A VALIDATION OF SOME PREDICTIVE CRITERIA USED BY DENTAL FACULTY ADMISSIONS

by

WILLIAM WINSTON WOOD

B.D.Sc., Melbourne University, 1966
D.D.S., University of Toronto, 1970

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Department of Higher Education

The University of British Columbia
2075 Wesbrook Place
Vancouver, Canada
V6T 1W5

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ABSTRACT

Admission into Faculties of Dentistry is based heavily on overall preprofessional average, prerequisite average and Dental Aptitude Test scores amongst other criteria. The purpose of this study was to investigate the predictive validity of these variables on success in the Faculty of Dentistry at the University of British Columbia. This success was measured by standardized grades for individual courses, and year averages which were the sum of course grades weighted for unit value. A further measure of success in psychomotor skills was dentoform technique grades for second year Fixed Prosthodontics and Operative Dentistry.

Data were collected from 312 students admitted to the Faculty of Dentistry at The University of British Columbia between 1969 and 1976. The data were organized into files on which multiple regression analyses were performed.

The results of these analyses showed that overall preprofessional average significantly correlated .17 to .29 with eight individual first and second year course grades. Overall average also significantly correlated .36 with first year average and .29 with second year average.

Prerequisite average did not correlate significantly with any of the criteria studied.

Of the DAT scores, the consistently significant correlations were between DAT Manual Average and five individual course grades. These were second, third and fourth year Restorative Dentistry (.36, .21 and .20 respectively), Oral Biology Occlusion .31 and Biochemistry 300 at .27. DAT Manual Average correlated .20 with second year average and .30 with third year average grades. Manual Average also showed significant correlations with preclinical technique grades, .38 with Fixed Prosthodontics and .32 with Operative.

Chalk Carving showed consistently significant correlations ranging from .20 to .40 with five individual course grades. These were second and third year Restorative Dentistry, Oral Biology Occlusion, Biochemistry and Anatomy (Neuro). Chalk Carving correlated .24 with third year average, .31 with Fixed Prosthodontics and .33 with Operative technique grades.

DAT academic average correlated significantly with five individual course grades in the first two years. It also correlated .20 with first year average.

The remaining DAT subscores showed few significant

correlations which could be used in the selection of students for admission to the Faculty of Dentistry.

It is recommended that overall average and chalk carving should be given equal emphasis in the selection process and that Manual Average may be disregarded if the chalk carving score is available.

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CHAPTER 1

INTRODUCTION

The high cost of professional education in universities and the high attrition rate in professional schools in the early part of the twentieth century led to an increasing demand for accountability by government and university administrators. Dental schools in North America are among the most expensive of the professional faculties and the pressure on dental admissions' procedures led to the introduction of batteries of aptitude tests aimed at predicting success in dental schools. The first schools to develop aptitude tests were the University of Iowa in 1927 and Columbia and New York Universities in 1929. These tests were experimental and were regarded with some skepticism by dental educators. This attitude was reflected by Cowling (1943), who complained that "...in this statistical age every quality must be measured; so it seems. Executives frequently are forced to assent to the pronouncements of standardized tests in preference to their own judgment."

Although most dental schools relied heavily on predental grades as a basis for selection, few statistical studies of their predictive validity had been undertaken prior to 1940. An exception was McGrath, who analyzed data at the University of Buffalo in alternate classes from 1932 to 1940. McGrath's finding of a significant correlation of .54 between predental grades and total grade point average in dental school is considerably higher than typical results reported today. Lower correlations found in current studies reflect the impact of improved admissions procedures which restrict the range of abilities of those who apply to dental schools. This restriction occurs through selection of better students and rejection of less competent students. The standard deviation of the total group, taken as a measure of range of ability, will be greater than the standard deviation of the selected group on that same ability, whether it be academic or psychomotor. Thus, the more selection by ability occurs, the lower will be correlation coefficients between that ability and any criterion variable where the sample is the selected group (Gulliksen, 1950).

After several years of testing, the nationwide Dental Aptitude Testing Program was instituted in 1951, and since

that time dental schools in the U.S.A. have required applicants to take the Dental Aptitude Test (DAT). Subsequently, in 1966, the Canadian Dental Association took the responsibility for administering and evaluating the DAT program for Canada.

The nature of the DAT battery has changed over the years as reliability and validity studies have produced more detailed information. In the U.S.A. in 1977, five standardized tests were used from which eleven coded scores were derived (see Appendix A for coding method, Chapter II for nature of tests and scores). In Canada in 1977, there is the chalk carving test in addition to the tests used in the U.S.A. Also, the 16PF, a personality factors test has been administered on an experimental basis since 1974; the results of this test are, as yet, unpublished.

The American Dental Association Division of Education Measurements in 1975, surveyed dental schools to determine how they used information in admissions. Ninety-three per cent of schools rated the predental grade point average as "very important", the DAT was second with seventy-five per cent of schools rating it "very important". Fifty-four per cent rated personal interviews very highly.

Rating or recommendations by predental advisors were considered very important by thirty-nine per cent of schools. No other measure was of universal importance.

At what criteria are these predictors aiming? Success in dental school is the only criterion at present being considered, although one may look further to predict success of graduates. This latter area is as yet not researched. The main aim of dental schools is to train and educate dentists for practice in the community. Additionally, dental schools are charged with the responsibility for the preparation of individuals for graduate work leading to specialized practice, teaching and research. It is obvious that the dental curriculum has a broad spectrum of objectives. These may be summarized as follows:

1. Academic excellence in basic biological sciences and dental sciences.
2. Excellence in surgical techniques with hard and soft tissues and manipulation of dental materials.
3. Excellence in patient management.
4. Professionalism.

In Canada, these objectives are met to a greater or lesser degree in a four-year program of studies after a

three-year preprofessional basic science and arts program. The prediction of academic excellence and manual dexterity in the surgical areas is aimed at by both entering grade point average and DAT scores, while an attempt will be made in the future to predict success in the behavioural and professional areas by the newly employed 16PF. Some faculties in Canada are making an attempt to deal with behavioural and professional problems by the use of interviews. The 16PF and interview technique were not investigated in this study.

The Admissions Committee for the Faculty of Dentistry at The University of British Columbia has used overall preprofessional average, prerequisite average, Dental Aptitude Test scores, letters of reference and place of residence as criteria for selecting studies. The Committee is asked to assign seventy per cent of a candidate's score to overall average and prerequisite average, ten per cent to DAT, and the remaining twenty per cent for letters of reference and place of residence. It was the aim of this study to investigate the predictive average, and DAT on "success in the Faculty of Dentistry at The University of British Columbia" and to make specific recommendations regarding the use of these predictors.

These predictors were investigated for correlation with individual course grades, with year averages, and with an overall average for the four years of dental school. Selected predictors were investigated for correlation with purely technical grades as measures of perceptual and psychomotor abilities.

The study was conducted on a total of 312 students admitted to the Faculty of Dentistry between 1969 and 1976.

CHAPTER II

REVIEW OF THE LITERATURE

The literature reviewed in this study encompasses material related to the nature of the Dental Aptitude Test battery, factor analysis studies performed on the DAT as a whole, certain subtests of the battery, and predictive studies of the DAT and other academic criteria.

The nature of the DAT traces some of the history of the test battery to its present form. The DAT battery has been subjected to factor analysis in order to better describe just what is being measured. The predictive studies cover an overall approach correlating grade point average and DAT with success in dental school. Closer investigation into the perceptual and manual predictability of subtests of the DAT battery is done in this section.

It is generally the case that preprofessional grades correlate more highly with student performance in dental school than do DAT scores. This happens because the preprofessional grade point average represents a composite

of many test scores and grades received over a period of several years. Moreover, the preprofessional grade point average may reflect motivational factors which influence the academic performance of students in dental school. In contrast, DAT academic scores constitute a more unitary measure of achievement and scholastic aptitude than preprofessional grades.

Preprofessional grades have limitations which can be minimized by expressing them in terms of standardized scores. There are variations between institutions in grading procedures. There are even variations in grading procedures within institutions, and between the difficulty or level of courses within an institution. Thus, by taking preprofessional grades, DAT academic average, and other relevant variables into consideration, better predictions result.

The Dental Aptitude Test Battery

The Division of Educational Measurement of the American Dental Association in 1951, designed the DAT battery to include five types of predictive tests:

1. Mental level
2. Reading comprehension

3. Science comprehension
4. Visualization or space conception
5. Carving dexterity

In the U.S.A. in 1977, eleven coded scores from eight subtests were used. Carving dexterity was dropped and the Space Relations test became the Perceptual Motor Abilities test. The eleven coded scores were as follows:

A. QUANTITATIVE REASONING - presently the DAQVT (Dental Admission Quantitative-Verbal Test) is used to yield the "Quantitative Reasoning", Verbal Reasoning", and "Total Q + V" scores. Quantitative reasoning or numerical ability is the ability to reason with numbers, to manipulate numerical relationships, and to deal intelligently with quantitative materials.

B. VERBAL REASONING - linguistic ability or verbal reasoning is the ability to use and understand the meaning of words.

C. TOTAL Q + V - this score is a combination of the "Quantitative Reasoning" and the "Verbal Reasoning" scores. It is sometimes referred to as an "intelligence" score. This test has broad norms,

thus, it is possible to compare dental applicants with college populations in general. The comparisons are routinely made by the Admissions Testing Committee and any trends, either favourable or unfavourable, are reported immediately to the dental schools.

D. READING COMPREHENSION - a reading test is often a better predictor of scholastic success than is an intelligence or mental level test. This is an instrument to measure the applicant's ability to read, organize, analyze and comprehend new information. It is a measure of reading comprehension and is not a speed test.

E. BIOLOGY - this score is a measure of the applicant's knowledge of the elementary principles of biology and ability to apply these principles.

F. INORGANIC CHEMISTRY - this score is a measure of the applicant's knowledge of the most elementary principles of inorganic chemistry and ability to apply these principles.

G. ORGANIC CHEMISTRY - this score is a measure of the applicant's knowledge of the most elementary principles of organic chemistry and ability to

apply these principles.

H. TOTAL SCIENCE - the total science is a combination of E, F and G above and reflects the applicant's knowledge of factual information in biology and chemistry and ability to apply this information.

I. PMAT/2D - this score reflects the ability of the applicant to deal with and solve two dimensional perceptual problems.

J. PMAT/3D - this score measures the applicant's ability to deal with and solve three dimensional perceptual problems. Parts of the Space Relations test formerly included in the Dental Admission Test are also included in this subtest.

