RELATIONSHIP BETWEEN ADMISSION PROCEDURES AND PERFORMANCE IN THE BACCALAUREATE NURSING PROGRAM AT McMASTER UNIVERSITY. DESIGN OF TWO RANDOMIZED CONTROLLED TRIALS

By

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Master of Science

McMaster University

September 1981

ADMISSION PROCEDURES AND PERFORMANCE IN THE McMASTER B.Sc.N. PROGRAM

MASTER OF SCIENCE (1981) McMASTER UNIVERSITY
Medical Sciences Hamilton, Ontario.
(Design, Measurement, and Evaluation)

TITLE: Relationship Between Admission Procedures and Performance in the Baccalaureate Nursing Program at McMaster University. Design of Two Randomized Controlled Trials

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NUMBER OF PAGES: xi, 174

ABSTRACT

Each year, educational programs, with the responsibility of graduating health professionals, face the dilemma of selecting the most suitable candidates from numerous applicants. Since the number of positions in these classes is limited, the goal underlying the admission procedure is to identify those most likely to succeed.

Nursing programs, in particular, have had difficulty in realizing this goal. Despite the use of a variety of selection devices by different schools, the attrition rate of nursing students consistently remains between 30 and 40 percent.

The reduction of this attrition rate, by careful examination of various admission methods, will be addressed in this thesis. First, the scientific literature examining attrition and admission procedures in nursing, as well as other disciplines, will be reviewed. Following this, the extent of the attrition problem, specifically in the baccalaureate nursing program at McMaster University, will be explored by means of a retrospective analysis of four years of data. Finally, the design of two randomized controlled trials, each addressing one of two categories of applicants, will be described.

The McMaster baccalaureate nursing program presently assesses candidates applying for a position directly upon completion of secondary school on the basis of Grade 13 marks. A second group, 'special' applicants, are considered on the basis of interview scores. The designs will examine two selection devices--the autobiographical letter

and the team interview.

An additional feature of the proposed study is that all applicants will participate in each admission procedure, but will be blind to the device used to determine their admission. Data about the alternate selection tools will be available for analysis at the end of the study.

The validity of the selection devices will be assessed by the examination of four outcome measures. First, success of students in terms of remaining in the program, failing, and withdrawing will be monitored. Second and third, grades in nursing courses for the first two years of the program will be recorded, as well as grades in nursing science courses. Lastly, first and second year tutors will be asked to evaluate the students in terms of their abilities in self-directed learning, problem-solving, interpersonal relations, and self-evaluation.

ACKNOWLEDGEMENTS

The completion of a thesis does not seem quite as overwhelming when one knows there are concerned people 'rooting' for her. For this, the author is grateful to Susan French, Associate Dean (Nursing) for providing the opportunity for completion of the thesis; to the faculty and staff of the School of Nursing for constant support and encouragement; and to students in the Design, Measurement, and Evaluation program for the extra 'boosts' periodically required.

Three gentlemen provided essential direction throughout this experience. Thanks to Brian Haynes, thesis supervisor for his meticulous editing, as well as invaluable suggestions; to Rob Roberts for remarkable perseverance as he provided guidance through the mysteries of statistical analysis; and to Vic Neufeld for his helpful recommendations and encouragement.

Thanks to Margit Haynes for lending a patient and understanding ear through the many trials and tribulations of this endeavour, and to Helen Drozd for her uncompromising precision in the preparation of this manuscript.

A special thanks to my husband, Frank, for his tolerance through my 'marathon' work habits and for sharing a rather unusual summer.

To all of you, thanks for caring.

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CHAPTER I

INTRODUCTION

Programs charged with educating and graduating health professionals share the luxury of attracting an excessive number of applicants from whom the most appropriate can be selected. Enrollment in these programs is usually limited and, therefore, admission committees bear the heavy responsibility of identifying the most suitable candidates.

Selection methods vary considerably among institutions. Some programs choose to employ one admission procedure only and base their decision on the results of that particular device, for example, academic grades, personality tests, personal interviews; and others elect to make use of a combination of selection tools. The decision of which tool or tools to use is usually not made on the basis of systematic evaluation of their ability to predict success in the program, but rather on the basis of tradition and theoretical value. Some of these selection devices are often costly in terms of time and effort.

Despite the heavy emphasis that is frequently placed on admission procedures, many of these programs continue to experience a high attrition rate. In specialized areas such as the health professions, attrition creates a serious problem because positions vacated by the students withdrawing cannot be filled by others. Therefore, the class continues to diminish in size as it progresses through the program. A number of groups are affected by this

attrition--the student who has withdrawn or failed has lost both time and money, and sometimes self-esteem; the program has lost its ability to substantiate the need for faculty and various other resources; and society has lost a health professional with the potential of contributing his services to meet the needs of the community. A last group, peers and faculty of those who withdraw, may begin to fault the program and question their own decision about remaining.

This thesis will address the problem of identifying valid and reliable admission procedures to select and retain suitable nursing students. Despite a variety of selection devices, attrition rates in nursing remain consistently at 30 to 40 percent. There is an urgent need to rigorously evaluate admission procedures in order to determine if any one or combination of various devices can select nursing candidates who will both remain and succeed in the program.

The thesis will develop in the following fashion. First, the scientific literature will be critically reviewed. Following this, data collected to facilitate the identification of admission strategies will be analyzed. Lastly, research designs of two randomized controlled trials to test the admission strategies will be presented.

CHAPTER II

A REVIEW OF THE LITERATURE

2.1 Introduction

A cursory perusal of the literature addressing the issue of student selection, particularly into health professional programs, would soon reveal a diversity of admission practices and a continued search for valid predictors of achievement. Most of these programs find themselves with an enormous number of applicants and the frustrating problem of identifying a few select candidates [20]. The overall goal of the admissions committee is to choose the students most likely to succeed in a program and ultimately in their careers. Two groups of individuals must be kept in mind when evaluating admission procedures--first, the failures and withdrawals who represent a tremendous wastage of human resources in monetary terms, as well as in terms of opportunity loss to the unsuccessful students [105] and, second, the rejected applicants who may not only profit from university instruction, but who, by their exposure to university teaching, may offer a great deal to the community [70].

This review of the literature will focus on four related topics. First, the extent of the problem concerning admissions will be explored, followed by a summary of current literature on each of three selection devices. These three admission devices--grades, personal interview, and autobiographical letter are included in the research design to follow.

In the review, literature from three disciplines will be drawn upon--nursing, other health professions, and lastly, when applicable, general education literature. This expansive focus has been chosen because of the similarities in admission procedures investigated and the consistent concerns about student selection. Admissions appears to be an area which could very well benefit from the mutual endeavours of various disciplines. An attempt will be made to critically analyze the cited research; however, two points must be kept in mind throughout this review. A majority of the literature is comprised of papers emphasizing the problems inherent in admission procedures or suggesting methods of improving the process. Relatively few of the articles constitute scientific investigations of the problem and the majority of these are retrospective in nature. The second issue pertains to the review of the nursing literature in particular. Comparability of research results is somewhat impaired due to the different nursing populations used--diploma, baccalaureate and, in the United States, associate degree nursing students.

As well as outlining that which will be summarized in a literature review, it is important to identify that which will not be addressed. Personality testing, as a selection tool, has been investigated extensively. Based partly on the review of that literature, this device will not be included as an admission procedure in the research design and, therefore, will not be summarized in this review. Second, although it is true that the ultimate goal of a program is to graduate health professionals who will demonstrate on-the-job competence, it is the intent of this investigation to assess the relationship of various

admission procedures to performance in the program, rather than after completion of the program. For this reason, the literature review will be limited to papers with this same focus.

2.2 Extent of the Problem

The literature reveals a variety of selection procedures in use; however, there is a definite lack of systematic studies to evaluate the effectiveness of those selection processes [47,56,96]. Anderson [1], as recently as mid-1980, remarked about the lack of research in the United Kingdom on selection for entry to medical school and the lack of knowledge about the success of selection procedures. Funkenstein [29] noted that admission policies have not changed as rapidly as the medical schools themselves and, with the pressure for change building, there is a danger that orderly modifications of the admission procedures, based on a reasoned analysis of the problems, may not take place. He recommends that research should be carried on in all aspects of the admission process, including the validity and reliability of admission methods and techniques.

The Registered Nurses' Association of Ontario [75] has recently completed a position paper reflecting the current thinking of the organization with respect to the admission and selection of students to nursing programs. One of the purposes cited for preparing the paper is to encourage further research pertaining to the issue of admissions.

In three surveys, two in nursing [4,86] and one in medical technology [30], admission procedures used by various programs were identified. Beale [4], who surveyed 35 nursing programs in Virginia with a 100 percent return rate, concluded that admission to nursing

school is a highly individualized process, each program placing value on certain devices more than others. However, the responses did demonstrate a heavy reliance on measures of academic success, with "specific high school units" and "secondary school grade point average" the only items to be considered "very important" by more than 50 percent of the total respondents.

Schwirian [86] reports the results of a conference with representatives of nine 'high predictor' schools of nursing ('high predictor' defined as schools whose predictions of success for their graduates were most congruent with the ratings of performance given by the graduates' immediate supervisors). All participants agreed that their schools' admission procedures relied heavily on high school and college grades, as well as consistency of academic performance. In addition, most collected letters of reference for each applicant although they did not find them particularly useful. One school used the personal interview to determine the applicant's motivation for nursing. Preadmission counselling was used by the schools to help the candidate assess his/her personal and professional goals in relation to the philosophy and goals of the nursing school. A limitation of both these surveys is the small number of schools included in the samples. The data collected could not be described as representative of schools of nursing.

Garza [30] sent a questionnaire to 86 randomly selected educational institutions and 33 hospitals with programs in medical technology, with 64.7 percent responding. Total grade point average, science grades, references, and transcripts were the selection devices used in a majority (76-100%) of the institutions. Approximately 70 percent

required an interview and 20 percent an autobiography. Ninety percent of the institutions reported that their admission procedure could be improved.

Despite the variety of selection tools used, admission committees in nursing programs have not been able to realize the goal of choosing students most likely to succeed. In the United States, attrition rates in college schools of nursing average about 40 percent annually [40]. There has been a dramatic shift upwards in the dropout rates in Ontario nursing programs [11]. From 1948 to 1961, attrition rates in Ontario ranged from 14 percent to 19.5 percent [67]. The estimated attrition rate for 1975 to 1976 was about 30 percent [11].

Hegarty [40] attempted to study the problem of attrition through a questionnaire sent to 150 collegiate schools of nursing, of which 60 (40%) responded. He discovered that attrition rate over the four-year program was definitely affected by the devices used in screening candidates for the program. The greater the number of devices used, the more effective the school was in minimizing future attrition. Comparing schools that used two devices with those that used more than two devices showed a significant difference favouring more than two devices. The use of the personal interview appeared to be more effective in avoiding future attrition. The average four-year attrition rate for schools using personal interview (50%) was 21 percent compared to a four-year attrition rate of 43 percent for those not using this selection device.

There are two methodologic problems identified in this study, either of which could discount the results. First, and most evident, the 40 percent response rate is poor. Second, the average four-year

attrition rate of this sample was 28 percent. This is a lower attrition rate than the national average which creates the suspicion that the schools with the high attrition rates were reluctant or embarrassed to respond. If this is true, then some very relevant data relating to attrition would be missing, possibly invalidating these results.

Reasons for withdrawal are difficult to identify. Often the real reasons remain hidden behind reported reasons. Singh and Smith [91] conducted a longitudinal study of students at 18 schools of nursing in England collecting a variety of measurements at the time the students started training with the objective of comparing those who left nursing and those who stayed. Within two years, 131 (15.3%) of the 845 students had left. Twenty-three (17.4%) withdrew for academic reasons. The majority of those who dropped out did so for personal reasons. These 'personal reasons' included nursing dislike (38.9%), home sickness (9.9%), and ill health (10.6%). Comparison of leavers and stayers revealed that the average number of ordinary level passes for academic failures was significantly lower than for stayers; leavers seriously considered other careers before taking up nursing and stayers were more significantly influenced by a desire to help people than were leavers.

Rottkamp [82], in her study of reasons for withdrawals, explains that it is a fallacy to categorize these items as academic or nonacademic. Often there is more than one reason for withdrawal and it is difficult to label which came first. Did the academic difficulties arise from a nursing dislike, physical illness, family problems, or did the nursing dislike result from consistent academic problems?

It has been suggested that a substantial part of nonacademic attrition could be accounted for by a mismatch between the students' goals and the objectives of the particular program [86]. The position paper by the RNAO [75] further explains that different curriculum models and instructional methods require different qualities and abilities among the students accepted into the programs. Therefore, the selection process should be tailored to the objectives of the program.

The organization of nursing curricula further compounds the problem of attrition. The structure requires that students in a specific class rotate through a particular sequence of courses with their classmates. If a student drops out of the program, the vacated slot cannot be filled. Such attrition prevents full use of the nursing school's resources. Withdrawing students also incur losses--in terms of career choice disappointment and investment of time, energy, and funds [43]. Finally, there is a loss to society in meeting the community's needs for nursing graduates.

To summarize the extent of the problem, then, professionals from various disciplines are in agreement about the need for systematic evaluation of selection processes. Nursing in particular, must investigate the relationship between admission procedures and the problem of attrition.

Prior to concluding this general discussion, one issue remains to be addressed. Most prediction studies employ a regression procedure that assumes linear relationships between predictor and performance variables. Yet, there exist few theoretical justifications to restrict

relationships between admission variables to a strictly linear form, particularly when some of the variables involved are not measures of academic aptitude. Thus, a methodology which incorporates nonlinearity can potentially yield greater predictive power [27].

Knopke [51] identified the need to consider interrelationships among variables in order to forecast the probable success or nonsuccess of students. An example of such a study involves the selection of occupational therapy students [8]. Using discriminant analysis and multiple regression, 33 independent variables were examined, of which seven were able to discriminate between students who would remain in the program from those who would withdraw before completion.

However, since most of the literature written to date does examine linear relationships between specific selection devices and performance in a program, it is convenient to categorize the studies under each of the admission procedures. This section of the review, therefore, will begin with the examination of grades, followed by the personal interview and finally, the autobiographical letter.

2.3 Grades (Table 1)

The examination of grades, in the literature, becomes somewhat complicated because individual programs identify different levels from which to assess the student's academic achievement. Some programs look at secondary school grades, while others examine grades achieved in the first two years of college (for some US schools, two years of college is prerequisite for nursing) and others require evidence of academic achievement in undergraduate years (medicine, dentistry).

Views on the merits of grades as predictors of success are not consistent. In this review, literature supporting the use of grades as an admission tool will be summarized first. Following this, literature which questions this selection device will be surveyed.

2.3.1 Literature in Support of Grades

The literature review addressing the evaluation of admission procedures revealed only one randomized controlled trial [70]. This trial, which was conducted at Trent University in Ontario, with all students applying for the academic year 1972 to 1973, attempted to assess the predictive validity of Grade 13 academic achievement. As the 2593 applications arrived, applicants were blindly assigned to one of five groups--Grade 13 academic achievement, teacher recommendations, Service for Admission to Colleges and Universities (SACU) tests, structured interview, and open admissions (random selection). A sixth group included those who were assessed by traditional admission methods. These were students who had achieved the normal admission requirements (60% on six credits, no failures in these credits), but perhaps missed their interview or had not written SACU tests. The outcome criteria assessed at the end of one year of university study were two measures of academic success--grade point average and success description (clear success, probationary success, failures).

There were 498 applicants randomly assigned to the Grade 13 academic achievement group of whom 377 who had an interim Grade 13 average equal to or greater than 60 percent were offered admission. One hundred and five of these students accepted the offer and registered for the academic year.

In comparison to the other five groups, the number of students withdrawing from the university was the highest for the Grade 13 group (9.5%). Of those students completing the year, the mean grade point average (G.P.A.) was highest for this same group although the difference was not significant. The percentage of clear successes in the Grade 13 academic achievement group was the highest of the six groups and the percentage of failures was the lowest. The differences were not analyzed in terms of statistical significance due to small cell frequencies in some categories. The highest correlation, in any group, was recorded between Grade 13 marks (females) and first year grade point average. This correlation was .63 and accounted for 40 percent of the variance. However, the investigators explain that this high correlation was obtained by "being highly selective and literally 'picking' the data."

Perhaps a more interesting finding is noted upon examining the open admissions group. For this group, the withdrawal rate was one of the lowest (6.5%); the final first year grade point average was in line with the other groups as was the failure rate.

This randomized trial has two limitations which should be identified. First, it is unclear why the sixth nonrandom group was included in the study. It appears to be an afterthought since the original design involved randomizing all applicants to one of five groups. Second, most of the data did not permit statistical analysis since the cell frequencies in some categories were small. Perhaps the study should have been conducted for a period longer than one academic year or the one sample should have been followed up for a longer period of time.

Clemence [20] conducted an exploratory/descriptive study to determine what significant relationships existed between admission

procedures and the successful completion of a Bachelor of Science degree in nursing. The selection devices included admission grade point average (G.P.A.), course requirements, and demographic data. The sample consisted of 247 students entering the School of Nursing from 1969 through 1973. The findings suggest that admission G.P.A. is the most significant factor in relation to success. This program, located in United States, requires completion of the sophomore year in a liberal arts curriculum before admission into the School of Nursing. It is not clear in the paper whether admission G.P.A. represents the grades attained in the sophomore year or in secondary school prior to entering university. Since this is a retrospective study, it suffers the limitation of incomplete data. The investigator admits that the lack of control over the data could have influenced the validity of the findings. Finally, although the writer explains that chi-square was the test used and level of significance was set at five percent, no data or computations whatsoever are provided for the reader.

Seither [88] in a retrospective descriptive study, investigated, among other variables, the predictive validities of high school percentile rank and grade point averages in the biological and behavioural sciences in predicting cumulative grade point average. The sample included all students who completed the baccalaureate program in nursing between 1972 and 1976 (N=198). This description would imply that data for any withdrawals or failures were not included in the analysis. Using stepwise multiple regression, high school percentile rank demonstrated the highest predictive ability for cumulative grade point average; however, the

proportion of variance explained by this predictor tended to be low (R-Square=.13). When grade point average in the biological sciences and in the behavioural sciences were combined with high school percentile rank to predict the cumulative grade point average, the percentage of explained variance increased. The G.P.A. in the biological sciences explained the largest proportion of the variance (R-Square=.54) while the G.P.A. in the behavioural sciences accounted for the greatest percentage of remaining variance. High school percentile rank explained only two percent of the total variance. It is unclear whether these biological and behavioural sciences were part of the high school curriculum or courses taken at a college level prior to entering the nursing program.

Burgess, Duffey, and Temple [14], in a cohort analytic study, examined 58 intellective, interest, personality, and educational variables as predictors of G.P.A. on two independent student samples in a collegiate program of nursing. The two samples consisted of 76 students admitted as juniors in 1965 who formed the experimental group, and 74 students admitted as juniors the following year--the cross-validation group. Results obtained through product moment and multiple regression analyses demonstrated that the combined freshman and sophomore (prenursing) grade point average was the single most significant variable in predicting collegiate nursing G.P.A. The study was replicated with students admitted in 1967 and 1968, and once again freshman and sophomore G.P.A. emerged as the strongest predictor--accounting for 31 percent of the variance for the 1967 group and 41 percent of the variance for the 1968 group. A third study was conducted in which grade point average was deleted from the predictive matrix. Considerable prediction shrinkage

occurred, revealing that the prenursing G.P.A. clearly was a significant factor in overall prediction. Despite the consistency of their findings, the authors conclude that this approach to prediction (prenursing G.P.A.) is far too narrow in scope.

Stronck [96] conducted a descriptive study, once again with no data or analysis provided for the reader, in which four admission procedures were assessed for predictive ability with students' academic performance in a baccalaureate nursing program (N=501). The four selection devices consisted of: cumulative grade point average in a two-year program of prerequisite courses taken on main campus; cumulative grade point average for specific courses prerequisite to the nursing major; admission interview; and letters of recommendation. Results indicated that grade point averages, both for prerequisite courses and for all courses taken before admission to the nursing program, correlated at the 0.001 level of significance with all measurements of academic performance. There was no correlation between interview scores or recommendation letter scores and academic performance of students. Although the most appropriate predictor of future academic performance was the grade point average in previous courses, a major problem was identified. The investigator found that institutions differed greatly in their requirements for awarding grades. Therefore, admission policies would be unfair if they were based on the assumption that a grade of 'A' from one college was equivalent to a grade of 'A' from another college.

Weinstein, Brown, and Wahlstrom [105] in a descriptive Canadian study examined 1169 nursing student files assembled from colleges across Ontario. Data collected included application information (age, number

of secondary school credits), transcripts, interviews, and intelligence testing. Discriminant function and chi-square analyses were performed to identify the individuals likely to succeed or fail in the diploma nursing programs. Basically, the analysis indicated that a combination of pure and applied science background and language skills was the best preparation for success. The discriminant function was applied to the 1975 entry class. The result was that 61 percent of the students failing to complete the first year of the nursing program would not have been admitted. However, it would have been necessary to deny admission to 41 percent of those students who successfully completed their first year. Only 59 percent of the applicants would be correctly classified by the discriminant function. The reason for correctly classifying such a small percentage of applicants was the small proportion of variance (3.9%) accounted for by the significant variables. Although the investigators recognize that the variables considered were not sufficient to completely account for the difference between successful and unsuccessful students, they conclude that secondary school English performance and the number of pure and applied science courses taken can be considered the best available predictors. They also concluded that the interview failed to contribute significantly to predictive power.

Lastly, McGuire [59] developed a prediction index consisting of the applicant's overall premedical grade point average, the grade point average of science courses listed as prerequisites and two subtests of the Medical College Admissions Test (MCAT-Sc and MCAT-Q). This index was then applied to the entering classes of 1965 through 1974 and correlated with class standing at the completion of the freshman year.

The Pearson r ranged from .26 ($p<.05$) to .49 ($p<.01$). Therefore, the index was able to account for 6.7 to 24 percent of the variance. The correlation for the class entering in 1974 rose dramatically to $r=.84$ because that year more students with lower scores were admitted and, as a group, they tended to receive lower grades.

Scientific articles defending the use of grades as admission procedures have been summarized. Brief mention will be made of three literature reviews which formulate conclusions regarding the use of grades as nursing selection devices.

Brown, Weinstein, and Wahlstrom [11] in their review of the literature, conclude that the factor that has consistently predicted academic success best in health education programs has been the grade point average, and/or class rank for the immediately preceding period of education.

Taylor [97] concluded that high school grades demonstrate widely varying relationships with achievement criteria and yet represent the most useful predictors of later achievement.

