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Sub-categorizing hyperactivity: a replication and extension of the stony brook scale

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of the syndrome rather than perhaps a re-evaluation of their own theoretical pre-suppositions which are no doubt reflected in their research methodologics.

This review will now turn to an critical evaluation of current research. This research has claimed some support for a situation-specific theory of hyperactivity and moreover has demonstrated the possibility of sub-categorizing groups of hyperactive children. Although these studies have been of a mainly descriptive nature they have laid the methodological and theoretical groundwork on which O'Leary & Steen (1982) have formulated a more empirical approach to sub-categorizing hyperactive children. The present study as will be seen has derived its inspiration directly from the work of O'Leary & Steen (1982).

Current Research Perspectives in Subcategorizing Hyperactivity

Factor-analytic research, investigating the etiology and symptomology of hyperactivity, yielded surprisingly disappointing results (Werry, 1979). Typically, such studies have produced a large amount of small factors, independent of each other yet highly correlated to the source of information (Langhorne et al, 1976). It was on the basis of similarly disappointing results that Langhorne et al (1976) posed the possibility of situational-specific hyperactivity. If such a hypothesis were true it may account for the lack of interrelatedness of variables in multi-data source designs (e.g. Routh & Roberts,

1972; Quay, 1979).

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On the basis of Langhorne, et al's (1976) findings, and acknowledging the validity of Mischel's (1968) theoretical framework, Loney, Langhorne and Paternite (1978) conducted a study based on a single data source. Loney et al (1978) undertook a single-source analysis of ratings of symptoms, amongst a samle of 135 boys diagnosed hyperactive, and referred for stimulant medication.

The single data-source, comprised of judges ratings of clinical files, on the basis of 13 selected behavioural symptoms. These symptoms were selected on the basis of their frequency in an overview of descriptive research papers (Loney et al, 1978). These authors performed a principal-axis factor analysis with orthogonal rotations on the 13 symptom variables for the 135 cases. Loney et al's (1978) results indicate the emergence of two factors with good internal consistency. The authors named these factors aggression and hyperkinesis respectively. The aggression factor, contained significantly inter-

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related variables of control deficits, negative affect, aggressive interpersonal behaviour; whilst the hyperkinesis factor was composed of variables such as hyperactivity, inattention, and judgment deficits. (Loney et al, 1978). Further to this, the authors report that these factors are valid in their separate and high correlations with independent measures.

The significance of the Loney et al, (1978) study should not be under-estimated. These authors claim that this is the first single-source study to elucidate and validate relatively independent symptom dimensions within a sample of hyperactive children (Loney et al, 1978). It is noted by O'Leary and Steen (1982), however, that other unsuccessful factor-analytic studies have been based on single-source data. They suggest that one of the key elements for the success of Loney et al's (1978) research is the highly selected clinical nature of their sample. Loney et al's (1978) sample was comprised of seriously problematic boys who met clinically stringent criteria for being diagnosed hyperactive, and who were being treated with psychostimulant medication. The implications of Loney et al's (1978) research are important. Their results suggest that, as has been long suspected (Fish, 1975), the group of children diagnosed hyperactive are heterogeneous in nature. Additionally, distinct sub-groups of hyperactive children may be elucidated. These groups can be expected to differ in both etiology and prognosis. Loney et al (1978) claim their factors of hyperactivity and aggression fulfill these long sought-after functions.

O'Leary and Steen (1982) document serious problems in replicating Loney et al's (1978) research. The basis of these problems was the highly complex and somewhat subjective nature of the clinical-file material on which Loney et al's (1978) judges based their ratings. In an attempt to solve this problem O'Leary and Steen (1982) present an assessment procedure which they deem

(a) is based on Loney's conceptual framework;

(b) uses a single data source (teacher ratings); and

(c) is practical in terms of research and treatment.

These authors developed a scale based on the same thirteen symptom descriptors used by Loney et al (1978). The O'Leary and Steen (1982) scale is an amalgamation of the highly validated Connors Teaching Rating Scale (TRS) - (Connors, 1973), and the equally valid and reliable Peterson - Quay Behaviour Problem Checklist (BPC) -(Quay and Petersen, 1975). All items on the combined scale, named the Stony Brook Scale (SBS) were assigned to one of Loney et al's (1978) symptom descriptors (See Appendix 1 O'Leary & Steen, 1982). The authors, however, do note that Loney et al's thirteenth symptom - "sleep disturbance" was omitted as no such behaviours are itemized on either the TRS or BPC.

What has emerged is a scale (the SBS) composed of two highly validated instruments, broad enough to cover the range of symptoms outlined by Loney et al (1978). Further to this, the scale presents with face validity. It seems able to objectively capture data from a single source which is an improvement on Loney et al's (1978) use of less systematic judges rating of clinic files.

O'Leary and Steen (1982) utilize the Stony Brook Scale in a factor analytic study designed to test two hypotheses. The first suggests that a different factor structure would emerge, from highly selected clinical samples of hyperactive children, than would emerge from a more heterogeneous sample. The second hypothesis predicts the emergence of independent and cross validated factors of hyperactivity and aggression amongst data attained from the selected sample (O'Leary & Steen, 1982). Teacher ratings on the SBS were attained for the following:

(a) A heterogeneous sample of 75 boys and 17 girls referred for school related problems.

(b) A selected sample of 49 boys and 13 girls empirically diagnosed hyperactive.

(c) A replication sample of 44 boys and 2 girls who had also been highly selected on the basis of their hyperactivity.

