interrater reliability based upon

TABLE 1

INTERRATER RELIABILITY FOR INDIVIDUAL SCALES

Scale	*a*
1. Human relatedness	.93
2. Imitation	.79
3. Affect	.71
4. Use of body	.70
5. Relation to objects	.76
6. Adaptation to change	.63
7. Visual responsiveness	.73
8. Auditory responsiveness	.71
9. Near receptor responsiveness	.78
10. Anxiety reaction	.67
11. Verbal communication	.69
12. Nonverbal communication	.62
13. Activity level	.67
14. Intellectual consistency	.55
15. Global impression	.76

[a] Probability of all correlations is .0001

agreement percentage of 88% (Autistic Versus Non-Autistic). When these same two examiners rated a child on a three point scale (i.e., Severely Autistic - Mildly/Moderately Autistic - Non Autistic), an interrater reliability agreement score of 81% was obtained. Converting these percentages to correlations by taking the square roots of these proportions an estimated correlation coefficient of .93 and .90 respectively, are obtained. These results suggest that the CARS is a very reliable instrument when used by experienced raters.

Several problems, however, arise in the interpretation of these results for interrater reliability. First, the two raters were not "blind" to the child's previous and/or current clinical psychiatric diagnosis. Therefore, the use of the instrument to classify a child as autistic who has already been so diagnosed by clinical procedures may have biased the observers to some unknown degree. Finally, the degree of agreement by chance alone has often been criticized us not being accounted for by simple percent agreement methods. Where, many complex diagnostic decisions are required, interrater reliability by chance alone, however, is low. Agreement to the level of four out of five is highly unlikely to be a chance event in this situation

TABLE 2

CHI SQUARE FREQUENCY DISTRIBUTION OF AGREEMENT BETWEEN PSYCHIATRIC DIAGNOSIS (AUTISTIC/NON-AUTISTIC) AND FORM E-2, ABC, AND THE CARS.

		Autistic	Non-Autistic	Total
Form E-2	Frequency	0	16	16
	Percent	0.00	100.00	100.00
ABC	Frequency	11	5	16
	Percent	68.75	31.25	100.00
CARS	Frequency	15	1	16
	Percent	93.75	6.25	100.00
Psychiatric Diagnosis	Frequency	16	0	16
	Percent	100.00	0.00	100.00
	Total	42	22	64
		85.63	34.38	100.00

Criterion Related Validity

Statistical analysis by chi square (2x4 contingency table) was employed to establish the percentage of agreements between a psychiatric diagnosis of Infantile Autism of Non-Autistic and a child's classification of Autism or Non-Autistic on Form E-2, the ABC and the CARS. Table 2 presents the distribution of the frequency data calculated by chi square. As can be seen in Table 2 psychiatric diagnosis of Infantile Autism corresponds the most with the CARS classification system (93.75% agreement) followed by the ABC (68.75 % agreement) and lastly, actually not all, with Form E-2 (0.00% agreement).

A chi square value of 44.60, df = 3 was obtained and, therefore, the null hypothesis was rejected. (Ho : no relationship between the psychiatric diagnosis of Infantile Autism and the classification of Autism based on Form E-2, the ABC and the CARS). This relationship is significant at the .05 level of significance.

An analysis of variance resulted in a significant F value ($F=46$, $p < .05$). A Scheffe Test was subsequently applied to all possible comparisons with an overall confidence interval of 95%. (See Table 3). The results of the Scheffe Test indicate that there is not a significant difference between a clinical psychiatric diagnosis of Autism/Non-Autistic based on psychiatric diagnosis and

TABLE 3

SCHEFFE TEST COMPARING PSYCHIATRIC DIAGNOSIS OF AUTISM WITH FORM E-2, THE ABC AND THE CARS.

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

SCHEFFE	GROUPING	MEAN	N	NAME
	A	1.0000	16	FORM E-2 TOTAL
	B	0.31250	16	ABC TOTAL
C	B	0.06250	16	CARS TOTAL
C		0.00000	16	PSYCHIATRIC DIAGNOSIS

the CARS. Table 2 shows 1 out of 16 misclassified which agrees with this observation. Also of note, is the lack of a significant between the ABC and the CARS in classifying children as Autistic/Non-Autistic.

Another series of statistical procedures were employed to establish the degree of correspondence amongst the three diagnostic assessment instruments for autism (i.e., Form E-2, the ABC and the CARS) in classifying the degree and/or probability of Autism. Each child was rated as Non-Autistic, Low Autism or High Autism.