The RNAO position paper [75] developed in March 1981 identifies high school grade point average as the most commonly used admission device. Based on two studies described earlier [88,105] and three studies of associate degree nursing programs in United States, the position paper recommends the incorporation of the following admission criteria:

i) High school grade point average and/or class rank.

ii) Required science, mathematics, and English courses.

iii) All required science and English courses at the senior, advanced level.

iv) The establishment of minimal acceptable standards for high school grade point average and grades for science, mathematics, and English.

2.3.2 Literature Critical of Grades

On the other side of the coin, literature questioning the predictive ability of grades in identifying successful students follows.

Nicholson [68] retrospectively studied academic and nonacademic variables as predictors of graduation from college. Three groups of students (non-nursing) were examined: those who graduated with honours (N=213), graduated without honours (N=1107), and those who failed to graduate (N=292). The nonacademic variables consisted of high school counsellor ratings and a socioeconomic index. Academic variables included secondary school rank in class and aptitude tests. Results indicated that academic variables were found to be important for distinguishing between graduates with and without honours ($p<.001$), but were unable to discriminate regular graduates from dropouts. A likely explanation for this lack of discrimination is the fact that many dropouts are in good academic standing when they leave the program. Nonacademic variables were found to significantly ($p<.001$) separate regular graduates from dropouts. The investigator concluded that assessment of motivation might be important in assisting academically able students.

Harrison Gough [35] who has written fairly extensively about medical school admission addresses the issue of grades as predictors of performance. He begins by acknowledging that the most highly valued applicant is typically the student with superior intellectual ability,

particularly along quantitative lines, and with an outstanding academic record, especially in the sciences and related subjects. However, he then explains the justification for assessment of 'nonintellectual' characteristics in the applicant,

> "...in spite of the rigor of measurements of intellectual aptitude and prior achievement, these indexes seldom exceed correlations of +.25 to +.30 with criteria of academic performance in the last two years of medical school. Even if, for convenience, one assumes a correlation of +.30 between intellectual or premedical achievement factors and criteria of performance in medical education, the amount of common variance would be only 9 percent; the obvious implication of this estimate is that a great deal of what is important in medical education (and practice) must be accounted for by nonintellectual factors." [35: 643]

Glaser [32] noted that admission committees (in United States) place more emphasis on grades than on any other single factor in appraising the intellectual capacity of the applicant. He identified a number of problems inherent in the use of grades. First, it is difficult to equate grades from different schools. Second, an erratic grade performance may be misleading. Third, a factor which is rarely considered is the amount of effort involved in the achievement of the grades. One student may compile a relatively good grade record, but only due to an enormous expenditure of study time, while another student may do as well while participating in various extracurricular activities. The last problem involves the applicant who has a very poor academic record, but after some other pursuit (e.g., military service) has returned to academic life as a mature and dedicated student. Conversely, the applicants who already have advanced degrees and have demonstrated academic ability, especially those past thirty, often do not perform well in medicine.

Vinson, Cooney, and Turnbull [99] in a prospective cohort analytic study at a new medical school in New South Wales compared the progress of those selected by multiple devices with that of students selected on the basis of academic achievement alone. Half of the available places were allocated to candidates (N=34) with the highest level of academic achievement (aggregate marks achieved in final high school examination or grade point average in tertiary courses). The remaining students (N=30) were selected using multiple devices. These procedures included academic achievement; paper and pencil tests measuring scholastic aptitude, creativity, and personality characteristics; general attributes such as age, sex, area of residence; and personal interview. Academic achievement was a criterion in both groups. In the first group, the top three percent of high school graduates were included. In the second group, the acceptable academic achievement was broadened to include the top ten percent of students. A limitation exists in this comparison. Since the acceptable academic achievement in both groups was so narrowly defined at the top three percent and ten percent, the groups in all likelihood were very similar to begin with. Unfortunately, the three percent and ten percent cut-off marks were not provided. In order to fairly compare these two groups, a more relaxed measure of academic achievement should have been allowed, for example, the top 25 percent of students. Then a comparison could be drawn between the groups in relation to the other methods used for applicant assessment. The other limitation of this study is the lack of randomization in allocation of applicants to groups. As postulated, the preliminary findings from assessments made during the first year of the course indicate that

there are no apparent differences in the progress achieved by the two groups of applicants. Two students, one from each of the two basic admission categories, failed to meet academic requirements and have been excluded from the course. In relation to grades, however, this study indicates that the very top academic achievers do not perform better than those with somewhat lower grades. These would have been candidates not ordinarily considered for positions in the school.

Evaluations by the applicants in the described study revealed no enthusiasm for the traditional criterion of academic achievement. Nine out of ten of the applicants believed that such an approach completely overlooked the importance of personal qualities which are important for the practice of medicine. A follow-up survey of the attitudes of applicants to the McMaster Medical School toward the McMaster system of selection [60] concurred with these findings. There was overwhelming support for not selecting students solely on the basis of their undergraduate academic records.

Cohen [21] points out that contrary to the assumption that academic ability is necessary for professional success, research on attrition in nursing education reveals that many students who score high on academic predictor tests drop out, while others with minimal scores graduate. She proceeds to explain that although tests measure attributes and aspects correlated with success and intelligence, they cannot measure intelligence directly. Also, there is a possible disparity between cognitive ability and psychological maturity. Social and emotional development does not always follow the same pace as the development of academic ability.

Walton [103] uses three examples to question the reliance on examination performance to select medical students. Studies in the United Kingdom, USA, and Edinburgh found that school examination performance correlated poorly with medical school grades. Chaisson [18] concludes that although it is well supported by research studies that grade point average is not satisfactory as a predictor of school performance, it remains the sole criterion thus far acceptable to the outside community.

Barrett and Powell [3] established a procedure for the admission of unmatriculated applicants over 25 years old. The academic performance of successive entry cohorts was shown to be consistently superior to that of students entering direct from school. They concluded that a commitment to study is a more valid predictor of success than the possession of formal educational qualifications. Secondly, they hypothesized that many standard entry students drop out because they do not make well-informed decisions when applying for entry.

Those who question the use of grades as a selection device do not recommend that they be completely overlooked, but rather that they be considered as one of several devices. Cohen [21] states that although intellectual factors play an important role in the student's ability to complete a nursing education program, it is unquestionably not the only factor. Among students who have the intellectual capacity to complete a program, personality factors appear to be the crucial variable in determining their success in school. Haglund [38], studying nursing and admissions, adds that along with intelligence, motivation, difficult as it is to assess, most certainly enters into a person's learning

potential. Vinson [99] describes two reasons why multiple criteria are preferable to the single criterion of academic achievement:

> "(i) medical education and practice demand a range of personal skills which may or may not be associated with academic achievement, and (ii) an aggregate mark gained at the end of high school may be a very imperfect measure of the very varied intellectual skills which students are required to exercise in the type of problem-based education programme conducted at Newcastle." [99: 33]

Rezler [77], Stronck [96], Shanan [89] support the recommendation made by the RNAO [75] this year: that a combination of admission and selection procedures be used. Beale [4] explains that:

> "as the pool of prospective applicants becomes increasingly more homogeneous in terms of academic potential, it is incumbent upon nursing programs to begin looking more closely at other less academically oriented measures of successful performance in nursing school... the current emphasis in nursing education upon interpersonal relations skills and personal growth and awareness makes it imperative that admission directors begin screening more closely on factors that contribute to more effective interpersonal functioning. This is especially true when studies of nurse performance point out that effective nursing is positively related to nurse personality, ability to cope with stress, openness, flexibility, and self-assurance." [4: 30-32]

In conclusion, although the literature summarized represents two seemingly different views about the use of academic grades as an admission device, careful scrutiny reveals that the findings are remarkably similar. Those in support of the use of grades acknowledge the small amount of variance explained by this selection tool. They admit that grades do not completely account for the difference between successful and unsuccessful students. Some of the investigators also voice a concern about the lack of consistency among institutions in awarding grades.

The majority of those who question the use of grades do not advocate the complete dismissal of this information when considering applicants, but moreso, that additional information be used in order to assess the prospective student in terms of both academic and non-academic abilities.

Table 1

Grades As An Admission Procedure

Author/ Reference	Design	Type and Location of Program	Sample Size	Results
Pollock, Boksen, Gendreau & Gendreau [70]	Randomized controlled trial	University - Ontario	558	For Grade 13 group. Number of withdrawals highest. Mean G P.A. (first year) highest Percentage of successes highest Percentage of failures lowest. (None significant)
Clemence [20]	Descriptive	B Sc N - US	247	G.P.A most significant factor in relation to success/nonsuccess (no data or computations provided)
Seither [86]	Descriptive	B Sc N. - US	198	G P A in biological sciences explained 54% variance in predicting cumulative G P A. G P A in behavioural sciences explained 11% variance. High school percentile rank explained 2% variance.
Burgess, Duffey, and Temple [14]	Cohort analytic	Collegiate Nursing Program - US	76 experimental group 74 cross-validation group	Prenursing combined freshman and sophomore G P A. most significant variable predicting collegiate nursing G P.A
Stronck [90]	Descriptive	B.Sc N. - US	501	G.P A. both for prerequisite courses and all courses taken before admission to nursing, correlated at 0 001 level of significance with all measures of academic performance

Author/ Reference	Design	Type and Location of Program	Sample Size	Results
Weinstein, Brown, and Wahlstrom [105]	Descriptive	Diploma Nursing - Canada	1164	Secondary school English performance and [illegible] pure and applied science courses--best available predictors (account for 3 9% variance) of success in program
McGuire [59]	Prospective	Medical School - US	10 classes each with an average of 68 students	Correlation between prediction index and freshman class rank resulted in r-values ranking from .26 (p< 05) to .49 (p< 01)
Nicholson [68]	Descriptive	University - US (general program)	213 graduated with honours 1107 graduated without honours ~9% dropouts	Academic variables important for distinguishing between graduates with and without honours Nonacademic variables significantly separated regular graduates from dropouts
Vitro, Kinney, and Kornhoff [99]	Cohort analytic	Medical school - Australia	3, "academic achievement" candidates 30 f "comprehensive assessment" candidates	% differences in progress achieved by the two groups of applicants

2.4 Personal Interview (Table 3)

The interview, as a selection device, is used extensively in a variety of educational programs. In nursing education in the United States, 77 percent of 698 programs responding to a questionnaire on selection procedures identified that the interview was the device most used. Thirty-one percent of the users indicated that it was the most important component of their selection process [11]. The applicant interview is an integral part of the admissions process in 118 of 120 US medical schools [28]. Canadian medical schools also make extensive use of this selection device [63]. In occupational therapy, 34 of 37 programs responding to a survey indicated their use of the personal interview as an admission procedure [57].

A variety of purposes for the selection interview have been identified. First, interviewing helps determine the extent to which the prospective candidate identifies with the ideology of the profession and whether the commitment is superficial or rooted [32,101]. An interview can help ascertain whether the applicant is aware of the program's time demands and how he/she expects to cope [101]. It permits the interviewer to observe the applicant's ability to establish rapport and relate to others on an interpersonal level, as well as evaluate how the candidate reacts to anxiety and pressure [22,101].

The interview is a means to assess an individual's oral communication skills [101], as well as characteristics not amenable to evaluation through grades, for example, qualities of judgment, open-mindedness, maturity, and general coping ability [17,22,101]. Interviewing allows an opportunity to verify and clarify information obtained about the applicant

from the application form and from other sources [17,28,32,101]. Lastly, the interview affords the applicant an opportunity to learn more about the school by speaking with faculty and students, and obtaining responses to questions not easily answerable in calendars and brochures [17,28,32, 101].

Despite the widespread use of the admission interview and the identification of a variety of purposes for it, there exists, as with grades, a conflict in regard to the ability of this selection tool to predict performance. The literature review will first summarize data favouring the use of the interview followed by a report of publications questioning its validity and lastly, a presentation of the literature addressing reliability of the selection interview.

2.4.1 Literature in Support of Interview

Zubin [110] describes a conference where the majority of participants criticized the value of the interview until one New Zealander arose and said, "Gentlemen, if I wanted to get married and you had 20 willing maidens in this room and gave me all the tests in the world about them, I still would like to talk to each of them before I selected one as my wife."

Smeltzer [92] is a strong advocate of the use of interviews in the selection of student nurses. He states that "perhaps no other part of the selection process will contribute more to a reduction of the attrition rate" [92: 13]. Scholastic aptitude alone, he feels, should never be the criterion for discriminating, but rather that every effort should be made to evaluate the total concept of aptitude and then distribute the emphasis in selection equitably. Many will possess the

necessary mental qualifications, but it is the evidence of personal qualifications that will need to be analyzed. The interview session should be used to evaluate those qualities which can be judged, but not tested.

Stanojevic [93] in 1973 prospectively studied interviewing and its effect on attrition in a diploma nursing school in Toronto. Applicants who met the academic requirements for admission and who lived within a one hundred mile radius of the school were invited to an interview. Two hundred and fifty out of a total of 903 applicants were interviewed. Of the 377 who were accepted, 192 had been interviewed. Of the 207 students who actually started in September, 103 had been interviewed. Outcome measures included whether the students graduated or withdrew and whether withdrawal was due to nursing dislike. Of the 103 interviewed, 88 (85.4%) graduated; 10 (9.7%) withdrew due to nursing dislike; and 5 (4.9%) withdrew for other reasons. Of the 104 who had not been interviewed, 76 (73.1%) graduated; 20 (19.2%) withdrew due to nursing dislike; and 8 (7.7%) withdrew for other reasons. She concluded that there was a significant difference at the .05 level in the withdrawal rate between those interviewed and those not interviewed.

The investigator was aware of several limitations in this study. First and most important, since the decision of whether to attend the interview was totally left to the applicant, there is a strong likelihood that those who were very keen and motivated about nursing would attend (especially since interviews were conducted during spring break). Also, all applications had not been received at the time of interviews so that once again the highly motivated student would submit his/her application

earlier than someone who was vacillating. The decision to interview those within a one hundred mile radius of the school might have introduced a bias. The interviewed applicants, not chosen randomly, might not have been representative of all applicants.

Murden, Galloway, Reid, and Colwill [66] studied the relationships of measures of personal characteristics and of college academic performance with clinical success measured by internship letters of 458 medical students four years later. Emphasis was given to the degree to which the specific personal characteristics of "maturity", "nonacademic achievement", "rapport", and "motivation for medicine" as judged by admission interviewers, were related to clinical performance. The outcome measure, an internship evaluation letter was prepared on behalf of each graduate by a 10-member Internship Advisory Committee. The purpose of this letter was to estimate a student's future success as an intern. Findings indicated that cognitive measures did not correlate significantly at the .05 level with internship letter ratings after four years of medical school. However, ratings by admission interviewers on each of the four personal characteristics correlated significantly ($p=.0003$) with the letter ratings. Highest correlations occurred with the interviewer's judgment of the candidate's maturity.

The investigators conclude that when a decision must be made between applicants with high grade point averages, but with few strong personal characteristics and candidates with high levels of maturity or nonacademic achievement, but borderline grade point averages, the second group should be chosen. When screening candidates to determine who to interview, both measures of nonacademic achievement and grade point

average should be obtained from the applicant. Again, a few limitations of this study could have influenced the results. First, contamination was likely because the interviewers reviewed each applicant's total file including application materials, college transcripts, MCAT scores, and letters of reference prior to interviewing the candidate. Litton-Hawes and others [54] concluded in a study of the interview that concentration on the applicant's file tended to bias the interviewers. Second, the personal characteristics were not precisely defined for the committee. Therefore, interviewers rated the applicant according to their individual interpretations of the characteristic.

Wahlstrom, Danley, and Jones [100] examined the files of 2097 applicants to the Ontario Teacher Education College (OTEC) for the 1977 to 1978 academic year. This total included all applicants--960 to the Hamilton campus and 1137 to the Toronto campus. The files contained the application form, university transcripts of academic record, admission test results, interview results, and other pertinent documents or information. The outcome measures consisted of success in the OTEC academic program and success in the practice teaching program. The study examined what the best predictors for success were; how the selected candidates differed from those not accepted; and how the withdrawals differed from the graduates of the program. For students at the Toronto campus, the admission procedures which significantly ($p<.01$) predicted both academic and practice teaching grades were working experience and the interview. In Hamilton, test score and grade point average predicted both academic and practice teaching grade. For the latter, interviews also

related significantly. The investigators concluded that a selection model be developed including three admission devices with equal weighting: interview score, grade point average, and test score.

Interview score, grade point average, test score, and work experience differed significantly between selected and nonselected candidates. The only variable that demonstrated a moderately strong significant difference between withdrawals and completers was age. The completers were slightly younger than the withdrawals.

Richards and Taylor [78] conducted a study to evaluate the degree to which academic performance in medicine could be predicted on the basis of interviews. Sixty-five students admitted to medical school had been interviewed and rated in three areas: personal characteristics, chances for success in medical school, and whether he/she should be accepted into medicine. The interview scores were compared with the four MCAT scores and undergraduate G.P.A. The outcome measures were grade averages in each of the three years of medical school. For each of the three years, r-values for interview ratings were considerably higher than any MCAT scores and in some cases higher than the undergraduate average. The interview correlated with third year average with an r-value of .32, while the undergraduate average correlated with the same year with an r-value of .28.

The difficulty in assessing the validity of the interview might be in the outcome measures chosen. One would not necessarily expect ratings of personality characteristics to be evident in or influence academic grades [90]. Interview ratings might be more suitably validated trait by trait against outcome measures of corresponding traits [28].

Federici and Schuerger [24] studied the admission of students to a graduate program in psychology. The selection devices investigated were undergraduate G.P.A., test scores, letters of recommendation, and interview ratings. The outcome measures were graduate G.P.A. and faculty ratings of interpersonal skills. Using multiple regression, one test score and undergraduate G.P.A. correlated significantly with graduate G.P.A., and only interview ratings contributed significantly to prediction of interpersonal skills. The investigators concluded, as suggested by Fruen [28], that both procedures, an academic measure and an interview, be used to predict the two outcome measures (grades, interpersonal skills) which are so independent of one another.

In a study by Weinstein, Brown, and Wahlstrom [105] described earlier, the interview failed to contribute significantly to prediction of success in diploma nursing schools. However, the investigator does note that the attrition rate was lower for the group of students that had been interviewed. Hegarty [40] concurred with this finding. Weinstein [105] sees the effect of the interview as helping students evaluate their own suitability for a program, rather than to identify the best candidates.

Schubert [84] arranged for a number of raters to assess applications before and after interview. About 72 percent of the time, judgments of the component items remained identical when interview material was added. Stability was the highest in the most easily defined items, for example, intellectual capacity, and lowest in those areas most difficult to define, for example, assessment of motivation.

Preinterview recommendations for acceptance changed toward denial about one-tenth of the time and doubtful recommendations changed to clear acceptance about one-third of the time. She concluded that judgments made after the personal interview tended to improve slightly and that the interview seems to be most useful, in connection with the final decision, only in the middle group of applicants on whom the preinterview evidence includes some negative points. If such applicants were automatically denied admission, many good students would be excluded.

Calkins and others [16] present a paper describing an innovation in selection procedures in an American medical school. A minimum score on high school rank in class and admission test scores was set to determine those applicants who would be interviewed. The interviews were used to assess leadership, motivation, interests, and interpersonal skills. Admission was then based on this assessment only. The validity of this process in terms of success of the students accepted had not yet been investigated.

Pollock, Bowman, Gendreau, and Gendreau [70], in a randomized trial described earlier, compared six groups of students each of whom had been selected on the basis of different admission procedures. The interview group began with 498 applicants of whom 350 were interviewed by a trained interviewer. The interview was structured and addressed eight specific criteria. The applicant was rated as excellent, above average, average, or poor. Of the 350 interviewed, 256 were offered admission and of these 96 registered.

A total of seven students (7.3%) from this group withdrew (9.5% withdrew in grades group and 9.1% in the traditional admission group).

The mean G.P.A. for students completing the year in the interview group ranked second highest among the six groups. The percentage of students who completed the year was very similar to the other groups, but the percentage of failures for the interview group was one of the lowest. The investigators noted that a "face-to-face interview with a representative of the university tends to break down the corporate and bureaucratic image which most universities have acquired in the eyes of students."

Four surveys of applicants' reactions to the interview have been reviewed [31,60,71,95]. In all four reports, the majority of respondents felt that interviewing was essential for selection. In one survey [95], applicants indicated that the interview should carry more weight than it does. Hobson [42] compared two groups of applicants to dental school--one was interviewed and the other was not. The results showed that candidates who were invited to attend a personal interview were more likely to accept firmly the offer of a place in the dental school.

Brief mention will be made of a literature review conducted by Wahlstrom, Danley, and Jones [100]. These investigators examined studies of the admission interview and concluded that:

> "Although the selection interview suffers from problems of reliability and bias and is a very expensive procedure, sometimes very "demanding and impractical to implement" in the area of educational selection and more specifically the selection of teacher candidates, the procedure is among the best, if not the best predictor of successful student teaching. The picture which emerges is that the low predictive efficiency of the interview is not universal. While it may have low predictive validity in personnel recruiting and selection in general, its utility in selection of teacher candidates, especially when it is structured, systematic and well-designed and used by the proper personnel, is on the road to being firmly established." [100: 48]

To summarize, the interview has, in the studies described above, demonstrated an ability to predict the successful student.

2.4.2 Literature Critical of Interview

Conversely, there exists considerable literature which questions the validity of the admission interview as a selection device.

Morse, presenting a paper [65] at a conference on personality measurement described the selection interview as "a cat with more lives than nine". He explained that it is characterized by personal opinions; its validity has not been proven and there is a lack of hard-nosed evaluation. He then reported results of an evaluative study he had conducted in a school of dentistry. Interviewers were asked to rate applicants with respect to appearance, self-expression, motivation, and significant experiences. They were also asked to express their degree of acceptance for the candidate. A limitation with the interviewing process became evident as applicant feedback indicated that some faculty interviewers were concentrating on a discussion of G.P.A. and test scores. The interview scores along with other predictor variables--undergraduate G.P.A. and test scores were correlated with the admission decision. Using multiple regression analysis, required G.P.A. and test scores were found to contribute significantly. It was concluded that interview reports made a minimal input into the selection decision.

A questionable issue in this study was the use of the admission decision as an outcome measure, rather than performance in the program. Admission decisions are based on data provided in the applicant's folder. Since it is highly likely that the interview would not be measuring the same attributes as those described in the folder, one could not expect a

correlation between the two.

