

Some Factors Affecting Undergraduate Academic Achievement

R. C. A. HUNTER, M.D., C.M.,* *Kingston, Ont.*

ABSTRACT

A related series of studies, most of which have been published previously, is described. These studies form a coherent whole and demonstrate the development of a theme, namely, the identification of factors in the student and the medical school which, in their interaction, influenced undergraduate academic performance at one medical school. In the population concerned no reliable positive or negative correlation could be demonstrated between cognitive ability and academic performance, when the former was measured by the Wechsler Adult Intelligence Scale and the Medical College Admission Test, and the latter by the current assessment methods of the medical school. Other factors, including socioeconomic and individual personality variables, are at present under investigation as to their effect on academic achievement. It is emphasized that the results of these studies cannot be regarded as valid for all medical schools, but the methods employed can be generalized.

SOMMAIRE

L'article décrit une série d'études dont la plupart ont été publiées auparavant. Ces études forment un ensemble cohérent et ont en commun le thème de préciser les facteurs relatifs à l'étudiant et à la faculté de médecine qui, par leur interaction, ont influencé les réalisations académiques des étudiants non diplômés inscrits à une faculté de médecine donnée. Dans le cas en question, il n'a pas été possible de mettre en évidence une corrélation quelconque entre la capacité d'apprendre et les résultats académiques, le premier élément étant évalué par les tests W.A.I.S. et M.C.A.T. (échelle de Wechsler pour l'intelligence de l'adulte et Test d'admission de la faculté de médecine): le second étant basé sur les dernières méthodes d'évaluation de la faculté. On évalue actuellement l'influence que peuvent avoir sur les résultats académiques des facteurs différents, dont certaines variables socio-économiques et relatives à la personnalité de l'individu. On souligne que les résultats de ces études ne peuvent s'appliquer pour toutes les facultés de médecine bien que les méthodes employées puissent être généralisées.

THE following account draws together in summary form a number of studies carried out at McGill University and published over the past five years. It is my hope that presenting this work in one convenient capsule will stimulate further an already burgeoning interest on the part of Canadian medical schools in the problems of medical education. By tradition and training doctors of medicine are ever ready and willing to exercise a healthy self-scrutiny. This is one of the strengths of the profession. Similarly, it is a measure of McGill's robustness and broad-mindedness that as a medical school it has fostered a program of deliberate self-analysis.

In 1959, psychiatric counselling facilities were established for medical undergraduates at McGill University. A number of acute emotional disturbances had affected senior medical students and acted as a catalyst for the creation of a service of this kind for which there had been a long-felt need. The service was initiated in the form of a research project, the purpose of which was to survey the state of mental health of medical undergraduates. It became obvious, however, that con-

siderations of student mental health were inseparable from the major life task to which the students were committed, namely, the acquisition of a medical degree. We found ourselves confronted weekly by students who, while they were possessed of measurably adequate intelligence and aptitude, were performing academically in a way which seemed to bear little relationship to their cognitive abilities. We formed a clinical impression that I.Q. had little to do with grades and that a number of other variables, such as ambition, motivation, neurotic facilitation or handicap, and reactions to current life problems like marital or economic worries, seemed to play a major determining role in school performance.

Another clinical observation that we felt to be valid at this time was the feeling that, after some experience, we could surprisingly often predict whether a student was a high or low achiever. Linked with this was a third belief, gleaned from a variety of sources including the literature, that medical schools differ appreciably one from the other in a number of highly important ways, many of which are unavowed and implicit rather than explicit. At about this time Nicholas Malleon¹ published his important paper in the *British Medi-*

*Professor and Head, Department of Psychiatry, Queen's University, Kingston, Ontario.