K. MANUAL AVERAGE - is a PMAT average of 2D and 3D.

In Canada in 1977, the coded scores derived are:

A. ACADEMIC AVERAGE - this is a combination of B, C, D, E below.

B. READING COMPREHENSION - as for the U.S.A.

C. BIOLOGY - as for the U.S.A.

D. INORGANIC CHEMISTRY - as for the U.S.A.

E. TOTAL SCIENCE - as for the U.S.A. using only biology and inorganic chemistry.

F. 2D - as for the U.S.A.

G. 3D - as for the U.S.A.

H. PMAT AVERAGE - average of 2D and 3D

I. CHALK CARVING - carving test using a knife, a rule and a piece of chalk. The criteria measured are lengths, sharp angles, flat planes, symmetry and similarity to the plan given.

K. MANUAL AVERAGE - a combination of 2D, 3D, and chalk carving weighted by chalk carving.

In the U.S.A., after twenty-five years of use, the chalk carving test was replaced by the PMAT in 1972. However, in Canada, the carving test was dropped for a short period between April 1972, and January 1975. It was then re-introduced for further validation studies since its discontinuance was accepted with mixed feelings by many schools.

Althoughhthe predictive validity of the PMAT and chalk carving test are similar, many people are not convinced that the chalk carving should be dropped. The lack of finger dexterity as a construct in the DAT battery has concerned many. Peterson (1974) speaks strongly in favour of the chalk carving test and claims it is partly responsible for the attrition rate dropping from as much

as fifty per cent in the middle 1940's to the national average of six per cent in 1973. He claims that the simple fact that a manual dexterity test is in the DAT battery adds to the applicant's conception that he is truly being tested in digital dexterity.

Graham (1972) showed that in five separate studies in four consecutive years, the PMAT (2-3D) and chalk carving tests performed equally in predicting success in technical performance in a sample of U.S.A. dental schools. The chalk carving test is an expensive test to administer, especially on large numbers of applicants whose carvings have to be mailed to evaluation centres with the possibility of damage. Even though the predictive validity of the two tests is the same, they do measure different constructs, as shown by Zullo (1971 b). However, the DAT Committee decided to discontinue the chalk carving test in the U.S.A.

Much emphasis is placed on perceptual and psychomotor tests mainly because of the paucity of information about these constructs for candidates entering dental school. Additionally, approximately half of the time spent in dental school is directly related to these skills.

Factor Analysis Studies

Several studies have shown similar results regarding the nature of the Dental Aptitude Test battery. A summary of these is shown in Table I.

Chen, et al. (1967) found that the carving ability test of the DAT measured a factor related to temperament rather than digital skill and that the entire DAT battery with the exception of quantitative and verbal reasoning and carving ability measures one common factor suggested to be cognitive facility.

Dworkin (1970) found that the results of a factor analysis of the thirteen scores of the DAT based on the data obtained from the class of 1966, at New York University yielded three factors:

1. Science factor with loadings by academic average, biology, chemistry, factual science, science application, total science and reading.
2. Manual factor with loadings by manual average, spatial relations and carving dexterity.
3. Intelligence factor with loadings by academic average, individual Scholastic and College Aptitude Test (SCAT) and reading.

These results do not vary greatly from those of the

TABLE I

FACTOR ANALYSIS - SUMMARY OF LITERATURE

Authors and Year of Study	Sample Studied	Variables	Extraction/ Transformation	Results
1. Padshadley, Chen and Shrock, 1967	72 juniors University of California 1965-66	DAT subtests	principle component/na*	1.Temperament factor loaded by carving test. 2.Cognitive facility loaded by remainder of DAT.
2. Dworkin, 1970	123 students 1966 class of New York School of Dentistry	13 scores of DAT	na/varimax	1.Science factor, loadings by biology, chemistry, factual science, science application, total science, reading. 2.Manual factor, loadings by manual average, spatial relations, carving dexterity.
3. Zullo, 1971	111 students 1968 Freshmen University of Pittsburgh	7 subtests of DAT	principle component/ varimax	1.Verbal science 2.Abstract reasoning 3.Carving dexterity.
4. Zullo, 1971	100 students 1968-69 University of Pittsburgh	Perceptual and motor abilities test	principle component/ varimax	1.Spatial relations loaded on different factory from PMAT and PMAT did not load on dexterity factors.
5. Full and Foley, 1971	119 Freshmen University of Iowa, 1967, 1968	DAT averages Dental Anatomy Predental GPA 1st year GPA	principle component/ varimax	1.Academic potential 2.Dexterity and space 3.Anatomy survival
6. Graham, 1974	1163 randomly sampled from 1973 U.S. DAT Program.	PMAT items	operator choice/ varimax	1.Block design 2.Length of lines 3.3D drawing 4.Space relations 5.Sequence of ideas 6.Passing object through hole.

* n/a - information not stated

test designers. Reading comprehension is not a separate factor but does load on both science and intelligence. In addition, the manual factor appears to represent both visualization and space conception and carving dexterity. Dworkin suggested further investigation of these findings.

Zullo (1971 a) looked at only the seven subtests of the DAT used at that time and found similarly that only three factors emerged. He labelled these:

1. Verbal science
2. Abstract reasoning
3. Carving dexterity.

Zullo (1971 b) factor-analyzed perceptual and motor abilities in dental students and produced findings in conflict with Chen, et al. He suggested that his definition of manual dexterity may be different from that of Chen whose tests for manual skills are more generally accepted. Zullo observed from his analysis that the Spatial Relations test of the DAT loaded on a different spatial relations factor from the Perceptual Motor Ability Test (PMAT). Further, the PMAT loaded on the spatial relations factor but not on any of the dexterity factors extracted. Further evidence that the PMAT does not measure any motor ability in a positive fashion is

offered by the tests that loaded on the Bipolar Factor. This factor is so named because of the opposite polarity of the factors loading on it. The finger dexterity test and to a lesser degree the chalk carving test loaded positively on this factor, whereas the PMAT loaded negatively.

Full and Foley (1971) performed a factor analysis on nine variables including three DAT averages, dental anatomy grades, predental, and first year grade point averages (GPA). They found three factors emerging which they labelled academic potential, dexterity and space, and anatomy survival. The anatomy survival, as would be expected, relates highly to first year grade point average, but not to academic potential. This indicates that performance in first year is related to anatomy but not to the predictive tests.

Graham (1974) performed a factor analysis of the items of the PMAT (which now included space relations as part of the test) and observed that six separate factors emerged:

1. Block design
2. Length of lines
3. 3D drawing

TABLE II

PREDICTION STUDIES - SUMMARY OF LITERATURE

	Authors and Year of Study	Sample Studied	Predictor Variables	Criterion Variables	Main Findings
1.	Parkin, 1958	Nationwide population of freshmen dental students	Preprof. GPA, DAT academic and technique average, other DAT subtest scores	Freshmen technique GPA, theory GPA	Correlation of .34 between preprof. grades and freshmen theory grades; correlation of .28 between DAT academic average and freshmen theory grades.
2.	Tocchini, Endy, Thomassen and Reinke, 1961	148 students from graduating classes 1955-57 at University of the Pacific	Age, prereq. GPA, preprof. GPA	Four-year dental school GPA	Correlation not reported; preprof. GPA best predictor, then DAT academic average and marital status.
3.	DeRevere, 1961	University of Pennsylvania class of 1959	Space relations, chalk carving.	1st year operative technique grades, 4th year clinical operative grades	.37 and .39 between 1st year operative and chalk carving and space relations respectively. .26 between 4th year clinic and chalk carving. Same for space relations.
4.	Hood, 1963.	300 freshmen dental students admitted from 1957-60 at University of Minnesota	Preprof. GPA, DAT academic average, other DAT subtests, preprof. college attended. Years of preprof. education age, marital status.	Freshmen overall theory grades, technique grade point average.	.49 correlation between preprof. GPA and overall dental GPA; .51 correlation between preprof. GPA and theory GPA in dental school; correlation of .36 and .33 between DAT academic average and overall and theory GPA in dental school.

TABLE II - continued

PREDICTION STUDIES - SUMMARY OF LITERATURE

	Authors and Year of Study	Sample Studied	Predictor Variables	Criterion Variables	Main Findings
5.	Manhold and Manhold, 1965	1960-64 graduating class at Seton Hall. Total number of students ranged from 134 to 140.	DAT academic average, DAT manual average preprof. science GPA, preprof. non-science GPA, preprof. overall GPA	Four-year dental school overall GPA, basic science GPA, preclinic. GPA, clinic. GPA.	Correlations of .32 between DAT academic average and basic science in dental school, preprof. science grades correlated .22 and .40 with basic science GPA in dental school.
6.	Heller, Carson and Douglas, 1965	88 students in 1961, 87 students in 1962, 79 students in 1963 at University of Illinois.	DAT manual average, DAT academic average, preprof. science GPA, preprof. non-science GPA, preprof. total hours, total science hours, total non-science hours.	1st year overall grades, 1st year theory grades, 1st year technique grades.	DAT academic average correlations ranged from .22 to .27 with overall GPA in dental school; DAT academic average correlated significantly with theory grades in only one of three classes. Correlations high between all categories of preprof. grades and criterion variables, e.g. .61 for 1961 between predental grades and theory grades in dental school.
7.	Ginley, 1966	500 senior dental students chosen randomly from a national population in 1962 and 1964	DAT manual average, DAT academic average, DAT subtest scores.	Theory grades of seniors, technique grades of seniors.	Correlations of .21 for 1962 and 1964 between DAT academic average and theory grades. All DAT scores except for space relations in 1962 correlated significantly with theory grades. Correlations ranged from .06 to .23

TABLE II - continued

PREDICTION STUDIES - SUMMARY OF LITERATURE

	Authors and Year of Study	Sample Studied	Predictor Variables	Criterion Variables	Main Findings
8.	Manhold and Manhold, 1967	Seton Hall 8-year study	DAT academic DAT manual General science grades overall av.	Basic sciences, Preclinical dental sciences, clinical av., final standing.	Chalk predicted preclinical and clinical performance better than space relations.
9.	Fernandez-Pabon, 1968.	3 classes at University of Carolina, 1955, N = 40 1965, N = 49 1966, N = 47	Overall college av, overall college science av, total college credit hours, college science credit hours, DAT manual, academic av. DAT subtest.	1st year total GPA, 4th year total GPA, basic science GPA, laboratory technique GPA	No statistically significant correlations between preprof. grades or academic DAT with four year GPA; overall college grade was best predictor of basic science GPA - significant correlation of .50 and .28 for 1955 and 1966 classes.
10.	Phipps, Fishman, Scott, 1968	1960-1963 graduating classes of University of Buffalo (361 students	Preprof. required GPA, elective GPA, total GPA, DAT academic av, DAT manual av, DAT subtest scores.	Freshmen dental school DAT.	Correlations of DAT academic average with 1st and 4th year dental students .19 and .20. Total preprof. grades correlated .41 and .39 with 1st and 4th year grades. Required and elective preprof. GPA not as effective in predicting success as total preprof. grades.