These ratings were then subjected to a principal component factor analysis with varimax rotation (O'Leary & Steen, 1982). These authors report that their results largely supported their expectations. The SBS was capable of differentiating between hyperactivity and aggression in both selected samples (O'Leary & Steen, 1982). However, this was not the case for the more heterogeneous sample (O'Leary & Steen, 1982) where, as predicted, a different factor structure emerged. In addition, a third factor emerged in the selected sample and the replication sample which the authors name Anxiety / Depression (O'Leary & Steen, 1982). Further to this these authors display both concurrent and disciminative validity for their aggression and hyperactivity factors.

The consequence of this research is that an instrument has been developed which appears to be able to delineate between sub-groups of hyperactive children, confirming the research of Loney et al (1978). O'Leary and Steen (1982) note that the SBS is practical in both clinical and research settings for use with children idenitified as highly hyperactive. The importance of this research should not be underestimated. For the

first time in eighty years of research with hyperactive children (Ross & Ross, 1976) a usuable instrument exists which it is claimed would, through sub-categorizing hyperactive children, improve diagnostic practice (O'Leary & Steen, 1982). Further to this, the research reported by O'Leary and Steen (1982) has implications for etiological issues, and problems of classification. In conflict with the research of Sandberg et al (1978), and the view of Quay (1979), O'Leary and Steen have produced some validation for the continued existence of a diagnostic category for hyperactivity. In addition to this, the distinction between hyperactive and aggressive children, who have until now been crudely diagnosed 'hyperactive', may be etiologically important. Indeed these delineated sub-groups may differ in etiology, prognosis and treatment response, on the lines suggested by Loney (1980).

Rationale for this Study

The emergence of an operational and usable methodology for sub-categorizing hyperactive children (O'Leary & Steen, 1982) is certainly a long-awaited and exciting occurrence in this field (Ross & Ross, 1976). The diagnostic and prognostic possibilities of such an instrument in clinical practice, as well as the theoretical and etiological implications, of successfully delineating sub-groups of hyperactive children, is seen as the motivating force behind the present study. This

study attempted to replicate and extend the work of O'Leary and Steen (1982), in the following respects.

1 Replication of empirical evidence is acknowledged as one of the cornerstones of scientific research (Kuhn, 1962). In the field of child behaviour, particularly in the specific area of hyperactivity, replication of evidence is recognized as a vital and necessary practice (e.g. Sandberg, Wieselberg & Schaffer, 1982; Fleischman, 1981). While this may be true in terms of experimental evidence, replication seems even more important in evaluating the validity and reliability of a psycho-technical instrument (e.g. Deluty, 1979; Reynolds & Paget, 1981; Roper & Hinde, 1979). This study aimed to replicate the research of O'Leary and Steen (1982) on heterogeneous and highly selected samples of South African children. Importantly, this study was an attempt to evaluate the ability of the Stony Brook Scale to provide separate factors of hyperactivity and aggression in a significantly different environment from the initial research (O'Leary & Steen, 1982). This would enable evaluative comment on the validity, reliability and robustness of the SBS. Further to this recent research illustrates that the application of questionnaires standardized in the United States are not necessarily appropriate to

South African populations. (Barling, Bresgi & Kendall, 1981). In this regard it is of interest to see if any differences occur between the current study and the original research, which may reflect such socio-cultural differences.

2 While replication in itself may be a worthy cause for research, this study will also attempt to extend the work of O'Leary and Steen (1982). The present study empirically investigates the application of the Stony Brook Scale to a second source, parent ratings. Using the Stony Brook Scale O'Leary and Steen (1982) were able to distinguish between dimensions of aggression and hyperactivity in highly selected populations of hyperactive children, on the basis of teacher ratings. This present research examines whether this factor structure is constant over different situations, by obtaining independent parent and teacher ratings for the same selected sample of hyperactive children. This may illustrate the applicability of the Stony Brook Scale to another source setting. Additionally, this comparison may also provide evidence evaluating the validity of a situation/specific theory of hyperactivity (Langhorne, et al 1976; Mischel, 1968). Should parent ratings prove to be as valid and reliable as teacher ratings additional clinicial utility and validity would accrue to the SBS.

From the above aims, two hypotheses emerge:

1 It was expected that factor anaylysis of the Stony Brook Scale would produce two independent dimensions of aggression and hyperactivity in the selected sample of South African hyperactive children. However, this ability was not expected in the heterogeneous sample of children.

2 Comparable factor structures were expected to emerge, separating dimensions of aggression and hyperactivity, for independent Parent and Teacher ratings on the Stony Brook Scale, amongst the selected sample of hyperactive children.

METHOD

Subjects

This study was conducted using two samples. A heterogeneous sample of schoolgoing children, and a selected sample of hyperactive children. These combined to form a total sample of (N = 180) ranging in age from 6 years 4 months to 11 years 11 months. The mean age for the total sample was 8 years 3 months. The sample consisted of 129 boys and 51 girls all attending schools in the Greater Johannesburg area. They

ranged in class level from the first to the fifth school year. All these children were White South Africans largely emanating from middle to upper middle class socio-economic backgrounds. Although the broad demographic details of the selected sample and the heterogeneous sample are largely identical, subject selection procedures differed in each instance. An examination of these samples and respective selection procedures is warranted.