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cal Journal on "Operational Research in the University". This paper along with others from the Harvard group, notably Farnsworth,² Funkenstein,³ and Erikson,⁴ and the views of George Miller⁵ at the University of Illinois helped us to crystallize our thoughts and permitted us to frame a number of hypotheses which we then set about testing. We employed as our basic assumption the idea that the vicissitudes of academic achievement in the Faculty of Medicine at McGill were resultants of the interaction between the University and the students, that is, that they each affected each other in a positive or negative manner along a number of directions. We therefore do not presume to offer our findings as valid for all medical schools, although we do think that the methods we have used can be generalized. Furthermore, recommendations were made at the annual meeting of the Association of American Medical Colleges in 1958 that since medical schools are known to vary with respect to student selection policies, curriculum structure, teaching methods, avowed and unavowed educational goals, etc., work of this kind is necessary if we are to be able to clarify not only the differences between medical schools but also the communality of characteristics that exist between them.

As a first step we set about describing the average medical student at McGill and the best performing medical student at McGill, and attempted to compare the two. The composite picture of the average medical student at McGill University emerged as follows:^{*6, 7}

(a) He would be Caucasian, Christian, male, single and aged 21 at the time of his admission to medical school.

(b) He would be half-American, half-Canadian.

(c) His father would probably be in a professional or managerial occupation.

(d) He would have had four years of science education before entering medicine.

(e) The chances would be three to two that he had taken his premedical training at a university other than McGill.

(f) He would be of superior intelligence.

The same statistical techniques revealed the best performing student in the following light:

(a) He would be Caucasian, Jewish-Canadian and in his early twenties.

(b) He would have taken his premedical training at McGill University, having honoured in a medical science.

(c) He probably would have obtained a high score on the Medical College Admission Test (MCAT) verbal scale, and even more likely a high score on the MCAT science scale.

(d) His father would have been born in a non-English speaking country and would not be engaged in a professional career.

(e) He would have obtained first-class standing in at least three of the five compulsory premedical courses. He would probably have achieved first-class standing in organic chemistry, physics and introductory chemistry.

Taking an impressionistic view of this best performing student we characterized him as a "striver", hardworking, serious, goal-directed in somewhat straitened economic circumstances and lacking in many of the advantages of traditional family professionalism and status. Having obtained his undergraduate training at McGill University, he would have taken as many science subjects as possible or certainly more than the bare prerequisites.

Having established some kind of socioacademic picture of the average and successful student, we then compared a group of psychiatrically counselled medical students with an appropriately selected control group of their peers who had no history of emotional disturbance and who had never required psychiatric counselling at McGill or elsewhere. We demonstrated that students who differed significantly in academic rank in the first year of medicine at McGill are essentially similar on measures of intelligence and aptitude. In scholastically successful undergraduates who did not require counselling no significant relation was revealed between intelligence and aptitude scores on the one hand and academic standing on the other. In students requiring psychiatric counselling, however, significant correlations between these variables were obtained at a low level of significance. Since intelligence and aptitude scores were similar in the two groups, the effect of intelligence and aptitude on the academic performance of these students appeared secondary to that of other influencing factors.⁸

Scrutiny of the counselled group, which at this time was made up of 58 students seen by the University Student Mental Health Service plus 15 seen by the Student Health Service and four seen in private therapy by University psychiatrists, revealed that no importance could be attached to whether they were referred or self-referred, what year of the course they were in, their age or marital status. We did find, however, that roughly one-third sought help for emotional problems antedating enrolment in the medical school and two-thirds for problems postdating entry. The former group possessed diagnoses indicative of chronicity, while the latter group were largely reactive and acute with regard to the clinical characteristics of their relevant psychiatric disorders. This latter reactive group were again subdivided into three groups: (1) those whose problems were related to the medical school milieu or medical subjects of study, (2) those

*This was in 1959. Since that time changes in admission policies have produced differences in the average student, but not, however, in the characteristics that affect our findings.

whose problems were related to university, but not specifically to the medical school, and (3) those whose problems were primarily sexual, appearing during attendance at medical school. This classification permitted further hypotheses based on answers to the question, "What problems do students in this university encounter while pursuing this course of study?"—a question which provided a take-off point for much of the work subsequently done in the area of student mental health.⁹