Prywes [72] retrospectively studied selection procedures in a medical school in Jerusalem. The admission process consisted of three components: matriculation certificate, entrance examination, and personal interview. For eight classes (N=350), these selection devices were examined in relation to three outcome measures--premedical grades, preclinical and clinical grades. Only 120 candidates screened by the entrance examination were interviewed each year. The correlation coefficients (r) among all six variables indicate that the matriculation grade is the only significant ($p<.01$) predictor of the students' achievement at all three levels of the medical curriculum ($r=.39$; $.31$; $.24$). The entrance exam is significant as a predictor for the premedical period only ($r=.17$), while the nonstructured personal interview does not have predictive value for any of the three levels.

Whereas, 63 percent of the students achieved high grades at the interview, a high proportion of them received low marks at the premedical and preclinical stages (42% and 33% respectively). The situation becomes paradoxical in the clinical period when the low achievers at the interview show the largest proportion of high grades (47%) and the smallest proportion (6%) of low grades. In the preclinical and clinical stages, the students with poor results at the interview performed better than those whose interview grades were high. As a result, the personal interview was abolished as an admission tool. A factor which may have contributed to the negative findings of the interview is that it was unstructured. The issue of the structured/unstructured interview will be addressed in the next part of the review, but suffice it to say that

the establishment of validity of the interview rests on its need for structure.

Gough, Hall, and Harris [36] conducted a retrospective study using 14 classes at the University of California School of Medicine (N=1088). Admission devices--four scales of the MCAT, premedical G.P.A., and interview ratings were examined in terms of outcome measures--grades in each year plus overall G.P.A. for each student. Median correlations are shown in Table 2.

The investigators conclude that the admission procedures are not doing very well with respect to differential prediction. At this point, it might be worthwhile to consider a possible explanation which Murden and others [66] suggest. They hypothesize that these low correlations may result from methodological difficulties. Since the students have been chosen on the basis of certain admission procedures, only those who attain highest levels in each component of the admission process are accepted. Therefore, the selection restricts the range of the predictor. Later efforts to demonstrate a correlation of that predictor with success can only yield lowered correlations. Another contributor to low correlations is low reliability of either the predictor or the criterion measure.

> "Thus, the best assessment of the importance of various predictors would require random selection without regard to the predictors to be tested, high reliability in measurement of the predictors, and high reliability and validity of the performance measure. It is little wonder that correlations in past studies have been low." [66: 712]

Milstein, Wilkinson, Burrow, and Kessen [63] in a cohort analytic study compared a group of 24 applicants who were interviewed and accepted at the Yale University School of Medicine, but went to other medical schools with a group of 27 applicants who attended the same schools, but

Table 2

Median Correlations* Between Admission Procedures and Outcome Measures

Outcome Measures	Admission Procedures: MCAT Verbal	MCAT Quantative	MCAT Modern Society	MCAT Science	Premed G.P.A.	Premed Science G.P.A.	Premed G.P.A. (last 2 terms)	Personal Interview
First Year Grades	.14	.18	.12	.28	.22	.28	.27	.01
Second Year Grades	.08	.09	.06	.10	.22	.22	.22	.04
Third Year Grades	-.05	.05	.03	.01	.16	.17	.16	.05
Fourth Year Grades	-.07	.10	.01	.00	.07	.04	.09	.05
Overall G.P.A.	.04	.15	.11	.13	.18	.22	.21	.05

*None were statistically significant.

had been rejected at Yale following an interview. Data on the performance of the two groups of students consisted of two outcome measures--scores on Part I and Part II of the examinations of the National Board of Medical Examiners and scores on an evaluation form filled out by the dean's office at each student's medical school.

Various analyses were conducted examining the relationship between the interview results and the outcome measures, and none suggested any relation between them. The investigators conclude that given the cost of the interview process and failure to find differences in medical school performance, the use of this device demands reconsideration. Several limitations in this study may have influenced the results. First, the sample size is small (N=24; 27). Second, selection devices should co-ordinate with the objectives of the school. The goals of the schools the applicants attended may have differed from those of Yale. Third, it would have been of interest to include, as another comparison group, those students admitted to Yale on the basis of the interview--did they perform as well, worse than, or better than the students at the other schools on the examinations of the National Board of Medical Examiners?

Walden [101] weighs the pros and cons of the interview and decides that on balance the record against interviewing is more persuasive than the record in its favour. Costs of interviewing are considerable--in terms of the student and the system, and in terms of time, energy, and anxiety. In single admission interviews, the applicants will be at their best behaviour and may be adept at giving answers the interviewer expects to hear, rather than answers that reflect their

real perceptions. The interview is subjective, lacking adequate controls. Some interviewers will apply admission standards strictly and some loosely. Human rights legislation has had an effect on admission interviews. Interviewers need the specialized knowledge which will avert legal entanglements.

Kelly [48] is often cited as a critic of the interview. He suggests that this selection device gives a great deal of satisfaction to the persons who use it. However, the validity of the interview is questionable and in view of its cost in terms of professional time, it cannot be defended as an economical procedure. It was in 1957 that he presented this view at a conference. At that time, he concluded by saying:

> "In closing I am going to stick my neck out and predict with a very high level of confidence that the selection interview will continue to be a widely used and highly respected technique. No amount of evidence, negative evidence, regarding its validity seems likely to change the situation. I predict that the popularity of the interview will decrease only when and to the degree that more valid techniques and devices are developed to do the practical jobs of selection in our complex society." [48: 84]

Lastly, the RNAO [75] in its recent position paper stated that based on the literature, the interview does not have predictive power for selecting or rejecting students in terms of their motivation, personality, communication skills, or interest in nursing. However, it is a useful tool for recruitment and counselling techniques. Interviews may assist students make informed decisions regarding their application to a program. This may then indirectly reduce attrition rates. In conclusion, their final recommendation is that structured interviews be used for information exchange and diagnostic and counselling purposes, rather than for screening.

Table 3

Personal Interview As An Admission Procedure

Author/ Reference	Design	Type and Location of Program	Sample Size	Results
Stanojevic [93]	Cohort analytic	Diploma Nursing Program - Ontario	103 interviewed 104 not interviewed	Significantly fewer ($p<.05$) withdrawals in interview group compared to non-interview group.
Murden et al [66]	Longitudinal	Medical School - US	458	Ratings of four personal characteristics in interview correlated significantly ($p=.0003$) with internship letter readings. Cognitive measures did not correlate with outcome measure.
Wahlstrom et al [100]	Descriptive	Teacher's College - Ontario	2097	For Toronto campus, interview significantly predicted ($p<.01$) academic and practice teaching grades. For Hamilton campus, interview significantly predicted ($p<.05$) practice teaching grades.
Richards and Taylor [78]	Longitudinal	Medical School - US	65	Interview correlated with third year average $r=.32$. Correlations higher than MCAT scores and in some cases higher than undergraduate G.P.A.

Author/ Reference	Design	Type and Location of Program	Sample Size	Results
Pollock, Bowman, Gendreau & Gendreau [70]	Randomized controlled trial	University - Ontario	558	Mean G.P.A. for students completing year in interview group ranked second highest among the six groups. Percentage students who completed year similar to other groups. Percentage of failures for interview group one of the lowest.
Morse [65]	Longitudinal	Dental School - US	160	Required G.P.A. and test scores correlated significantly with admission decision. Interview made minimal input.
Prywes [72]	Descriptive	Medical School - Israel	350	Unstructured personal interview not able to predict premedical, preclinical, or clinical grades. Abolished as selection device.
Gough et al [36]	Descriptive	Medical School - US	1088	Interview did not contribute significantly to prediction of grades in each of four years or overall G.P.A.
Milstein et al [63]	Cohort analytic	Medical School - US	24 applicants accepted at Yale, but went elsewhere 27 applicants rejected at Yale and went elsewhere	Interview unable to predict differences in medical school performance.

2.4.3 Reliability of Admission Interview

Most investigators, when studying the admission interview, stress the importance of establishing its reliability. Prior to examining this concept directly, two factors thought to influence reliability will be reviewed--the structure of the interview and the training of the interviewers..

Mayfield [58] and Wright [109], in reviews of the literature about the employment interview, concluded that structured interviews, in general, provide a higher interrater reliability than do unstructured interviews. Mayfield found that in almost all cases where a satisfactory reliability for the selection interview was reported, the interview was of a structured form. Use of criteria would introduce a greater degree of objectivity into the use of the interview as an evaluative tool [28]. Ulrich and Trumbo [98], in their summary of literature about the employment interview, found validity to be highest in studies evaluating structured interviews.

Chaisson [18] summarizes the recommendations made at a conference on admissions in 1971:

> "...if the interview continues to be incorporated in the admission process, it should be structured with some predetermined questions and criteria. Judgments about the students' status on different criteria could be assigned to a well-defined point system which is weighed in relation to importance and converted into a measurable format. Criteria selected for calculation ought to reflect the basic philosophy of the particular medical model." [18: 11]

Krupka [52] suggests that as the interview is more structured, the information obtained becomes more accurate. The advantages of structuring include a greater uniformity of information, a reduction in

the collection of nonrelevant data, and provision of clear guidelines for beginning interviewers.

Greenwald and Wiener [37], in an attempt to minimize subjective bias in interviews of post-graduate applicants to internal medicine, introduced a standardized interview to be conducted in a uniformly structured manner by all interviewers with all applicants. The interview form consisted of 14 items to be rated for each applicant. The structure of the interview consisted of a general discussion for seven minutes, assessment of medical skills for 12 minutes, and answers to questions from the candidates for eight minutes. The rating form facilitated calculation of means, medians, and modes for each interviewer. This data provided a guide to identification of "hard" and "easy" interviewers, and also those who were able to discriminate between applicants.

Once the format of the interview has been developed based on specific, pertinent criteria, attention should be focused on training of interviewers in order to facilitate an unbiased, accurate, and honest assessment of the applicant. Through the use of videotapes [52] and/or simulated applicants [46], interviewers can receive feedback on their interviewing skills. Krupka [52] suggests that interviewers who consistently offend applicants or are not consistent with other interviewers, and are unable or unwilling to change, should not continue to be used. Johnson [46] after conducting a workshop for interviewers, recommended that interviewers be thoroughly familiar with the interview rating form prior to the actual interviews and that more time be allowed in the workshop for review and critique sessions. Those unable to attend should have an opportunity to attend makeup sessions prior to conducting interviews.

Burton [15] describes the interview as "notoriously unreliable and subjective". Results of studies investigating the reliability of this selection device have been disappointing. Burgess, Calkins, and Richards [13] attempted to determine the level of agreement between physician and non-physician interviewers. Forty-two physicians and 13 non-physicians participated in an orientation session, reviewed specific guidelines for the structured interview and interviewed 205 applicants for medical school. Agreement on individual items in the scale ranged from 28 percent to 31 percent; however, the level of agreement on total composite overview, that is, the recommended decision, was 73 percent (149/205 applicants). The investigators acknowledged this, but went further to note that the correlations between physician and non-physician ratings were low, but generally positive. A problem arose in reviewing this paper because reference was frequently made to various tables; however, the tables had been omitted from the text due to difficulties accommodating the charts on the journal pages.

Broadhurst [10] studied the reliability of the interview in selecting students for post-graduate study in clinical psychology. Selection consisted of a preliminary stage where application forms and referees' letters were assessed. Twenty-nine of the 128 applicants were interviewed. Two interview teams, each consisting of two clinical psychologists, interviewed each applicant. Correlations between the two members of each team reached significance--one at the .05 level (0.40) and one at the .001 level (0.61). The correlation between the two teams (.27) did not reach significance. She concludes that interviewing is a doubtful or only moderately reliable system of selection. She does,

however, identify a limitation that could have influenced the results. Since all the applicants had been prescreened, only a select group attended interview. Discrimination between individuals of such high standard would be more difficult than a random sample. The investigator appears hasty in her conclusions; it must not be overlooked that members of each interviewing team were able to agree with each other at a significant level (interviewers independently completed rating of applicant).

Mann [57] examining the interview process in occupational therapy programs, analyzed interviewer scoring differences. Each applicant was interviewed by two faculty, one clinician and, in most cases, one occupational therapy student. Each interviewer's scores were considered as a group, and the means computed. Analysis of variance was used to determine if the difference in mean interview scores for each interviewer was significant. Results indicated that interviewers scored applicants differently even though a structured interview rating form was used. However, it was not clear in the paper whether the interviewers worked as a team or interviewed individually. If the latter is true, there is a possibility that the applicant would react differently depending on the type of atmosphere created by the interviewer. This could contribute to variation in interviewer ratings. The other problem identified through this analysis was the nondiscriminating interviewer--one who rates all applicants the same.

Given the problems, Mann offers suggestions for controlling these effects. First, deviant interviewers could be eliminated from participating in future years--providing of course, that the program can afford to lose the manpower. Second, the applicant could be interviewed by a

number of interviewers and then using ANOVA, identify the deviant interviewers and eliminate their scores, averaging the remainder of nondeviant scores for that applicant. Third, the importance of using the rating form according to the guidelines should be stressed in the training session. Fourth, the same discriminating interviewer could interview all applicants--a somewhat unrealistic and impractical suggestion. Lastly, ANOVA could be used to adjust interview scores so that the mean score of each interviewer matched the grand mean.

It is difficult to compare the results of the various studies examining the admission interview. The structure of the interviews evaluated in the studies range from unstructured to semi-structured to structured. Often interviewers have access to the applicant's file creating an academic, rather than nonacademic focus to the interview. Sometimes the main purpose of the interview is for the applicant to learn more about the program, rather than for the interviewer(s) to assess the applicant. The amount of training of interviewers is seldom specified. Few investigators establish the reliability of the device prior to pursuing a study of its validity. Outcome measures used to assess the predictive validity of the admission interview vary from academic to nonacademic. It is perhaps unrealistic to expect a measure of nonacademic ability to be reflected through an academic outcome such as grades achieved in a program.

Since interview procedures vary from program to program, it is important that each one develop a plan for examining the reliability of this device. Once the measure of reliability is acceptable, the validity should be determined in terms of appropriate outcome measures.

2.5 Autobiographical Letter

The literature addressing the autobiographical letter as a selection device is scarce when compared to that focusing on grades and the personal interview. There are no studies which investigate the validity of the letter and only one or two which examine its reliability.

The RNAO [75], in its recent paper, concludes that there is very little written in relation to the effectiveness of the biographical essay for collecting data on the interests, language skills, and background of applicants. As far back as 1959, Beyer [7] suggested, as one of many selection devices, that the applicant's written reasons for entering nursing be assessed to determine his/her interest.

Stronck [96], examining the validity of grades versus interview in predicting academic performance in a nursing program, mentions the autobiographical letter briefly. A very small proportion of points in the admission score (4/77 points) were awarded on the basis of a short essay composed by the applicant. Results indicated that narrative skills of the applicants correlated ($p=.044$) with academic performance in the nursing college. Therefore, the investigators recommended that each applicant identify their professional goals and attitudes in writing.

In a survey of admission procedures in occupational therapy programs [47], ten out of 39 respondents required an application letter or essay. These were evaluated for neatness, organization, ability to express oneself clearly, and content. Sometimes, they were used to assess the student's motivation for occupational therapy.

Walden [101] sees the autobiographical letter as an alternative to the interview:

> "Applicants can be asked to write personal essays by which they can be evaluated more comprehensively with regard to such qualities as motivation, values, degree of open-mindedness, coping strength, or whatever. The objective would be to translate into written form what one might hope to gain from a direct interview with an applicant. Admission raters could then be trained to examine these statements for the qualities desired. A probable result would be greater consistency and greater standardization among raters." [101: 56]

Walden does identify a few disadvantages to the letter. The organized, articulate writer is likely to fare better than he who has difficulty putting his thoughts on paper. Also, there is no assurance that the applicant himself wrote the personal statement. Ceithaml [17] adds that information regarding nonintellectual characteristics which appear in the written essay are superficial or merely suggestive. There is an advantage to the autobiographical sketch, when compared to the interview; the document is readily available for reference if inconsistencies in rating occur.

Hamilton [39] describes the selection of medical students at McMaster University. Applicants are asked to write a letter about themselves, each of which is then assessed independently by three members of a reading team. The teams participate in an orientation session and use a structured rating tool for assessing the letters. The teams consist of a student, a faculty member, and a community representative. Those applicants whose letters are rated highly are invited to an interview. In 1971, the Admissions Committee compared those selected for interview on the basis of letter ratings with 30 students selected at random. Even though the academic profiles of the two groups were very similar, the randomly selected group received poor interview ratings when compared to

those selected on the basis of letter scores. Interviewers were blind to the basis of selection for interview. In a follow-up of attitudes of applicants to McMaster medical school [60], the overall mean score on the adequacy of the autobiographical sketch was 4.257 (7-point scale). They liked the fact that it allowed the applicant to express himself, but disliked the fact that it could be falsified easily and gave advantage to those who could write well.

Roberts and others [79] investigated the reliability of letter scores. The percentage of observed agreement among the three readers rating the global score was compared with expected agreement by chance. Results indicated that the excess agreement was highly statistically significant and readers were able to agree with one another.

Walton, Sheldrake, and Maguire [103] criticized the emphasis on pre-entry intellectual criteria in medical school admissions. Selection should also include an assessment of attitudes, values, and motives.

> "Some schools, Edinburgh in the past, and McMaster, Canada, and Beersheba, Israel, currently, ask applicants to submit self-descriptions, on the theme: 'Why I want to become a doctor?' Entrants portray themselves in their essays. In addition, of course, they make statements aimed to meet selectors' expectations and preferences. Such effort to present socially approved attributes, in addition to self-portrayal, to be thought well of by selectors, need not be disparaged; it is a source of motivation, and in fact differentiates students who are successful from less successful students." [103:11]

Walton, also, examined the agreement among ratings. The reliability of two independent raters was assessed for 23 percent of the self-descriptive essays (N=215) submitted to Edinburgh medical school. The task of each reader was to determine whether they could identify

various categories out of a total of 42 in letters (examples, medical background, service to patients). Agreement between raters ranged from 0.53 to 1.0 (all correlations significant at $p<0.001$). Walton, therefore, is in agreement with Roberts [79] in concluding that medical school applicants' personal qualities can be reliably assessed from an autobiographical letter.

In conclusion, the autobiographical letter has been suggested as a selection device and in a few cases is actually in use. Before a decision can be made by admission committees to incorporate the letter as an admission procedure, it is important that the validity of this device be established.

2.6 Conclusions

The literature addressing each of three admission procedures--grades, interview, and autobiographical letter has been reviewed. There is no agreement about the validity of grades or interviews. The letter brings with it both advantages and disadvantages. Whitla [106] sums it up best:

> "...after a decade of frenzied research activities, the field is wide open for new criteria and for new predictors. Currently, there are two approaches to the problems of admissions. One set of admissions officers thinks there is veracity in men; and they react by giving credibility to teachers' reports, counselors' reports, and students' own statements. There are older and more disillusioned men who take another view. They distrust the counselor's evaluation...the student's own essay...the interview...And so they choose to enter the personal side of admissions on the basis of randomness. There is just enough truth yielded by each of these styles to keep them alive." [106: 101]

Chaisson [18] warns that the era of unvalidated decision-making in the admission of students to health professions' schools may be at

an end. Although there may not be a flawless plan for selecting the best candidate, weighing of pros and cons of various strategies through research will identify the most equitable and feasible policy.

The RNAO [75] recommends that each nursing program engage in systematic evaluation of its particular admission procedures and practices in order to determine their validity, reliability, and cost-effectiveness as predictors of success for the program. Also, it recommends that nursing programs conduct in-depth studies of attrition rates--both costs involved and factors related to the problem.

Finally, the need to evaluate admission procedures is confirmed by the following statement issued by the American Nurses' Association:

> "One of the most important criteria for judging the quality of a nursing school is the philosophy, standards, policies, and procedures of admission. The decision to admit should be based on known criteria and it should be the intention to retain those students who are admitted.
> ...The entrance requirements should be related to the profession for which the student is preparing and the program of the school." [38: 240]

Although the studies reviewed differed in their findings about the various admission procedures, agreement was consistent about two major issues. First, even when investigators proved that the admission device they were evaluating did have some predictive validity, most acknowledged that the selection tool did not completely account for the difference between successful and unsuccessful students.

Second, most of the studies were either descriptive or longitudinal in nature. A few cohort analytic designs and one randomized controlled trial were reported. Most investigators stressed the need for rigorous, systematic evaluation of selection devices.

In conclusion, few investigators dispute the use of grades as an admission device; moreso, it is the extent of this use which causes disparity. Some are content to rely totally on grades to identify those who should be accepted into a program and those who should not, whereas others prefer to consider a variety of additional information about the applicant in their decision-making.

Two admission procedures, in addition to grades, have been reviewed. The structured interview has been found by some investigators to have predictive validity and to reduce attrition rates. The validity of the autobiographical letter has not been evaluated to date.

Plans for evaluating admission procedures in the McMaster University School of Nursing through two randomized controlled trials will be described in the following section.

CHAPTER III

RESEARCH DESIGN PART I

3.1 Introduction

The remainder of this thesis will be divided into two parts. In Part I, results of a retrospective analysis of data examining the admission and retention of four classes as they progressed through the McMaster baccalaureate nursing program will be presented. Also, results of reliability testing of the instruments to be evaluated in the randomized trials will be reported. Part II will concentrate on the development of the designs for two controlled trials of various admission strategies which may be more effective in selecting students who will remain and succeed in the nursing program.

3.2 Background Information

McMaster University School of Nursing has been in operation for 35 years. Students receive a Bachelor of Science degree in Nursing upon graduation. Class size has gradually increased over the years with an average of 76 students in the most recent classes.

Two types of applicants are considered for admission into the program. The first group is composed of those candidates who at the time of application are completing Grade 13 in a secondary school. Their selection is based totally on Grade 13 interim marks providing they have taken certain required courses (Grade 12 mathematics, Grade 13 chemistry, and at least two of: English, another language, mathematics, biology, or physics). This group constitutes at least two-thirds of the incoming class (50 to 54 students).

The second group is classified as 'special' applicants and consists of most candidates who are not applying directly from Grade 13. These applicants may be presently attending university in a different program, may want to transfer from another degree nursing program, may want to re-enter having previously failed or withdrawn, may be in the work force, at home with children, or may have already earned degrees in other programs. It is required that these students complete Grade 13 chemistry prior to entering the program. Their admission is based heavily on the results of a team interview. This group comprises up to one-third of the class (26 students). A few nursing transfer students, re-entries, and certain other qualified 'special' applicants are sometimes admitted directly into higher level years. This occurs only if spaces in those classes have been created by attrition.

3.3 Retrospective Analysis

Data from students in the classes entering the program from 1976 to 1979 inclusive were collected and analyzed. Results will be summarized and presented in order to give the reader an idea of how the present admission process relates to student performance in the program and attrition. For the purposes of this analysis, a 'successful' student will be defined as one who, at the time of this analysis, is still in the program or has graduated and a 'withdrawal' will be a student who, for any reason, has left the program (e.g., failure, personal reasons, nursing dislike).