Selected Sample. A selected sar of (n = 90) were extracted from a wider school going population of approximately 1 800 children. Subjects were allocated to the select sample on the basis of scores attained on a selection procedure, completed by teachers, for all 1 800 children. The selection instrument was the 10 item Abbreviated Teachers Rating Scale (Connors 1973). This hyperactivity scale for which there is evidence of validity (Werry, Sprague & Cohen, 1975), is a well accepted screening instrument for hyperactive children in both clinical and research settings (Prinz, Connor & Wilson, 1981). The admission criterion to the select sample was a score 15 on the abbreviated TRS. This is a suggested cut-off score (p 0,05) for the presence of hyperactive symptomatology, being 1,96 standard deviations above the mean. (Werry, Sprague & Cohen, 1975). The selected sample comprised of 73 boys and 17 girls ranging in age from 6 years 4 months to 11 years 11 months. The mean age for the sample was 8 years 8 months (SD = 17,5 months). All these children were attending normal schools at the time of assessment.

Heterogeneous Control Sample. This sample (n = 90) consisted of 56 boys and 34 girls attending schools in the Greater Johannesburg area. These children ranged in age from 6 years 5 months to 10 years 3 months. The mean age was 7 years 10 months (SD = 12,5 months). There were no specific selection criteria employed in the admission of these children to the heterogeneous sample. They corresponded broadly to the select sample in that they were of similar socio-economic background, educational level and age. Accessability was a key factor in the selection of these children. Although they were thought to broadly typify average school going children of that age in this country, it is noted that the sample was not randomly drawn.

Assessment

TRS. The abbreviated Teachers Rating Scale (Connors, 1973) was used as a screening instrument in the selection of the highly hyperactive "select" sample. This scale consists of 10 items extracted from the longer and more comprehensive TRS (Connors, 1969). Each item is rated on a 0 - 3 severity index. This scale has a range of scores from 0 - 3,0. A score of 1,5 which is two standard deviations above the mean has been suggested as a cut-off point for the presence of hyperactive symptomology (Ross & Ross, 1976; Sprague, 1977). This instrument is one frequently used and highly accepted in

both clinical (Cantwell, 1975) and research (e.g. Prinz, Connor & Wilson, 1981) situations. Construct validity is claimed for the scale (Werry Sprague & Cohen, 1975). These authors established a satisfactory correlation (r = 0,94) between the abbreviated TRS and the hyperactivity factor of the TRS. Moreover Connors (1973) reports test - retest reliability at between r = 0,70 and r = 0,90. In this regard the abbreviated TRS seems to be a more refined and validated screening instrument than the six item TRS hyperactivity factor utilized by O'Leary & Steen (1982). Moreover the 1,5 cut-off score seems both sufficiently stringent and statistically appropriate.

SBS. The Stony Brook Scale, utilized in this study, is a 94 item scale derived from a combination of the TRS (Connors, 1969) and the BPC (Quay & Peterson, 1975), by O'Leary and Steen (1982). The scale is a broad inventory of possible child behaviour problems, that covers 12 of the 13 symptom descriptors of hyperactivity outlined by Loney et al (1978). O'Leary and Steen (1982) in a factor analytic investigation of the SBS found it differentiates between dimensions of Aggression, Hyperactivity and Anxiety-Depression, amongst nighly selected groups of hyperactive children. This seems to provide an initial basis for the validity of the scale, however, an investigation of the reliability and validity of the SBS is in itself a factor motivating the present study.

Due to its recent inception, no normative data or further details regarding the validity and reliability of the SBS are available. A more detailed account of the characteristics of its component parts, the TRS and the BPC, however, may be illuminating.

The Teachers Rating Scale (TRS) was developed by Connors (1969) primarily as an instrument for use in drug studies with hyperactive children. Since then its use has been extended to a variety of clinical and research settings (Cantwell, 1975). The scale is a 4 point, 39 item behaviour symptom checklist which has been shown to discriminate clearly between hyperactive and normal children (Sprague, Christensen & Weary, 1974). Werry Sprague and Cohen (1975) conducted a factor analytic study of the Connors Scale which yielded four major factors. These was named Conduct Problems, Hyperactivity - Inattentiveness, Unsociability and Tension - Anxiety. This factor structure was seen as comparable to the factor structure of Connors' (1969) original analysis, indicating some validity and reliability of the measure. Despite this it is noted that whilst these factors appear valid and reliable, they are not necessarily independent of each other. In particular Factor 1 (conduct disorder) and Factor IV (hyperactivity) correlate significantly ($r = 0,77$) (Werry et al, 1975).

The BPC (Quay & Peterson, 1975; Quay, 1977), constitutes the

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The BPC (Quay & Peterson, 1975; Quay, 1977), constitutes the

other major part of the Stony Brook Scale (O'Leary & Steen, 1982). The BPC has 55 items each rated on a 3 point dimension, tapping problem behaviours often occurring in childhood. This scale is used in research (Quay, 1977) and clinical settings (Ross & Ross, 1976), and measures four primary dimensions of behaviour. These dimensions derived from the factor analysis of behaviour ratings are: Conduct Problems; Anxiety-Withdrawal; Immaturity; and Socialized Aggression (O'Leary & Johnson, 1979).

Some data exists pertaining to both the validity and reliability of this scale. Speer (1971) successfully utilized the measure in differentiating between clinic children and their siblings, and between clinic children and a non-referred control group. Further to this O'Leary and Johnson (1979) cite evidence confirming the ability of the BPC to reflect changes of both a psychological and a pharmacological nature. These authors also comment that due to the extensive normative data, clinicians may use the BPC in assessing levels of deviance or disturbance in the individual patient. Satisfactory reliability figures for the scale were also reported (Evans, 1973).

In sum, it may be seen that the Stony Brook Scale is the combination of two particularly well validated and reliable measures. Additionally these measures together provide a broadened inventory covering a wide spectrum of behavioural symptoms.