This data, in the form of a chi square, (3x3 contingency table) is presented in Table 4. A significant chi square value of 31.13, df = 4 was obtained at the .05 level of significance, suggesting that there is a significant relationship amongst the diagnostic assessment instruments in classifying the sample as Autistic/Non-Autistic based on degree and/or probability of Autism. An analysis of variance resulted in a significant F value ($F = 30.30$, $df = 2$, $p < .05$). A Scheffe Test (See Table 5) indicates that the ABC along with the CARS classify Autism in a relatively consistent manner. The classification scheme that Form E-2 is based upon, is significantly different from that employed by either the ABC of the CARS.

In summary, these results taken together suggest that the ratings and/or classification of Autism by the CARS is

TABLE 4

CHI SQUARE FREQUENCY DISTRIBUTION OF AGREEMENT BETWEEN FORM E-2, ABC AND THE CARS IN CLASSIFYING AUTISM BY DEGREE/PROBABILITY.

	HIGH AUTISM	LOW AUTISM	NON-AUTISTIC	TOTAL
Form E-2				
Frequency	0	2	14	16
Percent	0.00	12.50	87.50	33.33
ABC				
Frequency	11	3	2	16
Percent	68.75	18.75	12.50	33.33
CARS				
Frequency	9	6	1	16
Percent	56.25	37.50	6.25	33.33
TOTAL(S)	20	11	17	48
	41.67	22.92	35.42	100.00

TABLE 5

SCHEFFE TEST COMPARING FORM E-2, THE ABC AND THE CARS WITH DEGREE/PROBABILITY OF AUTISM

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

SCHEFFE GROUPING	MEAN	N	NAME
A	1.8750	16	FORM E-2
B	0.5000	16	CARS
B	0.4375	16	ABC

ALPHA = 0.05 DF = 45 MSE = 0.348611

CRITICAL VALUE OF F = 3.20432

MINIMUM SIGNIFICANT DIFFERENCE = .52846

more closely related to the criterion i.e. psychiatric diagnosis (Autistic/Non-Autistic)than either of the other two.. The criterion-related validity of Form E-2 and the ABC was not supported by statistical analysis. However, there was a significant relationship between the CARS and the ABC in classifying children as Autistic/Non-Autistic and also when the classification of Autism is based on the degree and/or probability of autism.

Construct Validity

The results from empirical inquiry into the criterion related validity of Form E-2, the ABC and the CARS suggests that only the CARS is closely related with the criterion, namely, clinical psychiatric diagnosis. When a dichotomous classification system is used in an attempt to investigate construct validity a number of hypotheses are posited which may help to explicate the relationship between DSM III and the autistic children's ratings on Form E-2, the ABC and the CARS.

Table 6 displays the amount of overlap between DSM III criteria and the item content of Form E-2, the ABC and the CARS. As can be seen in Table 6, which was derived from qualitative item analysis, the CARS appears to have the most (i.e., 28 out of 30 possible) diagnostic criteria specified in DSM III. The ABC has 24 out of 30 possible items in common with DSM III, whereas, Form E-2 has only 21 items in

TABLE 6

DEGREE OF OVERLAP (+) BETWEEN DSM III CRITERIA AND ITEM CONTENT OF FORM E-2, THE ABC AND THE CARS.

CRITERION	FORM E-2	ABC	CARS
I. Age of onset before 30 Months	+	+	-
II. Pervasive Lack of Responsiveness to Other People			
a). Failure to cuddle	+	+	+
b). Lack of eye contact	+	+	+
c). Lack of facial responsiveness	+	+	+
d). Aversion to physical contact	+	+	+
e). Interchangeability of adults	-	+	-
f). Mechhanical clinging to one adult	-	-	+
g). Failure to develop peer friendships	-	+	+
h). Lack of cooperative play	-	+	+
III. Impairments in Language Development and Communication			
a). Language is absent	+	+	+
b). Immature grammar	-	-	+
c). Delayed/Immediate echolalia	+	+	+
d). Pronominal reversals	+	+	+
e). Metaphorical language	+	-	+
f). Inability to use abstract terms	-	-	+
g). Abnormal speech melody	-	+	+
h). Deficient/Absent non-verbal communication	-	+	+
IV. Bizarre Responses to Various Aspects of the Environment			
a). Resistence/catastrophic reaction to minor changes.	+	+	+
b). Attachment to odd objects	+	+	+
c). Ritualistic behaviours	+	+	+
d). Fascination with movement	+	+	+
e). Fascination with music	+	-	-
f). Fascination with and good memory for schedules, dates, songs	+	-	+
V. Absence of Delusions, Hallucinations and Loosening of Associations	n/a	n/a	n/a
VI. Associated Features			
a). Labile mood	-	+	+
b). Unexplainable or inconsolable affective responses	+	+	+
c). Over/under responsiveness to stimuli	+	+	+
d). Lack of appreciation for real danger	-	+	+
e). Nervous habits (hair pulling, body biting)	+	+	+
f). Rhythmic body movements	+	+	+
g). Variability in intellectual functioning	+	+	+
Total	21	24	28
Compared to "perfect" match	z=8.57	z=5.71	z=1.90
Significant Level	Sig	Sig	NS

