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## The Newcastle Adolescent Behaviour Screening Questionnaire

M. PLACE, I. KOLVIN and S. M. MORTON

As part of a larger study, a brief rating-scale was developed which focusses on the mid-adolescent phase of development. Completed by teachers, the questionnaire has an inter-rater reliability of 0.78, with a test-retest correlation of 0.82. When the performances of various screening instruments were compared it became clear that no single questionnaire was obviously more efficient than the others at detecting potential disturbance in an urban adolescent population. Indeed, different questionnaires seemed to highlight particular facets of functioning. The Newcastle Adolescent Questionnaire proved to be a reliable and valid screening measure.

Several teacher questionnaires measure facets of the behaviour of children and adolescents. Some of these questionnaires are standardised for specific stages of development, e.g. the Devereux Scale (Spivack *et al.*, 1967), while others are used across the whole school age-range with only minor attempts to standardise for age (Rutter, 1967; Conners, 1969). The Rutter B2 Scale consists of 26 items and gives rise to two sub-scales, neurotic and antisocial behaviour, while the Conners Scale consists of 39 items and generates four sub-scales: inattentive-passive; passivity; anxiety; and hyperactivity. The Behaviour Problem Checklist (Quay & Peterson, 1979) consists of 55 items and also generates four factors. Although this instrument has been well validated, especially in the younger age-group, the factors show a bias toward detecting conduct and personality problems, so that the checklist may miss a portion of the distressed adolescents in the community (Place & Kolvin, in preparation). One of the few scales which is specific for adolescence is the Adolescent Life Assessment Checklist (Gleser *et al.*, 1977), but this 40-item scale has only been validated for selected samples (Boyle & Jones, 1985) and so its value as a community screening instrument is unclear.

As part of a larger study, it was decided to develop a questionnaire which would be very brief and would focus on the mid-adolescent phase of development. Using clinical experience and published reports, we considered a large number of behavioural features for inclusion. Seven were eventually chosen because they often give rise to concern in educational settings: they include a sense of confusion, excessive day-dreaming, lability of mood and emotion, lack of confidence, and being easily upset in the face of educational failure (see Figure 1). In addition it was decided to include three more global ratings. The first

reflects more widespread neurotic behaviour, the second antisocial behaviour. As a final item we decided to include educational difficulties which were serious enough to warrant special attention. We suspected that a positive rating on this item would prove a useful indicator not only of general educational difficulties but also of personal and interpersonal problems.

The aim of the current paper is to explore the use of this brief questionnaire in an adolescent sample drawn from the community. Our primary hypothesis was that adolescents detected as being potentially disturbed using a 'multiple-criterion screening' technique (described below in the 'Method' section) would prove to have significantly high scores on this brief questionnaire. This would in effect provide a form of validation of the questionnaire. A second aim was to study its sensitivity and specificity compared with a psychiatric interview. Finally, it was planned to compare the scores obtained on this instrument with the scores obtained on longer screening questionnaires by the same population.

### Method

The 4th and 5th-year pupils of four large comprehensive schools agreed to participate in the study: 1446 adolescents formed the population for this phase of the study, and they were screened using a 'multiple-criterion screen' method. This technique uses the number of extreme scores that an individual obtains on a variety of instruments as a measure of potential disturbance. The detailed methodology may be found elsewhere (Place *et al.*, 1985), but in brief the screen consisted of:

- (a) Rutter B2 Scale (Rutter, 1967, 1973)
- (b) a sociometric assessment technique (MacMillan *et al.*, 1978)

*Newcastle Adolescent Behaviour Questionnaire*

Name of Child ..... School.....

Date of Birth ..... Form .....

Below are a series of questions describing behaviour often seen in adolescents. If the description applies to this youth please mark the third column. If it does not apply please mark in the first column. If it applies to a lesser degree please put a cross in the box in column two.

Please consider only recent behaviour, i.e. in the last 6 months.

	No	Somewhat	Yes	For Official Use Only
1. Excessive day dreaming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Often looks puzzled or confused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Over-emotional when checked or frustrated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Lacks confidence in educational situations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Tends to vary in mood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Easily upset when cannot master educational tasks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Reserved and uncommunicative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

It would be most helpful if you could make an overall assessment as to whether this youth:

	No	Somewhat	Yes	For Official Use Only
is nervous, i.e. emotional, tense, worried and anxious, to the extent of impeding him in his school work or relationships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
shows problem behaviour, i.e. difficult and disruptive behaviour, disobedient, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
has educational difficulties which merit special attention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- (c) Junior Eysenck Personality Inventory (Eysenck, 1965)  
 (d) General Health Questionnaire (Goldberg, 1972)  
 (e) Rutter Malaise Inventory (Rutter *et al*, 1970).