Since we already know that our counselled group performed less satisfactorily academically than their non-counselled brethren, the case material on 70 consecutive counselled students was analyzed, with particular emphasis on study difficulties. Forty-three of these students unequivocally revealed such difficulties. They were divided into an "intrinsic group", in whom the study difficulties arose primarily from problems within the student himself, and a "reactive group" in whom difficulties with school work were seen as the result of unfavourable environmental situations. In the intrinsic group we recognized motivational problems, emotional inhibitions of studying, and neurotic interference with study habits, while in the reactive group a variety of difficulties occurring in the student's life, some of which were related to the medical school, were distinguished.¹⁰

At this point we were able to make a number of generalizations about McGill's medical school and its students, the average ones, the so-called over-achievers, and the so-called under-achievers; the mental health of the students and some of the relationships between cognitive factors, mental health, the medical school environment and academic performance.

Several significant gaps existed in our knowledge, however. One of these concerned the student who failed outright or withdrew for other reasons. Studying these cases presented certain methodological difficulties. First, when a student fails or withdraws he is not usually in a mood conducive to lending himself to investigation, and secondly, McGill students are relatively highly selected even for the first year and there is, as a result, a relatively low failure rate, which makes only a small number of students available for study at the best. Actually after five years of work, and with the Dean's co-operation in referring all dropouts, only relatively few have actually come to see us, and there were fewer than 20 psychiatrically studied and psychologically tested cases in our files. Accordingly, we carried out an analysis of the records of dropouts, a method which leaves a lot to be desired since the records, although factual and accurate as far as they go, are scanty in precisely the kind of data in which we were most interested. The analysis of the available data, however, yielded the following findings. Over a

10-year interval 138 students withdrew from the Faculty of Medicine. This is a failure rate of 9% to 10%. Of these, 82 (60%) were retired because of academic failure. They may be described as being older than the average medical student presently attending the university. More of them have Canadian- or American-born parents, and the substantial majority come from professional homes; relatively few took their premedical training at McGill and on the average these students had a lesser number of premedical science course credits; their aptitude ratings in premedical grades were consistently lower than those of current medical undergraduates, but not significantly so. Fifty-six (40%) left school for non-academic reasons. Like the academic failure group, they may be described as being older than current students; a majority came from professional homes and attended premedical colleges other than those at McGill; on the whole they took less science courses than either current or failing students. Their MCAT scores, however, are slightly higher than, or similar to, those of current students. Except in physics they do not differ in premedical achievement from medical students.¹¹

These findings were notable insofar as they confirmed point by point, in a reciprocal way, the findings derived from going at the problem from the other direction, namely, that of the successful student.

A second important gap in our knowledge was occasioned by the lack of any reliable information concerning correlations between undergraduate performance as rated by the McGill Assessments System and achievement after graduation as measured by any indices whatsoever. As is well known, work by Gottheil and Michael,¹² Bull,¹³ Gaier,¹⁴ Miller⁵ and Gough, Hall and Harris¹⁵ has cast serious and justifiable doubt on the ability of conventional examination and grading practices to measure anything but the ability of the student to pass examinations. Examinations certainly must be held in the gravest suspicion as indices of future performance of any kind. It is interesting to note in this connection that as long ago as 1869 James Paget, at St. Bartholomew's Hospital in London, was so concerned with these very issues that he undertook a follow-up study of 1000 medical graduates from that hospital.¹⁶ In doing so he was attempting to answer a question which had been asked by a then famous surgical anatomist called Mr. Abernathy, who on entering the anatomical theatre for one of his introductory lectures looked around at the crowd of pupils and exclaimed as if with painful doubt "God help you all, what will become of you?" In an attempt, therefore, to provide more modern answers to Mr. Abernathy's query and to test the predictive value of the McGill rating system, the graduates of the class of 1944 were canvassed by questionnaire 15 years after their graduation.