Procedure

Different selection procedures were used in selecting the heterogeneous control sample and the 'highly selected' hyperactive sample.

In the case of the selected sample principals of six Johannesburg primary schools were approached by the researcher. This procedure was followed in order to elicit their support for the study and to gain permission for the participation of their staff and pupils. The researcher briefly outlined the current diagnostic problems in the area of hyperactivity to the school principal, and motivated the importance of research in this area. It was explained that the SBS had been recently formulated in the United States and the present study would evaluate its applicability amongst South African parents and teachers, in the diagnostic evaluation of hyperactive children. It was pointed out that one of the possible conclusions of the research might be a better diagnostic ability to differentiate between aggressive and hyperactive children. The principals agreed to consult their staff members, and if support was forthcoming, to arrange a meeting between agreeable teachers (teaching first to fifth years), and the researcher.

The teachers' co-operation was obtained in all six schools and

consequently the meetings were held. At these meetings teachers were given envelopes with copies of the abbreviated TRS and a personalized letter containing the following instructions:

> "Enclosed please find sufficient copies of the Abbreviated Connors Teachers Rating Scale to enable you to complete one for each child in your class. The completed inventories will be collected from you one week from today. A small number (3 or 4) will be selected for a more extensive ninety point enquiry, to be completed by yourself and by the parent of the child concerned."

The instructions for completing the abbreviated TRS were printed on the top of the abbreviated TRS form and read as follows:

> "Please enter a (x) in the square that best describes the level of activity of this child's behaviour. The behaviours to be rated are presented in the left hand column. Please ensure that you respond to all the listed behaviours and enter the response that most accurately describes this particular child's behaviour."

It is noted that no further instructions or information regarding the study were provided to the teachers. They remained blind to the more specific questions to which the present research was addressed. Each school was, however, promised detailed feedback on the research findings, at a later stage.

Upon completion the abbreviated TRS forms were collected and scored. All children scoring 1,5 and above, were included in the "selected" sample. This score is recommended by Werry et

al (1975) and represents 1,96 standard deviations above the abbreviated TRS mean. Its use is common in research practice (Prinz, Connor & Wilson, 1981; Trites, 1979).

For all such selected children, two copies of the SBS were submitted to the teacher, one being in a sealed and addressed envelope to the parents of the child concerned. The teachers were asked to forward this envelope to the parents via the child, and to complete the other copy.

The envelope contained a copy of the SBS with the following letter of request, stating that:

> "...in the interest of improving educational and psychological services available to children in the Johannesburg area, certain aspects of childhood behaviour are being investigated. In this connection, we request you to complete the enclosed inventory in full. Please return this to your child's teacher by .... (date of the following day). Thanking you for your co-operation and assuring you that all material will be treated in strict confidence."

The SBS instructions preceded the scale items and were of a similar nature to the abbreviated TRS instructions. It is noted that neither teachers nor parents were obliged to participate in this study. Whilst none of the teachers refused to assist with this research, the parents of six children did not complete the SBS.

The procedure for the selection of the heterogeneous sample was less complex. Teachers, teaching first to fifth years in primary schools in the Johannesburg area, were approached directly to assist with this research. They were told that the present study investigated aspects of child behaviour in the classroom setting. As such they were asked to complete the full SBS for any ten children in their class. There were no specific admission criteria for this sample.

As with the selected sample of children, teachers assisting in the collection of data for the heterogeneous control sample were assured of complete confidentiality. Although names of subjects were originally recorded in both samples, they were substituted with numerical codes in compiling the raw data sheets. Age and sex were also coded on the data-sheets which were consequently included in the statistical analysis. Data from (a) parents' ratings of the selected sample; (b) teacher ratings of the selected sample and (c) teacher ratings of the heterogeneous sample were submitted for analysis separately. This is in keeping with the single-source design of the present research.

Statistical Analysis

In terms of the nature of the present study it was important that the statistical procedures should follow those of the

original SBS study (O'Leary & Steen, 1982) as closely as possible. As such this study utilized three separate factor analyses as the primary means of evaluating the data collected.

The most distinguishing feature of factor analytic technique is its data-reduction capacity, in relatively homogenous samples, (Gilbert, L. 1977). Factor analysis may be used in the examination of complex correlational data, to investigate whether such data can be explained by the existence of a small number of hypothesized underlying dimensions (Harman, 1976).

The present study used a principal components analysis with varimax rotations. This procedure was utilized because (a) principal components analysis maximizes communality scores, and the percentage variance accounted for by the emergent factors; (b) an orthogonoal - varimax rotation, utilizing an iterative procedure produces relatively unrelated factors, which progressively represent clusters of underlying variables (Child, 1970; Gilbert, 1977; Kim & Muller, 1978).

As such this procedure was likely to maximise the possibility of producing specific factors, with an overall factor structure approaching simplicity (Harman, 1976).

This results in a situation in which emergent factors are specific predictors of individual differences as assessed by the SBS.

The present study, in determining significance of a factor, retained only those factors with an eigenvalue equal to or greater than one. This procedure is a "rule of thumb" and well accepted practice in factor analytic research (Gilbert, 1977). Symptoms were assigned to the factor on which they had the highest loading above 0,40. This assignment of items is consistent with the procedure of O'Leary and Steen (1982). A significance level of 0,40, although arbitrarily determined, is commonly accepted in factor analytic studies as being an adequately stringent measure (Child, 1970; Gilbert, 1977).

Finally in the present study, factor scores were computed as linear summations of all symptoms assigned to a particular factor. O'Leary and Steen (1982) note that this is a commonly used and practical procedure. They however, do include a more statistically appropriate weighted-factor scoring procedure employing all symptoms loading 0,40 on a factor. This study also computed these weighted-factor scores for comparison purposes.