TABLE II - continued

PREDICTION STUDIES - SUMMARY OF LITERATURE

Authors and Year of Study	Sample Studied	Predictor Variables	Criterion Variables	Main Findings
11. Kreit and MacDonald, 1968	510 students from eight graduating classes at Indiana University School of Dentistry (1956-63)	Preprof. grades, DAT academic and manual average, other DAT subtests.	Dental school GPA, National Boards, Part I, National Boards, Part II.	Correlation of .38 between preprof. grades and overall dental school GPA. Correlations of .24 between DAT academic average and dental school grades.
12. Dworkin, 1970	134 students from 1966 class of New York University School of Dentistry	Preprof. GPA, years of preprof. education, DAT manual av, DAT academic av, other DAT subtest scores.	Freshman, sophomore, junior, senior theory and technique grades, freshman GPA in dental school, overall class standing.	Significant correlations of .25 and .43 between DAT academic average and freshman and sophomore theory grades. Correlations of .19 and .24 between preprof. grades and freshman and sophomore theory grades.
13. Grainger, 1972	Canadian National	All DAT scores		Chalk carving gives false negatives but not false positives.
14. Bellanti, Mayberry, Tira, 1972.	UMKC 3 years 344 students	DAT carving, DAT space visualization, DAT general achievement, GPA (predent.)	Preclinical Fixed Prosthodontics grades	Carving dexterity .37 with technique grades.

TABLE II - continued

PREDICTION STUDIES - SUMMARY OF LITERATURE

Authors and Year of Study	Sample Studied	Predictor Variables	Criterion Variables	Main Findings
15. Chebib, 1974	University of Manitoba, five classes.	11 DAT scores, chemistry, physics, biology, predentistry GPA.	Didactic average laboratory average, clinic average for each year and for all years.	Manual average and list year laboratory .46. Second year laboratory .42. Chalk carving correlated .36 to .45 with laboratory or clinic for all four years.
16. Thompson, 1975	Canadian National	All DAT scores.		PMAT and chalk carving .36 with each other.
17. Thompson, 1977	Canadian National	DAT scores 16PF scores	Didactic average Preclinical average.	Chalk and preclinical .19 and PMAT and preclinical .15.

4. Space relations
5. Sequence of ideas
6. Passing an object through a hole.

He suggested that stepwise multiple regression analysis should be applied to these data when criterion measures are available to determine whether subscores of the PMAT on these factors would give better predictive validity than the total test score. To date this has not been published.

Predictive Studies

A summary of the predictive studies is presented in Table II. Many of the studies in the literature reflect the fact that preprofessional grades are the best predictors of academic performance in dental school, and that the predictability increases when used in combination with DAT academic average.

Parkin (1958) examined a U.S. national sample and found a correlation of .35 between predental grades and first year theory grades and a correlation of .28 between DAT academic and first year theory grades.

Tocchini et al (1961) found that the best predictors of success were grade point average, DAT academic average and marital status. They found that married students performed better than unmarried students.

Hood (1963) employed twenty-two predictor variables and three criterion variables in a study involving 300 freshmen students admitted to the University of Minnesota School of Dentistry from 1957 to 1960. He found that only two predictor variables, preprofessional grade point average and DAT manual average, contributed significantly to the multiple correlation (R) of .50 with freshman technique grades. In contrast, R's for predicting theory and overall freshman grades were .60 and .61 with the same predictors.

Heller, Carson and Douglas (1965) studied data from 254 students of the entering classes of 1961, 1962 and 1963, to the University of Illinois, utilizing multiple regression techniques involving eight predictor variables. For each of the three classes, multiple Rs in predicting freshmen technique grades were disappointing, .22, .19 and .29. Multiple Rs for predicting first year theory and first year total grades ranged from .40 to .60. The finding that it was more difficult to predict motor skills performance than academic performance, reported by Heller et al, is consistent with the results of Hood's (1963) study. Phipps, Fishman and Scott (1968), found it was not possible to predict clinical grades, although they

obtained fairly good results in predicting various criteria involving academic performance. The predictor variables employed by Phipps and his colleagues were preprofessional required GPA, preprofessional elective GPA, total preprofessional GPA, and the thirteen scores derived from the Dental Aptitude Test. However, in their study, failures and dropouts were omitted which restricted the range of the criterion variable considerably.

Manhold and Manhold (1965) found DAT academic average was the best predictor of basic sciences and in 1967, suggested that chalk carving predicted preclinical technique and clinical performance better than space relations or a combination of the two.

Kreit and MacDonald (1968) found a correlation of .38 between preprofessional grades and final dental school grade point average for 509 students over an eight year period at Indiana University. The correlation between DAT academic average and final dental school grades was only .25. Combining predental grades with DAT academic average to predict final dental school grades yielded a modest increase to a multiple R of .44 and R^2 of .19. Interestingly, in this study, the reading

comprehension subtest and the total science score were as effective as the DAT academic average in predicting dental school grades. This was found also by Grainer (1972) in a national survey in Canada. He also found that chalk carving gives some false negatives but no false positives and that those students who score 4 or better on the test never failed or dropped out of the courses involving manual dexterity. Later, Grainger (1974) added that the chalk carving test yielded a measurement of conceptualization and digital deftness.

In a study done at the University of Missouri at Kansas City, Bellanti et al (1972) found that carving dexterity correlated .39 to .51 with an overall correlation of .37 with fixed prosthodontic technique grades. Thompson (1975) found PMAT average and chalk carving correlated .36 with each other and obtained similar results in 1976. His studies were on the Canadian national results. In 1977, he found a correlation of .19 between chalk carving and preclinical technique grades and .15 between PMAT average and preclinical grades.

In Dworkin's study (1970) involving 134 students of the class of 1966 at New York University, it was found that multiple correlations between predictor

variables and sophomore and senior technique averages were .45 and .36, utilizing the first five variables of the stepwise analysis. This contrasts with the initial correlations of .37 between DAT manual average and sophomore technique grades, and -.17 between DAT academic average and senior technique grades. It is interesting to note that for senior technique grade point average, the academic portion of the DAT was more highly correlated with technique grades than was the manual portion of the DAT.

Chebib (1974) at the University of Manitoba found the correlation between the manual average and first year technique courses to be .46 and second year technique courses .42. He also found that the academic average of DAT correlated significantly with GPA throughout the first three years and showed no correlation with technique performance. Chalk carving correlated significantly with technique and clinic performance throughout the four years ranging from .36 to .45.

Most studies typically found low but statistically significant correlations between the manual portion of the Dental Aptitude Test and performance in dental school. In some cases, the correlations may have been

spuriously low because the criterion variable was contaminated with non-technique courses. This was the case in the study conducted by Kreit and MacDonald (1968). An average correlation of .26 was found between the manual portion of the Dental Aptitude Test and total grade point average in dental school for the 502 students on whom data were available during the eight year period. Correlations were statistically significant in four of the eight classes; the highest correlation obtained for any class was .38. DeRevere (1961) used more refined criteria in his prediction study; grades in the first year operative techniques course and grades in the fourth year clinics. Correlations of .37 and .39 were found between freshmen operative technique grades and the chalk carving and spatial relations tests respectively. In contrast, correlations of .26 and .26 were found between fourth year clinic grades and the chalk carving and spatial relations tests respectively. The discrepancy between the correlations for the fourth year versus the freshmen grades may reflect greater reliability and validity of freshmen operative technique grades asaa criterion measure of perceptual motor skills in DeRevere's study.

Several workers have investigated other tests to predict psychomotor ability. These include Smith (1976), Deubert, et al, (1975) and Brigante and Lamb (1968).

Brigante and Lamb described a series of mechanical devices they developed at the University of California School of Dentistry, which were designed to measure perceptual motor aptitudes of applicants. They were better able to predict the technique performance of dental students using the tests they developed than by the manual portion of the Dental Aptitude Test. The perception and control tests they used were designed to measure eleven abilities:

1. Tactile palpation
2. Purposeful hand direction
3. Depth perception
4. Visual acuity
5. Tactile discrimination
6. Hard/soft sensitivity
7. Surface contour matching
8. Finger pressure co-ordination
9. Finger tension co-ordination
10. Hand steadiness with support
11. Texture sensitivity.

They found that correlations between their test battery and technique course grades ranged between .42 and .58 over a three year period for forty to sixty-five students in each year. By contrast, the chalk carving test correlated between .21 and .26 for the same students. Since then, no further reports on this subject have appeared in the literature.

In a Canadian survey, Grainger (1973) found that females performed better than males in dental school and that younger students performed better than older. Graham (1976) on a similar group found that eight per cent of applicants were female but eleven per cent were accepted. He concluded, however, that there was not a large enough discrimination on which to base admissions policy.

Some work has been done with regard to attitudes and personality. An unpublished report to the Canadian Dental Association by Thompson (1977), compared admitted applicants with rejected applicants on the basis of a dull/bright range as measured by the intelligence scale of the 16PF. No significant difference was found. There was a wide range of dull and bright students throughout each group.

To summarize, the correlations of preprofessional overall average with first year theory ranged from .19 by Dworkin to .60 by Heller et al. Hood, Parkin, and Phipps all observed correlations in this range. DAT academic average correlated with first year theory .25 according to Dworkin and with overall GPA in dental school .22 by Heller et al and .36 by Hood. Preprofessional overall average correlated with overall GPA in dental school from 0.0 by Ferandez-Pabon to .49 by Hood with Kreit and McDonald, and Phipps obtaining correlations in this range.

Chalk carving correlated with technique grades from .19 by Thompson to .42 by Chebib with most others including Bellanti et al, DeRevere obtaining correlations of .37. Manual average also correlated strongly with technique grades ranging from .36 to .46 by Chebib.

Generally, the only predictors currently being measured correlating with any criteria of success in dental school are preprofessional overall average, DAT academic average, DAT manual average and chalk carving. It is interesting that only the one subtest of the DAT battery is, generally speaking, of any predictive value, although the two averages - academic and manual - are of value.