Key:

\+ Individuals overlap
\- no overlap
NA Not applicable
Sig. Statistically Significant
NS Statistically Non Significant

common. To investigate the meaningfulness of these numbers a test of the significance of difference between independent samples was conducted. The assumption of the need for a perfect match was made (p_1=1.00; p=.99 $S_p=\sqrt{pq\,(2)}{N}$=0.035) (See Ferguson, 1966). It was observed that only the CARS withstood this stringent criterion of acceptability.

Upon closer scrutiny of item content, it also appears that the items which help operationalize the DSM III criteria for social relatedness and communication, account for most of the variance amongst the diagnostic classification systems. On the other hand the items which comprise the criteria for bizarre responses to the environment and associated features, seem to account for most of the convergence amongst the three assessment instruments.

It is hypothesized that the definition and/or concept of autism incorporated by the CARS is broader than the definition and/or concept of autism underlying both Form E-2 and the ABC. This may explain at least in part the significant correspondence between the CARS and DSM III, and not for the ABC or Form E-2.

Another construct which may help to account for the relations between DSM III and Form E-2, the ABC and the CARS, is the method of administration that is utilized for

each of the assessment instruments under study. It is hypothesized that those diagnostic assessment instruments and/or systems that employ similar classification methods to DSM III, will result in more consistent ratings and/or classifications than those diagnostic systems which utilize different administration procedures.

An examiner (e.g., psychiatrist) using DSM III relies on a number of clinical procedures including parent/child interview, observation and review of the child's clinical chart, for rendering a diagnosis or classification of the child's presenting condition(s). Similarly, the CARS has been designed in such a way so that ratings of a child can be made under alternate conditions, including parent interview, observation and chart (case history) review. The correlation using coefficient *Kappa* which corrects for the percent agreement figures for chance, of these ratings (i.e., parent interview and chart review), with behavioural observations were reported by Schopler et al (1986) to be .75 and .63, respectively.

In comparison, both Form E-2 and the ABC are more restricted with regard to this method of administration. Form E-2 solely relies on parental report which in many instances is retrospective in nature. The ABC is predominantly dependent upon contemporaneous observation

although it does take into account developmental changes within the child.

In essence, it would be expected that the CARS would be more strongly related with DSM III because the two diagnostic systems share the wide range of administration methods relative to those incorporated by Form E-2 and the ABC. Further, since the method of administration for the CARS and ABC are more similar than that employed by Form E-2, it is expected that the CARS and the ABC would show a closer relationship to each other than with Form E-2.

Taken together, the method(s) of construct validation employed in this study, indicate that the CARS has the best construct validity relative to DSM III. However, more complex multitrait-multimethod matrix methods maybe warranted in further investigating the construct validity of these three instruments.

Program Planning Usefulness

Diagnostic ratings and classifications are clinically important and essential in their own right, however, of at least equal significance, is the degree to which diagnostic assessment instruments facilitate the planning of educational objectives and program goals for the exceptional

TABLE 7

RELATIONSHIP BETWEEN PROGRAM PLANNING VARIABLES AND FORM E-2, THE ABC AND THE CARS

VARIABLE	*FORM E-2	ABC	CARS
1. COGNITIVE FUNCTIONING LEVEL	†	†	†
2. COMMUNICATION SKILL LEVEL	†	†	†
3. SOCIAL INTERRACTION SKILL LEVEL	-	†	†
** 4. LEVEL OF SELF-INDEPENDENCE	-	†	-
5. INTENSITY/FREQUENCY OF NON-ADAPTIVE BEHAVIOURS	†	†	†

KEY:

† Provides Program Planning Information
- Program Planning Information Not Provided

* Up Until Age 5
** Not Incorporated in DSM III

child (i.e., autistic). Table 7 illustrates the type of program planning information provided indirectly and/or implicitly by Form E-2, the ABC and the CARS. The selected variables including cognitive functioning level, communication skill level, social interaction skill level, level of self-independence and intensity/frequency of non-adaptive behaviours were derived on the basis of clinical experience with autistic children, as well as by clinical inference. Each of these variables with the exception of the level of self independence, is incorporated, at least to some extent, in DSM III. Nevertheless, all the aforementioned variables are considered important for educational program planning.