Finally correlation matrices of factor scores of the SBS, the TRS and the BPC were calculated. This provided an evaluation of the independence of the SBS factors, as well as some indications of concurrent and discriminative validity.

The validity of results attained using this procedure may be

questioned on the basis that TRS, BPC, and SBS factors share certain items. It is noted however that well validated, independently measured factor structures exist for both the TRS (Connors, 1969) and the BPC (Quay & Petersen, 1975). As such the use of a Pearson's correlational procedure is justified. This procedure is also consistent with that used in the research of O'Leary & Steen (1982).

RESULTS

Three separate factor analyses were computed, one for each group of data.

The first set of data to be analyzed was the teacher SBS ratings for the highly selected sample of hyperactive children. The principle components factor analysis with varimax rotation yielded three factors with an eigenvalue greater than unity (See Table 1). Analysis of the three symptom descriptors defining the first factor (control deficits; negative affect; aggressive interpersonal), resulted in this factor being labelled "Aggression". The second factor was defined by five symptom descriptors, namely, inattention, anxiety, self-esteem deficits, uncoordination and speech disturbances. These items seem reflective of general inadequacy and poor coping abilities. This factor was thus simply labelled "General". Like the first factor the third factor is also very specific, and is primarily defined by two symptom indicators, hyperactivity and fidgetiness. Accordingly this factor was labelled "Hyperactivity". These three factors accounted for 91,8% of the variance, and communuality of the items was acceptable. The varimax rotation resulted in ten symptom descriptors loading on the three factors mentioned above. Two symptom descriptors loaded on neither of the three factors (viz. judgment deficits and depression). These did load on a fourth factor which was

statistically insignificant (eigenvalue = 0,67; accounting for 8% of the variance).

Table 1

Principal Components Factor Analysis with Varimax Rotation for Teacher SBS Ratings in the Highly Selected Sample of Hyperactive Children

Symptom	Aggression	General Hyperactivity		h^2
Control Deficits	**0,98**	-0,04	0,17	0,99
Aggressive-Interpersonal	**0,95**	0,00	0,16	0,92
Negative Affect	**0,73**	0,05	0,10	0,81
Self Esteem Deficit	-0,06	**0,81**	0,12	0,74
Anxiety	0,01	**0,71**	-0,17	0,76
Inattention	0,03	**0,69**	0,45	0,69
Speech Disturbance	0,06	**0,59**	-0,03	0,35
Unco-ordination	-0,15	**0,54**	0,37	0,45
Hyperactivity	0,21	-0,01	**0,76**	0,62
Fidgitiness	0,16	0,20	**0,67**	0,53
Eigenvalues	3,34	2,56	1,59	
% Variance	40,9	31,4	19,5	

The responses of parents (on the SBS) for children in the highly selected hyperactive sample were also subjected to principal

component factor analysis with an orthogonal-varimax rotation. Three factors with eigenvalue greater than one emerged (See Table 2). The first of these factors was defined by three symptom indicators, namely control deficits, negative affect, and aggressive interpersonal. Accordingly, this factor was labelled "Aggression". The second factor which emerged was characterized by the symptoms of anxiety, selfesteem deficits and speech disturbances. This factor appeared to be a general indication of anxious, inadequate functioning, and was thus named "General - Anxiety". The label "Hyperactivity" was attached to the third factor. This was decided following an analysis of the symptoms loading on this factor, which were hyperactivity, fidgetiness and inattention. These three factors accounted for 93,5% of the total variance in this sample, yielding communalities on the items which appeared adequate. Symptoms of depression, judgment deficits and uncoordination did not load appreciably on any of the three factors. Depression and judgment deficits, however, did load on a fourth factor which was statistically insignificant (eigenvalue = 0,55), and accounted for less than 10% of the variance.

Table 2

Principal Components Factor Analysis with Varimax Rotation for Parent SBS Ratings in the Highly Selected Sample of Hyperactive Children.

Symptom	Aggression	General-Anxiety	Hyper-activity	h^2
Aggressive-Interpersonal	0,94	-0,00	0,24	0,95
Control Deficits	0,91	0,02	0,27	0,96
Negative Affect	0,72	0,29	0,13	0,81
Self Esteem Deficit	-0,08	0,84	0,05	0,75
Anxiety	0,18	0,77	-0,03	0,64
Speech-Disturbance	-0,21	0,44	0,21	0,32
Hyperactivity	0,26	-0,03	0,80	0,78
Fidgetiness	0,03	-0,02	0,63	0,42
Inattention	0,33	0,26	0,54	0,47
Eigenvalues	4,39	1,60	1,02	
% Variance	58,1	21,2	13,5	

The final principal components factor analysis with varimax rotation was computed on the teachers SBS ratings of children, in the heterogeneous control group (See Table 3). Three factors emerged which all attained eigenvalues greater than unity. Six symptom descriptors defined the first factor, these

being control deficits, negative affect, aggressive interpersonal, judgment deficits, hyperactivity and speech disturbances. This factor seems to be of a fairly broad nature, combining symptoms characteristic of both aggression and lack of control. Accordingly this factor was labelled "Conduct Disorder" as this was seen to represent the broad spectrum of behavioural difficulties included in this factor. The second factor which emerged from teacher ratings of the heterogeneous sample was defined by three symptoms. The label "Inattention-Uncoordination" reflected the essence of this factor, which comprised of symptom descriptors of inattention, fidgetiness and uncoordination. The final emergent factor was depicted by the symptoms, anxiety depression and self esteem deficits. This factor was labelled "Anxiety-Depression". The factor structure accounted for 100% of the variance in the sample, and communalities for the items were acceptable. All variables were loaded appreciably on at least one factor in the above analysis.