CHAPTER III

DESIGN OF THE STUDY

The purpose of this study was to investigate the predictive validity of the overall preprofessional average, prerequisite average, and Dental Aptitude Test battery on "success in the Faculty of Dentistry at The University of British Columbia". "Success" was measured in several ways. Firstly, grades for individual courses throughout the four year dental program were used. Secondly, year averages which were the averages of the grades for courses across the year weighted according to unit value as assigned by the institution were used. Thirdly, as a measure of psychomotor and perceptual "success", technique grades from the second year Fixed Prosthodontics and Operative Dentistry courses were used. Finally, a correlation between years to estimate the predictability of one year by another was done.

Preparation of the Data File

Data were collected from the files of 312 dental students admitted to the Faculty of Dentistry at The

University of British Columbia between 1969 and 1976. The variables were:

1. Overall entering average: A percentage score representing the average of all courses over the three or four years of preprofessional education. Student grades from the University of Victoria, the University of Alberta, and Simon Fraser University were converted to a percentage score according to the conversion table presented in Appendix B. Student scores from other universities were taken at face value since transformation to the scale used by The University of British Columbia was not possible.
2. Prerequisite average: A percentage score representing the average of all the prerequisite courses for admission into the Faculty of Dentistry. The courses are listed in Appendix C.
3. Subscores of the Dental Aptitude Test battery: These were norm-referenced scores coded as presented in Appendix A and representing subtests and averages as presented in Chapter II.
4. The course grades for each student in the dental

program. A grade expressed as a McCall's T standard score. The standard score for each course was derived according to the formula:

$$\text{Score} = 50 + \left(\frac{\text{raw score} - \text{mean}}{\text{standard deviation}}\right) \times 10$$

This was done so that all grades across years for a particular course could be pooled for the purpose of analysis.

5. Weighted Year Averages: As the DAT subtest composition changed somewhat around the years 1970-72 and stabilized in 1973, it was decided to analyze only the data from 1972 onwards. An average grade for all courses in each year was calculated for each student weighting the standard scores according to unit value of the course (see Appendix D). (The unit value is a measure of course time. One hour lecture and a three hour laboratory or clinic session each week for the year represents 3.0 units.) Subsequently, an overall average for each of the four years and for the total dental program was calculated for each student. Thus, five classes of first year students entering from 1972-76 totalling 195 students, four

classes of second year students entering from 1972-75 totalling 157 students, three classes of third year students entering from 1972-74 totalling 109 students, two classes of fourth year students entering from 1972-73 totalling 71 students, and 76 students over all four years were examined. Hence, a new set of five dependent variables was created.

6. Standardized Technique Grades: Second year technique course grades in Fixed Prosthodontics and Operative Dentistry developed from evaluation of dentoform technique work untarnished by any direct didactic grades. The second year classes of 1976, 1977 and 1978 were used. The method of teaching and evaluation for each of these two courses was constant over this period as were the faculty members who taught the courses. During this time, the instructors developed a grading procedure which was conceptually reliable, though its reliability was unmeasured. The grades were developed on a 10-point system at first by each individual and subsequently discussed until a mutually agreeable grade was established.

For Operative Dentistry, the dentoform technique work consisted of class I, II and V amalgam alloy preparations and restorations and class III, IV and V composite crown preparations. For Fixed Prosthodontics, classical crown preparations were required of the students including full gold, 3/4 gold, onlay, ceramo metal and porcelain jacket. Gold castings and temporary restorations were also required.

For these years, all subjects completed the 2D, 3D and PMAT tests, the 1975-76 and 1976-77 years completed the chalk carving, and only the 1976-77 year had a manual average recorded.

Analysis of the Data

Computer files were constructed with these data and analysis performed by a packaged program TRP (Triangular Regression Package) on the AMDAHL 470 Model V6 computer. This program consisted of a step-wise multiple regression analysis. The level of significance for both entering and deleting variables was .05. A summary of the regression analyses is presented in Table III.

TABLE III

SUMMARY OF REGRESSION ANALYSES

	Dependent Variable	Independent Variable
A. 1.	Individual course grades	Overall average Prerequisite average DAT averages
2.	Individual course grades	Overall average Prerequisite average DAT subtests
3.	Individual course grades	DAT averages
4.	Individual course grades	DAT subtests
B. 1.	Weighted year average grades	Overall average DAT average
2.	Weighted year average grades	Overall average DAT subtests
3.	Weighted year average grades	DAT averages
4.	Weighted year average grades	DAT subtests
C. 1.	Second year average grades	First year average grades
2.	Third year average grades	First year average grades
3.	Fourth year average grades	First year average grades
4.	Third year average grades	Second year average grades
5.	Fourth year average grades	Second year average grades
6.	Fourth year average grades	Third year average grades
D. 1.	Fixed Prosthodontics technique grades	PMAT, Manual average
2.	Fixed Prosthodontics technique grades	2D, 3D, chalk carving
3.	Operative technique grades	PMAT, Manual average
4.	Operative technique grades	2D, 3D, chalk carving
5.	Combined Operative and Prosthodontics grades	PMAT, Manual average
6.	Combined Operative and Prosthodontics grades	2D, 3D, chalk carving

Tatsuoka (1969) wrote "Use of this tool (multiple regression equation) is indicated whenever one wishes to make quantitative predictions on some criterion variable (such as success on a job or in college) on the basis of scores on several predictor variables - such as tests of general ability, specific aptitudes, personality traits, interest patterns and the like. It is therefore indispensable when one undertakes to validate a battery of tests being used for screening candidates for school admission...." Houston and Mensh (1975) support this stand, but Chambers (1972) is very critical of the regression model. His reasons are that:

1. there is a selection of redundant predictors.
2. there is an interactive effect of some predictors.
3. the predictors may be non-linear.
4. the criterion variables are heterogeneous.

However, these reasons are, at least in part, fallacious. Stepwise methods do not select redundant predictors and, if divided carefully into groups of sub-tests and averages, do not have much interactive effect. The non-linearity of predictors has not been reported previously. Fernandez-Pabon (1968) was in agreement with Chambers and suggested additionally the problems of

restriction of range of the criterion variable, the unreliability of the criterion, small sample sizes, and the failure to cross validate.

Since each analysis was based on linearity of the relationships between the dependent variable and each of the predictor variables, a scattergram of each independent variable with each dependent variable was made and inspected visually to ensure that no non-linear correlations existed.

Selection of the students by the Admissions Committee of the Dental Faculty of The University of British Columbia was made mainly on the basis of overall academic average, taking into account the improvement made during the three qualifying years and the types of courses making up the average. Lesser importance was placed on DAT scores and letters of reference and application provided by the applicant. Priority was given to British Columbians - so much so that very few other Canadian or foreign applicants gained admission.

Since selection is based heavily on overall average, a correction for restriction of range resulting from explicit selection was investigated to estimate the correlation between the independent variables and the

dependent variables (R) for the unrestricted group. The formula was:

$$R = \frac{r \frac{S_X}{s_x}}{\sqrt{1 - r^2 + r^2 \left(\frac{S_X}{s_x}\right)^2}} \qquad \text{(Gullicksen, 1950)}$$

where r is the correlation between the variables for restricted group,

S_X is the standard deviation of the total group including eligible unsuccessful applicants, and

s_x is the standard deviation of the restricted group, i.e. the admitted students.

It should be noted that the above correction may be applied only to the applicant group. It is noted that there is an additional restriction of range in the form that sixty-five per cent overall average is required before the Admissions Committee will accept an application for review.

Restriction of range resulting from explicit selection was also investigated for all the subscores of the DAT.

CHAPTER IV

RESULTS

The results of the analysis of the data are presented in the following order. There is a discussion of the investigation of restriction of range followed by the correlations of individual courses with predictors, year averages with predictors, correlations between year averages and finally correlations between technique scores and predictors.

Restriction of Range

As seen in Gullicksen's formula (see Chapter III) for correction of a correlation for restriction of range resulting from explicit selection, a comparison of the standard deviations of the grades of the total group of applicants to the admitted group is necessary. Inspection of Table IV for the years entering 1972 to 1975 reveals that the standard deviations of the grades of the two groups are similar and in some cases the standard deviation for the admitted group was greater than that of the total applicants. Thus, to correct the correlations

TABLE IV

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (S) OF OVERALL AVERAGES AND DAT SUBSCORES FOR TOTAL APPLICANTS GROUP AND ADMITTED GROUP FOR ENTERING YEARS 1972 TO 1976

Year		OVAV	AA	MA	RC	BIOL	INCHEM	TOTSCI	2D	3D	PMAT	CHALK
1972-73 n=163	Total $\bar{x}$	72.6	4.74	4.40	4.48	4.98	no	5.54	no	no	no	4.15
	s	4.96	1.39	1.45	2.07	1.91	test	1.95	test	test	test	1.76
	Admit $\bar{x}$	75.1	5.24	4.53	4.92	5.50		6.29				4.16
	s	4.36	1.50	1.57	2.17	1.61		1.66				2.26
1973-74 n=164	Total $\bar{x}$	73.4	4.75	no	4.66	4.82		5.24	4.02	4.01	4.25	4.00
	s	5.08	1.33	test	2.04	1.85		1.77	2.08	1.99	1.84	1.70
	Admit $\bar{x}$	77.6	5.29		5.08	5.21	6.13	5.89	5.00	3.74	4.06	4.57
	s	4.62	1.29		1.91	1.85	1.63	1.80	1.87	1.71	1.60	1.27
1974-75 n=116	Total $\bar{x}$	74.3	5.20	no	4.75	5.51	5.44	6.55	4.63	4.26	4.94	no
	s	5.47	1.76	test	2.08	1.46	1.70	1.60	2.04	1.79	1.81	test
	Admit $\bar{x}$	78.8	5.92		5.05	5.67	6.15	6.18	4.90	5.28	5.23	
	s	4.88	1.46		1.83	1.53	1.41	1.32	2.19	1.76	2.02	
1975-76 n=104	Total $\bar{x}$	74.9	4.64	no		4.76	4.67	5.04	4.13	4.54	4.61	4.79
	s	5.93	1.69	test		1.60	1.92	1.70	2.13	1.90	1.85	1.71
	Admit $\bar{x}$	78.4	4.95		3.80	5.15	5.40	5.78	4.55	4.85	4.81	5.28
	s	4.56	1.72		1.86	1.44	1.78	1.58	2.12	1.78	1.80	1.53
1976-77 n=201	Total $\bar{x}$	n/a*	n/a	4.43	n/a	n/a	n/a	n/a	4.23	4.24	4.42	4.14
	s			2.07					1.84	1.75	1.77	2.06
	Admit $\bar{x}$	78.3	5.73	5.13	5.28	4.83	5.05	5.35	4.35	4.38	4.63	4.81
	s	3.89	1.38	2.09	1.63	1.81	1.91	1.55	1.53	1.53	1.48	2.21

*n/a - Data not used in this study.

for restriction of range by explicit selection was of no value.