(a) *Rutter B2 Scale* This is a teacher-report instrument which has been used in many settings, both in this country (Ryle & MacDonald, 1977; Rutter, 1973; Wolkind, 1974; MacMillan *et al*, 1980) and abroad (Minde, 1975; Zimmermann-Tansella *et al*, 1978). The instrument was designed for the 6-13 age-group (Rutter, 1967), for whom it has an inter-rater reliability of 0.72 and test-retest reliability of 0.89. Little validation work has been carried out on the instrument in the adolescent age-group.

(b) *Sociometry* This technique uses the responses of peers to gauge an individual's social standing. It allows identification of those youths who are likely to be avoided by classmates (rejection) and those who would not be chosen as friends (isolation). It has been shown to be a rapid way of gathering useful information from younger children (MacMillan *et al*, 1978) with a test-retest reliability of 0.87

for rejection and 0.72 for isolation (tests carried out 4-5 weeks apart), but its effectiveness with adolescents seems less clear (Place & Kolvin, in preparation).

(c) *Self-Report* The Junior Eysenck Personality Inventory (Eysenck, 1965) was used as the main item of self-report, although previous work with 11-year-olds has shown that it tends to select a rather unique population compared with other measures (MacMillan *et al*, 1980). The neuroticism scale is reported to have a split-half reliability of 0.84 and a test-retest reliability of 0.77 (Eysenck, 1965).

In addition, 605 youths completed the 30-item General Health Questionnaire (Goldberg, 1972) and 1237 completed the Rutter Malaise Inventory, which has a test-retest reliability of 0.91 (Rutter *et al*, 1970). In an effort to reduce the workload on teachers and also to minimise the disruption of classes for the pupils, all were tested, but not everyone with all the tests. This also ensured that the exercise remained within the resources of the research team.

The next step was to compare the results obtained from the questionnaire with the data obtained from a psychiatric interview. For these purposes a sub-sample of 82 youths

TABLE I  
Correlation of items in the Newcastle Adolescent Behaviour Questionnaire. All correlations are significant at the 0.001 level, except for \* ( $P < 0.05$ )

	A	B	C	D	E	F	G	H	I	J	K
A. Educational difficulties	1.0										
B. Disruptive and disobedient	0.16	1.0									
C. Tense, worried and anxious	0.43	0.14	1.0								
D. Reserved and uncommunicative	0.25	0.06*	0.39	1.0							
E. Easily upset	0.29	0.37	0.42	0.2	1.0						
F. Variable mood	0.17	0.58	0.27	0.11	0.53	1.0					
G. Lacks confidence	0.44	0.18	0.44	0.43	0.47	0.32	1.0				
H. Overemotional	0.22	0.58	0.28	0.08	0.58	0.68	0.29	1.0			
I. Puzzled	0.42	0.13	0.38	0.38	0.38	0.26	0.66	0.25	1.0		
J. Day dreams	0.36	0.19	0.39	0.43	0.29	0.28	0.52	0.25	0.61	1.0	
K. Total Score	0.56	0.51	0.63	0.54	0.69	0.65	0.76	0.64	0.72	0.69	1.0

was selected on a random basis from the youths who had an extreme score on at least one of the four screening instruments. The percentage levels used for cut-off were varied to ensure the inclusion of at least 20 individuals on each major criterion, but because of overlap the number selected on each was approximately 30. In addition, 50 adolescents were selected at random from the youths who had no extreme scores on any of the measures. All of these 132 youths were given a structured psychiatric interview, the interviewer being unaware of the questionnaire results. Psychiatric disturbance was rated as 'absent', 'dubious', 'moderate' or 'marked' and these ratings were then further combined to produce two groups—'no significant disturbance' (absent/dubious) and 'significant disturbance' (moderate/marked).

For comparison, 30 adolescents who were resident in a medium-stay psychiatric unit were assessed with the instruments mentioned above, with the exception of the sociometric technique. Additional data were obtained from the teachers of this in-patient group to allow a study of the Newcastle Questionnaire's inter-rater and test-retest reliabilities to be undertaken: two of the teachers were asked to rate the youths' behaviour at the time of the survey and again one month later.

### Results

It is important to establish the reliability and validity of any new behavioural measure, and this may be done in various ways.