Table 3

Principal Component Factor Analysis with Varimax Rotation for Teacher SBS Ratings in the Heterogeneous Control Sample.

Symptom	Conduct Disorder	Inattention Uncoordination	Anxiety Depression	h^2
Control Deficits	0,91	0,35	0,01	0,94
Aggressive Interpersonal	0,88	0,36	-0,04	0,97
Negative Affect	0,86	0,13	0,36	0,89
Judgment Deficits	0,78	0,22	0,28	0,75
Hyperactivity	0,74	0,56	0,03	0,87
Speech Disturbance	0,44	0,36	0,12	0,34
Inattention	0,45	0,78	0,16	0,83
Fidgetiness	0,46	0,76	0,02	0,78
Unco-ordination	0,18	0,71	0,25	0,60
Anxiety	0,01	0,21	0,83	0,74
Self Esteem Deficits	0,04	0,50	0,81	0,90
Depression	0,33	-0,16	0,61	0,50
Eigenvalue	6,33	1,71	1,03	
% Variance	69,8	18,8	11,3	

Following the factor analyses, factor scores were calculated for each factor emerging from the analyses of teacher and

parent ratings, for the select sample of hyperactive children. In order to evaluate the inter-relatedness of the factors concerned, these factor scores were then correlated.

Pearson Product moment correlations were calculated for the factor scores, obtained from the factor analysis of teacher ratings of selected hyperactive children (See Table 4). In this correlation matrix, attention is drawn to the relationship between the Aggression and Hype.activity factors (r = 0,33). Whilst this is a moderate correlation it does attain statistical significance (p 0,01) indicating some association between these two factors.

Table 4

Correlation Matrix of Factor Scores on Factors Retained in Teacher SBS Ratings of the Select Sample.

	Hyperactivity	Aggression	General
Hyperactivity	1,00		
Aggression	0,33	1,00	
General	0,21	0,04	1,00

Finally Pearsons Product moment correlations were also calculated for the factor scores obtained from parent ratings of selected hyperactive children. Examination of the correlation matrix (Table 5) illustrates a significant correlation (p 0,01) between aggression and hyperactivity factors. The correlation is of a moderate nature (r = 0,51) but indicates a stable asscciation between these two factors.

It is noted that whilst weighted scores were also computed they were almost identical to the non-weighted scores in each instance. The correlation between weighted and non-weighted scores was at no point less than r = 0,99.

Table 5

Correlation Matrix of Factor Scores on Factors Retained in Parent S.B.S. Ratings of Select Sample.

	Hyperactivity	Aggression	General-Anxiety
Hyperactivity	1,00		
Aggression	0,51	1,00	
General-Anxiety	0,22	0,24	1,00

The concurrent and discriminative validity of the SBS Hyperactivity and the SBS Aggression factors were investigated. Comparisons between these SPS factors and independent TRS (Hyperactivity and Conduct Disorder) and BPC (Conduct Disorder) factors were calculated. A Pearson's product moment correlational procedure was utilized for Parent and Teacher data respectively.

Table 6

Correlation Matrix of Factor scores for certain SBS, TRS and BPC factors derived from Teacher Ratings of the Select Sample

	SBS Aggression	SBS Hyperactivity	TRS Conduct	TRS Hyperactivity	BPC Conduct Disorder
SBS Aggression	-				
SBS Hyperactivity	0,33	-			
TRS Conduct Disorder	0,96	0,25	-		
TRS Hyperactivity	0,63	0,76	0,56	-	
BPC Conduct Disorder	0,89	0,56	0,78	0,69	-

Table 7

Correlation Matrix of Factor scores of certain SBS, TRS and BPC factors, derived from Parent Ratings of the Select Sample

	SBS Aggression	SBS Hyperactivity	TRS Conduct	TRS Hyperactivity	BPC Conduct Disorder
SBS Aggression	-				
SBS Hyperactivity	0,52	-			
TRS Conduct Disorder	0,96	0,50	-		
TRS Hyperactivity	0,50	0,73	0,58	-	
BPC Conduct Disorder	0,91	0,59	0,81	0,67	-

Table 7

Correlation Matrix of Factor scores of certain SBS, TRS and BPC factors, derived from Parent Ratings of the Select Sample

	SBS Aggression	SBS Hyperactivity	TRS Conduct	TRS Hyperactivity	BPC Conduct Disorder
SBS Aggression	-				
SBS Hyperactivity	0,52	-			
TRS Conduct Disorder	0,96	0,50	-		
TRS Hyperactivity	0,50	0,73	0,58	-	
BPC Conduct Disorder	0,91	0,59	0,81	0,67	-

DISCUSSION

The requirement that psychometric instruments be empirically demonstrated to be reliable and valid is well documented (Anastasi, 1976; Mittler, 1970; O'Leary & Johnson, 1979). Clinicians require the certainty that their diagnostic tools consistently measure what they purport to measure. As such not only do the instruments themselves need to be seen to be reliable ard valid, but these qualities must also be apparent in the research surrounding psychometric instruments. In this sense, research investigating the properties of such instruments should produce consistent results at different times, with different samples. It is only through this rigorous practice of testing operationally defined hypotheses that any psychometric instrument will come to have empirical and clinical credibility. It is within this framework that the results of this study are evaluated.