In Table 4, one notes that the attrition rate for the four classes ranges from 28 to 39 percent. The data for the classes of 1978 and 1979 are incomplete because these students still have one and two

Table 4

Attrition Rates For Four Classes In The

McMaster Nursing Program

Incoming Class	Number of Applicants	Number Accepted+	Withdrawals/ Failures	Attrition (%)
1976	data not available	77	22	28.6
1977	463	79	31	39.2
1978*	454	80	29	36.3
1979**	462	86	25	29.1
Total	-	322	107	33.2

\+ Includes transfers to other years of the program who became part of that class.

Since these students are still progressing through the program,

* data for fourth year performance not available at time of analysis;

** data for third and fourth year performance not available at time of analysis.

years of the program respectively to complete and therefore, the attrition rates for these two classes may increase.

From Table 5, one can deduce by which year in the program the majority of withdrawals have occurred. Although some of the data are incomplete, it appears that most students who leave the program do so by the end of second year. There may be a few factors contributing to attrition at this particular point in the program. First, students in second year are exposed to a considerable amount of clinical nursing and it is usually at this time that they decide whether they enjoy this role; second, this year of the program tends to be the heaviest in terms of unit load. Students often find themselves under a fair degree of pressure with stress levels, at times, soaring.

At the end of each year, when the university sends out notification of grades achieved, students are given two figures. The first represents overall achievement in the year including all courses--nursing-related plus electives. The other figure represents achievement in the nursing-related courses only. These include all the health science courses taken that year, for example, anatomy and physiology, biochemistry, nursing, and epidemiology. The correlations computed between achievement in nursing-related courses and overall achievement range from .86 to .97. This would be expected since grades in the nursing-related courses are part of the overall grade. However, since these grades are so closely related, it was decided, for the purposes of analysis, to use the nursing-related course marks only. Correlations between grades achieved by each class in various years of the program are presented in Table 6. Although the amount of data is limited, it can

Table 5

Withdrawals In Relation To Program Year

	1976		1977		1978		1979	
	Number	Cumulative Percent	Number	Cumulative Percent	Number	Cumulative Percent	Number	Cumulative Percent
Year I	10	45.5	12	38.7	5	17.2	8	32.0
Year II	8	81.8	14	83.9	18	79.3	17	100.0
Year III	2	90.9	5	100.0	6	100.0	N/A	-
Year IV	2	100.0	0	100.0	N/A	-	N/A	-
Total	22		31		29		25	

Table 6

Relationship Between Performance In Program Years*

	1976				1977			1978		1979
	Year I	II	III	IV	Year I	II	III	Year I	II	Year I
1976: Year I	-									
Year II	.68	-								
Year III	.55	.70	-							
Year IV	.45	.50	.45	-						
1977: Year I					-					
Year II					.75	-				
Year III					.38	.55	-			
1978: Year I								-		
Year II								.68	-	
1979: Year I										-

* All values are significant at $p<.01$

be seen that performance each year is significantly related to performance in the previous year and the extent of the relationship decreases as the years get further apart. That is, fourth year performance is related more to third year performance than it is to first year performance.

In terms of the admission process, Table 7 presents a breakdown of withdrawals in terms of how the students were selected into the program. The differences in attrition rates between the two groups of applicants are not consistent; for the classes beginning in 1976 and 1979, the attrition rate is higher for the Grade 13 group, whereas for the classes beginning in 1977 and 1978, attrition is greater in the 'special' applicants group. Overall for the four years, the withdrawal rate is higher for the Grade 13 group (34.9%) as compared to the 'special' applicants (29%). A chi-square test was applied to this data (Table 8). Based on these calculations (χ^2 (1df)=1.04; p=.308), there is little evidence to suggest a difference in attrition rates between the two admission routes.

The data were further analyzed according to specific factors and will be presented in the following order--Grade 13 overall grades, Grade 13 math/science grades, interview scores, autobiographical letter scores, and reasons for withdrawal.

Table 7

Attrition Rates According

To Type Of Applicant

	Grade 13 Applicants			'Special' Applicants		
	Number Accepted	Number Withdrew	%	Number Accepted	Number Withdrew	%
1976	60	18	30.0	17	4	23.5
1977	66	25	37.9	13	6	46.2
1978	52	18	34.6	28	11	39.3
1979	51	19	37.3	35	6	17.1
Total	229	80	34.9	93	27	29.0

Table 8

Chi-Square Analysis Of Successful Students Versus Withdrawals In Relation To Type Of Applicant

		Student Performance		
		Successful	Withdrew	Total
Type of Applicant	Grade 13	149	80	229
	Special	66	27	93
	Total	215	107	322

χ^2 (1df) =1.04

p= .308

3.3.1 Grade 13 Overall Marks

It was originally thought that Grade 13 marks could be correlated with marks achieved while in the program to assess the predictive validity of this selection device. The results of correlations between Grade 13 marks and performance in Year I nursing-related courses are presented in Table 9. Although the results look impressive and are significant, a bias prevails. There are a large number of missing values in each group, many of which represent the withdrawals from the program. Therefore, the conclusion derived from Table 9 would be that for those who remain in the program, Grade 13 marks demonstrate a significant correlation with performance in first year nursing-related courses. However, the issue of concern is the withdrawals and with an overall 35 percent withdrawal rate among the Grade 13 applicants, a more extensive investigation of this selection device seems warranted.

The next step, therefore, is to examine those out of the Grade 13 applicant group who withdrew in terms of their Grade 13 marks. Table 10 presents a breakdown of Grade 13 marks and number of withdrawals per group. Data for the four classes were pooled, rank ordered, and divided into quintiles. The highest percentage of withdrawals (43.2%) occurs among the students in the lowest quintile of Grade 13 marks ($\leq$76.9%). As the Grade 13 marks increase, the number of withdrawals decreases until the fifth quintile--the group with the highest admission averages ($\geq$85.6%). In this group, the number of withdrawals begins to increase.

Table 9

Correlation Between Grade 13 Marks

And Performance In First Year Nursing

Year I Nursing	Correlation Between Grade 13 Marks and Year I Nursing		
	R	Significance	Missing Values
1976	.28	.01658	19/77 (24.7%)
1977	.296	.01024	18/79 (22.8%)
1978	.61	.00000	21/80 (26.3%)
1979	.32	.00470	23/86 (26.7%)

Table 10

Success Or Withdrawal From Program

According To Grade 13 Marks

Grade 13 Mark	Successful	Withdrawal	Total	% Withdrawal
≤76.9	25	19	44	43.2
77.0-80.3	28	17	45	37.8
80.4-82.4	31	14	45	31.1
82.5-85.5	33	14	47	29.8
≥85.6	30	16	46	34.8
Total	147	80	227*	

* Two missing values in data

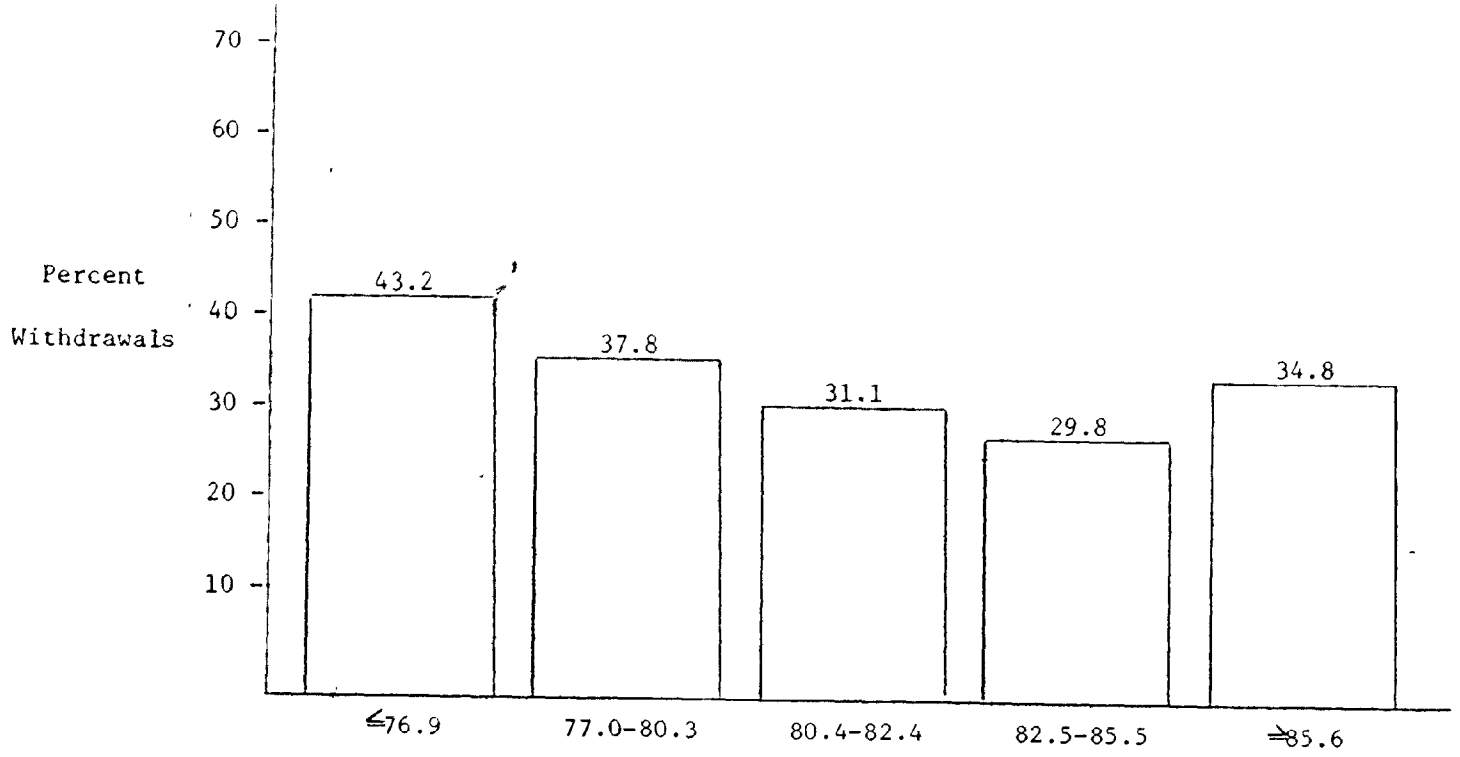
A possible explanation for this U-shaped distribution (see Figure 1) is that students with low Grade 13 marks withdraw due to academic difficulties while those with high Grade 13 marks leave the program due to frustration. With the high achievers, this frustration might stem from their inability to stay 'on top' of everything. The philosophy of a self-directed program does not permit this total sense of completion in learning. These explanations are purely speculative at this point. However, it will be interesting to keep them in mind and observe for U-shaped distributions in the analysis of the data of the proposed studies.

Through analysis of these data, one could determine if there are any real differences between withdrawal rates according to grouped Grade 13 marks. Since this latter variable has natural order, one can address an additional, more specific question of whether these proportions change in a linear fashion. This test is referred to as a chi-square for linear trend. Results of this analysis do not suggest a significant decrease in attrition rate as Grade 13 marks increase--a finding which might have been expected since these marks were used for the admission decision.

Source	df	Chi-Sq	P
Due to Linear Regression	1	1.198	.274
Departure from Linearity	3	1.098	.778
Overall Chi-Square	4	2.296	.682

Figure 1

Percent Withdrawals According To Grade 13 Marks



χ^2 (4df)=2.296; p=.682

3.3.2 Grade 13 Math/Science Marks

Although Grade 13 math/science marks are not presently an admission tool, it was decided to examine their relationship with performance in the program since a math and a chemistry course are required prior to entry into the program and more important, because the majority of nursing-related units in first year are sciences--six units of biochemistry and seven units of anatomy and physiology. These constitute 65 percent of the total nursing units in Year I. In second year, the student takes an additional eight units of anatomy and physiology.

First, as was expected, there is a high and significant correlation between Grade 13 math/science marks and Grade 13 overall averages ranging from .72 to .89. In three out of the four classes, the math/science grades correlated slightly better with the first year nursing-related courses than did the Grade 13 average, ranging from .29 to .63.

Withdrawals were examined according to math/science grades to determine if there was a relationship between the two. Table 11 summarizes success/withdrawal data for those students admitted to the program on the basis of their Grade 13 marks. The data were pooled, rank ordered, and divided into quintiles. As with the Grade 13 overall marks, the group with the lowest math/science grades ($\leq$75%) has the highest withdrawal rate. The U-shaped distribution is again evident in Figure 2. Chi-square was calculated. Again, there is little difference in withdrawal rates between the grade groups (χ^2 (4df)=1.299; p=.862).

It would have been interesting to investigate the 'special' applicants group in terms of their Grade 13 overall marks and math/science marks to establish if there was a relationship with their

Table 11

Success Or Withdrawal From Program

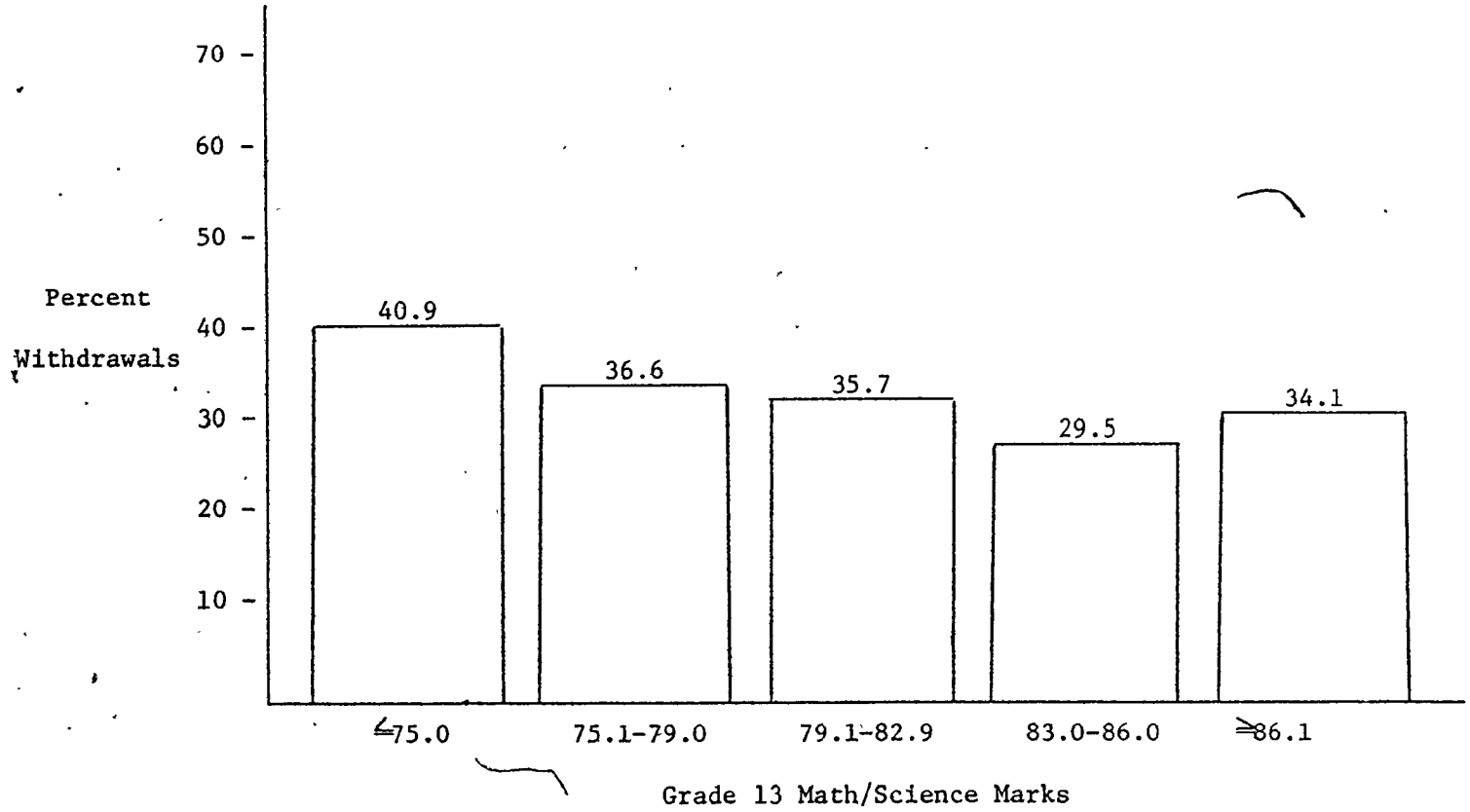
According To Grade 13 Math/Science Mark*

Grade 13 Math/ Science Mark	Successful	Withdrawal	Total	% Withdrawal
≤75.0	26	18	44	40.9
75.1-79.0	26	15	41	36.6
79.1-82.9	27	15	42	35.7
83.0-86.0	31	13	44	29.5
≥86.1	27	14	41	34.1
Total	137	75	212	

* 17 missing values in data

Figure 2

Percent Withdrawals According To Grade 13 Math/Science Marks



χ^2 (4df)=1.299; p=.862

performance in the program. Since the admission of this group of students had not been based on these selection devices, there might have been a wider variation in marks. However, since these marks were missing from the files of almost 50 percent of the group, it was not deemed a useful exercise.

3.3.3 Personal Interview

In Table 7, it was determined that 27 students out of a total of 93 admitted as 'special' applicants throughout the four-year period withdrew (29%). As described earlier, 'special' applicants include anyone who is not applying directly after completing Grade 13, nursing students wishing to transfer from another degree program, or re-entry students--those who for one reason or another left the program and now wish to return. Table 12 summarizes the status of each of the 93 'special' applicants categorizing them as successful or withdrawals. A high-risk group (although the numbers are very small) appears to be the re-entry group (50% withdrawal). Transfer students seem to have a fairly low withdrawal rate (17.4%). Chi-square analysis of these data did not reveal a statistically significant difference between the groups (χ^2 (2df)=2.946; p=.229).

Of the 93 'special' applicants, interview scores are available for 71 of the students. The concept of formally interviewing applicants was introduced in the program in 1976; however, at that time, it was not as structured as the current process. One or sometimes two faculty members interviewed the applicant with scores often not kept on file. In the past three to four years, the process has become much more structured with 3-member teams representing faculty, community, and

Table 12

Status Of 'Special' Applicants

In Relation To Success Or Withdrawal

	Successful	Withdrawal	Total	% Withdrawal
Mature	44	20	64	31.3
Transfer	19	4	23	17.4
Re-entry	3	3	6	50.0
Total	66	27	93	29.0

χ^2 (2df) =2.946

p= .229

student interviewing the applicant for 45 minutes in a room with a one-way mirror while a monitor observes for fairness. Interview scores, therefore, are not available for all students. However, for the 71 students with scores, the data will be examined to determine if there is a relationship between the interview scores and success/withdrawal.

For each applicant, the interviewers are provided with a structured rating tool which they must complete independently. After rating the candidate on five subscales, the interviewers each assign a global score ranging from one indicating unacceptable to seven which means very acceptable. The data are presented in Table 13. Inspecting the data, students with the highest mean global ratings (6.0-7.0) have the lowest withdrawal rate. However, looking at the complete table, there is not a consistent decrease in withdrawal rate as the mean interview score increases (see Figure 3). The data were collapsed into a 2X2 table comparing the withdrawal rate of those students with mean interview scores less than 5.0 and those with scores greater than 5.0. Results of chi-square analysis suggest little difference in attrition rates for the two groups of mean interview scores (χ^2 (1df)=.03; p=.864).

Of the 27 'special' applicants who withdrew, 17 had Grade 13 marks on file. These data were compiled to determine whether Grade 13 marks could have predicted their withdrawals any better than the interview scores had. Table 14 summarizes the data. From the table, it is noted that 29.4 percent of the withdrawals (with Grade 13 marks) might have been screened out by their marks. Interpretation of these data is difficult since limited information is available about Grade 13 marks of the 'special' applicants who did not withdraw from the program.

Table 13

Withdrawals And Successes

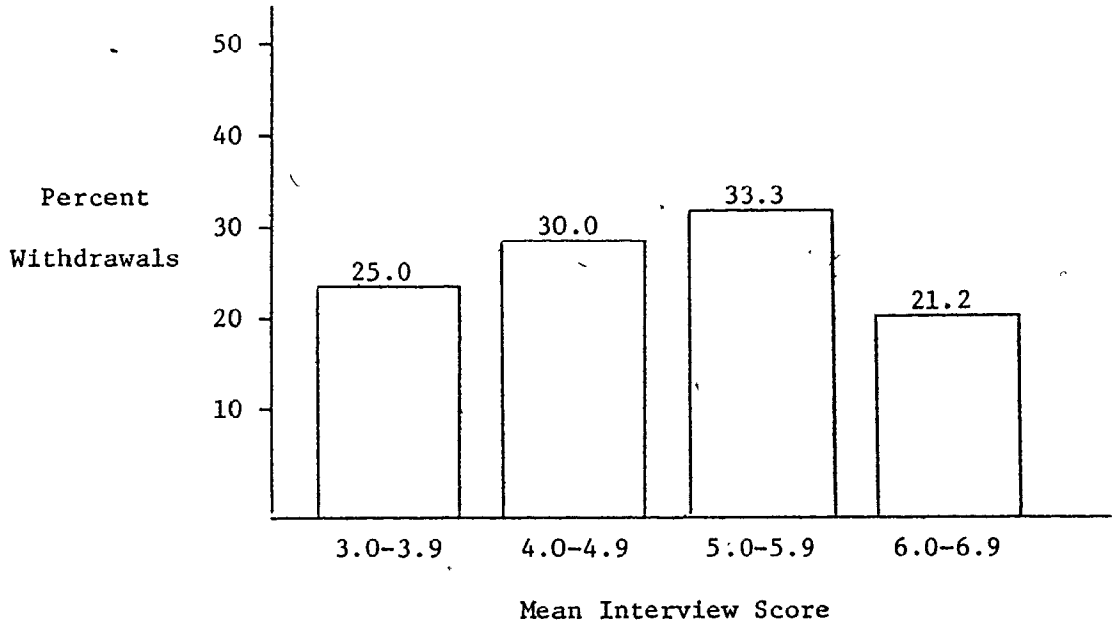
In Relation To Mean Interview Scores

Mean Interview Scores	Successful	Withdrawal	Total	% Withdrawals
3.0-3.9	3	1	4	25.0
4.0-4.9	7	3	10	30.0
5.0-5.9	16	8	24	33.3
6.0-7.0	26	7	33	21.2
Total	52	19	71	26.8

Figure 3

Percent Withdrawals According To

Mean Interview Score



χ^2 (1df)=.03; p=.864

Table 14

Grade 13 Marks Of 'Special' Applicants

Who Withdrew

Grade 13 Mark	Withdrawals	% Withdrawals
≤70.0	5	29.4
70.1-75.0	4	23.5
75.1-80.0	4	23.5
80.1-85.0	2	11.8
85.1-90.0	1	5.9
≥90.1	1	5.9
Total	17	100.0

Also, the number of withdrawals from the Grade 13 applicants who might have been screened out by interview cannot be calculated as they did not participate in this process.

