fact, the greatest worry should be fear of puncturing one or other posterior inferior cerebellar artery. In the normal person both arteries lie just off the midline and thus should not be at risk. Furthermore, as a rule they do not dip as low as the needle point when it is placed in the cisterna magna. In a small minority of normal subjects, however, these arteries may not only come to the midline but may dip below the level of the occipito-atlantal junction. Thus to be absolutely safe one should puncture between the atlas and the axis (where there is ample space between the spinous processes). There has been the occasional rare disaster of puncturing a posterior inferior cerebral artery at the occipito-atlantal junction.

As already indicated, the puncture at the C1/C2 level should be conducted under television control. The patient is placed in the true lateral position, the head flexed and supported by small pillows. The table should be tilted about 10° feet-down to enable the contrast substance to flow freely distally in the subarachnoid space in a similar manner to the lumbar technique described earlier. The same type of needle, three-way tap, tubing, and syringe are used.

If a complete block is present, about 3 ml of contrast substance is quite enough. After its introduction the needle is

immediately removed, as in these cases there is no question of withdrawing the contrast substance at the end of the examination. The patient is next tilted feet-down as far as the vertical if necessary. If he is paraplegic or tetraplegic and cannot support his own weight a suitable harness is used to support the crutch.

A complete block is easily seen on the television screen and appropriate radiographs are taken showing the upper level of the lesion. After this the patient is maintained in at least a semi-erect position to allow gravity to enable the contrast substance to seep past in part or in toto. After about half an hour he is re-examined and usually no seepage has occurred. The patient is then returned to the ward with instructions to remain in the semi or even quarter erect position (so far as the spine is concerned).

He should then be re-examined next day when the clinical picture allows such a delay. In most cases it will be found that some of the oil has now seeped past the block and collected at the lower end of the theca at the level of the first sacral vertebra.

The final procedure is to tilt the patient head-downwards in order to run the distal fraction of the oil up to the block. Radiographs are then taken and by synthesizing the two sets of pictures the extent of the lesion can be accurately defined.

Medical Education

Significance of Literacy in the Performance of Students in the First Year of the Nottingham Medical Course

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Summary

The "literacy" of a fresh intake of medical students as measured by standardized vocabulary tests has been measured and correlated with examination performance during the first year. Although most students lacked an upper social class upbringing, medical parents, or a classical education, the group performed to a high standard in the tests, comparable with an English honours intake. On the other hand, there appears to be no correlation between an extensive working vocabulary and the ability to perform well in any aspect of the course, apart from the community studies. A qualification in Latin confers no advantage at all on the aspiring doctor.

Introduction and Methods

Those who hold the view that medicine is a learned profession composed of men and women of broad culture must be saddened by the alarms raised at regular intervals in the medical press. It is said that as a learned profession medicine is on the decline; this is ascribed to a number of factors, such as the disappearance of the classics in education, the admission to medical schools of the lower social classes, and the general incompetence of

modern educational methods, which, it is claimed, have produced a semi-literate generation from which the candidates for the profession have to be drawn. One such claim¹ led us to put the matter to the test.

"Literate," "semi-literate," and "illiterate" are terms that do not lend themselves easily to scientific definition and measurement, but we believe that it is possible to measure with accuracy one major aspect of literacy—namely, the width and quality of a student's reading. We have worked on the hypothesis that the greater the number of words to which a person can give an acceptable meaning and which he can use accurately in context the wider his reading is likely to have been. We have discounted the possibility that a person can accumulate a large working vocabulary solely through conversation or exposure to media such as television. We realize that by employing vocabulary tests to measure width of reading we are not measuring linguistic expression in its full sense and are unable so far to evaluate scientifically complaints that modern students are unable to express themselves in writing—that is, are unable to handle the *syntax* of the language.²

TESTS EMPLOYED

The tests consisted of six basic word groups indicating the following vocabulary levels: (1) 6,000 words, likely to be reached between 8 and 9 years of age; (2) 12,000 words, likely to be reached between 11 and 12 years; (3) 18,000 words, likely to be reached between 15 and 16 years; (4) 24,000 words, likely to be reached in full-time education between 17 and 18 years; (5) 30,000 words, likely to be reached during the years of higher education; and (6) 36,000 or more words, words occurring so rarely that few people can ascribe a meaning to them.