Correlations of Individual Course Grades with Predictors

The results of the first four regression analyses (A1 to A4) as listed in Table III are presented in Tables V - VIII according to years. Four regression analyses were performed for each course, the results of which are entered in columns 1 - 4 for each course.

A.	1.	Individual course grades	Overall average Prerequisite average DAT averages
	2.	Individual course grades	Overall average Prerequisite average DAT subtests
	3.	Individual course grades	DAT averages
	4.	Individual course grades	DAT subtests

Each entry is the value of the correlation coefficient at the time the associated variable entered the regression equation as a predictor. For example, for ANAT 401, overall average was the only variable to enter the first equation, thus .24 represents the zero order correlation. Overall average entered the second equation before BIOL, hence $.24^{1}$ represents a zero order correlation and $.17^{2}$ represents

a first order partial correlation. Zero order correlation refers to the Pearson Product Moment correlation with no variable partialled out.

From Tables V - VIII, correlation coefficients of the overall average with individual course grades were generally significant for first and second year courses, especially those courses in basic sciences, i.e. Anatomy (ANAT 400, 401, 425), Physiology (PHYL 400, 425), Pharmacology (PCOL 425), Oral Biology (ORBI 423) and Microbiology (MICR 425) ranging from .17 to .29. The DAT academic average tended to support these correlations, but less strongly, ranging for first and second year from .08 to .22. Total Science exhibited weak correlations.

DAT Manual Average correlated with preclinical and clinical Restorative Dentistry grades (REST 422, 431, 441) .36, .21 and .20 for second, third and fourth years respectively. DAT Manual Average correlated with Oral Biology Occlusion (ORBI 420) .31 and also correlated .27 with Biochemistry (BIOC 300) which has now become a prerequisite course. PMAT average correlated negatively with grades for six courses, only one of which involves any psychomotor or perceptual skills and positively with preclinical Restorative Dentistry (REST 422) grades at .21

TABLE V

SUMMARY OF RESULTS OF REGRESSION ANALYSES A1 TO 4 FOR FIRST YEAR COURSE GRADES

	Mean	S.D.	ANAT 400				ANAT 401				BIOC 300				ORBI 410				PHYL 400			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	76.81	5.00	.23	.23			.24	$.24^{1}$								$.16^{2}$			$.23^{1}$	$.23^{1}$		
PREAV	76.04	6.71																				
DAT AVERAGES																						
DATAC	5.26	1.47													$.22^{1}$		$.22^{1}$					
DATMAN	4.73	1.70									$.27^{1}$		$.27^{1}$		$.16^{2}$		$.16^{2}$					
TOTSCI	5.82	1.71							.15										$.18^{2}$		.22	
PMAT AV	4.75	1.77									$-.34^{2}$		$-.34^{2}$									
DAT SUBTESTS																						
RDGCOM	4.70	1.93																				
BIOL	5.29	1.81						$.17^{2}$		.18		$.23^{2}$		$.23^{2}$		$.20^{1}$		.20		$.20^{2}$		.21
INCHEM	5.61	1.72																				
2D	4.41	1.97																				
3D	4.63	1.75																				
CHALK	4.62	1.95										$.31^{1}$		$.31^{1}$								
R^2			.05	.05			.06	.09	.02	.03	.18	.14	.18	.14	.08	.06	.08	.04	.08	.09	.05	.04

Note: Entry is the value of the correlation coefficient at the time the associated variable entered the equation as a predictor. The superscript indicates the order of entry.

TABLE VI

SUMMARY OF RESULTS OF REGRESSION ANALYSES A1 TO 4 FOR SECOND YEAR COURSE GRADES

	Mean	S.D.	ANAT 425				MICR 425				ORBI 420				ORBI 423				ORME 425				ORTH 429			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	75.98	5.27	.29[1]	.29[1]			.18								.26[1]	.26							.19	.19		
PREAV	75.13	6.72																								
DAT AVERAGES																										
DATAC	5.11	1.46			.20				.18[1]								.19[2]		.19[2]		.19[2]					
DATMAN	4.60	1.58	.19[3]								.31		.31													
TOTSCI	5.85	1.71																								
PMAT AV	4.79	1.87	-.21[2]		-.20[1]				-.16[2]						-.19[2]		-.18[1]		-.30[1]		-.30[1]					
DAT SUBTESTS																										
RDGCOM	4.57	1.97																								
BIOL	5.43	1.77																								
INCHEM	5.83	1.60				.18[3]						.21[2]		.21[2]												
2D	4.42	2.04																								
3D	4.72	1.84		-.21[2]		-.20[1]														-.28[1]		-.28[1]				
CHALK	4.52	1.86		.20[3]		.20[2]						.29[1]		.29[1]												
R^2			.16	.16	.08	.11	.03		.06		.10	.12	.10		.10	.07	.07		.12	.12	.12	.12	.04	.04		

TABLE VI - continued

SUMMARY OF RESULTS OF REGRESSION ANALYSES A1 TO 4 FOR SECOND YEAR COURSE GRADES

	Mean	S.D.	PCDH 427				PCOL 425				PHYL 425				REST 421				REST 422				ORSU 426			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	75.98	5.27					.27	.27			.17															
PREAV	75.13	6.72																								
DAT AVERAGES																										
DATAC	5.11	1.46																								
DATMAN	4.60	1.58																	.36[1]		.36[1]					
TOTSCI	5.85	1.71																								
PMAT AV	4.79	1.87																	.21[2]		.21[2]					
DAT SUBTESTS																										
RDGCOM	4.57	1.97																								
BIOL	5.43	1.77																								
INCHEM	5.83	1.60		-.20		-.20																				
2D	4.42	2.04																								
3D	4.72	1.84																								
CHALK	4.52	1.86																		.40		.40				
R^2				.04		.04	.07	.07			.03								.17	.16	.17	.16				

TABLE VII

SUMMARY OF RESULTS OF REGRESSION ANALYSES A1 TO 4 FOR THIRD YEAR COURSE GRADES

	Mean	S.D.	ORBI 430				ORME 434				ORME 435				ORSU 436				ORTH 439				PCTH 437				REST 431			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	75.42	5.27					.16				.17[1]				.30[1]	.30														
PREAV	74.54	6.75									-.19[2]																			
DAT AVERAGES																														
DATAC	4.98	1.35																												
DATMAN	4.54	1.56													.22[2]		.23										.21		.21	
TOTSCI	5.80	1.82																												
PMAT AV	4.03	1.64																												
DAT SUBTESTS																														
RDGCOM	4.66	1.98																												
BIOL	5.49	1.81																												
INCHEM	6.11	1.47		.27		.27																								
2D	4.30	2.04																												
3D	4.64	1.91																												
CHALK	4.30	1.91																										.20		.20
R^2				.07		.07						.03				.06				.14	.09	.05					.05	.04	.05	.04

TABLE VIII

SUMMARY OF RESULTS OF REGRESSION ANALYSES A1 TO 4 FOR FOURTH YEAR COURSE GRADES

	Mean	S.D.	ORBI 440				ORME 444				ORME 445				ORSU 446				ORTH 449				PCDH 447				REST 441			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	74.84	5.17		.22[3]																										
PREAV	73.79	6.46																												
DAT AVERAGES																														
DATAC	5.14	1.40																												
DATMAN	4.51	1.59																									.20		.20	
TOTSCI	5.88	1.74																												
PMAT AV	4.70	1.97	.24		.24														-.24		-.24									
DAT SUBTESTS																														
RDGCOM	4.48	2.02																												
BIOL	5.45	1.85																												
INCHEM	6.04	1.56																												
2D	4.28	1.98		-.34[2]		-.34[2]														.42[2]		.42[2]								
3D	3.63	1.62		.29[1]		.29[1]														-.30[1]		-.30[1]								
CHALK	4.25	1.95																												
R^2			.06	.23	.06	.19													.06	.25	.06	.25					.04		.04	

which was the second variable entering the regression after the DAT Manual Average. PMAT average also correlated .24 with Oral Biology (ORBI 440) grades.

The correlation coefficients for the DAT subtests showed some trends. Reading Comprehension did not correlate significantly with any course grades. Biology, however, correlated with Anatomy (ANAT 401), Physiology (PHYL 400) and Oral Biology (ORBI 410) in first year ranging from .18 to .21 as the first variable entering the regression and was also the second variable to enter the regression equation for these same courses.

The 2D and 3D showed no trend correlating negatively and positively with grades in a variety of courses which require no psychomotor or perceptual skills except for fourth year Orthodontics (ORTH 449), which correlated -.30 with 3D and .42 with 2D which was the second variable to enter the regression.

Chalk carving correlated .20 with Anatomy (ANAT 425) as the second variable in the regression and .31 with the now prerequisite Biochemistry (BIOC 300). More significant was the correlation of .29 with Oral Biology Occlusion (ORBI 420), .40 with preclinical Restorative Dentistry (REST 422) and .20 with clinical Restorative Dentistry (REST 431).

Inorganic Chemistry correlated -.20 with second year Public and Community Dental Health (PCDH 427) and .27 with third year Oral Biology (ORBI 430). It was the second variable to enter the regression correlating .18 with second year Anatomy (ANAT 425) and .21 with Oral Biology (ORBI 420).

Correlations of Year Averages with Predictors

Tables IX - XIII present the simple correlations between the weighted total averages and the independent variables. Table XIV presents the means and standard deviations for the variables presented in Tables IX to XIII.

The results of the second four regression analyses (B1 to B4) as listed in Table III are presented in Table XV.

B.	1.	Weighted year average grades	Overall average DAT average
	2.	Weighted year average grades	Overall average DAT subtests
	3.	Weighted year average grades	DAT averages
	4.	Weighted year average grades	DAT subtests

Four regression analyses were performed for each set of year averages. As with previous analyses, each entry is the value of the correlation coefficient at the time the

associated variable entered the regression equation as a predictor.