Factor structures in the present study

The principal components factor analysis of the teacher SBS ratings of the highly selected sample of hyperactive children yielded three orthogonal factors with an eigenvalue greater than unity. They were labelled Agression, General and Hyperactivity. This factor structure is consistent with the hypothesis of this research that the Stony Brook Scale is capable

of distinguishing between dimensions of aggression and hyperactivity. Examination of the present factor structure further illustrates its comparability with the factor analytic findings of O'Leary and Steen (1982). In the original study of the Stony Brook Scale these researchers, elucidated separate factors of Aggression and Hyperactivity in both an initial sample of hyperactive children and in an equally selected replication sample. Some differences do emerge between the present findings and those of O'Leary and Steen (1982). Whilst the Aggression factor in the present analysis contained the identical items to the Aggression factor of both O'Leary and Steen's (1982) samples, the hyperactivity factor was similar, but not identical.

In O'Leary and Steen's (1982) sample, four symptom descriptors loaded on the Hyperactivity factor. These were judgment deficits, hyperactivity, inattention and fidgetiness. In their replication sample, judgment deficits did not load on the Hyperactivity factor, but did load on the Aggression factor. The present study produced a Hyperactivity factor characterized by only two symptom descriptors, hyperactivity and fidgetiness. In this analysis, 'Inattention' formed part of a general factor characterized by lack of self esteem, anxiety and poor coordination. Judgment deficits formed part of an insignificant fourth factor.

Whilst O'Leary and Steen's research generated both an Anxiety-Depression and an Uncoordination factor, the present study seemed to produce a more inclusive General Factor. This factor not only combined elements of O'Leary and Steen's (1982) Anxiety - Depression and Uncoordionation factors, but also included the symptom descriptor, inattention, which loaded on their Hyperactivity factor. The extension of variables included in this General factor may explain at least in part, some of the factor-loadings presented by the current research.

Why this should occur is not abundantly clear. It is possible that the extended general factor is a reflection of a lack of psychological sophistication amongst South African trained teachers. If this were true, these teachers, while aware of the psychological and behavioural states of their pupils, might lack the discriminative ability to differentiate between similar behavioural symptoms. Inattention and anxiety provide an illustrative example of two distinct symptoms which may be reflected by similar behaviours within the classroom. South African teachers might be inclined to view such similar behaviour as the same. There is no research evidence confirming the above suggestion, and as such it is noted that it is a possibility of a speculative nature.

Given these differences, the present study confirms the findings of O'Leary and Steen (1982), that the Stony Brook Scale is

capable of delineating between different behavioural dimensions in highly selected samples of hyperactive children. While this ability seems to be a reliable feature of the Stony Brook Scale, it also offers support for the underlying theoretical propositions on which the scale is based. The elucidation of separate factors of aggression and hyperactivity of course, is central to this picture.

Examination of the principal components factor analysis of teacher ratings of the heterogeneous control sample reveals a substantially different factor structure. Three factors emerged and were respectively named Conduct Disorder, Inattention-Uncoordination and Anxiety-Depression respectively. In accordance with predictions, the factor analysis of ratings for the heterogeneous group clearly failed to delineate separate dimensions of aggression and hypractivity. The Conduct Disorder factor was a combination of symptoms describing aggressive type behaviour and hyperactivity, yielding a broad and non-specific factor. This factor accounted for almost 70% of the variance amongst the heterogeneous group. Once again these results are directly comparable to those of O'Leary and Steen (1982). Only one difference emerges in the comparison of these two factor analyses. Whereas the current study produced a single Inattention-Uncoordination factor, the original SBS research produced two separate factors of Uncoordination and Inattention. Apart from this detail, both the

factor structures and the item loadings of the two analyses are virtually identical. This is seen to confirm various aspects of O'Leary and Steen's (1982) research on the SBS. It is clear from the above that the SBS is a scale that is able to distinguish sub-groups of highly selected hyperactive children. Neither the scale itself nor the factor analytic methodology (Gilbert, 1977) may be applied to heterogeneous populations, with the same expectations. However, the extreme similarities in factor structure elucidated in heterogeneous samples by the present study and by O'Leary and Steen (1982) is of importance. The similarity of the factor structures generated in different cultural settings and at different time periods, itself is an indication of the reliable nature of the SBS. Further to this it provides a reliable index against which results of SBS ratings amongst more higly selected samples may be compared.

As has been seen, the factor structure of the present study for both hyperactive and control groups, closely resembles the findings of O'Leary and Steen (1982), despite some differences. The ability of the Stony Brook Scale to delineate separate dimsensions of hyperactivity and aggression in selected groups of hyperactive children is conceptually important. Such findings add credence to the suggestion of Langhorne et al (1976) and Loney et al (1978) that the group of children currently diagnosed hyperactive are of a heterogeneous nature and

may consist of various sub-groups. Such sub-groups would be likely to differ in terms of etiology, symptomatology and response to treatment.

The present study lends support to O'Leary and Steen's (1982) findings that (amongst selected samples of hyperactive children) some hyperactive children are aggressive whilst others are not. Both the original study (O'Leary & Steen, 1982) and the present study have illustrated the existence of non-aggressive hyperactive children. This is a theoretically and practically important finding, in the light of recent recommendations that little validity exists for the diagnostic classification - attention deficit disorder with hyperactivity, (American Psychiatric Association, 1980). Quay (1979), Sandberg et al (1978) and Sandberg et al (1980) have failed in their research programmes to differentiate between dimensions of conduct disorder and hyperactivity, and have thus advocated the abandoning of a diagnostic category of hyperactivity. The current research supports the findings of Loney at al (1978) and O'Leary and Steen (1982) that a dimension of hyperactivity separate from dimensions of aggression or conduct disorder clearly exists. As such the findings of the present study support the inclusion of a separate syndrome of hyperactivity in current diagnostic classification systems. The current description of Attention Deficit Disorder with hyperactivity seems adequate, and appropriate.

