MEDICAL PRACTICE

Contemporary Themes

A trial speech screening test for school entrants

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Abstract

An objective, low-cost means of screening school entrant children for speech disorders was designed, and speech therapists evaluated the doctors' screening results. In a field trial comprising 438 children, an accuracy rate of 92% was reported, with a referral rate by doctors of 14%, and speech therapists subsequently observing or treating 10%. The trial showed also the effects on accuracy rates of setting different pass levels.

Introduction

A need has often been expressed for a simple, inexpensive but effective means of screening the speech and language of children at the time of the school entrant medical examination. In Cheshire this examination is carried out preschool—that is, at 4·6-4·9 years. Any such test should be unambiguous, suitable for operation by all medical staff, whether experienced or inexperienced, free of observer error, and accurate.

One version of such a scheme for children aged 5-6 years has been reported by Radway and Norfolk[1]; this was described as using picture cards. In Cheshire for this younger age group it was agreed that objects would produce more satisfactory results. A possible screening system was devised and subjected to a trial. It requires children to state the names of a selection of familiar objects and also assesses their ability to produce a spontaneous sentence containing at least two verbs.

The accuracy of this pattern of screening, and the indication of the therapeutic needs of the children, was subsequently analysed by an independent assessment of each child by a speech therapist, using Renfrew, Reynell, and other appropriate tests including the Edinburgh Articulation Test.

The scheme was implemented on a trial basis by five doctor/speech therapist pairs; the doctors' skills and experience varied considerably.

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Method

The 12 different objects included in the test were carefully selected not only for their familiarity but also for their balanced phonemic values which children at a 4½-year developmental age could be expected to possess (table I). For two of these phonemic elements it was difficult to produce objects that could have no synonyms, and therefore two alternative items were made available to cover the leading "W" and "L" elements. Permissible omissions at this age level are indicated by parentheses in the list.

TABLE I—*List of test items*

Penny	Teapo(t)	Knife	Bu(s)
Cup	Duck	Chair	Fish
Wheel / Watch	Lett(er) / Light	Gun	(S)ock

The second part of the doctor's screening test was the spontaneous sentence. This had to contain two verbs and be understandable; within the sentence individual articulation errors could be discounted. One of the verbs could be implied rather than expressed if this was within the normal vernacular grammar of the locality.

The doctor completed a form for each child indicating (*a*) the child's score for the 12-word item, (*b*) whether or not the child uttered a spontaneous understandable two-verb sentence, and (*c*) whether or not the parent expressed concern about the child's speech or language. He carried out a full audiogram if the child failed any part of the screening test, a free field test of hearing being permissible only if it was not possible to do pure tone audiometry.

Each child in the survey was seen and assessed by a speech therapist

using the Renfrew and Reynell Tests, and the Edinburgh Articulation Test if this was indicated. The speech therapist then recorded her opinion on the child's speech and language, independently of the doctor's results. Thus the screening results were objectively assessed.

The pilot study population comprised 438 children representing the total population attending for school entrant medical examinations by the doctors concerned during the study period but excluding any already attending a speech therapist.

Results

Table II shows an analysis of the outcome of the screening by the doctor, identifying separately the results of each aspect of the tests. He passed 85·8% of children on all items, with the articulation element being failed twice as often as the spontaneous sentence. Table III shows a correlation of the medical results with the speech therapists' assessment. Of the 376 children shown in table II as being passed by the doctor, only nine (2·4%) were selected for observation by the speech therapist and none for therapy. Of the 62 children failed by the doctor, the speech therapist continued to observe or treat 36 (58·1%). The summary at the foot of table III shows that the articulation test element of the screening produced a larger number of true referrals but had a higher false-positive rate when compared with the spontaneous sentence element.