Categories of functioning most commonly expected to be associated with achievement in the clinical, teaching, research, and administrative fields were tapped by a series of 33 items, all requiring factual objective answers, the questions being of the closed-end variety wherever possible. A further refinement was added to the questionnaire by the inclusion of a clearly separated satisfaction-dissatisfaction rating scale, which permitted the respondent to rate subjective feelings of satisfaction or dissatisfaction about various aspects of his life, as distinct from the objective variables in the first section. Comparison with undergraduate academic achievement measures was carried out by means of statistical correlational techniques. In this study, with our method and the indices we employed, no statistically significant correlations, either positive or negative, were demonstrated between academic performance as a medical student and achievement as a physician 15 years after graduation on either or both of the rating scales (i.e. the subjective or the objective one). We concluded that the degree of excellence or its opposite in a given medical pursuit was dependent on variables not readily amenable to quantification and statistical manipulation and which may or may not be reflected in undergraduate achievement.¹⁷ A 1964 study by Price, Taylor and Jacobsen¹⁸ from the University of Utah of 500 medical graduates also "failed to support the assumption that medical school performance, as measured by grade-point averages, is positively related to on-the-job performance in medical practice".

The third gap in our knowledge has been how to apply our findings to the problem of student selection in a reliable and replicable way. At present a study is under way which, it is hoped, will provide some answers in this important but rather controversial and up to now rather arid area. This is called the "High-Achiever, Low-Achiever" study and some 40 threesomes of students have been selected from the second, third and fourth years of medical school. One member of each matched threesome is in the upper third of the class, one from the middle third as a sort of control, and one from the lower third. Within each threesome the intellectual factor is held constant because the members of each threesome have been selected so that the students have the same average MCAT score within a 10-point range on the MCAT (± 2 points on the Wechsler Adult Intelligence Scale). Since the validity of our findings with regard to intelligence and aptitude only applies to those cognitive variables measured by the MCAT and the WAIS, the students are being subjected to other test situations, some of which have been evolved locally, and some of which have been borrowed from other sources. These test situations are regarded as simulating the actual

processes involved in studying medicine. Thus, Drs. Lohrenz and Schwartzman are attempting to measure perseverance, motivation, reading speed, characteristics of memory, learning characteristics (rote *vs.* synthetic) etc. In addition, each student is being seen in a structured interview situation by a psychiatrically trained interviewer, and a data sheet with a scoring convention is filled out by that interviewer. The interview is tape-recorded, passed over to another assessor, blind and without identification data. The second assessor then scores the interview on a second but identical score sheet, yielding a satisfactory reliability coefficient. The tests and interview are designed to cover scores of variables which previous work indicates to be of possible significance in differentiating between high and low achievers. It is the intention to analyze the complete data, extract the discriminating factors which differentiate between the two groups, embody them into a test form, apply this to the incoming freshmen and predict their relative performance levels. These predictions will then be checked against the actual outcome after the examinations in the spring of 1965 and thus will represent an attempt to validate the method and the test.

Nor was the Medical School itself exempted from study, although a good deal of information about it has been implied in the student studies. Teaching practices in the Departments of Medicine and Surgery in the clinical years have been studied and described by Dr. Hilliard Jason,¹⁹ now of the University of Rochester Medical School. This study did its best to avoid making value judgments but described without undue bias and in a way that permits comparisons of the prevailing teaching techniques with those of other medical schools. Its findings also indicated a number of potentially important inconsistencies which reside principally in the differences between what the teachers say and what they do. In addition, some direct work was done on examination procedures in the clinical years in the Department of Medicine but this has not been published. Suffice it to say in this connection that some aspects of the present examination system probably lack the discriminatory power which has been traditionally ascribed to them.

The ultimate purpose of such work as has been done can be described as obtaining a better understanding of the educational processes at work in the medical school, and some evaluation of them in terms of their effect upon the student in his undergraduate and postgraduate medical life. It is hoped that some improvement of selection procedures will result, thereby reducing dropout and failure rates.

If I were asked to summarize my impression of the work that has been done up to date, I can do

no better than to refer once again to Paget who said nearly a hundred years ago: "Of course in watching and reflecting on the careers of the pupils, I have come to some strong beliefs on subjects of medical education. Only one will I set down, which by some hundred of personal recollections, in remembering those with whom I was year after year associated, and whom it was my duty to study, nothing appears more certain than that the personal character, the very nature, the will of each student, had far greater force in determining his career, than any other helps or hindrances whatever. All my recollections would lead me to tell that every student may draw from his daily life, a very likely forecast of his life in practice, for it shall depend on himself a hundredfold more than on circumstances. The time and place, the work to be done, and its responsibilities will change, but the man will be the same, insofar as he may change himself."