Another interesting point noted by examining the data, is that of the 27 who withdrew, 18 had stayed in the program long enough to be assigned a Year I nursing mark. Only in four cases, was this mark below 60 percent, with the remainder ranging from 60.7 to 89.4 percent.

3.3.4 Autobiographical Letter

The autobiographical letter has not, to date, been used as an admission tool in the nursing program. However, in the spring of 1979, the Admissions Committee conducted a pilot study in which they requested applicants for the 1979 to 1980 academic year to submit letters. The applicants were told that the letters would have no bearing on their admission. Of the 69 who responded, 20 were accepted into the program. Each letter was rated by three readers on a scale of one indicating poor to a maximum rating of four signifying outstanding. Total letter scores, ranging from three to 12 were compared to that student's performance in the program. Of the 20 students who wrote letters, nine (45%) withdrew. Four of these withdrawals had letter scores between four and eight, while the letters of the remaining five had been rated between nine and twelve. Three of the 20 students were 'special' applicants who were chosen on the basis of interview, while the remaining 17 were admitted on the basis of their Grade 13 marks. Correlations were computed between letter scores and grades in the first year nursing course and for comparison, Grade 13 marks and first year nursing for the same 20 students. The correlation for the letter scores was .095 and for the

Grade 13 marks was -.220, neither of which was significant. In relation to the 'special' applicants, two of the three would not have been accepted if their admission had been based on their letter instead of their interview, and yet all three are performing well in the program.

There are five possible explanations for these results. First, the sample of 20 students was probably too small to permit detection of a correlation between Grade 13 marks or letter scores and success; second, those who did respond to the request may not have been typical of the applicant pool; third, the applicants were told that the letter would not influence their admission and, therefore, they may not have put a great deal of time and effort into it; fourth, the performance in the program was only assessed by grades in first year. Performance may change as the students progress through the rest of the program. Fifth, the letter may not be a valid predictor of success in the nursing program. This remains to be formally investigated.

3.3.5 Reasons for Withdrawal

The last retrospective analysis which was done was to examine students' reasons for withdrawing from the program. Exit questionnaires have been routinely mailed to any students who drop out asking them, among other questions, their reasons for leaving. The questionnaires are coded so that the student does not have to sign the form. A few problems arise when examining these reasons for withdrawal. First, the response rate to the questionnaire is about 66 percent. Second, some of the students who do respond describe their reason for leaving as "personal". Third, since the program has a heavy emphasis on evaluation, most students know when they are heading for a failure. Therefore, they will

often transfer to another program to avoid having the failure noted on their transcript. Fourth, it is difficult to distinguish the real reason for withdrawal--did the failures result from lack of academic ability or was it really a dislike for clinical nursing which decreased the student's motivation causing his/her marks to drop? Table 15 summarizes the reasons which have been identified by the students who responded.

3.3.6 Summary

Data about four classes entering the baccalaureate nursing program at McMaster University from 1976 to 1979 were analyzed. The attrition rate for the four classes averaged 33 percent. Consistently, 80 percent of the withdrawals left the program by the end of second year. The average attrition rate was dissected to examine specifically the two categories of applicants. For the four classes, the average attrition rate for Grade 13 applicants was 34.9 percent and for the 'special' applicants 29 percent.

Four sets of admission data--Grade 13 overall average, Grade 13 math/science marks, interview scores, and autobiographical letter scores were examined in relation to their ability to identify "successful" students. Chi-square analyses were computed and for each selection device, there was no significant difference in terms of the admission tool, between those who succeeded and those who withdrew from the program.

The current admission procedure in the nursing program consists of two very different processes to identify two groups of students who come together in one class and share very similar learning methods and experiences. These two admission procedures vary in terms of time,

Table 15

Reasons For Withdrawal From Program

Reason	Number
Failure	26
Transfer to Other Courses	13
Nursing Dislike	11
Personal	11
Unsure About Nursing	3
Miscellaneous e.g., - Finances, - Illness	7
Total	71*

* Response rate: 71/107=66.4%

anxiety, and cost for both the program and the applicants. Yet neither grades nor interview, through this retrospective analysis, have been proven to select the candidate most likely to succeed.

Therefore, two studies will be proposed to examine alternate selection tools, as well as prospectively evaluate the existing process. The admission procedures will be studied in terms of both their ability to identify successful nursing students and their cost-effectiveness.

3.4 The Questions

Based on the literature review which stresses the need for systematic studies of selection processes along with this retrospective analysis which indicates that the McMaster School of Nursing shares the problem of high attrition rates, two randomized controlled trials to test admission procedures will be designed. One trial will focus on the 'special' applicants and will answer the question:

> Is there a difference in attrition rates between students admitted to the McMaster baccalaureate nursing program on the basis of a personal interview and those admitted on the basis of an autobiographical letter?

The second trial will pertain to the candidates applying directly from Grade 13 and will answer the following question:

> Does the addition of the autobiographical letter and the personal interview in combination to the admission procedure of Grade 13 overall average decrease the attrition rate in the McMaster baccalaureate nursing program?

As the designs are developed, data from the retrospective analyses will be helpful in providing rationale for project decisions. The reliability of the two selection tools--the interview and the autobiographical letter has been examined. Results of these investigations follow.

3.5 Reliability of Team Interview

Prior to establishing validity of an instrument, it is important to determine its reliability. With respect to the team interview, one is interested in interteam consistency--would the applicant be rated the same by all interviewing teams? In other words, does the applicant have an equal chance of being accepted into the program regardless of which team conducts the interview?

In April 1981, 10 simulated applicants were trained to participate in a study examining interteam reliability of McMaster nursing admission interviews. The objective of the study was to determine the agreement between ratings of two separate teams for the same applicant. The teams were not aware of the study and, therefore, blind to the fact that their applicant was simulated. The applicant maintained the same simulation for both interviews.

The applicants were programmed by the author--four as "poor" candidates and six as "good" applicants. As part of the training, the applicants participated in a "simulated" interview. The members of the training interview teams consisted of raters who would not be participating in the actual interview process. During the simulated interviews, the investigator observed the applicants to assess their ability to maintain their assigned roles.

On the day of the interviews, the simulated applicants were assigned to different reception areas for each interview in order that they would not be seen by their previous interviewing team. Each applicant was assigned randomly to two of the 19 teams. Teams excluded from the random allocation were those involving members of the research team

who were aware of the study and those consisting of interviewers familiar to the candidates.

Each applicant was interviewed by the assigned teams. The score sheets for each interview were totalled. One-way analysis of variance was used to partition total variation in interview scores into that part measuring differences "between applicants" and residual "within applicant" variation. This second source of variation represents inherent team to team differences in assessing the same candidate and is thus of prime concern here.

Two-way analysis of variance was also applied in order to detect a possible consistent variation in the applicants' second scores as compared to the first. This variation might then be attributed to a change in the applicants, for example, increased confidence in their role.

In using the F test, it is assumed that the interviewers were randomly selected from populations whose underlying distributions are normally distributed with equal variances. The null hypothesis is that all the applicants have the same mean score. The alternative is that the applicants have different mean scores. A significant F suggests the teams are able to distinguish between candidates and thus supports a reliable assessment technique.

The data consist of 10 sets of two interview scores. The data layout follows:

Total Interview Scores*

	Applicant	Interview #1	Interview #2	Difference in Scores	Mean Scores
Good	1	18	19	1	18.5
	2	18.5	21	2.5	19.75
	3	18	20.5	2.5	19.25
	4	15	19	4	17.0
	5	16	17	1	16.5
	6	18	19	1	18.5
					18.25
Poor	7	7	15	8	11.0
	8	7	8	1	7.5
	9	4	4	0	4.0
	10	6.5	4	2.5	5.25
	Mean Scores	12.8	14.65		6.9

* Minimum total interview score = 3
Maximum total interview score = 21

Source	df	SS	MS	F	p
Applicants	9	686.8625	76.3181	20.0471	< .001
Times	1	17.1125	17.1125	4.4951	0.08
Residual	9	34.2625	3.8069		
Total	19	738.2375			

Inspecting the data, it is evident that the total scores assigned to each applicant by the two teams are very close. Eight of the 10 applicants were rated within 2.5 points by each team. Scores for applicant number seven were the most divergent with a difference of eight points. In examining the comments made by the team scoring that particular applicant the highest, the team appeared to have some difficulty rating her and found themselves assessing her potential, rather than her

performance in the interview. For example, one interviewer noted that "perhaps the applicant's quiet tone 'masked' her real level of motivation".

The calculated F value (20.0471) falls within the rejection region (cut-off point with numerator df=9 and denominator df=9 is 3.18). Therefore, there is a difference in mean scores between applicants ($p<.001$) indicating that the interviewers were able to detect a difference between the candidates.

In a secondary analysis, the between applicant sum of squares can be partitioned into that part due to differences between the a priori "good" and "bad" groups. The F statistic comparing these two groups was 161.1 with the difference in the expected direction. Thus not only do teams tend to mark consistently, but also in line with the intent of the simulations.

The F test associated with differences between first and second interviews was close to being significant ($p=0.08$). There was thus weak evidence to suggest a slight training effect, but in general, the subjects held their simulations well.

3.5.1 Reliability Coefficient

Reliability is the term used to imply a measure which has good reproducibility (or in other words, is precise). The statistical quantification of reliability is based on the within and between subject variances:

Source	df	SS	MS	F
Between Applicants	9	686.8625	76.3181	14.855
Within Applicants (Between Teams)	10	51.3750	5.1375	
Total	19	738.2375		

If it is assumed that a single observation consists of two parts, M_i, the true value for subject i, and E_{ij}, the random error due to inherent variability in the measurement of observation j for subject i, then $y_{ij} = M_i + E_{ij}$.

Taking the variance,

$\text{Var}(y_{ij}) = \text{Var}(M_i) + \text{Var}(E_{ij})$ (if E_{ij} and M_i are independent)

= Between subject variance + within subject variance

$= \sigma^2_{\text{app}} + \sigma^2$.

Reliability is then defined as the proportion of variance representing real differences between subjects (as opposed to random error).

$$\text{Reliability} = \frac{\sigma^2_{\text{app}}}{\sigma^2_{\text{app}} + \sigma^2}.$$

From the analysis of variance table, σ^2_{app} and σ^2 can be estimated:

$$\hat{\sigma}^2 = \text{MS Error}$$

$$\hat{\sigma}^2_{\text{app}} = \frac{(\text{MS Subjects} - \text{MS Error})}{\text{Number of Observations per Subject}}$$

Therefore, using data for "simulated" applicants:

$$\hat{\sigma}^2_{\text{app}} = \frac{76.3181 - 5.1375}{2}$$

$$= 35.5903.$$

Inserting these values into the equation for reliability,

$$\text{Reliability} = \frac{35.5903}{35.5903 + 5.1375}$$

$$= .8739.$$

Therefore, 87 percent of the variation in interview scores is due to real differences between applicants and the remaining 13 percent due to inherent variability in the assessment technique.

A total of 123 "real" applicants were interviewed this past spring. Of these, 104 were interviewed by teams consisting of three interviewers. The standard deviation of the 104 scores was calculated to be 4.49. Variance is standard deviation squared and, therefore, would be equal to $(4.49)^2 = 20.16$.

Assuming the same inherent variability of the assessment technique, reliability of the team interview, using variance of "real" applicant scores is:

$$\hat{\sigma}^2 = 20.16 - 5.1375$$

$$= 15.0225$$

$$\text{Reliability} = \frac{15.0225}{15.0225 + 5.1375}$$

$$= .7452.$$

Therefore, the reliability of the team interview is 74.52%. Since this value has been calculated using all the "real" scores, this would be a more accurate measure of reliability.

In summary, an investigation of the team interview has revealed that it is a reliable process. One can, therefore, feel confident in proceeding to investigate the validity of this admission procedure.

3.6 Reliability of Autobiographical Letter

During the B.Sc.N. admission process in the spring of 1979, applicants were requested to submit an autobiographical letter. They were told that this letter would not influence their acceptance into the program, but instead would be part of a study to assist the Admissions Committee to improve their selection process (see Appendix A). They were asked to follow specific instructions when writing the letter (see Appendix B).

Until this past year, the letters had not yet been examined. Therefore, since the autobiographical letter was one of the selection tools to be included in the present study, it was decided to investigate the reliability of this instrument using these 64 letters.

Three forms of reliability were examined: intraobserver agreement--could readers agree with themselves when given the same letter to read three months later; interobserver agreement--could readers agree with each other when given the same letters to rate; and thirdly, inter-team agreement--could teams of readers agree when given the same letters.

3.6.1 Intraobserver Agreement

To test intraobserver agreement, three randomly selected letters were given to seven readers--four faculty members, one community representative, and two students from the program. Along with the letters, they were given a rating tool to be completed for each applicant (see Appendix C). Approximately three months later, these same three letters were once again given to the readers to rate. In between the readings of these letters, each reader had rated 28 other letters. When speaking to the readers, it was interesting to note that none of them recalled having read the three letters previously.

In examining the consistency of the assigned ratings, global scores only were used. It was decided not to examine the agreement for each of the nine questions on the rating tool as the questions were meant to help the reader arrive at an overall score. The global score consists of two parts. First, the reader is asked to rate the applicant's suitability for the McMaster B.Sc.N. program from one indicating poor to four indicating outstanding. Second, the reader determines whether he/she would accept the applicant into the program by circling yes or no.

Applicant's Suitability for Program

	Letters					
	#1		#2		#3	
Evaluator	1st	2nd	1st	2nd	1st	2nd
Faculty #1	1	2	3	3	2	3
#2	2	2	3	3	2	3
#3	2	3	1	3	3	3
#4	2	3	3	3	2	3
Community #1	3	2	3	3	2	2
Student #1	1	1	3	4	2	2
#2	2	2	3	3	2	3

On inspection of the data, it appears that Letter #1 is poor with 11/14 ratings less than or equal to 2. Letter #2 is good with 13/14 ratings greater than or equal to 3, and Letter #3 is fair with all ratings falling in the middle two to three range.

One-way analysis of variance was applied to the data. The cut-off point for the rejection region in the F table with numerator df=2 and denominator df=3 is 9.55 with level of significance α=.05. Only one

of the seven calculated F values (19.0) fell within the rejection region. This reader was able to discriminate between good and poor letters, and was consistent in the scoring of the same letters on the two occasions. The remainder of the F values were non-significant, indicating an unreliable measure. Therefore, the reader's agreement with oneself on the three letters can be attributed to chance. However, it is very likely that this sample size (N=3) is inadequate and more duplicate letters should have been assigned to the readers.

Using the data from the analysis of variance tables and the following equations, reliability scores were computed for each reader:

$$\sigma^2_{\beta} = \frac{\text{(MS Among Letters - MS Within Letters)}}{\text{Number of Observations Per Subject}}$$

$$\sigma^2_{\omega} = \text{MS Within Letters}$$

$$\text{Reliability} = \frac{\sigma^2_{\beta}}{\sigma^2_{\beta} + \sigma^2_{\omega}}$$

Calculations revealed that the reliability scores ranged from zero to 90 percent. As might have been predicted by the F values, the only acceptable ($\geq$80%) value for reliability occurs with one reader (F value - 19.0)--her ratings were 90 percent reliable.

Some interesting points about the data should be identified. Of the 21 sets of scores, 11 remain the same for both readings. However, nine of the 10 remaining sets of scores increase in rating on the second reading. There appears to be a tendency to rate easier on the second reading. Also, there seems to be less variation in rating the good letter--five of the seven readers maintain the same "good" score on each occasion. This is of particular interest since it will ultimately be the good scores with which the Admissions Committee is concerned.

Therefore, the readers do not seem to have problems in consistently evaluating good letters. As the letters get poorer, the reader has more difficulty agreeing with him/herself--with both the fair and poor letters three of the seven readers assign the same score on each of the two readings, while four of the readers change their ratings.

In examining the second part of the global rating--whether the reader would accept the applicant, the ratings assigned by the readers are shown below:

Accept Applicant into Program

	Letters					
	#1		#2		#3	
Evaluator	1st	2nd	1st	2nd	1st	2nd
Faculty #1	N	Y	Y	Y	N	Y
#2	N	N	Y	Y	N	Y
#3	N	Y	N	Y	Y	Y
#4	N	Y	Y	Y	Y	Y
Community #1	Y	N	Y	Y	N	N
Student #1	N	N	Y	Y	N	N
#2	N	N	Y	Y	N	Y

Inspecting the data, one can see that with the poor letter, Letter #1--3/7 or 43% of the readers agree with themselves on both occasions. With Letter #2--the good letter, 6/7 or 86% of the readers agree with themselves, and for the last letter, 4/7 or 57% of the readers agree on both occasions. This confirms the point made earlier, that is, the readers can agree with themselves better when rating a good letter and the extent of this agreement declines as the letter becomes poorer. The other consistent result is the tendency to rate

easier on the second rating--seven of the eight ratings which are changed on the second reading change from 'No' to 'Yes'.

Cohen's Kappa was calculated from the data for each letter. The values for Kappa ranged from -.27 for Letter #1 to .00 for Letter #2 to .28 for Letter #3. Interpretation of these results is difficult due to the small numbers in some cells.

In relation to intraobserver agreement, one would conclude that although the readers appear to be able to agree with themselves when rating "good" letters, none of the statistical tests demonstrated significance. A limitation of this investigation could be the small number of letters used (N=3).

3.6.2 Interobserver Agreement

The 64 letters were randomly and evenly distributed to three teams for rating, each team consisting of a faculty, community, and student representative. The letters were read independently by each reader and to avoid contamination, the identity of the other team members was not disclosed. To assess interobserver agreement, the three ratings for each letter were examined. Again, using the two parts of the global score, the data revealed:

Accept Applicant into Program

Number of Total Agreements	(YYY/NNN)	= 37 (57.8%)
Number of Disagreements	(YNN/YYN)	= 27 (42.2%)
Total		= 64

In addition to the observed number of agreements and disagreements, if one calculates the expected numbers, a chi-square test can be computed. To derive the expected numbers, the ratings for the 64

letters were examined. The frequency of assigning 'Yes' and 'No' by type of reader was:

Faculty		Community		Student	
Yes Responses (N)	No Responses (N)	Yes Responses (N)	No Responses (N)	Yes Responses (N)	No Responses (N)
39 (n_1)	25 (n_2)	42 (n_3)	22 (n_4)	42 (n_5)	22 (n_6)

$$P_1 = \frac{n_1}{n_1 + n_2} \qquad P_2 = \frac{n_3}{n_3 + n_4} \qquad P_3 = \frac{n_5}{n_5 + n_6}$$

$$= 39/64 \qquad = 42/64 \qquad = 42/64$$

$$= .609 \qquad = .656 \qquad = .656$$

If readers were assigning ratings at random, but at these frequencies of 'Yes' and 'No', the probability of each score combination can be calculated:

$$P\ (YYY) = P_1\ P_2\ P_3$$

$$= .609 \times .656 \times .656$$

$$= .262$$

$$P\ (NNN) = (1 - P_1)\ (1 - P_2)\ (1 - P_3)$$

$$= .391 \times .344 \times .344$$

$$= .046$$

$$\text{Expected Number of YYY} = 64 \times P_1\ P_2\ P_3$$

$$= 64 \times .262$$

$$= 16.768$$

Expected Number of NNN = $64 \times (1 - P_1)(1 - P_2)(1 - P_3)$

$= 64 \times .046$

$= 2.944$

Total Expected Number of Agreements (YYY/NNN) = 16.768 + 2.944

= 19.712

By subtraction,

Total Expected Number of Disagreements (YNN/YYN) = 64 - 19.712

= 44.288

With this data, chi-square can be calculated:

	Observed	Expected	$\frac{(O - E)^2}{E}$
Agreement YYY/NNN	37	19.7	15.19
Disagreement YNN/YYN	27	44.3	6.76
Total	64	64	21.95

χ^2 (1df) = 21.95 $p<.001$

Therefore, the agreement among readers when rating the same letter is not due to chance and is highly significant $p<.001$.

The second part of the global rating which addresses applicants' suitability for the program was also examined in relation to inter-observer reliability. Eight letters were each given to nine readers to be rated.

One-way analysis of variance was applied to the data.

Source	df	SS	MS	F	P
Among Letters	7	16.2083	2.3155	9.012	<.001
Within Letters	64	16.4444	.2569		
Total	71	32.6527			

The cut-off point for the rejection region in the F table with numerator df=7 and denominator df=64 is 2.17 with level of significance α=.05. Since the calculated F value (9.012) falls within the rejection region, it can be concluded that the readers are able to discriminate between letters (p<.001).

Again, to quantify agreement between readers when rating the same letters, reliability is calculated:

$$\text{Reliability} = \frac{\sigma^2_\beta}{\sigma^2_\beta + \sigma^2_\omega}$$

$$\sigma^2_\beta = \frac{(\text{MS Among Letters} - \text{MS Within Letters})}{\text{Number of Observations Per Subject}}$$

$$= \frac{2.3155 - .2569}{9}$$

$$= .2287$$

$$\text{Reliability} = \frac{.2287}{.2287 + .2569}$$

$$= 47.1\%$$

In summary, the raters are able to agree with each other at a highly significant level (χ^2=21.95, p<.001) when determining whether the applicant should be accepted into the program (Yes/No). The readers are also able to discriminate between letters (p<.001). However, when assign-

ing a value from one to four assessing the applicant's suitability for the program, the agreement or interobserver reliability is 47.1 percent.

3.6.3 Interteam Agreement

As previously described, the letters were assigned to three teams of readers for rating. In addition, eight randomly chosen letters were given to each of the three teams in order to assess interteam reliability. The scores assigned to each letter by the team were totalled. The data are shown below.

		Letters								Mean Scores
		1	2	3	4	5	6	7	8	
Teams	1	7	10	9	10	7	9	8	9	8.625
	2	7	9	9	11	6	9	9	10	8.750
	3	6	9	8	11	5	10	7	8	8.000
Mean Scores		6.67	9.33	8.67	10.67	6.0	9.33	8.0	9.0	

Source	df	SS	MS	F	P
Teams	2	2.5833	1.2917	2.679	.103
Letters	7	48.625	6.9464	14.407	<.001
Within	14	6.75	0.4821		
Total	23	57.9583			

Inspecting the data, it appears that the teams are able to agree within one to two points of each other for both poor and good letters.