From Table XV, the first year average showed a zero order correlation of .36 with overall average and .20 with DAT Academic Average. The correlation of .20 for first year averages with Reading Comprehension accounts for much of the correlation with DAT Academic Average. From Table IX the correlation between the two subscores was .73, indicating that fifty-three per cent of variance of the two sets of scores is common variance. Further examination of the simple correlations between first year averages and all the predictors indicates that all the simple correlations are very low.

The second year average correlated .29 with overall average and .20 with Manual Average. Contrary to expectation, no single subtest of the DAT which contributed to the Manual Average entered into the multiple regression. As with first year, the simple correlations for second year were quite low.

The third year average correlated .30 with Manual Average and .24 with Chalk Carving. From Table XI, the correlation between the two subscores was .73. The remaining simple correlations between third year averages and the predictors showed low correlations.

TABLE IX

SIMPLE CORRELATION BETWEEN WEIGHTED 1ST YEAR AVERAGES AND PREREQUISITE AVERAGE, OVERALL AVERAGE AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	1STYR GRDE	OVA AV	DAT AC	DAT MAN	QR	VR	Q&V	RDG COM	BIO	IN CHEM	ORG CHEM	TOT SCI	2D	3D	CHALK	PMAT AV
GRDE	1.00	1.00														
OVAAV	0.36	1.00														
DATAC	0.20	0.21	1.00													
DATMAN	0.08	-0.21	0.02	1.00												
QRR	0.07	0.03	0.52	0.26	1.00											
VR	0.05	0.00	0.62	0.33	0.04	1.00										
Q&& V	0.04	0.00	0.79	0.40	0.60	0.78	1.00									
RDGCOM	0.20	0.13	0.73	0.11	0.32	0.39	0.51	1.000								
BIO	0.11	0.07	0.53	-0.16	0.19	0.24	0.30	0.027	1.00							
INCHEM	-0.11	0.20	0.47	0.17	0.26	0.30	0.36	0.018	0.30	1.00						
ORGCHEM	0.11	-0.23	0.31	0.01	0.03	0.14	0.09	0.016	0.06	0.04	1.00					
TOTSCI	0.12	0.12	0.67	-0.15	0.27	0.33	0.38	0.030	0.73	0.65	0.50	1.00				
2D	0.02	-0.01	0.24	0.53	0.27	0.28	0.33	0.016	0.03	0.11	0.21	0.13	1.00			
3D	0.04	-0.08	0.15	0.63	0.12	0.38	0.34	0.007	0.09	0.06	0.21	0.12	0.54	1.00		
CHALK	0.05	-0.04	-0.14	0.84	0.00	0.15	0.14	-0.002	-0.15	-0.25	-0.00	-0.16	0.25	0.37	1.00	
PMATAV	0.06	-0.04	0.20	0.58	0.19	0.34	0.34	0.009	0.05	0.08	0.24	-0.11	0.85	0.84	0.34	1.00

TABLE X

SIMPLE CORRELATION BETWEEN WEIGHTED 2ND YEAR AVERAGES AND PREREQUISITE AVERAGE, OVERALL AVERAGE AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	2ND YEAR GRDE	OVA AV	DAT AC	DAT MAN	QR	VR	Q&V	RDG COM	BIO	IN CHEM	ORG CHEM	TOT SCI	2D	3D	CHALK	PMAT AV
GRDE	1.00															
OVAAV	0.29	1.00														
DATAC	0.18	0.18	1.00													
DATMAN	0.20	0.01	-0.34	1.00												
QR	0.01	0.01	0.52	0.22	1.00											
VR	0.15	0.02	0.63	0.33	0.05	1.00										
Q & V	0.13	-0.01	0.79	0.37	0.60	0.79	1.00									
RDGCOM	0.18	0.10	0.73	0.38	0.32	0.38	0.49	1.00								
BIO	0.05	0.08	0.54	0.05	0.21	0.23	0.30	0.25	1.00							
INCHEM	0.06	0.21	0.53	0.01	0.26	0.34	0.38	0.29	0.44	1.00						
ORGCHE	-0.15	-0.29	0.31	0.02	0.06	0.13	0.10	0.12	0.09	-0.01	1.00					
TOTSCI	0.06	0.10	0.66	0.18	0.29	0.32	0.38	0.31	0.75	0.69	0.52	1.00				
2D	-0.01	0.00	0.27	0.61	0.24	0.29	0.31	0.18	-0.03	0.09	0.19	0.13	1.00			
3D	-0.01	-0.07	0.24	0.01	0.15	0.34	0.34	0.11	0.10	0.12	0.28	0.17	0.52	1.00		
CHALK	0.12	0.10	0.03	0.65	-0.04	0.17	0.13	0.12	-0.02	0.16	-0.01	0.03	0.34	0.31	1.00	
PMATAV	0.08	-0.01	0.22	0.09	0.18	0.31	0.32	0.10	0.01	0.11	0.27	0.11	0.71	0.85	0.34	1.00

TABLE XI

SIMPLE CORRELATION BETWEEN WEIGHTED 3RD YEAR AVERAGES AND PREREQUISITE AVERAGE, OVERALL AVERAGE AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	3RD YEAR GRDE	OVA AV	DAT AC	DAT MAN	QR	VR	Q&V	RDG COM	BIO	ING CHEM	ORG CHEM	TOT SCI	2D	3D	CHALK	PMAT AV
GRDE	1.00															
OVAAV	0.19	1.00														
DATAC	0.14	0.21	1.00													
DATMAN	0.30	0.00	0.36	1.00												
QR	0.01	0.09	0.50	0.23	1.00											
VR	0.12	0.02	0.70	0.33	0.09	1.00										
Q&V	0.11	0.04	0.81	0.38	0.59	0.81	1.00									
RDGCOM	0.20	0.11	0.74	0.40	0.31	0.45	0.52	1.00								
BIO	-0.04	0.18	0.55	0.05	0.18	0.26	0.30	0.29	1.00							
INCHEM	0.03	0.20	0.57	0.02	0.33	0.41	0.45	0.34	0.44	1.00						
ORGCHE	0.00	-0.20	0.22	0.02	-0.11	0.25	0.09	0.04	-0.04	0.00	1.00					
TOTSCI	0.04	0.16	0.68	0.18	0.29	0.38	0.41	0.36	0.74	0.69	0.45	1.00				
2D	0.01	0.00	0.34	0.63	0.27	0.29	0.32	0.23	0.03	0.09	0.27	0.22	1.00			
3D	-0.03	-0.12	0.33	0.01	0.07	0.41	0.34	0.10	0.16	0.16	0.40	0.25	0.61	1.00		
CHALK	0.24	0.00	0.16	0.73	-0.05	0.17	0.13	0.30	0.12	0.00	0.00	0.21	0.32	0.00	1.00	
PMATAV	-0.07	-0.05	0.32	0.07	0.18	0.33	0.32	0.12	0.09	0.16	0.37	0.22	0.77	0.86	-0.02	1.00

TABLE XII

SIMPLE CORRELATION BETWEEN WEIGHTED 4TH YEAR AVERAGES AND PREREQUISITE AVERAGE, OVERALL AVERAGE AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	4TH YEAR GRDE	OVA AV	DAT AC	DAT MAN	QR	VR	Q&V	RDG COM	BIO	IN CHEM	ORG CHEM	TOT SCI	2D	3D	CHALK	PMAT AV
GRDE	1.00															
OVAAV	0.36	1.00														
DATAC	0.20	0.21	1.00													
DATMAN	0.08	-0.12	0.02	1.00												
QR	0.07	0.03	0.52	0.26	1.00											
VR	0.05	0.00	0.62	0.33	0.04	1.00										
Q & V	0.04	0.00	0.79	0.40	0.60	0.78	1.00									
RDGCOM	0.20	0.13	0.73	0.11	0.32	0.39	0.51	1.00								
BIO	0.11	0.07	0.53	-0.16	0.19	0.24	0.30	0.27	1.00							
INCHEM	-0.11	0.20	0.47	0.17	0.26	0.30	0.36	0.18	0.30	1.00						
ORGCHE	0.11	-0.23	0.31	0.01	0.03	0.14	0.09	0.16	0.06	0.04	1.00					
TOTSCI	0.12	0.12	0.67	-0.15	0.27	0.33	0.38	0.30	0.73	0.65	0.50	1.00				
2D	0.02	-0.01	0.24	0.53	0.27	0.28	0.33	0.16	0.03	0.11	0.21	0.13	1.00			
3D	0.04	-0.08	0.15	0.63	0.12	0.38	0.34	0.07	0.09	0.06	0.21	0.12	0.54	1.00		
CHALK	0.05	-0.04	-0.14	0.84	0.00	0.15	0.14	-0.02	-0.15	-0.25	-0.00	-0.16	0.25	0.37	1.00	
PMATAV	0.06	-0.04	0.20	0.58	0.19	0.34	0.34	0.09	0.05	0.08	0.24	-0.11	0.85	0.84	0.34	1.00

TABLE XIII

SIMPLE CORRELATION BETWEEN WEIGHTED TOTAL AVERAGES AND PREREQUISITE AVERAGE, OVERALL AVERAGE AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	TOTAL	OVA AV	DAT AC	DAT MAN	QR	VR	Q&V	RDG COM	BIO	IN CHEM	ORG CHEM	TOT SCI	2D	3D	CHALK	PMAT AV
GRDE	1.00															
OVAAV	0.09	1.00														
DATAC	0.02	0.17	1.00													
DATMAN	0.11	-0.01	0.37	1.00												
QR	-0.12	0.25	0.60	0.23	1.00											
VR	0.19	-0.06	0.69	0.35	0.14	1.00										
Q & V	0.10	0.06	0.84	0.39	0.58	0.86	1.00									
RDGCOM	0.09	0.05	0.78	0.38	0.41	0.52	0.65	1.00								
BIO	-0.07	0.13	0.62	0.05	0.16	0.29	0.29	0.36	1.00							
INCHEM	-0.02	0.25	0.75	0.01	0.42	0.32	0.44	0.62	0.54	1.00						
ORGCHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00					
TOTSCI	-0.06	0.17	0.76	0.21	0.32	0.38	0.43	0.45	0.83	0.82	0.00	1.00				
2D	0.00	-0.01	0.34	0.65	0.37	0.25	0.35	0.31	-0.05	0.15	0.00	0.18	1.00			
3D	-0.06	-0.24	0.17	0.00	0.17	0.31	0.32	0.25	-0.19	-0.01	0.00	-0.06	0.52	1.00		
CHALK	0.12	0.01	0.15	0.73	-0.05	0.17	0.13	0.30	0.12	0.00	0.00	0.21	0.32	0.00	1.00	
PMATAV	-0.06	-0.07	0.11	0.06	0.25	0.12	0.19	0.13	-0.22	0.08	0.00	-0.02	0.74	0.83	-0.02	1.00