As can be seen in Table 7, the ABC provides the most relevant program planning information for all five selected variables, followed by the CARS (information provided for four out of five variables) and lastly, Form E-2 (information available for three out of five variables - up until age 5). The ABC, therefore, in comparison with Form E-2 and the CARS would appear to be the most valid assessment instrument for facilitating the decision making process relative to educational placement and program planning for the autistic child.

Educators also need to use assessment instruments which are easily and quickly administered, scored and yet are also

reasonably accurate. Since Form E-2 is generally completed by parents and is not actually intended for program placement/planning decisions, only the ABC and the CARS will by considered for qualitative comparative purposes. On the basis of a review of test manuals, test critiques and this investigators own clinical experience with both the ABC and the CARS,. it would appear that both diagnostic assessment instruments, overall, meet the educational requirements cited above. Although the ABC is more quickly administered than the CARS, the CARS appears to be more valid for classification purposes. Finally, the qualifications and training of the raters for both the ABC and the CARS make them easily amenable to inservice training programs.

CHAPTER 5

Conclusions And Implications

There is universal consensus within the professional community, and in particular, within the disciplines of education and psychology, that all diagnostic assessment and screening instruments must be critically examined and empirically investigated for their psychometric properties. This objective, however, presents a significant but necessary challenge for those educators and clinicians responsible for the assessment, classification and program planning for such a complex, multifaceted and wide-spectrum disorder as autism.

The delivery of comprehensive and specialized services for autistic children is critically dependent upon reliable and valid evaluation procedures. The scientific literature is replete with recommendations for independent investigations of the reliability and validity of the instrumentation, including questionnaires, checklists, and rating scales, employed for assessing autistic children. In the present study, the criterion-related and construct validity as well as the program planning usefulness of three widely and diagnostic assessment and screening instruments was examined.

Careful attention was given in this study to describing pertinent sample characteristics, so as to enhance the meaningfulness and generalization of the conclusions, gleaned from the research data. The age of onset, level of cognitive functioning, and level of social-communicative competence of the subjects in this sample appear fairly consistent with descriptions of research samples cited in previous autism studies.

The sample employed in this study was admittedly non-randomized and small. In addition the male to female ratio (i.e. approximately 1:1) is quite different from that typically reported in the literature. Steffenburg and Gillberg (1986) have suggested, however, that the over-representation of boys with autism is marked only in the classically autistic, i.e. Kanner's syndrome.

The reliability, specifically, interrater reliability of Form E-2, and the ABC was not incorporated into the experimental design of this particular study. Previous reliability studies, at least for the ABC, have indicated quite high interrater agreement. Due to the small sample size of this preliminary study, further interrater reliability studies using larger samples appears warranted. A more objective analysis of the parental report (e.g., intercaregiver reliability, test retest), for Rimland's Form E-2 would also appear worth pursuing.

The interrater reliability of the CARS was found to be very high in this study. Some caution is called for, however, before fully embracing this result. A number of methodological limitations (e.g., use of 'non-blind' raters) inherent in the study may restrict the generalization of this finding. At the same time though, it should also be noted, that in actual clinical practice examiners are often cognizant of a child's current and/or previous diagnostic classification, if any.

Although, none of the diagnostic methods inherent in rendering a clinical diagnosis (i.e. psychiatric interview) has been assigned to particular assessment instrument for autistic symptomatology, it does appear from the criterion-related validity results of this study, that the CARS unlike Form E-2 and the ABC closely corresponds with clinical diagnosis. It is, of course, presumed in this study that the selection of a clinical diagnosis of autism using DSM III criteria as the 'gold standard" of diagnostic accuracy is valid. However, it should also be noted that in actual clinical practice, a perfect diagnostic system or scheme for clinical diagnosis does not actually exist. It is anticipated though that the use of DSM-III-R in future autism studies will enhance diagnostic reliability and accuracy.

This result though may also be confounded since the psychiatric diagnosis of autism was generally rendered prior to the completion of either the ABC or the CARS. As such the ratings on the ABC and/or the CARS may have been biased. Further, it would be helpful in future investigations of the interrater reliability of the psychiatrists or examiners responsible for making a clinical diagnosis of autism/non-autistic, be established. Purely independent evaluations are, of course, also preferred.