FORM OF THE UNIVERSITY TEACHING HOSPITAL

The physical facilities in university teaching hospitals of the future will continue to revolve around the needs of individual patients. The number of beds planned in a particular hospital should be related to the educational needs of the university. All too often educational programs are swamped by the responsibilities of the faculty for supervision of patient care. The increasing emphasis on the ambulatory patient will encourage self-help and greater reliance on the patient and his family for care of long-term or chronic illness. As the families are involved to a greater extent, the hospital will inevitably become closer to the community and a more integral part of it. Community patterns of medical practice in delivering health care are changing. The teaching hospital has a responsibility for the training not only of professional people but of service personnel in the practical aspects of patient care.

The university teaching hospital may serve as the location of several community resources. The diagnostic laboratories will become more and more a community resource as instrumentation becomes increasingly sophisticated. The technical skill required to maintain the new laboratory instruments and to institute quality control checks makes it likely that more laboratory tests will be done for practicing physicians in the hospital and fewer in the doctor's office.

In some communities the tendency for physicians' offices increasingly to cluster around the hospital, or even to be built in it, will accelerate this trend toward its use as a medical community resource. Already, many teaching hospitals are serving as the home of the rehabilitation facility for the community and for the area blood bank.

As the concept of the clinical research center and its approach to improvement in patient care is more widely adopted, the university teaching hospital will become the center for development and integration into practice of new techniques such as cineradiography, enzyme chemistry, and other tests which adapt themselves to expensive and complicated equipment. The greater use of university teaching hospital facilities will permit more wide-spread programs of early detection and prevention of disease.

Research has assumed an increasingly important role in the educational process. The laboratories for fundamental basic research may be located in either a medical sciences building or the university teaching hospital. The location of the laboratories will depend upon the site available and the educational program and administrative relationships of the school and hospital. Clinical research increasingly is

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requiring physiologic procedure rooms to study the function of particular organ systems; the development of heart stations and pulmonary function laboratories are examples. The development of clinical research centers as specialized facilities relating laboratories and procedure rooms to hospital beds is one solution to the need. In the design of new university teaching hospitals multiple clinical research facilities should be provided immediately adjacent to patient rooms on each clinical service or ward.

The university teaching hospital should conduct research in patient care. The development of new patterns of care, both in the institution and in the community, should be explored. Experimental facilities should be built to implement studies on the use of automated monitoring equipment and on different administrative groupings of personnel with particular emphasis on using greater numbers of non-physician workers to improve the understanding of instructions for care.

Experimental nursing homes should be built in conjunction with university teaching hospitals. This level of long-term care has been largely overlooked as a function of complete health services. The lessons learned could be applied to better design of housing for aged and retired persons who need some medical supervision, though usually at less frequent intervals and by less highly trained individuals than would be found in a nursing home.

Future hospitals should provide more facilities for teaching and observation of behavior from a broad biologic point of view. A facility is needed to teach students the range of variability in normal behavior both as a factor of age and of the stress of daily living in a highly competitive society. Such a resource could include a nursery school and living space set up for observation just as playrooms are now used. More emphasis will be given in the future to study of the normal physiologic variations in human beings so that the alterations occurring in disease states can be better interpreted. More emphasis will be given to normal patterns and the range of variation in human growth and development. Facilities should be provided so that students can recognize that mental retardation, for example, shades off from the normal by gradual degrees. The effects of mental retardation on the patients' and families' reaction to normal living patterns as well as to illness should be studied. More facilities should be designed to permit study and understanding of the emotional overlay which commonly affects all illnesses in patients. The nursing home and elements of the home in the teaching hospital will help serve this purpose, particularly in the study of older patients, who are increasing rapidly in number.—G. T. Harrell, *J. Med. Educ.*, 39: 1017, 1964.