#### Reliability

##### (a) Inter-rater reliability

It is necessary to confirm that different teachers will give similar ratings for similar behaviour. Greater agreement occurs when the instructions on the use of the instrument are carefully presented in a standard form, and it was for this reason that we chose to follow the presentation used by

Rutter in his teacher questionnaire (Rutter, 1967). To test reliability we used the 30 adolescent patients in a medium-stay psychiatric unit: community surveys yield small numbers of potentially disturbed youths and so the correlations found may be influenced by a lack of spread in the data. The questionnaire's inter-rater reliability was found to be 0.78 ( $n = 30$ ), which is satisfactory for this kind of brief instrument.

##### (b) Test-Retest reliability

This was established using the same 30 in-patients as for inter-rater reliability: they were reassessed after one month. Such exercises, which are essential to test the reliability of an instrument, are often bedevilled by the variation of behaviour which occurs over time. Nevertheless, the correlation value obtained (0.82) is an acceptable one for this type of screening instrument.

##### (c) Split-half reliability

After pairing items, one member of the pair was assigned randomly to either the first or second half of the questionnaire. A Pearson correlation of 0.84 was obtained between these halves, and applying the Spearman Brown Prophecy formula the split-half reliability was calculated at 0.91. This is a highly satisfactory level of reliability for a scale of 10 items, particularly as one of the items is not intended to measure behaviour directly.

To confirm this finding, the split-half reliability exercise was repeated without the more global assessments being included. This yielded a Pearson correlation coefficient of 0.85, which is almost identical to the value obtained for the full scale.

In addition, the means and standard deviations of the split-halves were calculated, and proved to be almost identical, indicating that they are equivalent measures of behaviour.

TABLE II  
Validation: mean scores on the Newcastle Adolescent Behaviour Questionnaire for three different groups selected using other previously validated screening instruments

	A Controls (screen -)	B Screen +	C Psychiatric in-patients
<i>n</i>	1144	302	30
Mean	1.99	3.98	6.87
s.d.	2.73	3.94	3.35
Significance ( <i>t</i> -test)	A vs B <i>t</i> = 10.2 <i>P</i> < 0.0001		B vs C <i>t</i> = 3.88 <i>P</i> < 0.001
	A vs C <i>t</i> = 7.91 <i>P</i> < 0.0001		

### Validity

#### (a) Content validity

Content validity is usually taken to mean that the items reflect the type of behaviour that the instrument is intended to measure. We believe the items chosen for this instrument have face validity. However, their relationship to each other and to the total score was explored. As Table I shows, although some of the correlations are reasonably high and some are low, all the correlations are positive. The average inter-correlation of the items was 0.34, and this suggests that the items are measuring similar aspects of behaviour. Cronbach has developed a formula for assessing the internal consistency of a questionnaire (Bynner, 1969), which provides a coefficient based on the average correlation between items and the number of items used. For an instrument to have valid internal consistency the Cronbach coefficient should be more than 0.5. The present scale gives a coefficient of 0.69, which is satisfactory.

#### (b) Concurrent validity

This compares the scores obtained on the scale with an external criterion, either information obtained from a clinical interview or scores on other instruments which are known to be valid. We explored our instrument's ability to distinguish between three groups of youths:

**A. Controls** Youths who did not emerge as high scorers on a number of previously validated instruments of child disturbance, i.e. youths who were 'screen negative'.

**B. Screen positives** Youths with a number of extreme scores on previously validated instruments designed to detect disturbed behaviour.

**C. Psychiatric cases** Adolescents whose difficulties were so severe as to not permit them to survive in the community and so warranted admission to a psychiatric unit on an in-patient basis. These youths could be expected to be more disturbed than the screen-positive adolescents who were surviving in the community.

Table II demonstrates a highly significant step-by-step increase in mean score on the questionnaire as we move from group A (the least disturbed) to group C (the most disturbed).

Table III gives teachers' ratings on the individual questions for each of these three groups, and confirms that all the questions distinguished between the controls and the potentially disturbed subjects. Such a finding adds further to the conclusion that the Newcastle Adolescent Behaviour Questionnaire is a valid instrument for an urban adolescent population.

#### (c) Sensitivity, specificity and efficiency

Cut-off scores of 3, 4, 5 and 6 on the Newcastle Questionnaire were explored in relation to the findings on the psychiatric assessment, and it was established that a score of 4 or more proved to be optimal for identifying potential cases in this particular population. Such an exploration tests the validity of the questionnaire at each particular cut-off score: it checks the proportion of 'correct' cases the instrument detects against the proportion it misses (*sensitivity*); the proportion of true negatives it correctly identifies (*specificity*); and the proportion of correct selection in the sample as a whole (*efficiency*).