The clinical implications of distinguishing dimensions of aggression and hyperactivity are also of importance. Loney, Kramer and Milich (1979) outline a model in which hyperactivity and aggression have different antecedents and different consequents. In particular these authors postulate that aggression in childhood is associated with adolescent symptoms and delinquency, whilst hyperactivity is not. These different symptoms are not only prognostically different. Loney et al (1979), also postulate that while childhood hyperactivity may respond to stimulant medication, aggressive behaviour remains unaffected by these drugs. As such different therapeutic interventions, possibly directed at family and environmental levels, are needed in dealing with childhood aggression. The ability to systematically separate hyperactive from aggressive children in clinical populations may thus open the possibilities suggested by Fish (1975). These include a clearer diagnostic assessment of each individual case, and the planning of theurapeutic interventions on the basis of established etiological differences and differential responses to various treatments.

While these etiological and treatment aspects may not be fully validated as yet, this study is seen to present some evidence, which may clarify some of the abovementioned diagnostic issues.

Parent Ratings on the Stony Brook Scale

As may be recalled, the aims of this study were twofold. Firstly, to attempt to replicate the methodology and findings of O'Leary and Steen's (1982) original research on the SBS. Secondly to extend their research, by exploring the use of the Stony Brook Scale, in obtaining parent ratings amongst selected samples of hyperactive children.

The principle components factor analysis with varimax rotation produced three factors with eigenvalues greater than one, in the parent SBS ratings of highly selected hyperactive children. These factors were respectively called "Aggression", "General-Anxiety" and "Hyperactivity". Once again the factor structure was consistent with the predictions of the present study. The SBS proved capable of clearly delineating separate dimensions of aggression and hyperactivity amongst parent ratings of their own hyperactive children. Some differences emerge between the factor structure of teacher ratings on the SBS (of the select hyperactive sample) and parent ratings of the same children. The most important of these differences relates to the nature of the General-Anxiety factor. Whilst this factor is similar in some respects to the "General" factor in the analysis of teacher ratings, some important differences do emerge. The parent's "General-Anxiety" factor, tends to be of a more specific nature. Examination reveals that major

differences from the teacher's general factor is that inattention, amongst the parent data, loads on the Hyperactivity factor and not the General-Anxiety factor. Further to this, uncoordination did not load on the General-Anxiety factor in the parents ratings, but loaded on a clinically insignificant fourth factor. As such this General-Anxiety factor is more specific than the teacher - "General" factor and is defined by the symptoms, anxiety, self-esteem deficits and speech disturbances.

More importantly, however, is the consequent change in the nature of the Hyperactivity factor. This factor is defined by three symptoms in the parent ratings analysis. These symptoms descriptors are, inattention, hyperactivity and fidgetiness. The relocation of inattention to the Hyperactivity factor is considered important. The resultant factor structure is remarkably similar both in its factors and symptom loadings to the findings presented by O'Leary and Steen (1982).

Thus not only has the Stony Brook Scale shown itself to be consistent and reliable over time, distance and cultural contexts, but now this consistency is extended over different data sources too. Importantly, the Stony Brook Scale has clearly illustrated a capacity to subcategorize dimensions of hyperactivity in different settings. The findings of the present

study indicate that the use of this scale may be extended successfully to the accumulation of data from parents of hyperactive children. Not only may such data prove to be useful, but it also seems to be of a reliable and valid nature. The extension of the SBS to parent ratings presents some interesting theoretical and practical implications.

Many possibilities are presented for the use of the SBS amongst parents of hyperactive children, as an assessmewnt instrument, in clinical practice and research endeavours. O'Leary and Johnson (1979) note that over and above demonstrating reliability and validity, an assessment instrument must have clinical utility. As such O'Leary and Johnson, describe a clinically useful assessment instrument as having an appearance of relevance to the presenting problem (i.e. face validity); being brief enough to be practical in its administration; and finally it must be acceptable to the person completing the device.

The Stony Brook Scale would in these terms qualify as a clinical instrument with potential for practical usage. The willingness in the present study of both parents and teachers to complete the SBS may be taken as an indication of its plausability and acceptability to the potential subject population. Further to this the scale is both simply and speedily completed. Given its current face valid appearance it may be used as a simple diagnostic tool, to be completed by parents in

the clinicians' waiting room. If teacher SBS ratings were then attained for the same child the clinician would have at his disposal systemstically collected and valid data, concerning the child's behaviour across two different situations. Further to this the robustness of the SBS as illustrated in this study would allow the clinician to diagnostically assess these data, in the knowledge that the SBS is able to measure and delineate the same dimensions in both situations. The potential use of this scale for the more specific assessment of hyperactive children seems encouraging to say the least. This potential is seen to be greatly enhanced by the evidence provided, illustrating the consistency and validity of this scale when completed by parents of hyperactive children.

The successul extension of the SBS to parent ratings also has some important theoretical implications. The comparable factor structures provide confirmatory evidence to suggest that the SBS measures the same dimensions for both teacher and parent ratings. However, it is noted that despite highly similar factor structures for both data sources, the inter-source correlations of identical factors reveal some interesting features. The correlation between these factors were calculated on the basis of factor scores which were first added and then correlated. The correlation between Teachers Aggression factor and the Parents Aggression factor was $r = 0,20$. This correlation is insignificant (p 0,05).

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