The two-way ANOVA applied to the interteam data resulted in an F of 14.4 on 7 and 23 df. This would be very unusual ($p<.001$) if the mean scores for the letters really were the same and is thus very strong evidence that the teams can reliably detect differences between the applicants' letters. The reliability coefficient associated with the team letter score was calculated to be 78.7 percent. In other words, 79 percent of variation in letter scores represents real differences between candidates and the remaining 21 percent due to inherent variability in the assessment technique.

The F test measuring differences between teams was 2.7 and non-significant ($p=.103$). The teams thus seemed to be using the scales in the same way.

In conclusion, the autobiographical letter has been examined in terms of intraobserver, interobserver, and interteam reliability.

Although raters appeared to agree with themselves when rating "good" letters, a significant relationship was not achieved. The limited sample size (N=3) could have influenced these results.

Raters are able to agree with each other at a highly significant level ($p<.001$) when determining whether applicants should be accepted into the program (Yes/No); however, when assigning a value from one to four assessing the applicant's suitability for the program, the reliability falls to 47.1 percent.

The agreement between ratings assigned by different teams to the same applicant is 78.7 percent.

Therefore, based on the agreement between raters in assessing who should be accepted into the program ($p<.001$) and the agreement between

teams (78.7%), one can conclude that the rating of the autobiographical letter is a fairly reliable process. The validity of this device as an admission procedure remains to be investigated.

CHAPTER IV

RESEARCH DESIGN PART II

4.1 Introduction

The primary objective of this proposed investigation is to determine whether the personal interview or autobiographical letter, singularly or in combination, influences the attrition rate of students in the baccalaureate nursing program at McMaster University.

Two applicant populations will be studied by means of randomized controlled trials. Trial I will focus on 'special' applicants, those who have not attended secondary school on a full-time basis for at least one year. Applicants will be randomized to one of the two admission strategies--letter or interview and acceptance into the program will then be based on the designated selection device. Trial II involves candidates applying directly from Grade 13. In this trial, applicants will be randomized to one of two groups--those accepted on the basis of Grade 13 marks only and those accepted on the basis of an autobiographical letter and admission interview.

Although the two groups of applicants will be studied by two separate trials, the students, once accepted into the program, come together in one class in which study load and expectations of them are the same. Therefore, for both groups, outcomes will consist of the following measures: student status in the program in terms of success, failure, or withdrawal; marks achieved in nursing and nursing science courses; and ratings assigned by tutors. For this reason, the two

trials will be described together, rather than in separate sections.

4.2 Methods of Procedure

4.2.1 Source of Samples

Both study samples will be identified by applications to the McMaster School of Nursing submitted through the Ontario Universities' Application Centre in Guelph by midnight of April 1st of each year for the duration of the study. Those transferring within the university, will be notifying the Assistant Registrar (Health Sciences) directly also by April 1st and, therefore, will be identified by this office.

4.3 Inclusion Criteria

Trial I

An applicant who has applied to the McMaster University School of Nursing by the first of April will be included in the study if he/she meets the following criteria [61]:

1. Has not attended secondary school on a full-time basis for at least one year.

2. Has English as a native language or has achieved a standing satisfactory to the university in the University of Michigan English Language Test.

3. Has completed or plans to have successfully completed Grade 13 chemistry prior to enrollment in the program.

4. Has achieved a minimum of a 'C' average in any programs previously enrolled in.

Trial II

An applicant who has applied to the McMaster School of Nursing by the first of April will be included in the study if he/she meets the

following criteria [61]:

1. Has applied for enrollment directly upon completion of Grade 13 or the equivalent in other countries.

2. Has completed or is presently in the process of successfully completing Grade 12 mathematics and the following Grade 13 subjects: (i) chemistry; (ii) at least two subjects from the following: English, another language, mathematics, biology or physics; and (iii) additional subjects sufficient to qualify for a secondary school Honour Graduation Diploma.

4.4 Exclusion Criteria

Applicants will be excluded from the study in the following circumstances:

Trial I

1. Any 'special' applicant who plans to proceed through the program on a part-time basis.

2. Any 'special' applicant who wishes to be considered for transfer from other nursing degree programs.

3. Any 'special' applicant who wishes to be considered for a position above first year.

4. Any 'special' applicant who wishes to re-enter the program.

Trial II

1. Any applicant from another country whose native language is not English and who does not obtain a satisfactory standing on the Michigan English Language Test.

4.5 Ethical Considerations

Through a variety of means which will be described later,

potential applicants will need to be made aware of the changes in the admission procedures. In effect, they should be informed that some applicants who previously would have been accepted, may, now with the new selection devices, be rejected, whereas some who previously would have been rejected may now be accepted.

Ethically, this departure from the established admission process should not pose a problem. First, there is no evidence to prove that the selection devices currently used are the most discriminating between those applicants who will succeed and those who would not succeed in the program. Second, the two groups of applicants are already being assessed by two completely different admission procedures--grades for one group and interview for the other. One of these devices, the interview, is much more rigorous in terms of time and effort for both the program and the applicant. Since these two groups of students will come together into one class with the same expectations of them, it is difficult to substantiate the difference in selection procedures. Third, it is stated in the Nursing Calendar [61], a brochure printed specifically for potential applicants, that "the University reserves the right to grant admission to a limited number of students...to change the admission requirements at any time without notice". Further on, it states:

> "As places in the School of Nursing are limited, admission is by selection of applicants and possession of published minimum requirements does not guarantee admission. Normally there are many more applicants than there are places, and high qualifications are expected of the applicants selected." [61: 5]

Although ratings for a number of admission procedures will be collected for each applicant, the admission of many candidates will be based only on specific ratings which have been previously identified. The other ratings will not be allowed in any way to influence the applicant's admission decision. These ratings will only be used retrospectively at the end of the study to assess relationships. The applicant will not be informed of which admission procedure was used for the decision. This is justified since, until the study is complete, there is no evidence to prove that the ratings of one selection tool are any more predictive of success than the other. If these data were available, there would be no reason to conduct the study.

4.6 Stratification

Providing the inclusion and exclusion criteria are applied to the sample, there should be no need for stratification. Based on the retrospective analysis, there did not appear to be any factors other than the factor being examined in the trials which could influence the outcome. However, age, sex, and marital status were not examined due to the few students in the program who were older or male or married. The limited sample size and few candidates to whom any of the identified descriptors would apply, would not permit stratification; however, these factors should be examined separately in the data analysis.

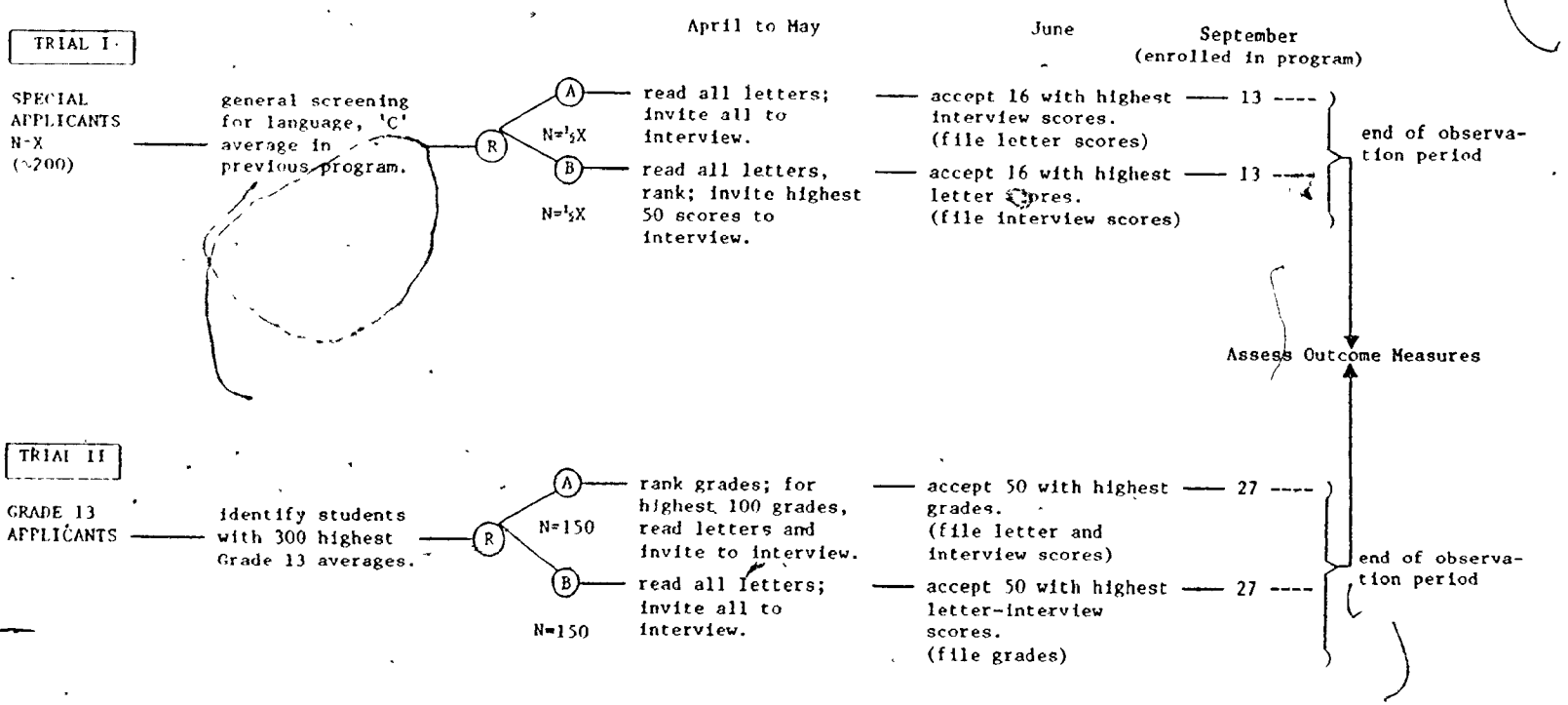
Randomization should tend to distribute the unidentified influencing factors evenly among the groups.

4.7 Description of the Manoeuvre (Figure 4)

As mentioned previously, potential applicants will need to be notified about the changes in the admission procedures. A number of

Figure 4

Flow Diagram Of Trials



routes exist for transmitting this information. Firstly, guidance counsellors of all Ontario high schools will be made aware of the changes and asked to announce them to the Grade 13 students well ahead of the April application deadline. Secondly, university student liaison officers visit most high schools in Ontario throughout the year and they too will be asked to convey the new information. Thirdly, many potential applicants visit the School of Nursing to speak with faculty or students about the baccalaureate program and, at that time, admission procedures can be reviewed. The Registrar's Office (Health Sciences) receives many inquiries about admission to the nursing program, and lastly, the information can be incorporated into the new issue of the nursing calendar which will address the academic years beginning in 1982 and 1983. Accompanying the information about the changes will be a request to submit an autobiographical letter to the School of Nursing by April 1st, the same due date as their application. Instructions for writing the letter will accompany the request (Appendix B). The information should also include the dates for two weekends in May during which team interviews will be conducted. In this way, the applicants will have advance warning and can reserve these dates.

Once the April 1st deadline has passed, applications can be separated into two groups--the 'special' applicants who will be processed through Trial I and the Grade 13 applicants who will become part of Trial II.

4.7.1 Trial I

All 'special' applicants who meet the inclusion and exclusion criteria will be admitted to the trial. Each autobiographical letter

will be rated independently by a team of three readers. The team will consist of representatives from faculty, community, and students. Prior to reading the letters, all team members will participate in a training session where the instructions for writing the letter (Appendix B) and the tool for rating the letters (Appendix D) will be reviewed. Examples of good and poor letters will be described. In order to assess the validity of a reader's ratings, two 'control' letters will be included, unknown to the readers, in their assigned package. These letters will have been prescreened, one to be a "good" letter and the other a "poor" letter.

The rating tool was changed slightly from the one used in the reliability testing of the autobiographical letter (Appendix C). Since it is believed that a scale should have at least seven points to optimize reliability*, it was decided to change the global scoring from a four-point scale to one consisting of seven points. The revised rating tool (Appendix D) will be used in both trials. Prior to implementation of the trials, intraobserver and interteam reliability using the revised instrument will be tested. This testing will be set up in the same fashion as the original letter reliability investigation using the same pool of letters.

Using a table of random numbers, applicants will be assigned to one of two groups--A_I or B_I. The admission decision for candidates in group A_I will be made on the basis of mean interview scores.

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*Birkett, N., and Norman, G. "How many boxes?: Chapter 2". Presented at Work in Progress Seminar. Hamilton: McMaster University, April 9, 1981.

Interviews will be conducted using a three-member team--with faculty, community, and student represented. The structured interview will last 45 minutes after which each interviewer will independently assess the applicant according to a rating tool (Appendix E). The interviewing rooms will have one-way mirrors, from behind which a monitor will observe to ensure the applicant has had a fair interview. Prior to the actual interviews, all interviewers will attend a training session at which time specific areas to be assessed in the interview will be reviewed, followed by an opportunity to interview a simulated applicant. Monitors will provide feedback to the teams about their interviewing skills, as well as review the use of the rating tool.

In group A_I, the 16 applicants ranked highest in mean interview scores will be offered positions anticipating that 13 will accept the offer and enroll in the program in September. Mean letter scores for these students will be kept on file and will be compared to interview scores in terms of outcome measures at the end of the study.

For applicants in group B_I, mean letter scores will be ranked from highest to lowest. The 50 applicants with the highest scores will be interviewed. In order to ensure enrollment in the program of 13 students from this group, 16 with the highest letter scores will be offered positions. The interview scores for this group will be disregarded until the end of the study. At that time, as with group A_I, the letter and interview scores will be compared.

4.7.2 Trial II

All Grade 13 applicants who meet the inclusion and exclusion criteria will be admitted to the trial. The Grade 13 interim averages

will be ranked for all candidates from highest to lowest. Autobiographical letters for applicants with the highest 300 grades will be read and rated in the same manner as described in Trial I. As a matter of fact, during the letter reading stage, all letters to be read for both trials can be grouped together. This would total approximately 500 letters (it is estimated that there would be 200 in Trial I, although this may vary and 300 in Trial II, this figure remaining constant). Therefore, 25 teams will be identified, each to read and rate approximately 20 letters.

Using a table of random numbers, the 300 candidates with the highest grades will be randomized into one of two groups--A_{II} and B_{II}. The manoeuvre for each of these groups is as follows:

Group A_{II}--The Grade 13 marks for the 150 applicants randomized to this group will be rank ordered. The top 100 applicants will be invited to an interview. The admission decision for applicants in this control group will be based solely on the Grade 13 marks, not unlike the current admission procedure. Therefore, the 50 candidates with the highest grades will be accepted, with the goal of enrolling 27 students from this group in the program. At the end of the study, the letter and interview scores for these students will be analyzed along with the Grade 13 marks in relation to the outcome measures.

Group B_{II}--Letters for applicants in this group (N=150) will be read and rated. All candidates will be requested to attend an interview. Mean letter and mean interview scores will be totalled for each applicant and then rank ordered from highest to lowest. The highest 50 applicants will be offered positions in the program with the expectation that 27 will accept and register in the fall. Grade 13 marks will be disregarded

until the end of the study. At that time Grade 13 marks, interview, and letter scores will be examined in relation to outcome measures.

The interview process in Trial II will be identical to that described in Trial I. As with the letter, there is no reason why the applicants in both trials cannot be grouped together and interviewed during the same weekends. This would result in a total of approximately 400 interviews (it is estimated that there would be 150 in Trial I, although this may vary and 250 in Trial II, this figure remaining constant). The medical school at McMaster presently interviews 440 applicants over two weekends (110 interviews per day). Based on five interviews per team and 21 teams interviewing per day, 420 interviews could be conducted over two weekends. The teams would be asked to commit their time for both days of the weekend so that a total of 42 teams would be required for the process.

The schedule for the admission process would be as follows (1982 used as an example):

April 1st

All applications and autobiographical letters submitted.

April 5th

Workshop for training letter readers, followed by distribution of 20 letters to each of 25 teams.

April 16th

Letter ratings due.

April 23rd

Ranking of letter scores and invitations to attend interview sent to identified applicants (N=400).

May 12th

Workshop for training interview teams.

May 15th to 16th, and
May 22nd to 23rd

Interview dates.

May 24th to June 4th

Collation.

June 7th

Notice of acceptance sent to identified applicants.

For each group of applicants, more offers will be sent out than the number expected to enroll. The determination of the number of offers to send out is difficult. Historically, the majority of offers made to 'special' applicants are accepted (for academic year, 1981 to 1982, 32 offers have been sent out to fill 26 places in the class). This high rate of acceptance most likely occurs because the McMaster baccalaureate nursing program is rather unique in allocating up to one-third of its first year positions to 'special' or 'mature' applicants. For these reasons, it was decided to offer acceptance to 16 from each of group A_I and B_I anticipating that 13 from each group will accept. Close follow-up of the applicants will be required to ensure that the quota of 13 per group is achieved. Telephone calls will be made to any applicants who have not responded to the offer within two weeks. If, after contacting all 16 applicants, the sample consists of fewer than 13 students, the next applicants rank ordered in the appropriate group will be offered positions. This process will continue until the two groups each have

13 students enrolled in the program.

The number of offers to send out for Trial II is very difficult to establish. Historically, in order to identify the 54 students for whom places exist in the program, three times that number have been offered admission. For the academic year beginning in September 1981, 132 applicants were offered positions in the McMaster B.Sc.N. program of whom 55 accepted. Usually applicants identify three universities they would like to attend; often, McMaster is not the first choice (see Table 16). Therefore, if accepted by both McMaster and their first choice, the applicants will most likely plan to attend the other university. This is a "Catch-22" situation. If too many offers are sent out and the applicants accept, the class size exceeds the resources available. If too few offers are sent, then the class is not filled and a second set of offers must go out. By this time, many of the applicants have accepted positions in other programs resulting in the admission of less suitable candidates who were originally ranked low on the applicant list.

In Trial II, it has been decided to send out 50 offers from each group in the hopes of enrolling 27. The review of the literature pointed out that when applicants are requested to write autobiographical letters and attend interviews, they look more closely at their suitability for a program. Therefore, since a certain amount of commitment by the applicants will be demonstrated through their agreement to participate in the more rigorous admission procedures, more places offered may be accepted than is presently the case. In addition, the accept rate, especially in group B_{II}, may be higher since this group may have lower grades and thus

Table 16

First Year Nursing Applications

Academic Year	Ranking of Application to McMaster						Total
	First Choice		Second Choice		Third Choice		
1977-78:	N	%	N	%	N	%	
Grade 13 Applicant	135	35.5	143	37.6	102	26.9	380
'Special' Applicant	29	34.9	29	34.9	25	30.2	83
1978-79:							
Grade 13 Applicant	112	30.8	141	38.7	111	30.5	364
'Special' Applicant	30	33.3	40	44.4	20	22.3	90
1979-80:							
Grade 13 Applicant	111	30.8	142	39.5	107	29.7	360
'Special' Applicant	42	41.2	33	32.4	27	26.4	102
1980-81:							
Grade 13 Applicant	136	31.7	167	38.9	126	29.4	429
'Special' Applicant	69	50.0	45	32.6	24	17.4	138
1981-82:							
Grade 13 Applicant	192	30.5	244	38.8	193	30.7	629
'Special' Applicant	104	48.4	65	30.2	46	21.4	215

fewer offers. As with Trial I, close follow-up of these applicants will be maintained so that the decision about enrolling can be ascertained as soon as possible. If the 27 positions in each group are not filled, the applicants next on the list will be offered positions. In both Trials I and II, not all applicants will be interviewed. In the groups where admission will not be based on the interview, it was decided to interview only those most likely to be offered positions according to the determining admission device. Allowance has been made for the situations where more than the planned number of offers must be made. For example, in group B_I, although 16 applicants will be accepted, 50 will be interviewed.

Frequently in Trials I and II, ratings will be ranked from highest to lowest and decisions made on the basis of these rankings. Situations are likely to arise where predetermined cut-off points separate tied values. Whenever this occurs, the tied values will be put in a hat and randomly drawn. For example, in group B_{II}, the decision to offer a position to a candidate will be made on the basis of a total score calculated by combining mean letter and mean interview scores for each applicant. It is possible that once ranked, the fiftieth and fifty-first applicants may have the same score. In order to determine which applicant to accept, the tied scores along with applicants' names will be placed in a hat and the required number of names will be drawn.

At the end of the study, or earlier if the student fails or withdraws, outcome criteria will be examined in relation to the various admission procedures.

4.8 Compliance

Compliance becomes an issue in these two trials when the appli-

cants are asked to write an autobiographical letter and attend an interview. Any candidate who has not submitted an autobiographical letter by April 1st, will not be considered for admission into the program. If an application form, only, is submitted well ahead of the April 1st deadline, the applicant will be notified and invited to send in a letter.

Some candidates might find it difficult to attend an interview either because of previous commitments or distance. Attempts will be made to notify applicants as soon as possible of the dates for interviews. The office in charge of setting appointments for interviews will try to accommodate the applicants at times most suitable for them. If the candidate, due to an unforeseen circumstance or a crisis, cannot attend either weekend, arrangements could be made for him/her to be interviewed at another time. For those who must travel great distances, the importance of seeing the school and speaking with faculty and students will be emphasized.

4.9 Contamination

In executing the manoeuvre, certain measures will be taken to avoid the possibility of contamination. First, although letter reading teams will consist of three members, the identity of these individuals will not be disclosed. The letters will be rated independently and, therefore, there is no reason for a reader to know who else is rating the same letters. This will avoid the possibility of team members comparing assigned letter scores.

Second, applicants' names on the letters will be replaced by code numbers. If by chance an individual rated a letter and then interviewed that same applicant, the interviewer might be biased on the basis of his rating of the letter.

Third, interviewers will not have access to the applicant's file or information pertaining to his/her academic background. This will ensure that the candidate is rated solely on the basis of data obtained during the interview.

Fourth, the interviewers, after seeing the candidates, will be instructed to independently rate him/her without team discussion. This will permit each interviewer to think through his own assessment of the applicant before hearing the views of the other interviewers.

Contamination occurs when comparison groups are exposed to the same manoeuvre as the experimental group. In these trials, this should not present a problem. All candidates who will be offered places in the program will have participated in the same admission procedures. They will all have submitted letters and will all have been interviewed. They will not be aware of which selection device(s) will be used for their admission decisions. Faculty will also be unaware of the basis for this decision. This will avoid bias on the part of the tutor when rating students at the end of the term.