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In allocating words to these groups use was made of a number of vocabulary studies both of children's speech and of adult reading matter.³⁻⁵ Frequency of occurrence in print was a factor determining the selection of words, but from group 4 onwards it was also necessary to take into account the existence of specialist vocabularies. These vocabulary groups were tested on school pupils, students in colleges of education and further education, university students, and adults, both British-born and immigrant, and standardized on the results.

To read a popular newspaper in its entirety a vocabulary of some 18,000 words is required. A university lecturer would be expected to have a vocabulary of some 27,000 words *excluding* his specialist vocabulary. For the university entrants studied in this paper we regarded 20,000-22,000 words as a satisfactory average level of literacy. The phrase "more literate" used to describe students hereafter refers to levels of over 23,000 words.

GROUPS TESTED

The standardized vocabulary tests were administered to 40 first-year medical students in the first month of the autumn term together with a "control" group of 40 first-year English honours students. Apart from six mature students in each group the undergraduates were fresh from school. In addition each student provided details of previous performances in Latin A or O level examinations. Details of the tests are given in the Appendix. The results obtained from the arts students were anonymous; the medical students identified their papers with their class code number, which was later matched with their similarly coded records to ensure anonymity.

The following hypotheses were tested statistically: (1) that an arts faculty honours English intake is likely to be more widely-read than a medical intake; (2) that the better-read student is likely to perform significantly well in certain types of examination—for example, the essay—and in handling certain classes of learning material; and (3) that a student with Latin is likely to be at an advantage in assimilating the basic vocabulary of medicine and that this in turn should be reflected in his examination performance.

EXAMINATION RESULTS ANALYSED

The examination for the first two years of the Nottingham medical course is split into a series of intermittent assessments which occur towards the beginning and end of terms. A wide variety of assessment methods is employed, ranging from traditional essays, practicals, and vivas to computer-marked YES/NO exams, completion tests, extended essays, project assessments, etc. Information during these years is presented and tested in three main themes—A, the cell; B, man; and C, the community. The first term deals mainly with introductory courses, information handling, cell and tissue biology, and social medicine; more traditional "anatomy" and "physiology" do not appear until the system courses start in the second term. We compared the ranking of literacy scores with examination performances over the first three terms, with examination types—for example, all essays—and with individual examinations.

Results

Arts versus Medical Intake.—Both the medical and the arts students had a mean vocabulary level of some 21,000-22,000 words, and there was no significant difference (Student's *t* test) between the results. The medical students' results ranged from 18,000 to 26,000 words.

Level of Literacy and Examination Performance.—The more widely-read student had no advantage over his fellows in term 1 or in the first year as a whole. He did not perform significantly better than his colleagues in essays, orals, or indeed in any type of examination. On the other hand, we found that he handled the information required for theme C, the community

aspect, significantly better than his fellows. This raised performance was obvious by term 2 ($P = 0.27$) and for the year as a whole ($P = 0.46$). Curiously enough his literacy did not help him in oral examinations, even in his theme C vivas, where his performance did not differ from that of his colleagues.

Latin, Learning, and Literacy.—The χ^2 test showed that a student qualified in Latin at any level did no better than his "modern" fellows. He gained no advantage in any term of his first year, in any theme, or in any type of examination. Even traditional anatomical "spotter" examinations did not favour the classically educated student. Using the same technique we found no correlation between the possession of qualifications in Latin and the ability to perform well in vocabulary tests in either group tested.

Discussion

The important finding in this study is, we think, that the medical students examined had very acceptable levels of vocabulary, indicative of a wide range of previous reading, and that these levels compared favourably with those found in an English honours intake in the same university. Before considering the implications of this we have to examine the possibility that these particular medical students had been selected either for literacy or for backgrounds conducive to the development of this characteristic. But the idea of carrying out this study came to us almost a year after the students had been selected, and therefore the idea could not have influenced the selection process itself.

The 40 medical students were selected after interview by one of four independent panels of selectors, and although academic ability, personality, motivation, and general interests were taken into account, width of reading was not a *primary* deciding factor in selection. In fact, 16 students did not even mention reading as a specific interest on their application forms. A further factor shown by this study is the lack of correlation between oral performance and width of reading. In other words, if literacy *had* been a primary deciding factor in the minds of the selectors they would not necessarily have selected the group we eventually studied.

The nature of the educational and family backgrounds of our students is also of interest, especially when compared with the Todd Report's 1966 findings for first-year students in provincial universities.⁶ Only 25% of our students had attended private, independent, or direct-grant schools, compared with 42% in 1966, and only 45% had parents in social classes I and II, compared with 67% in 1966. Furthermore, the group could boast of only one medical parent (14.0% in 1966).