The method of selecting the interview sample did not permit direct inferences about the total study population. The number of disturbed adolescents in the total sample was estimated from the proportion of disturbed youths found at each score in the interview sample. This estimate was then used to explore the performance of the questionnaire when the optimum cut-off was used (Table IV). Our method of calculating sensitivity, specificity and efficiency is detailed elsewhere (Place *et al.*, 1985). The results reveal that the instrument is capable of selecting potential cases of adolescent disturbance with a moderate degree of accuracy, but is far less efficient than the Behaviour Screening Instrument developed by Richman & Graham (1971) for pre-schoolers, particularly in terms of specificity, and less efficient than scales developed for adult populations (Goldberg, 1972).

#### Comparison with other measures

In order to establish the comparative efficiency of this measure compared with other available scales which might be considered appropriate for screening adolescents, all the instruments were compared using their estimated performance in the study population when the optimum cut-off was used: the sensitivity, specificity and misclassification rate were established for each instrument. This is a rather crude analysis, but it showed that no instrument was clearly superior to the others. The sociometry scales showed a low sensitivity (isolation 30%, rejection 19%); highest were the Malaise Inventory (61%) and General Health Question-

TABLE III  
Validation: percentage of high scores on each question of the Newcastle Adolescent Behaviour for each of three different groups (selected with previously validated screening instruments)

	A	B	C	Significance		
	Screen (n = 1144)	Screen + (n = 302)	Psychiatric in-patients (n = 30)	P < 0.05	P < 0.01	P < 0.001
Day dreams	2.9	11.3	8.9			AvB
Puzzled and confused	4.7	12.6	15.6	AvC		AvB
Over-emotional	0.9	10.6	11.1			AvC AvB
Lacks confidence	4.9	20.2	17.8	AvC		AvB
Variable mood	2.3	19.5	11.1	AvC		AvB
Easily upset	1.2	9.6	13.3			AvC AvB
Reserved and uncommunicative	4.5	12.3	15.6		AvC	AvB
Tense, worried and anxious	0.9	9.3	8.9			AvC AvB
Disruptive and disobedient	0.9	15.6	6.7			AvC AvB
Educational difficulties	0.09	7.0	6.7			AvC AvB

TABLE IV  
Efficiency of the Newcastle Adolescent Behaviour Questionnaire in identifying cases in an adolescent population, compared with the estimated prevalence of disturbance. For these calculations the optimum cut-off score was used (4 or above)

	n	Sensitivity	Specificity	Misclassification	$\kappa$
Total population	1446	51%	82%	26%	0.32
Boys	745	57%	83%	23%	0.38
Girls	701	46%	80%	30%	0.26

naire (57%). The Newcastle scale fell in-between, with 51%. Although the Rutter B2 Scale was not very sensitive (32%), it had a lower misclassification rate (22%) than the Newcastle Scale (26%). The performance of the Rutter B2 Scale in this population shows that some of the items were not as sensitive at this age-level as they had been in the younger age-group.

The Newcastle Questionnaire scores were correlated with the scores obtained on the other measures, and for comparison the exercise was repeated for the Rutter B2 Scale (Table V). The significant correlations are with the peer-report measures and they are low; but they are of the same order as those obtained by the Rutter B2 Scale. The inter-correlation of the Newcastle Adolescent Questionnaire and the Rutter B2 Scale gives a reasonably high coefficient (0.69) which suggests that the two scales have much in common. There is a moderate but statistically significant correlation between the Newcastle Questionnaire and the multiple-criterion screen score. It is lower than the correlation between the multiple-criterion screen score and the B2 Scale, but the B2 Scale contributes to the screening procedure and so a high correlation is to be expected.

Comparing the Newcastle and Rutter B2 Scales (both

teacher-report instruments) with questionnaires which explore other facets of functioning, we can clearly see that correlation between some of the scales is poor. It has been pointed out elsewhere (MacMillan *et al*, 1980) that the Junior Eysenck PI neuroticism scale has little in common with other screening measures for 11-year-old subjects, and it is perhaps not surprising to find a similar result in adolescence. However, all the self-report inventories correlate well with each other, and they show equal validity when compared with a psychiatrist's assessment (Place & Kolvin, in preparation). If we assume that these inventories are tapping internalised distress, there seems little doubt that the potential cases that they select are likely to be distinct from those who have shown behaviour problems at school. This distinction between internalised distress and externalised problems of conduct is not new (Rutter *et al*, 1970), but cannot be tapped in adolescence unless specific questionnaires are used. If this is not done, any survey tends to reflect objective behaviour problems and show minimal internal climate problems. With such little overlap between scales which measure such functions, the importance of using both sources of information is reaffirmed.