TABLE II—*Outcome of doctor's screening*

Result of screening	No of cases (n = 438)
Passed screening (both articulation and spontaneous sentence)	376 (85·8%)
Failed articulation only	32 (7·3%)
Failed spontaneous sentence only	5 (1·1%)
Failed both parts of screening	25 (5·7%)
Total failing articulation above	57 (13·0%)
Total failing spontaneous sentence above	30 (6·8%)

TABLE III—*Correlation of results of doctor's screening with speech therapist's assessment*

Results of medical screening:	Results of speech therapy evaluation		
	Failed by speech therapist		Passed by speech therapist (n = 393)
	Taken on for therapy (n = 14)	Taken on for observation (n = 31)	
Passed screening	–	9	367
Failed articulation only	4	10	18
Failed spontaneous sentence only	–	2	3
Failed both parts of screening	10	10	5
Total failing articulation above	14	20	23
Total failing spontaneous sentence above	10	12	8

ASSESSMENT OF THE ARTICULATION TEST

As the screening scheme was designed as a trial, it was arranged to analyse the value of each word in the articulation test. The results obtained showed that each of the objects and words produced satisfactory results. None of the elements had an unsatisfactory high number of children failing to pronounce the word, and in no case was there excessive disagreement between the result of the words and the overall result produced by the speech therapist. We therefore suggest that the original pattern of words selected needs no modification.

SIGNIFICANCE OF THE ARTICULATION TEST

An assessment was then made as to the number of children who were shown to be satisfactory by the speech therapist, but who failed a small number of words in the articulation test. There was close agreement with the speech therapist in the case of children passing all word patterns, and of the children failing only one word, most were considered satisfactory by the speech therapist. On the other hand, children failing four or more words were very likely also to fail the Renfrew Test.

SIGNIFICANCE OF THE SPONTANEOUS SENTENCE

When originally included in the screening package, there was total support for the need for a spontaneous sentence, but at the same time concern was expressed that this was a subjective item. The results in table III show that the spontaneous sentence has a lower pick-up rate than the articulation test, and that few children failed only the spontaneous sentence. On the other hand, of the children failing articulation the accuracy of the referrals was much higher where it was confirmed by the child also failing the spontaneous sentence. It therefore would appear that the main value of the spontaneous sentence is its use in conjunction with the articulation test. Additionally, however, the spontaneous sentence was considered to be important for detecting the small minority of children who have difficulty with connected speech though not with articulation.

SIGNIFICANCE OF PARENTAL CONCERN

When doctors carried out the screening they asked the parent whether they had any concern about the child's speech or language. Parental concern was expressed in less than half of the cases that failed screening, and similarly with those who failed the Renfrew Test. Where parental concern was expressed, however, this was found in most cases to be justified. It therefore appears that parental concern is a fairly reliable indicator but is not sensitive enough to be the only detector of problems.

VARIATION BETWEEN OBSERVER PAIRS

Five doctor/speech therapist pairs participated in the trial scheme, each pair assessing between 81 and 96 cases. Agreement between the two members of each pair ranged between 85·2% and 97·6% (using the full criteria of the child having to pass both elements of the screening test to be considered satisfactory by the doctor). As the doctors in the trial purposely had different amounts of experience in this branch of the service, and included other than British-born doctors, this analysis indicates the suitability of the screening scheme for all users.

ACCEPTABILITY OF THE SCREENING TEST

Doctors reported full co-operation by children in carrying out this screening test, since to a child the naming of objects on a table was a fully acceptable play activity. Indeed, the doctors reported that the test was in many cases valuable in inducing a child to relax at the beginning of the medical examination. As a result, it was reported that carrying out the test appeared to make little difference to the duration of a session of preschool examinations, as the amount of time taken was on average balanced out by the resulting co-operation by the child. Similarly, the test was acceptable to parents. The items used to compile sets of test material were of low cost, and in general readily available from retail sources.

Discussion

Table III indicates that of 438 children assessed in the trial scheme, 45 (10·3%) were taken on by the speech therapist either for therapy or observation, the type of management depending partly on resources as well as being related to the nature of the presenting condition. The prevalence of problems detected is lower than that reported in Surrey in 1971 by Radway and Norfolk[1] but double the figure quoted for school entrant children in the Quirk Report on Speech Therapy Services,[2] which was related to children needing treatment.