Hence we have apparently admitted recruits to the profession who lack the apparently essential benefits of an upper social class upbringing, medical parentage, and a classical education. Yet these students still possess a measurably high degree of literacy in the sense of a working familiarity with the general vocabulary of literature.

From this investigation we cannot so far answer the charge² that such students nevertheless cannot handle the language or express themselves in writing, but in turn we question whether such a charge can be substantiated by impressions gained from the results of present examination systems. Surely to write a series of genuine essays on unseen circumscribed subjects, each within some 40 minutes, is a severe test of literary ability in any sense of the word?

Finally, we are obliged to refute with some sadness the hypothesis that an education in Latin is an advantage in gaining and understanding a wide vocabulary in English or in assimilating the basic jargon of the medical profession. Undoubtedly English and medical education have been adapted to compensate for the loss of the classics—and we take comfort from the conclusions drawn from previous investigations by a distinguished professor of economics:

"I know there are solid arguments advanced in favour of the classics. I often hear them from my colleagues. My friend the

Professor of Greek tells me that he truly believes the classics have made him what he is. This is a very grave statement, if well founded. Indeed, I have heard the same argument from a great many Latin and Greek scholars. They all claim, with some heat, that Latin and Greek have practically made them what they are. This damaging charge against the classics should not be too readily accepted. In my opinion some of these men would have been what they are, no matter what they were."—STEPHEN LEACOCK.

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Appendix

SAMPLE TEST

Level 1	Level 2	Level 3
1. capital	11. curfew	21. colossus
2. centipede	12. gully	22. grapple
3. diary	13. ignorance	23. humiliate
4. hibernate	14. laborious	24. invertebrate
5. howl	15. merriment	25. lunar
6. ledge	16. obtainable	26. mosaic
7. medium	17. ravenous	27. penance
8. pioneer	18. rivet	28. sieve
9. wobble	19. temporary	29. tenacious
10. yap	20. valueless	30. venomous

Level 4	Level 5	Level 6
31. capillary	41. atropine	51. chiasmus
32. genre	42. diacritical	52. dipnoad
33. heterodox	43. heterodyne	53. glaucous
34. jurisdiction	44. hubris	54. ichthyornis
35. lapidary	45. jalousie	55. laniary
36. matrix	46. lumen	56. primage
37. onus	47. metempsychosis	57. reremouse
38. parvenu	48. pointillist	58. scantling
39. prehensile	49. provenance	59. thanatology
40. sirocco	50. semantic	60. ulema

Instructions.—No time limit is set. The student is requested to tick any word to which he considers he cannot give a definite meaning. When 10 such words have been ticked the student stops and writes down the meaning of the last five words recognized. The accuracy of the meanings given are checked and the results adjusted. Each student performs three such tests; the mean result is interpreted in accordance with the scale indicated in the text.

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A New Look at Infectious Diseases

Gastroenteritis of Infancy

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Gastroenteritis of infancy is a common infectious disease affecting children under the age of 2 years. The disease is more common in the industrial North than in the South of England, but on average one baby in every ten will be seen each year by a general practitioner on account of gastroenteritis. Of the cases seen at home nine out of ten are successfully managed there and only one requires admission to hospital.¹

Causes

Fully breast-fed babies are almost completely immune, and children above the age of 2 years are rarely affected in an outbreak in a family or institution. In a minority of cases specific agglutinable *Escherichia coli* are isolated from the faeces; about a dozen pathogenic types are recognized, including 026, 055,

086, 0111, 0114, 0119, 0125, and 0126. These organisms act as pathogens only in this single disease and are otherwise indistinguishable from "ordinary" coliforms. The main cause of the disease may be the temporary clinical upset which accompanies the acquisition of new strains of coliform organisms in the gut of the young child. A similar change in coliform pattern is one of the causes of "travellers' diarrhoea,"² so it may be that the baby's trip to the local nursery is the bacteriological equivalent of the adult's trip to Egypt.

Clinical Diagnosis and Assessment

The initial diagnosis and assessment of gastroenteritis is clinical and includes the answers to four questions. Firstly, are the symptoms and signs found compatible with simple gastroenteritis or does any feature suggest more serious intra-abdominal disease? Secondly, are there any signs of infection in other systems such as ears, throat, chest, or nervous system to which the diarrhoea and vomiting might be secondary? Thirdly, is there any degree of dehydration present? Fourthly, is the mother capable of carrying out the necessary management of fluids or is further help necessary? These questions will now be considered in rather more detail.

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