TABLE XIV

MEANS AND STANDARD DEVIATIONS (S.D.) FOR YEAR AVERAGES, PREREQUISITE AVERAGES, OVERALL AVERAGES AND DAT SUBSCORES FOR YEARS ENTERING 1972-76

	1st Year		2nd Year		3rd Year		4th Year		Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
GRDE	50.26	7.28	50.30	6.08	50.21	6.33	50.13	6.65	49.95	5.40
OVAAV	77.69	4.62	77.55	4.84	77.13	4.82	76.52	4.77	76.50	4.67
DATAC	5.42	1.50	5.32	1.52	5.49	1.44	5.26	1.42	5.24	1.39
DATMAN	4.78	1.80	4.56	1.51	4.56	1.51	4.56	1.51	4.52	1.51
RDGCOM	4.80	1.92	4.67	1.99	4.98	1.96	4.92	2.00	4.97	2.00
BIOL	5.26	1.67	5.34	1.63	5.48	1.68	5.31	1.78	5.36	1.75
INCHEM	5.61	1.72	5.82	1.59	6.11	1.48	6.03	1.58	5.96	1.54
TOTSCI	5.89	1.59	6.00	1.59	6.13	1.59	6.04	1.76	6.05	1.74
2D	4.51	1.91	4.61	2.02	4.54	2.06	4.40	1.98	4.32	1.96
3D	4.62	1.75	4.76	1.87	4.68	1.89	3.69	1.61	3.79	1.67
CHALK	4.60	1.94	4.52	1.78	4.02	1.77	4.02	1.77	3.97	1.78
PMATAV	4.75	1.76	4.84	1.89	4.73	1.95	4.10	1.61	4.09	1.59
	n = 195		n = 157		n = 109		n = 71		n = 76	

TABLE XV

SUMMARY OF RESULTS OF REGRESSION ANALYSES B1 TO 4 FOR YEAR AVERAGES AND TOTAL AVERAGE

	1st Year Average				2nd Year Average				3rd Year Average				4th Year Average				Total Average			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OVAAV	.36	.36			.29[1]	.29														
DATAC			.20																	
DATMAN					.21[2]		.20		.30		.30									
TOTSCI																				
PMAT AV																				
RDGCOM				.20																
BIOL																				
INCHEM																				
2D																				
3D																				
CHALK										.24		.24								
R^2	.13	.13	.04	.04	.12	.08	.04		.09	.06	.09	.06								

There was no significantly correlating variable with fourth year average or with the total average for all years. From Table XII, the simple correlation of .25 between fourth year average and Manual Average was not significant but higher than most of the others. 3D at -.27, overall average at .21 and Inorganic Chemistry at .20 were others to note. From Table XIII, simple correlations for total average were very low.

Correlations Between Year Averages

The results of the third set of regression analyses (C1 to C6) listed in Table III are presented in Table XVI. The correlation coefficients presented represent zero order correlations.

C.	1.	Second year average grades	First year average grades
	2.	Third year averagesgradess	First year average grades
	3.	Fourth year average grades	First year average grades
	4.	Third year average grades	Second year average grades
	5.	Fourth year average grades	Second year average grades
	6.	Fourth year average grades	Third year average grades

When first year overall weighted average was taken as the independent variable and correlated with second, third

TABLE XVI

SUMMARY OF REGRESSION ANALYSES C1 TO C6

CORRELATIONS BETWEEN YEAR AVERAGES AND PREVIOUS YEAR AVERAGES

Independent Variable	Dependent Variables		
	2nd Year Average Grades n = 145	3rd Year Average Grades n = 106	4th Year Average Grades n = 70
1st Year average grades	.79	.45	.25
2nd Year average grades		.60	.54
3rd year average grades			.79

and fourth years as the dependent variables, the correlations were .78, .45 and .25 respectively. With second year as the predictor and third and fourth years as the criterion, the correlations were .60 and .54 respectively. With third year as the predictor and fourth year as the criterion, the correlation was .79.

Correlations Between Technique Scores and Predictors

The results of the last set regression analyses as listed in Table III are presented in Table XVIII. Two analyses were performed for each dependent variable.

D.	1.	Fixed Prosthodontics technique grades	PMAT, Manual average
	2.	Fixed Prosthodontics technique grades	2D, 3D, chalk carving
	3.	Operative technique grades	PMAT, Manual average
	4.	Operative technique grades	2D, 3D, chalk carving
	5.	Combined Operative and Prosthodontics grades	PMAT, Manual average
	6.	Combined Operative and Prosthodontics grades	2D, 3D, chalk carving

Each entry represents a zero order correlation. The simple correlations between these variables is presented in Table XVII. From Table XVIII, when the manual subtests

TABLE XVII

SIMPLE CORRELATIONS BETWEEN PSYCHOMOTOR AND PERCEPTUAL SCORES OF DAT AND TECHNIQUE COURSE GRADES IN FIXED PROSTHODONTICS, OPERATIVE DENTISTRY AND A COMBINATION OF BOTH

	MANUAL AV	2D	3D	CHALK	PMAT	FIXED PROSTH	OPER	COMB
MANUAL AV	1.00							
2D	.42	1.00						
3D	.70	.53	1.00					
CHALK	.92	.27	.39	1.00				
PMAT	.62	.85	.85	.36	1.00			
FIXED PROSTH	.38	.06	.15	.31	.09	1.00		
OPER	.32	.11	.18	.33	.14	.67	1.00	
COMB	.39	.09	.18	.35	.13			1.00

TABLE XVIII

SUMMARY OF RESULTS OF REGRESSION ANALYSES D1 TO 6

MEANS, STANDARD DEVIATIONS AND CORRELATIONS BETWEEN PSYCHOMOTOR AND PERCEPTUAL SCORES OF DAT AND TECHNIQUE COURSE GRADES IN FIXED PROSTHODONTICS, OPERATIVE DENTISTRY AND A COMBINATION OF BOTH

	Mean	Standard Deviation	Fixed Prosths.		Operative		Combined Prosths & Op	
			1	2	1	2	1	2
DAT AVERAGES								
PMAT AV	4.94	1.80						
MANUAL AV	5.07	2.08	.38		.32		.39	
DAT SUBTESTS								
2D	4.64	1.89						
3D	4.84	1.75						
CHALK	4.97	1.90		.31		.33		.35

Note: Means and standard deviations for dependent variables were standardized to 50 and 10 respectively.

and averages of the DAT were the predictors and Fixed Prosthodontics technique was the criterion, the correlations were .38 with the Manual Average and .31 with Chalk Carving. The correlations between Fixed Prosthodontics and 2D, 3D and PMAT were not significant (r = .06, .15 and .09 respectively), indicating that Chalk Carving accounted for most of the variance of Fixed Prosthodontics attributed to the DAT subtests.

Similarly for Operative Dentistry, the correlation coefficient was .32 with Manual Average and .33 with Chalk Carving. The correlations between Operative and 2D, 3D and PMAT average were not significant (r = .11, .18 and .14 respectively) indicating again that Chalk Carving accounted for most of the variance of Operative attributed to the DAT tests.

For the combination of Operative and Fixed Prosthodontics, the correlation coefficients were .39 with Manual Average and .35 with Chalk Carving. The correlations between the combination of Operative and Fixed Prosthodontics and 2D, 3D and PMAT average were not significant (.09, .18 and .13 respectively), indicating that Chalk Carving accounted for most of the variance of the combined Operative and Fixed Prosthodontics attributed to the DAT tests.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

There is a consistently significant correlation of overall average with individual courses, especially in the first two years. Likewise, the correlation of overall average with first year average was .36 and second year average was .29. Despite the obvious restriction of range by limiting the applicants to those with overall average of more than sixty-five per cent leads one to the conclusion that success in the first two years of dentistry is, in part, predicted by overall average. These results were similar to those of Parkin (1958), Manhold and Manhold (1965), Dworkin (1970) and Phipps et al (1968), although Dworkin's correlations were lower. The conclusion that academic grades when averaged predict academic grades is not difficult to believe. It is rather surprising, however, to see correlations as low as .36 and .29 although they are common in the literature. The reason for this is unclear but suspicion would lie with unreliability of both variables.

Prerequisite average on the other hand did not

correlate significantly with individual course grades. This may be explained by the timing of these prerequisites. Commonly, students take these courses in their first year of university which fixes their prerequisite average to a constant figure. The overall average, however, may alter by the addition of subsequent courses be they high or low grades. Hence, a student may improve his overall average but cannot improve his prerequisite average.

The correlations between DAT academic average and individual first and second year courses and also first year averages are significant. The correlation of .20 with first year average is similar to that obtained by Parkin (1958) of .28, Manhold and Manhold (1965) of .32 and Dworkin (1970) of .25.

The Total Science component of DAT adds little to the predictive validity of the DAT. Reading Comprehension likewise correlates with first year average .20 but is not significant with individual courses. This result is difficult to interpret. Thompson (1977) suggests that Reading Comprehension is a very important predictor in first and second year for Canadian students but no other investigators place much emphasis on it.

Biology correlates significantly with some first year courses and like DAT Academic Average, is best used to

complement knowledge of course grades from preprofessional years and overall average. Inorganic Chemistry may be treated in the same way.

The academic excellence of an applicant may be assessed then fairly well by three or more years of preprofessional university education, the overall average attained in this time and complemented by the DAT Academic Average.

The results presented in Table XVI reveal that first and second years are to some extent similar and third and fourth years are similar, but there is a difference between the first two years and the second two years. The nature of many of the first two years courses is more academic than that of the third and fourth years, which are more clinical. This is born out by first year average correlating with second year average .79, the third year with fourth year .79 but second year with third year .60. It should be noted that these analyses were performed on standardized scores. Also there was no systematic drop out during these years. These correlations between years explain why overall average is a significant predictor in first and second years but not in third and fourth years.

Looking at the manual portions of the DAT, the correlations with individual courses, especially the second year courses of Oral Biology (ORBI 420) and preclinical Restorative Dentistry (REST 422) are high for Chalk Carving and consequently for Manual Average. These results are in agreement with DeRevere (1961), Manhold and Manhold (1967), Chebib (1974) and Thompson (1977). The fact that Chalk Carving correlated .24 with third year average which is based heavily on clinical courses requiring psychomotor skills strengthens the view that Chalk Carving is the best predictor of psychomotor oriented courses that is offered in the DAT battery. The correlation for Chalk Carving with Oral Biology Occlusion (ORBI 420) of .29, a three-unit heavily psychomotor and perceptual oriented course, with preclinical Restorative Dentistry (REST 422) of .42, a three-unit (subsequently upgraded to a six-unit) course heavily oriented to psychomotor skills, supports this. Similarly, the correlation for Chalk Carving with clinical Restorative Dentistry (REST 431) of .20 which is a twelve-unit course heavily oriented to psychomotor skills also supports this view.