The construct validity of the CARS relative to DSM III, unlike Form E-2 and the ABC, was also supported by the results of this study. However, the possibility and issue of criterion related contamination in examining construct validity by the method employed in this study confounds the meaningfulness of this result. Further research into the construct validity of these three instruments is in order. The use of multitrait - multimethod matrix methods seems appropriate toward this end.

Despite the empirical support, at least from this study, for the criterion-related validity and construct validity of the CARS, it should be underscored that the results derived from the administration of an assessment instrument for autism, whether it be a questionnaire, checklist or rating scale, should not be equated with clinical diagnosis. The information provided by the various

assessment instruments for autism, by itself, is simply not sufficient to fully address the complexity of the diagnostic process for autism. The informational data derived from either Form E-2, the ABC or the CARS should be best viewed as complementing, rather than competing with clinical diagnosis derived from a psychiatric evaluation or from other neuro-medical procedures.

In considering, further, the results of this study it is important to be cognizant of the context and purposes for which the assessment instruments under study, were designed. The ABC and the CARS were both designed as screening/ assessment instruments, in order to facilitate decision-making relative to the classification, placement and programming for autistic children. Both instruments also incorporate developmental changes (i.e., 'age factor') within a child, as well as differentiate autistic children from children with other conditions. In contrast Form E-2 was designed to identify and discriminate subtypes of autistic children within the larger population of children diagnosed as 'autistic'. The results of this study support the findings from previous investigations (e.g., DeMeyer, 1971) suggesting that Form E-2 be used only as a screening tool.

Forness and Cantwell (1982) have argued that a common frame of reference between clinical assessment procedures

including psychiatric diagnoses and educational decision making requirements needs to be established. The concept of program planning usefulness was examined in this study, in response to this ever present need. In this regard, the ABC in comparison to the CARS appears to provide the most useful data base for planning behavioural objectives and educational interventions for autistic children, at least on a face validity basis. More systematic efforts, however, such as employing statistical procedures in conjunction with qualitative methods are needed for translating clinical findings e.g., psychiatric diagnosis into educationally relevant information. With this accomplished, more successful educational outcomes for autistic children are predicted.

In summary, the assessment, diagnostic classification and the educational programming of children with autism represents an enormous challenge for clinicians and educators alike. The multifaceted nature and complexity of the autism syndrome necessitate a service delivery system which is comprehensive and yet can be individualized to the unique programming needs, educational and otherwise, of the autistic child.

It would appear, therefore, that a multiaxial diagnostic classification system which utilizes objective and operationally defined criteria (based on parental

report, as well as supplemental by direct behavioural observational procedures and structured interviews); allows for reliable and valid subclassification and finally, takes into account developmental parameters and program planning variables, would represent an ideal diagnostic scheme for autism. Ultimately, however, the value of any diagnostic scheme is dependent upon validating empirical research and demonstrated clinical utility.

The diagnostic screening and assessment instruments under investigation in the present study; namely, Form E-2, the ABC and the CARS have to varying degrees contributed to the quantification of the autism syndrome, as well as clarify the programming needs of the individual autistic child, when used in conjunction with clinical diagnosis. Further investigations into the reliability and validity of these instruments is strongly recommended, if these seemingly functional measures are, in fact, going to attain their optimal usefulness.

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APPENDIX A

Sample Characteristics (N=16)

Sex	Males 7 (43.75%)	Females 9 (56.25%)		
Chronolcgical Age	Preschool (0-5) (18.75%)	School Age (6-10) (62.50%)	Preadolescence/ Adolescence (11 and older) (18.75%)	
Level of Intellectual Functioning	Average 1 (6.25%)	Mild M.R. 6 (37.50%)	Moderate M.R. 7 (43.75%)	Profound/ Severe M.R. 2 (12.50%)
Neurological Findings	Idiopathic 10 (62.50%)	Stigmatic 4 (25%)	Syndromatic 2 (12.50%)	
Level of Adaptive Functioning	Mild M.R. 2 (12.50%)	Moderate M.R. 7 (43.75%)	Profound/ Severe M.R. 7 (43.75%)	
Primary Mode of Communication	Verbal 6 (37.50%)	Non-Verbal 10 (62.50%)		

Educational Placement

Regular Class	Integrated Pre-School	Developmental Handicap class	Trainable M.R. class	Autism T.M.R. class
1 (6.25%)	3 (18.75%)	4 25%)	3 (18.75%)	5 (31.25%)