The Newcastle scale appears to be more sensitive for boys

TABLE V  
Correlations of Newcastle Adolescent Behaviour Questionnaire and Rutter B2 Scale with other measures of adolescent behaviour

	Newcastle Rutter B2	
Multiple-criterion screen	0.33*	0.55*
<i>Sociometry</i> <sup>1</sup>		
Isolation	0.19*	0.21*
Rejection	0.19*	0.20*
Rutter Malaise Inventory <sup>2</sup>	0.03	0.04
General Health Questionnaire <sup>2</sup>	0.02	0.03
<i>Junior Eysenck Personality Inventory</i> <sup>2</sup>		
Neuroticism	0.03	0.03
Extroversion	0.01	0.02
Rutter B2 Scale <sup>3</sup>	0.69*	—

1. Peer report

2. Self-report

3. Teacher-assessed

\* $P < 0.0001$  ( $n = 1446$ )

than for girls, a finding which is supported by the higher kappa score (Table IV). When considered with the above findings this suggests the hypothesis that behaviour scales may be more accurate at detecting disturbed boys while self-report measures may be more accurate at detecting disturbed girls. Such a theory is discussed in more detail elsewhere (Place & Kolvin, in preparation).

### Discussion

New rating scales seem to appear frequently, and disappear almost as quickly. Snaith (1981) has urged that existing measures be refined and improved rather than perpetuating the development of more and more new instruments. This is a most appropriate aspiration because the response to a rating scale must be considered in the light of various factors.

'Overall Agreement Set' (Cronbach, 1942) identifies respondents' desire to give the answer that is expected or at least which appears less critical of themselves. This may be a particular problem in school-based research which uses the teachers as a source of information, when the results may be used to assess a school's ability to educate and control (Rutter *et al*, 1979; Rutter 1980). Despite this limitation many surveys have depended upon school-based research (e.g. Rutter *et al*, 1970; Offer, 1969; Coleman, 1974; Newman 1979) because, as Lewine *et al* (1978) have pointed out, "teachers are capable of making sophisticated and valuable observations

regarding the psychological adjustment of their students". In addition, this type of research is popular with epidemiologists because the number of 'missing cases' is lower than with other methods of identifying a population: this advantage may be reduced in an adolescent population, however, because absentee rates tend to be high in this age-group (Fogelman *et al*, 1980).

In screening populations it is usual to seek a brief measure which is reliable and valid and of low cost (Boyle & Jones, 1985). Such a measure is already available for pre-school children (BSQ: Richman & Graham, 1971). The Rutter B2 Scale is a well-established instrument for use with school children but is not specific for adolescents. The Newcastle Adolescent Behaviour Questionnaire has been developed in an attempt to fill this gap, but its advantages over the Rutter B2 Scale, other than brevity, have yet to be established. However, its very brevity makes it suitable for investigating large populations.

One area of concern is the high misclassification rate which is obtained when this instrument's scores are compared with the findings at psychiatric interview. However, the other instruments tested show a similar range of misclassification values. Although some authors report minimal misclassification rates (Goldberg, 1972), others have obtained rates similar to those reported here when studying urban community populations (Tarnopolsky *et al*, 1979).

The lack of correlation between the self-report measures and the teacher-assessed scales could reflect a lack of validity in the new scale or could indicate that the self-rating scales are measuring different components of behaviour. Since the lack of correlation is similar for the well-validated Rutter B2 Scale, and with evidence of the validity of the self-report measures being available, it seems likely that the different types of instrument are detecting different components of behaviour.

Goldberg (1972) has pointed out that when screening a population research workers assume that psychiatric disturbance is evenly distributed throughout the population in varying degrees of severity. An individual's score on a questionnaire may then be seen as a quantitative estimate of that individual's degree of potential disturbance. These assumptions allow the researcher to decide upon a limit score, or cut-off, such that subjects with scores above it have a high probability of showing disturbance. However, like most screening instruments, such a questionnaire is not intended to make diagnostic distinctions.

Our results indicate that no single screening instrument is superior for detecting potential disturbance in adolescence. Indeed, different questionnaires

seem to highlight particular facets of functioning, which are not necessarily detected by the others. Behavioural measures must sample both internal and external qualities if they are to fully explore disturbance in an adolescent population. The Newcastle

Adolescent Questionnaire, although very brief, has proved to be almost as reliable and as valid as most of the other screening instruments available for this age-group.

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