The consistently high correlations between Manual Average and psychomotor oriented courses of Oral Biology

Occlusion (ORBI 420) .31, preclinical Restorative Dentistry (REST 422) .36, Orthodontics (ORTH 439) .23, clinical Restorative Dentistry (REST 431) .21 and clinical Restorative Dentistry (REST 441) .20 (which is a twelve-unit course), almost mirrored the correlations for Chalk Carving. This subscore also correlated with second year averages .20 and third year averages .30, making this an important predictor of success in the Dental Faculty.

The variable nature of 2D, 3D and PMAT average in correlations with individual courses leads to the conclusion that these scores are not particularly helpful. Four of the significant correlations were positive and ten were negative. Graham (1972) showed PMAT and Chalk to be equally predictive in five separate studies in the U.S.A., however, the results of this study are at variance with his. The correlation of .31 for Chalk Carving with the technique portion of preclinical Fixed Prosthodontics was in close agreement with that found by Bellanti et al (1972) of .37. This finding is strengthened by the correlation of .33 found between Chalk Carving and preclinical Operative Dentistry, which resembles that found by DeRevere (1961) of .37. The lack of significant correlation of any of the PMAT scores in this study using

dependent variables such as Prosthodontics and Operative technique grades strengthens the view that PMAT is not a valuable test. DeRevere, however, found a correlation of .39 between space visualization (an old form of 2D) and preclinical Operative Dentistry. The PMAT correlations, however, are variable from study to study whereas the Chalk Carving correlations are very stable.

Selection of students for admission to the dental faculty was based heavily on overall preprofessional grades with very little emphasis placed on the DAT scores. Because academic information, albeit doubtfully reliable undergraduate grades, is readily available, much emphasis is placed upon it. Little information is available concerning the perceptual or psychomotor abilities of applicants, although at least half of the program of dentistry demands expertise in these abilities. Chalk carving was shown to be a consistently reliable predictor of psychomotor ability, yet is little used. Similarly, Manual Average was a good predictor. However, Manual Average was made up of 2D, 3D and Chalk Carving, with a bias heavily to Chalk Carving. The Chalk Carving was a cleaner score untarnished by the very variable 2D and 3D scores.

From the results of this study, the conclusion was drawn that equal emphasis should be placed on the Chalk Carving test and the preprofessional overall average. If this is done to exclude students with low ability in these areas, it is likely that students will be admitted with higher overall competence. The Chalk Carving test, even though it is the best predictor available at present, still explains only a small amount of the variance of technique grades. Likewise, overall preprofessional average predicts only a small proportion of the variance of didactic grades, however, both of these predictors are important to maintain until better predictors may be validated.

It is recommended that preprofessional averages and DAT Chalk Carving should be used to select students for admission to the Dental Faculty. Grainger's suggestion to exclude applicants with a carving score of less than four is sound on the basis that false positives are almost non-existent in this test. Admissions committees can afford to exclude the false negatives and cannot afford the time and effort of training students with lesser psychomotor skills. It is true that the false negatives (students who perform poorly on the Chalk Carving test but would have performed well in dental

school) will be rejected. They have the choice of retest for the following year to try to improve their score. As long as the number of eligible applicants is higher in relation to places available, this philosophy can be followed. The sequelae to this philosophy is that the general standard of performance in dental school will improve. Validation of this should be carried out annually.

It is recommended that prerequisite average not be used as criterion for selection as the academic average is a stronger predictor. Similarly, all other subtests of the DAT other than Chalk Carving should not be used in the selection process. Academic Average is best used only when overall average is not available and Manual Average may be disregarded if Chalk Carving is available.

High hopes are held for the 16PF personality test currently being validated by the Canadian DAT Committee. However, similar efforts should be directed to the development of a better test to predict psychomotor skills to be used in conjunction with the Chalk Carving test or to replace it given the extensive psychomotor demands of dentistry.

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APPENDIX A

SCORING SYSTEM USED IN THE DENTAL ADMISSION TESTING PROGRAM

Standard Deviation	Coded Score		Percential Band Equivalents
+2.5	9	1.1%	98.9 - 99.9
+2.0	8	2.8%	97.0 - 98.8
+1.5	7	6.6%	90.0 - 96.0
+1.0	6	12.1%	78.0 - 89.0
+0.5	5	17.5%	61.0 - 77.0
0	4	19.8%	40.0 - 60.0
-0.5	3	17.5%	23.0 - 39.0
-1.0	2	12.1%	11.0 - 22.0
-1.5	1	6.6%	4.0 - 10.0
-2.0	0	2.8%	1.2 - 3.0
-2.5	-1	1.1%	0.0 - 1.1

The percentage figures included in the diagram indicate the portion of the applicants who would receive each coded score if there were a normal or perfect distribution of raw scores. All of the tests included in the admission program produce fairly normal distributions of raw scores so the percentages indicated above would apply for each part of the test battery. A coded score of nine would always mean that the applicant ranked, on the test in question, with the top one per cent of all applicants. A coded score of minus one would always mean that the applicant ranked with the lowest one per cent of all applicants. Coded scores of three, four, and five would always represent the middle group of about fifty-five per cent.

APPENDIX B

CONVERSION TABLE FOR GRADE POINT SCALES TO PERCENTAGES FOR ADMISSION TO UNIVERSITY OF BRITISH COLUMBIA

4 POINT SCALE

Where it is necessary to determine an approximate percentage equivalent to a grade point average (G.P.A.) on the 4 point scale the following table should be used.

(A=4.0 - B=3.0 - C=2.0 D=1.0)

GPA on 4 point scale	Approximate % equivalent	
4.0	90+	
3.9	88	
3.8	86	First Class
3.7	84	
3.6	82	
3.5	80	
3.4	78	
3.3	77	
3.2	76	Upper Second Class
3.1	75	
3.0	73	
2.9	71	
2.8	70	
2.7	69	Lower Second Class
2.6	67	
2.5	65	
2.4	64	
2.3	63	
2.2	62	
2.1	61	
2.0	60	Pass Class
1.9	59	
1.8	58	
1.7	57	
1.6	56	
1.5	55	
1.4	54	
1.3	53	
1.2	52	
1.1	51	
1.0	50	

9 POINT SCALE

(University of Victoria)

Where it is necessary to determine an approximate percentage equivalent to a grade point average (G.P.A.) on the 9 point scale used by the University of Victoria the following table should be used.

GPA on 9 point scale	Approximate % Equivalent	(To convert to 4 point scale)	
9.0	95+		
8.5	90	4.0	
8.0	88		First
7.5	85		Class
7.0	83		
6.5	80	3.5	
6.0	78		Upper
5.5	75		Second
5.0	73	3.0	Class
4.5	70		Lower
4.0	68		Second
3.5	65	2.5	Class
3.0	63		Pass
2.5	62		Class
2.0	60	2.0	
1.5	55		
1.0	50	1.0	

9 POINT SCALE

(University of Alberta)

9.0	90+		
8.5	90		First
8.0	85		Class
7.5	80	3.5	
7.0	75		Upper
6.8	73	3.0	Second Class
6.5	70		Lower
6.0	65	2.5	Second Class
5.5	63		
5.0	60	2.0	Pass
4.5	57		Class
4.0	53		
3.5	50	1.0	

APPENDIX C

PREREQUISITE SUBJECTS FOR ADMISSION INTO THE FACULTY OF DENTISTRY AT THE UNIVERSITY OF BRITISH COLUMBIA

English 100 (Literature and Composition)

Mathematics 100 (Calculus I)

Mathematics 101 (Calculus II) or Mathematics 130 (Finite Combination Mathematics).

Chemistry 103 (General Chemistry) or Chemistry 120 or 110 (Principles of Chemistry).

Chemistry 203 (Organic Chemistry) or Chemistry 230 (Organic Chemistry).

Biochemistry 300

Physics 145 (Elementary Physics) or Physics 110 (Mechanics, Electricity and Atomic Structure),
or Physics 115 (Wave Motion, Mechanics and Electricity)
or Physics 120 (Matter and Mechanics).

Biology 101 or 102 (Principles of Biology).

APPENDIX D

COURSE WEIGHTING ACCORDING TO UNIT VALUES ASSIGNED. ABBREVIATIONS OF COURSES FOR COMPUTER USE ARE SHOWN

Course Name	Computer Entry	Unit Weight
1st year		
Anatomy	ANAT 400	8.0
Anatomy	ANAT 401	6.0
Biochemistry	BIOC 300	3.0
Oral Biology (Dental Morphology)	ORBI 410	2.0
Physiology	PHYL 400	8.0
2nd year		
Anatomy (Neuroanatomy)	ANAT 425	2.0
Microbiology	MICR 425	5.0
Oral Biology (Occlusion)	ORBI 420	3.0
Oral Biology (Oral Pathology)	ORBI 423	8.0
Oral Medicine (Diagnosis)	ORME 425	2.0
Orthodontics	ORTH 429	1.0
Public & Community Dental Health	PCDH 427	1.0
Pharmacology	PCOL 425	5.0
Physiology (neurophysiology)	PHYL 425	2.0
Oral Surgery (anaesthesiology)	ORSU 426	1.0
Restorative Dentistry	REST 422	3.0
Restorative Dentistry (Materials)	REST 421	3.0
3rd year		
Oral Biology	ORBI 430	3.0
Oral Medicine (Periodontology)	ORME 434	4.0
Oral Medicine (Oral Diagnosis)	ORME 435	4.0
Oral Surgery	ORSU 436	3.0
Orthodontics	ORTH 439	3.0
Public & Community Dental Health	PCDH 437	3.0
Restorative Dentistry	REST 431	12.0

Course Name	Computer Entry	Unit Weight
4th year		
Oral Biology	ORBI 440	3.0
Oral Medicine (Periodontology)	ORME 444	4.0
Oral Medicine (Oral Diagnosis)	ORME 445	4.0
Oral Surgery	ORSU 446	3.0
Orthodontics	ORTH 449	3.0
Public & Community Dental Health	PCDH 447	3.0
Restorative Dentistry	REST 441	12.0