The pilot scheme as originally designed required that a child should pass all 12-word patterns of the articulation test and also pass the spontaneous sentence. The results, however, were recorded in such a way as to assess the effect of setting different pass levels. Table IV indicates the referral rates and accuracy that would have been produced by seven different possible screening standards using the same test material: specificity in all versions exceeded 93%.

TABLE IV—*Potential pick-up rates of different possible versions of screening tests*

Hypothetical screening standard	Results that would ensue				Referral rate a+b / a+b+c+d	Sensitivity a / a+c	Predictive value a / a+b	Accuracy a+d / a+b+c+d
	Genuine failure (true-positive) (a)	Would fail incorrectly (false-positive) (b)	Would pass incorrectly (false-negative) (c)	Genuine pass (true-negative) (d)				
Pass full 12 elements of articulation test only	34	23	11	370	13·0%	75·6%	59·7%	92·2%
Pass any 10 elements of articulation test only	21	5	24	388	5·9%	46·7%	80·8%	93·4%
Pass spontaneous sentence only	22	8	23	385	6·9%	48·9%	73·3%	92·9%
Pass *either* 12 elements of articulation *or* spontaneous sentence	20	7	25	386	6·2%	44·4%	74·1%	92·7%
Pass *either* 10 elements of articulation *or* spontaneous sentence	16	3	29	390	4·3%	35·6%	84·2%	92·7%
Pass both 12 elements of articulation and spontaneous sentence	36	26	9	367	14·2%	80·0%	58·1%	92·0%
Pass both 10 elements of articulation and spontaneous sentence	28	13	17	380	9·4%	62·2%	68·3%	93·2%

We therefore conclude that this trial is effective in enabling doctors of very varied experience to select those children needing speech therapy treatment or observation. In view of the considerable benefit in treating such conditions early the screening test seems an invaluable addition to the school entrant medical examination, introducing a high level of objectivity into a hitherto largely subjective field. We now intend to conduct a further study with particular reference to an analysis of the children selected for observation and the time taken by doctor and speech therapist in their respective assessments.

We wish to acknowledge the part played by Mrs R Eaton, Miss J Wren, and Mrs C Thompson, speech therapists, in designing this scheme, and the help provided by the clinicians who carried out the pilot study and Miss H Lees who assisted with the data analysis. The views expressed in this report are ours, and do not necessarily represent the position of Cheshire Area Health Authority.

References

[1] Radway CJ, Norfolk MB. The Surrey Speech Screening Test. *The Medical Officer* 1971;**125**:185-7.
[2] Department of Education and Science. *Speech Therapy Services*. London: HMSO, 1972.

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Occasional Review

The quality of life after cardiac surgery

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Abstract

A follow-up study to assess the quality of life after cardiac surgery was begun in 1973. The results, for a total of 383 patients followed up for a maximum of 44 months after surgery, showed an overall improvement in all aspects of life for most patients.

Introduction

In June 1973 a five-year follow-up study of the quality of life after cardiac surgery in adults was started at the Wessex Cardiothoracic Centre in Southampton. This was a joint undertaking between the cardiac surgical unit and the department of community medicine of Southampton University Medical School, and was designed to give more accurate information on the postoperative careers of our patients than could be expected from routine outpatient follow-up. The purpose of the study was to define the benefit of cardiac surgery to the individual, the family, and the community,[1] and the study was complementary to a costing exercise for open-heart surgery carried out in 1976.[2]

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Patients and methods

Initially 200 patients were included in the study,[1] all aged over 20 and on the waiting list for cardiac surgery. Names were taken as they appeared on the list, in consecutive order, starting in June 1973 and ending when a total of 200 had been reached. During 1975 and 1976 a further 200 patients were enrolled in a similar manner. Five patients died while on the waiting list, and 12 were followed up elsewhere. The remaining 383 patients (201 men, 182 women) were aged from 21 to 74.

Some 302 patients had valve replacements (some with other procedures), 39 coronary artery bypass grafts, 23 repair of septal defects, and 19 had miscellaneous operations. A total of 145 patients have been followed up for 44 months. Follow-up of the remainder has been for shorter periods.

The research assistant interviewed the patients at set intervals, using a standardised questionnaire. The first interview after referral took place in the patient's home. The second interview was on