The critical point in relation to contamination will be to ensure that only the ratings of the predetermined admission device(s) be used in making the admission decision for each applicant. For example, in Trial I, applicant X may have received a very poor letter rating and an excellent interview score. If he/she is assigned to the group where only the letter is to be considered, then this applicant must be rejected.

4.10 Outcome Measures

Outcomes in these two trials will be measured by the following parameters: (1) student status in the program in terms of success, failure,

withdrawal; (2) performance as measured by grades in Years I and II nursing courses; (3) performance as measured by grades in Years I and II nursing science courses; and (4) ratings by clinical tutors at end of Term I in Year I and at end of Term II in Year II.

4.10.1 Student Status in Program

Both in the literature review and the retrospective analysis, the attrition rate in nursing programs has been identified as an area of concern. In January 1981, the study group on admissions for the Health Sciences Education Committee [62] selected attrition rate as a measurement criterion because of the effects it has on a program. Among these effects are potential under-utilization of resources and potential elimination from the program of students who might have succeeded had they been admitted. The questions put forth in the proposed study both focus on the relationship of various admission procedures and rate of attrition. Therefore, an important outcome measure will involve the monitoring of withdrawals from the program for whatever reason.

Students who leave during the academic year must see the Program Chairman. At that time, she will request that each student complete an exit questionnaire (Appendix F). The main purpose of the questionnaire is to determine the student's reasons for leaving the program. Some students successfully complete a year of the program, but then fail to return for the next year. Upon identification of these students, a questionnaire will be mailed to them along with a self-addressed stamped envelope. If after three weeks, all forms have not been returned, a letter urging the students to complete and return the questionnaire will

be sent. The withdrawals will be analyzed in terms of their reason(s) for leaving the program (e.g., academic failure, nursing dislike, transfer to another program, finances, illness).

In the retrospective analysis, it was determined that approximately 80 percent of students who withdraw do so by the end of second year (Table 5). Therefore, attrition data will be collected for each class until the first week of third year. This will identify all those who have left during first and second year, as well as any who decide to leave during the summer between Year II and Year III.

The data will be categorized as successful, that is, a student who by the beginning of Year III is still enrolled in the program, failures and withdrawals for other reasons. These data will be examined in relation to the four groups identified in the two trials. For the outcome of attrition, the classes entered into the trials early on in the study can be followed for the duration of the observation period, rather than for two years. This would permit maximum utilization of the data by increasing the event rate for these first classes by 20 percent. This would be particularly valuable since the sample sizes are somewhat limited.

4.10.2 Performance in Nursing Courses

It will be of interest to determine if students admitted to the program on the basis of different selection devices, perform differently in the nursing courses. Therefore, grades achieved in the seven unit first year nursing course (1F7) and in the 15 units of second year nursing courses (2L6, 2M5, 2H4) will be recorded for each student by admission group. For those who withdraw, grades assigned to the point

of leaving the program will be recorded.

4.10.3 Performance in Nursing Science Courses

Similarly to the process described above, grades achieved in first year in the six unit biochemistry course (1A6) and the seven unit anatomy and physiology course (1B7), as well as grades assigned in second year anatomy and physiology (2B8) will be recorded for each student by admission group.

4.10.4 Tutor Ratings

In the McMaster baccalaureate nursing program, emphasis is placed on the development of the student in four critical areas: self-directed learning, problem-solving, interpersonal relations, and self-evaluation. Although all four years of the program are committed to cultivating these skills in the nursing students, it is first and second year in which they are most heavily stressed. Therefore, clinical tutors will be asked to rate their students' levels of ability in these four areas at the end of first term in Year I and the end of second term in Year II. The first year rating will be used in the analysis if the student withdraws prior to the end of second year. If the student remains in the program, only the second year rating will be used. An evaluation tool has been developed (Appendix G) which the tutors will use to simply circle one rating for each of the four skills. Descriptor statements will be used as anchors at certain points of the 7-point scale. Students' scores in the four areas will be listed according to their designated admission group.

Prior to the study, tutors will be tested on the use of this rating tool to ensure that the instructions for scoring are clear. Test-

retest reliability will be assessed by asking a group of tutors to evaluate their students at the end of the term using the rating tool. Two weeks later, they will be asked to once again score the same students. A reliability of 80 percent or higher will be considered acceptable. If problems arise with clarity of instructions or criteria or the reliability of the tool, revisions will be made and the new tool will again be tested.

4.11 Sample Sizes

There are two practical limitations influencing the sample size in both these trials. First, class size in the nursing program is restricted to the enrollment of 76 to 80 students per year. Since 'special' applicants are entitled to one-third of these places, Trial I is limited to a total sample of 26 students per year. Therefore, the remainder, 54 students per year can be entered into Trial II. Trial I involves two groups, each with 13 students (Figure 5) while Trial II involves two groups, each with 27 students (Figure 6).

The second limitation relates to the duration of the study. Educational programs are constantly evaluating their curricula and making changes where deemed necessary. It has been decided that the study should continue no longer than four years in the hopes that during that time the curriculum will not undergo many major changes. Due to the small number of students per group each year, it will be necessary to combine the data for the duration of the study. If during that time the curriculum remains fairly stable, the attrition rates can be examined in relation to admission procedures; however, if there are critical changes, fluctuations in the attrition rates may be attributed to increased or

Figure 5

Sample Size For Trial I

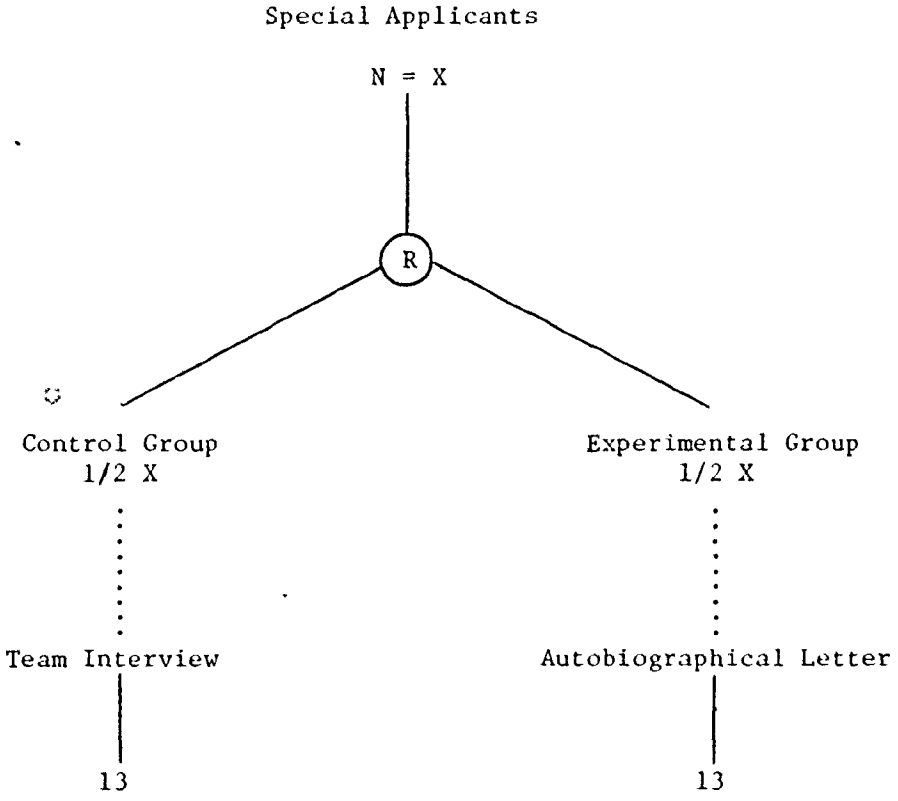
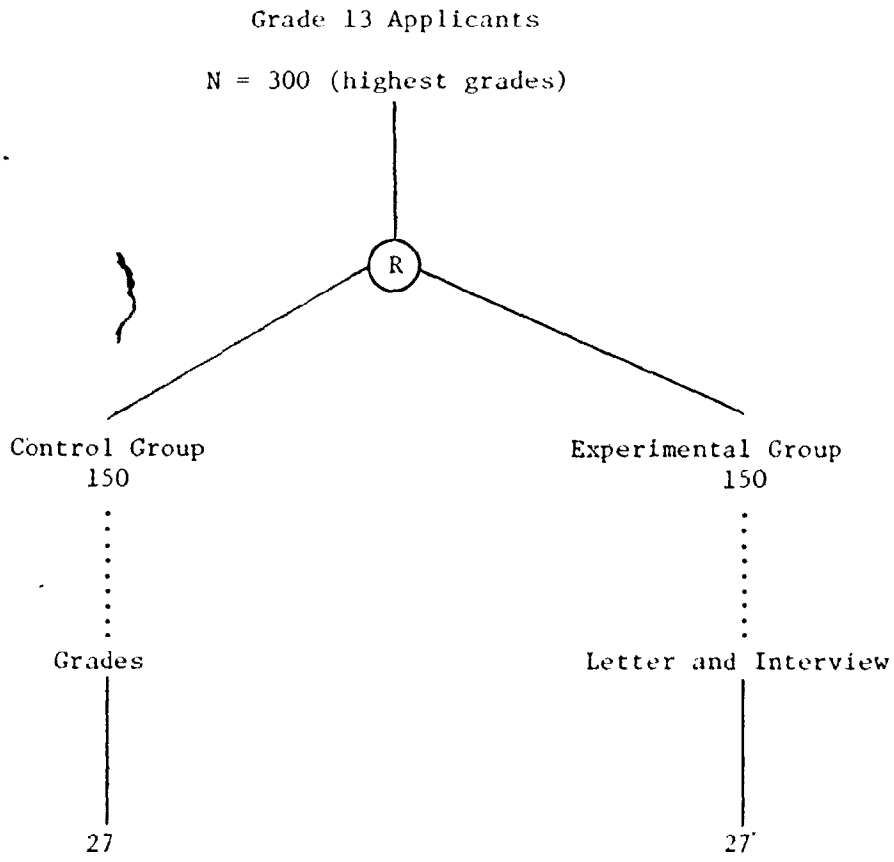


Figure 6

Sample Size For Trial II



decreased satisfaction with the new curriculum. For that reason, data will be collected during four years of admission for Trial I and three years for Trial II. Each of these classes will then be followed for two years with a total duration therefore, of five and a half years for Trial I and four and a half years for Trial II. The schedule would be as follows:

April 1982 Admissions--Class enters 1982--end of Year I, April '83
--end of Year II, April '84

April 1983 Admissions--Class enters 1983--end of Year I, April '84
--end of Year II, April '85

April 1984 Admissions--Class enters 1984--end of Year I, April '85
--end of Year II, April '86

April 1985 Admissions--Class enters 1985--end of Year I, April '86
--end of Year II, April '87

Duration of Trial I: April '82 to September '87 = 5-1/2 years.

Duration of Trial II: April '82 to September '86 = 4-1/2 years.

Taking these two limitations into consideration, the sample size is, in effect, predetermined. In Trial I, sample size will be 52 (13 X 4 years) per group and in Trial II, sample size will be 81 (27 X 3 years) per group. With the sample size established, one would want to calculate the power of the trials, that is, the probability of correctly rejecting the null hypothesis given there is a real difference between outcomes of the two admission procedures. The closer this calculated value is to one, the better. Power will be examined in terms of the four outcome criteria.

4.11.1 Attrition

To determine the power of these two trials in relation to attrition rates, the following information is required:

1. Present Attrition Rate (π).

2. Delta (Δ), the magnitude of the difference between the attrition rates associated with the two procedures that one would want to reliably detect if present. Thus $\pi_A = \pi - \Delta$

3. Alpha (α), the probability of rejecting the null hypothesis when there actually is no difference between groups. (Type I error.)

4. Sample Size (N).

With this information, beta (β) or the probability of failing to reject the null hypothesis when indeed there is a difference between groups (Type II error) can be calculated. Once beta is determined, power can be computed by the simple equation $1 - \beta$.

4.11.1.1 Trial I

Therefore, for Trial I, using the equation for sample size determination for independent proportions, calculation of power would be as follows:

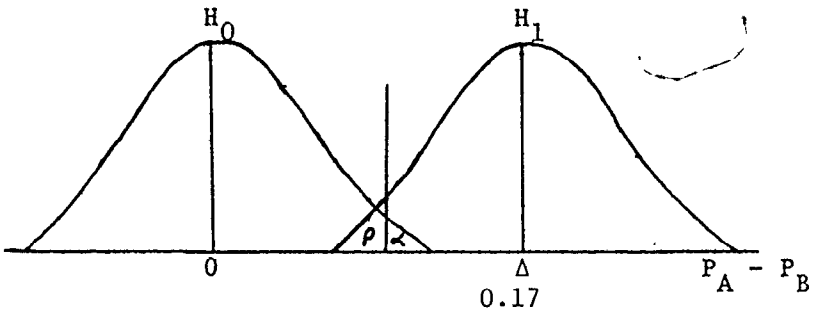
π = .29 (based on average attrition rate of 'special' applicants in retrospective analysis)

Δ = .17

π_A = .12

α = .05 (one-sided test)

N = 52 (13 per year X 4 years)



Since the desired difference is in terms of a reduction in attrition rate, Z_α will be negative (-1.645).

If

$$N = \left[\frac{Z_\alpha \sqrt{2\pi\ (1 - \pi)} - Z_\beta \sqrt{\pi_A\ (1 - \pi_A) + \pi\ (1 - \pi)}}{\pi_A - \pi} \right]^2$$

Then,

$$52 = \left[\frac{-1.645 \sqrt{.58\ (.71)} - Z_\beta \sqrt{.12\ (.88) + .29\ (.71)}}{-.17} \right]^2$$

Z_β = .3048

β = .382

Power = $1 - \beta$

= .618

With a reduction in attrition rate from 29 percent to 12 percent, the probability of correctly rejecting the null hypothesis is 61.8 percent. Due to the small sample available in this trial each year (N=13 per group) the power remains somewhat low even though the study has been extended one year longer than Trial II.

4.11.1.2 Trial II

For Trial II, power would be calculated in a similar fashion:

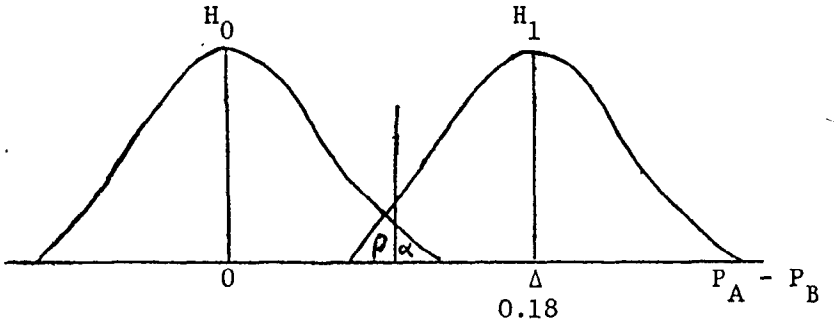
π = .35 (based on average attrition rate of Grade 13 applicants in retrospective analysis)

Δ = .18

π_A = .17

α = .05 (one-sided test)

N = 81 (27 per year X 3 years)



Since the desired difference is in terms of a reduction in attrition rate, Z_α will be negative (-1.645).

If

$$N = \left[\frac{Z_\alpha \sqrt{2\pi\ (1 - \pi)} - Z_\beta \sqrt{\pi_A\ (1 - \pi_A) + \pi\ (1 - \pi)}}{\pi_A - \pi} \right]^2$$

Then,

$$81 = \left[\frac{-1.645 \sqrt{.70\ (.65)} - Z_\beta \sqrt{.17\ (.83) + .35\ (.65)}}{-.18} \right]^2$$

Z_β = .8408

β = .200

Therefore,

Power = 1 - β

= .8

With a reduction in attrition rate from 35 percent to 17 percent, the probability of correctly rejecting the null hypothesis is 80 percent.

The differences anticipated in both trials are rather large (Trial I Δ=.17; Trial II Δ=.18). Also, the power in Trial I is rather low (61.8%). A number of possible strategies should be considered at this point. If there are no major curricular changes during the course of the study, the investigations could be extended. Secondly, if the Trial I students appear similar to the students in Trial II, the results might be pooled. A final strategy could be to recalculate sample sizes if the observed attrition rates differ from those in previous years.

4.11.2 Grades in Nursing and Nursing Science Courses

For these two outcomes, two calculations will be computed for each trial--one for first year nursing grades and another for second year nursing grades. For each year of grades, nursing and nursing science were averaged for each student and then means and standard deviations were calculated.

4.11.2.1 Trial I

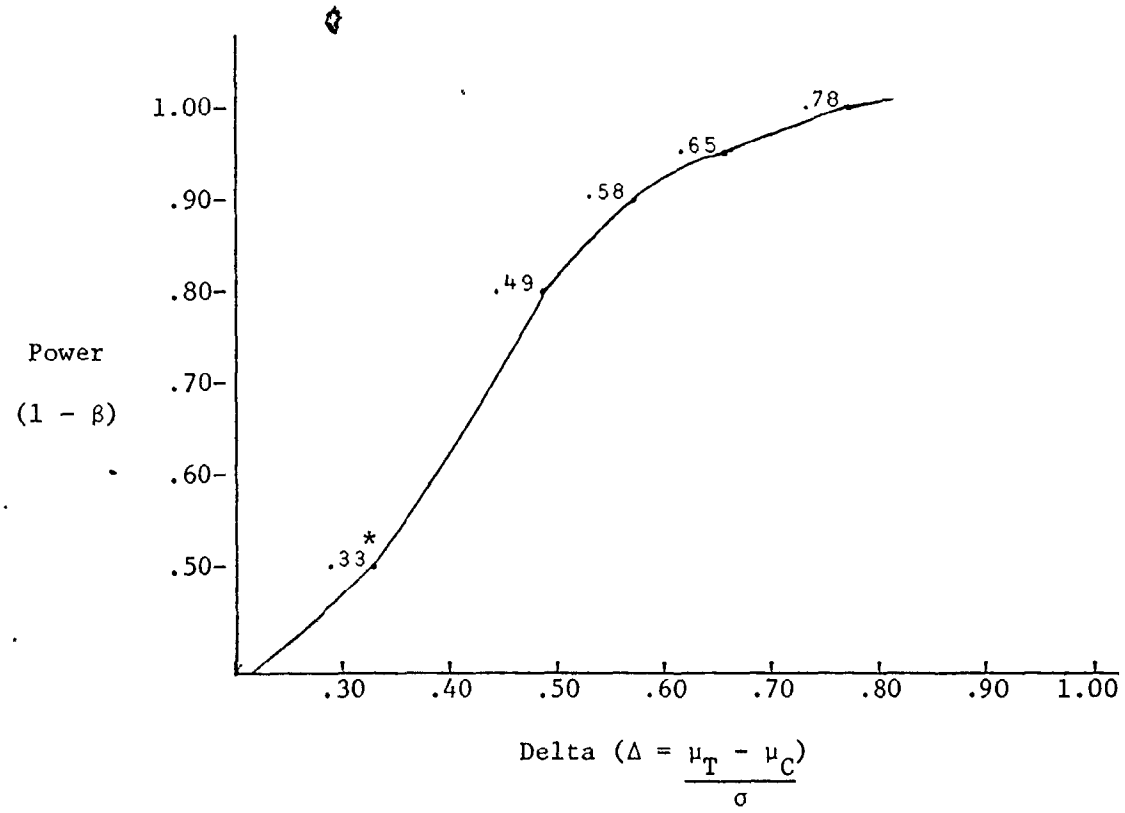
Using a sample size of 52 per group and alpha set at 0.05 for a one-sided test, a power curve was constructed* on the basis of various values of delta $\left(\frac{\Delta=\mu_T-\mu_C}{\sigma}\right)$ where Δ = delta.

μ_T = mean grade for experimental group.

μ_C = mean grade for control group.

σ = standard deviation.

*Number of observations for t-test of difference between two means. In W. H. Beyer (Ed.), Handbook of Tables for Probability and Statistics. Ohio: The Chemical Rubber Co., 1968, p. 289.



a) First year nursing grades

From this graph and with a standard deviation (σ) of 7.430, one can determine the differences in mean grades observable and the probability of correctly finding this difference if present. Therefore, with a sample size of 52, one would have a 95 percent chance of detecting a difference of 4.83 marks (Δ X σ) between the control and experimental groups in mean nursing and mean nursing science grades in first year. Since the mean nursing grade using the present admission process is 72.6, an observed difference of this size would result in the new admission process producing a class with a mean grade of 77.4 percent.

b) Second year nursing grades

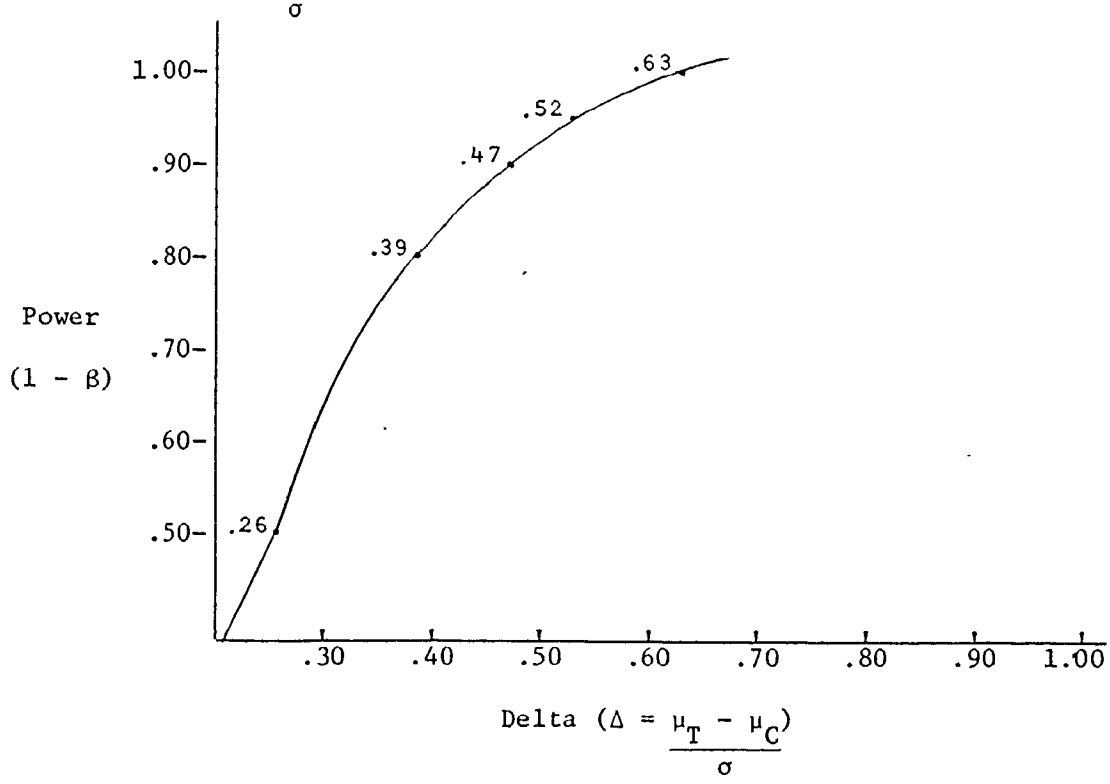
Again, using a sample size of 52 per group, but this time a mean grade of 72.8 (μ_C) and a standard deviation of 5.4 (σ), one would

*The plotted delta values on the graph correspond to power values of 50%, 80%, 90%, 95%, and 99%.

have a 95 percent chance of detecting a difference of 3.51 marks (Δ X σ) between the two groups if present. Therefore, the mean nursing grade and mean nursing science grade in second year would be expected to increase from 72.8 percent to 76.3 percent with the new admission process.

4.11.2.2 Trial II

With a sample size of 81 per group and alpha set at 0.05 for a one-sided test, a power curve was constructed* on the basis of various values of delta ($\Delta = \frac{\mu_T - \mu_C}{\sigma}$).



*Number of observations for t-test of differences between two means. In W. H. Beyer (Ed.), Handbook of Tables for Probability and Statistics. Ohio: The Chemical Rubber Co., 1968, p. 289.

a) First year nursing grades

From this graph and with a standard deviation (σ) of 7.593, one would have a 95 percent chance of detecting, if present, a difference of 3.9 marks between the groups when examining first year mean nursing grades and mean nursing science grades. Therefore, one would expect the mean grade of 70.7 for the control group to increase to 74.6 for the experimental group with the new admission process.

b) Second year nursing grades

Similarly, with a standard deviation of 6.439, one would have a 95 percent chance of detecting, if present, a difference of 3.3 marks between the two groups when interested in performance in second year nursing and nursing science courses. The mean grade using the present admission process is 72.7 in second year nursing courses. Therefore, one would expect the experimental group to average a mark of 76 percent on both second year nursing and nursing science courses.

4.11.3 Tutor Ratings

Sample size for this endpoint will not be determined because this rating tool has been devised specifically for this study and, therefore, there are no existing data which could be used for the calculations.

CHAPTER V

STATISTICAL ANALYSIS

In Trial I, each 'special' student will have a mean letter score and a mean interview score--one of which will have been used for the admission decision. In Trial II, each student will have a Grade 13 mark, a mean letter score, and a mean interview score. The objective of the analysis is to compare these admission procedures and their ability to predict student performance in terms of staying in the program, grades achieved in nursing and nursing science courses, and tutor ratings.

Strategies for analysis will vary for each of the outcome criteria. Since the outcome measures for both trials are the same, many of the tables presenting the data will be set up similarly.

5.1 Attrition

The number of failures and withdrawals for reasons other than failure for the control and experimental groups in each trial will be totalled. A chi-square test will then be applied to determine if the two observed attrition rates are really different or consistent with chance variation about a common attrition rate (see Tables 17 and 18). Chi-square is the appropriate analysis for comparing independent binomial proportions. The test will determine if there is a significant difference between the two admission procedures in each trial in terms of their associated attrition rates and thus their ability to select students who will succeed in the program.

Table 17

Student Status In Program According

To Admission Groups In Trial I

		Admission Procedure		
		Interview (A_I)	Letter (B_I)	Total
Student Status	Successful	a	b	
	Unsuccessful	c	d	
	Total			

$$\chi^2_1 = \frac{(|ad - bc| - N/2)^2 N}{(a + c)(b + d)(a + b)(c + d)}$$

Table 18

Student Status In Program According

To Admission Groups In Trial II

		Admission Procedure		
		Grades (A_{II})	Letter & Interview (B_{II})	Total
Student Status	Successful			
	Unsuccessful			
	Total			

X^2 (1df) =

Since the designs of the trials included the collection of all admission data for each applicant, the additional information, until this point disregarded, can be used to further strengthen the results. Therefore, once the selection devices actually used to determine the admission decision for each group have been compared, the additional admission data will be examined. In Trial I, each student accepted into the program on the basis of interview scores, will also have a letter score and each student accepted on the basis of a letter score, will have an interview score. If, for example, the chi-square analysis determines that the interview group (A_I) included significantly more successful students than the letter group (B_I), it would be important to examine the interview scores for the letter group to assess if those scores would have been more predictive of success for that group had they been used for the admission decision. It would be expected, therefore, that in the letter group (B_I) those with the high interview scores would be those who remained in the program and those with low interview scores would be those who failed or withdrew. If this were true, then the first finding in favour of the interview as a predictive admission device would be validated.

This process would be the same for Trial II; once one admission procedure is found to be more predictive of success than the other, the additional data can be examined. Again, for example, if the letter plus interview combination is proven to be more predictive of successful students than grades alone, the letter plus interview scores for the grades group (A_{II}) can be analyzed. It would be expected that the high letter-interview scores would be those of students who remained in the

program while the low ones failed or withdrew.

This additional admission information for each trial can be analyzed in terms of a chi-square test (see Table 19).

A third strategy which will be used to analyze the admission procedures in terms of attrition will be discriminant function analysis. The issue of univariate and multivariate statistics in research involving prediction has been addressed earlier. Discriminant function analysis is a multivariate technique which maximizes the use of information and provides a linear function of admission assessments (grades, letter, interview) which best predict the likelihood of success [15]. Therefore, it will be used to determine which combination of independent variables best discriminate between the successful and unsuccessful students. Discriminant function analysis is used when the dependent variable is nominal. In Trial I, the variables which will be entered into the analysis are: mean letter score, mean interview score, age, sex, marital status, number of years since last full-time education program. In Trial II, the variables which will be entered into the analysis are: mean letter score, mean interview score, Grade 13 marks, sex, and distance from home. Age and marital status for this group will not be examined since these remain fairly consistent with students applying directly upon completion of secondary school.

The last analysis in relation to attrition involves the exit questionnaire (Appendix F) which all unsuccessful students will be asked to complete. For each question, the responses will be totalled, summarized, and where appropriate, chi-square analysis applied to determine if there is a significant difference in responses between admission

Table 19

Analysis Of Alternate Admission Procedure(s)

Trial I - For Letter Group (B_I)

Student Status	Interview Scores: High	Interview Scores: Low	Total
Successful			
Unsuccessful			
Total			

χ^2 (1df) =

Trial II - For Grade Group (A_{II})

Student Status	Letter and Interview Scores: High	Letter and Interview Scores: Low	Total
Successful			
Unsuccessful			
Total			

χ^2 (1df) =

groups in each trial.

5.2 Nursing and Nursing Science Grades

For each group in each trial, mean nursing grades and mean nursing science grades will be computed. Since these are continuous data, a t-test for the comparison of two independent means will be calculated to determine if there is a significant difference in grades achieved by the two admission groups in each trial (see Tables 20, 21, 22, and 23).

Although the primary objective of the investigation is to reduce the attrition rate, it is important to assess the progress of those who remain in the program. It would be reassuring to note that the group of students who had the highest percentage of retention in the program also had the highest level of performance in terms of grades achieved in the nursing courses.

In order to examine the additional data collected at the time of admission, multiple linear regression will be computed. This statistical method can be used to describe the extent, direction, and strength of the relationship between several independent variables and a continuous dependent variable [50]. It can be thought of as analogous to the discriminant function analysis, but applied to the measured outcome grade as opposed to the binary categorical outcome attrition. Therefore, for each first and second year nursing and nursing science course, grades will be examined in Trial I in terms of letter and interview scores and in Trial II in terms of grades, letter, and interview scores.

A problem which arises with both the t-test and multiple linear regression is the exclusion of data about students who withdrew from the program. Since the grades assessed will be those assigned at the end of

Table 20

Mean Nursing Grades For Students In Trial I

		Admission Procedure		
		Interview (A_I)	Letter (B_I)	Independent-Samples t-test
Nursing Courses	Mean N1F7 Grade			
	Mean N2L6 Grade			
	Mean N2M5 Grade			
	Mean N2H4 Grade			

Table 21

Mean Nursing Grades For Students In Trial II

		Admission Procedure		
		Grades (A_{II})	Letter and Interview (B_{II})	Independent-Samples t-test
Nursing Courses	Mean N1F7 Grade			
	Mean N2L6 Grade			
	Mean N2M5 Grade			
	Mean N2H4 Grade			

Table 22

Mean Nursing Science Grades

For Students In Trial I

		Admission Procedure		
		Interview (A_I)	Letter (B_I)	Independent-Samples t-test
Nursing Science Courses	Mean N1A6 Grade			
	Mean N1B7 Grade			
	Mean N2B8 Grade			

Table 23

Mean Nursing Science Grades

For Students In Trial II

		Admission Procedure		
		Grades (A_{II})	Letter and Interview (B_{II})	Independent-Samples t-test
Nursing Science Courses	Mean N1A6 Grade			
	Mean N1B7 Grade			
	Mean N2B8 Grade			

the academic year, students who withdraw during the year will not be included in the analyses. Therefore, it is possible that the inspection of the grades in one admission group will appear more favourable than the comparison group, when in fact in that same group there were more withdrawals--students who perhaps would have had failing grades had they remained in the program. For this reason, the results of the grades analyses should always be examined in conjunction with the attrition analyses.

One strategy available for analyzing grades of those who withdraw is the Wilcoxon rank sum test--a nonparametric method used to compare two groups in independent samples. This test represents the nonparametric analog of the independent--two samples t-test. Tutors could be asked to develop a list ranking all students in the course including those who withdrew, from highest to lowest in terms of students' performance. This, however, would only be possible for students who had been in the course long enough for the tutor to become familiar with them. The students could then be ranked according to the admission procedure and statistical differences between the groups could be assessed.

5.3 Tutor Ratings

Each student will be rated by a clinical tutor in four areas--self-directed learning, problem-solving, interpersonal relations, and self-evaluation (see Appendix G). For students who remain in the program, this rating will be done at the end of second year. All students will have also been rated at the end of the first term of first year. Therefore, if a student withdraws before the end of second year, this first

set of ratings will be used for data analysis.

For each of the four areas rated, a frequency table will be drawn up summarizing the number of students in each admission group assigned specific ratings. Table 24 summarizes data about the tutors' ratings of interpersonal relations. Similar tables would be drawn up for each of the remaining three areas.

Once the frequencies are computed, a number of chi-square analyses could be calculated. Comparisons could begin by keeping the 7-point scale intact; however, an alternative worth exploring would be to collapse the table into three categories--ratings one to three (poor), four (average), and five to seven (good). This would reduce the number of degrees of freedom from six to two. In each trial and for each area rated, the two admission groups can be compared examining the successful and the unsuccessful groups of students (see Table 25). Subsequently, the alternate admission devices can be investigated in terms of their relationship with the ratings.

5.4 Criteria for Success

Plans for the analysis of four outcome measures have been outlined. Interpretation of the analyses of these data can present difficulties when all results do not point in the same direction. The ideal findings would reveal that students accepted into the program on the basis of one certain admission procedure have a lower attrition rate, higher nursing and nursing science grades, and higher tutor ratings than the group assessed by the alternate selection tool. However, one must be prepared for discrepancies in the findings. For example, one group of students might have a lower attrition rate, but their grades might

Table 24

Distribution Of Tutor Ratings For

Interpersonal Relations For Each Admission Group

Number of Students

Rating	Trial I		Trial II	
	Interview (A_I)	Letter (B_I)	Grades (A_{II})	Letter and Interview (B_{II})
1				
2				
3				
4				
5				
6				
7				
Total				

Table 25

Chi-Square Analysis Of Admission Groups And

Tutor Rating Of Student Performance

E.g., Interpersonal Relations: Trial I

	Number of Successful Students	
Ratings	A_I	B_I
1		
2		
3		
4		
5		
6		
7		

χ^2 (6df) =

Trial I

	Number of Unsuccessful Students	
Ratings	A_I	B_I
1		
2		
3		
4		
5		
6		
7		

χ^2 (6df) =

be much lower than the comparison group.

Interpretation of the data, therefore, will involve the careful examination of all findings for each admission group. The decision makers in the nursing program must be made aware of all the facts in order to determine the optimal trade-off which will benefit both the student and the program.

5.5 Cost Effectiveness

Along with information about their predictive validities, any decisions made about admission procedures must include consideration of costs involved. One would want to examine the expenditure in actually implementing the admission procedure versus the cost of students who withdraw from the program. For example, when assessing the team interview process, one would want to cost out the number of hours of time expended by people resources--interviewers, monitors, hostesses. Interviewing space, meals, and administrative costs would be a few more of the major costs involved.

Once this detailed cost analysis is computed for each admission procedure, it is important to examine the cost of withdrawals for each process. A major source of funding for universities is the government. The amount of funding per university is determined by Basic Income Units (B.I.U.). Each student is worth a certain number of B.I.U.'s; therefore, when a student withdraws from the university, these B.I.U.'s are lost. Further to this loss, is the loss of time for the student, as well as the loss of time for the faculty in teaching the student.

In a sense, the decision of which admission procedure to adopt in a program becomes a type of 'trade-off'. How many unsuccessful

students would this device identify during the admission process? How many successful students would it have eliminated from the program? What are the costs involved with this selection device--to the student, the program, the university, the faculty, the community? Only with all these data in hand, can the decision makers feel capable of identifying the most appropriate admission procedure for their program.

CHAPTER VI

BUDGET

6.1 Detailed Budget

Expenditures are requested over seven fiscal years. The first fiscal year consists of two months only during which time the project co-ordinator will be orientated and will begin planning. Of the remaining six fiscal years, Trial I will extend for five and one-half years and Trial II for four and one-half of those years. The remaining six months will be allocated to data analysis and preparation of reports for publication.

6.2 Budget Justification

The project co-ordinator who will be expected to have expertise in statistics, will be responsible for the overall management of the project. He/she will plan and conduct all training sessions, will be responsible for randomization of applicants to groups, develop rank lists of applicants to be offered positions, as well as conduct the statistical analysis for both trials. The position will be one which requires full-time work, 40 hours per week for certain months of each year. A schedule of his/her activities follows:

Project Co-ordinator

(Starting base salary of $1715.70/month with a

15 percent increase each year.)

Fiscal Year Ending March:			
	1982:	February	- orientation.
		March	- develop control letters for training readers.
			- organize training session for readers.
			- organize letters and reading teams.
	1983:	April	- separate applicants into Grade 13 and 'Special'.
			- distribute letters to teams.
			- follow-up those letters not rated by due date.
			- randomize applicants to groups.
			- plan training session for interviewers.
			- invite appropriate applicants to interview.
		May	- training for interviewers.
			- interview sessions.
			- prepare data for collation.
		June	- develop rank lists for acceptances for each group.
			- send out offers.
			- follow-up by phone after two weeks.
		March	- develop coding sheets and computer program.
			- code first year data.
			- organize letters and reading teams.

Fiscal Year Ending March:			
	1984:	April, May, June	- as above plus coding of data.
		March	- code data. - organize letters and reading teams.
	1985:	April, May, June, March	- as above.
	1986:	April, May, June	- as above
	1987:	June	- coding data.
		September	- end of Trial II.
		October, November	- analysis of data and reporting of results for Trial II.
	1988:	September	- end of Trial I.
		October, November	- analysis of data and reporting of results for Trial I.

Secretarial assistance will be provided by the School of Nursing and the Admission and Registrar's Office (Health Sciences). Since the project co-ordinator will be actively involved in the management of the trials, the secretarial responsibilities will not be many more than those presently required by the admission process.

Conference office services will be required for setting up the interview areas. Coffee will be provided at training sessions, as well as lunches for interviewers on interviewing days.

Keypunching is computed on the basis of two cards per student.

The present admission process in the baccalaureate program has been operating with a budget of approximately $2200.00. The bulk of these funds is channelled to the interview process. During the years the trials are in progress, these funds should be used to offset the costs of the project.

Table 26

Budget Details

	Fiscal Year Ending March 31:							
	1982	1983	1984	1985	1986	1987	1988	Total
a) Salaries								
Project Co-ordinator (Level II)	3,431.40 (2 mos.)	7,892.20 (4 mos.)	9,076.04 (4 mos.)	10,437.44 (4 mos.)	9,002.31 (3 mos.)	13,803.52 (4 mos.)	11,905.56 (3 mos)	65,548.47
15% Fringe Benefits	514.71	1,183.83	1,361.41	1,565.62	1,350.35	2,070.53	1,785.83	9,832.28
Secretary								NIL
b) Materials, Supplies, and Services								
Stationery, Office Supplies	50.00	300.00	300.00	300.00	150.00	50 00	50.00	1,200.00
Word Processing	-	200.00	200 00	200.00	100.00	-	-	700.00
Postage	-	100.00	100 00	100.00	100.00	-	-	400.00
Long Distance Telephone	-	200.00	220.00	230.00	150 00	-	-	800.00
Simulated Applicants	-	660.00	700.00	740.00	400 00	-	-	2,500.00
Conference Office	-	600.00	650.00	700.00	375 00	-	-	2,325.00
Lunches, Coffee, Donuts	-	2,000.00	2,200.00	2,400.00	1,000 00	-	-	7,600.00
c) Data Analysis								
Keypunching and Computation						3,000.00	1,500.00	4,500.00
Less Yearly Nursing Admission Budget	-	2,300.00	2,500.00	2,700.00	2,900.00	-	-	-10,400.00
Total	3,996.11	10,836.03	12,307.45	13,973.06	9,727.66	18,924.05	15,241.39	85,005.75

CHAPTER VII

SUMMARY

The literature review stresses the need for educational programs to evaluate, by means of systematic studies, the predictive validity of their admission procedures. Emphasis is placed on the importance of examining selection processes in terms of the specific philosophy and goals of each program.

It is unlikely that a 'flawless' admission procedure will ever be developed. However, as Seymour Sudman (source unknown) so aptly stated:

> "Where no searchlight is available, it is better to light a candle than to curse the darkness."

The formal investigation of those devices which appear appropriate will provide decision-makers with the necessary information--pros, cons, costs--to determine the most suitable and most valid process for their particular program.

The search for more appropriate admission procedures should be ongoing. Even while this study is in progress, a number of innovative instruments tapping dimensions such as communication skills and learning styles will be examined for their potential use as selection devices.

In conclusion, systematic evaluation of admission procedures will determine whether they assist in selecting students who will succeed in the nursing program.

APPENDIX A

Letter Sent to Applicants Requesting Autobiographical Letter (1979)

McMASTER UNIVERSITY
faculty of health sciences
School of Nursing
1200 Main Street West, Hamilton, Ontario L8N 3Z5

March 1, 1979

Dear Applicant:

We are pleased to have received your application to the McMaster University School of Nursing. If you have questions or need further information, do not hesitate to contact the Health Sciences Admissions and Records Office (phone 416-525-9140, extension 2114). You are invited to attend one of the McMaster University Information Sessions to be held March 13, 16, 20, 23, 27, and 30, 1979, at which time you will have the opportunity to talk with faculty and students in the programme. There will also be a Faculty of Health Sciences Open House at McMaster University Health Sciences Centre on April 27, 28, and 29, 1979, that you can attend and may find interesting and informative.

We would like to have you help us with a study we are doing this year in order to improve our selection process. At the present time, students entering the School of Nursing directly from Grade 13 are selected solely on the basis of their Grade 13 interim marks as reported by their secondary school. This will continue to be the only basis of selection this year. For future years, however, we would like to introduce another selection instrument: an autobiographical letter. We cannot use such an instrument without validating it. To help us with the validating process, we are, therefore, asking you to write an autobiographical letter in accordance with the instructions on the back of this page. This letter will not affect your admission one way or the other and, in fact, will not be placed in your admissions file. The reason we require the letter before the offers of admission are sent out is that in-course students will be helping us assess the letters and these students will not be here later in the Spring.

Thank you in advance for helping us in our search for new and, we hope, better methods of selection for the School of Nursing.

Yours sincerely,

Pat Ellis, Chairman
Undergraduate Nursing
Admissions & Registration
Committee

PE:ah

APPENDIX B

Instructions for Writing the Autobiographical Letter

Write a letter of not more than 800 words (approximately four double-spaced typed pages or six double-spaced handwritten pages) responding to the following questions:

1. Who are you? (Your personal beliefs, experiences, characteristics.)

2. How do you relate to people?

3. How do you learn? (What kind of learning experiences do you like and why?)

4. Why do you want the B.Sc.N. programme at McMaster?

APPENDIX C

Rating Form, Admission Autobiographical Letter

McMASTER UNIVERSITY
School of Nursing

Letter Reader _____ Applicant No. _____

Directions: These questions should be answered from the information contained in the autobiographical letter. Please answer all questions and circle one of the following for each question: 1 = poor, 2 = average, 3 = good.

1. a) Does the applicant show insight as to his/her own strengths and weaknesses? 1 2 3

   b) If so, are these described clearly and in an organized manner? 1 2 3

2. Does the applicant show insight as to how well he/she relates to other people? 1 2 3

3. Is there evidence that the applicant is aware of how he/she learns? 1 2 3

4. Is there evidence that the applicant can take responsibility for his/her own learning? 1 2 3

5. Has the applicant clearly portrayed appropriate motivation for wanting to enter the McMaster B.Sc.N. programme? 1 2 3

6. Has the applicant considered ways in which he/she is particularly suited for the McMaster programme? 1 2 3

7. Has the applicant stated his/her reasons for wanting a nursing career? 1 2 3

8. Is there evidence that the applicant has sufficient motivation and enthusiasm to successfully complete the B.Sc.N. course? 1 2 3

9. Was the applicant's letter organized, concise, and easy to understand? 1 2 3

Global Score

a) Do you think this applicant is suitable for the McMaster B.Sc.N. programme? Please circle one of the following:

1 = Unacceptable	3 = Acceptable
2 = Poor	4 = Outstanding

b) Would you accept this applicant into the programme? Yes or No

APPENDIX D

Revised Rating Form, Admission Autobiographical Letter

McMASTER UNIVERSITY
School of Nursing

Letter Reader _____ Applicant No. _____

Directions: These questions should be answered from the information contained in the autobiographical letter. Please answer all questions and circle one of the following for each question: 1 = poor, 2 = average, 3 = good.

1. a) Does the applicant show insight as to his/her own strengths and weaknesses? 1 2 3

   b) If so, are these described clearly and in an organized manner? 1 2 3

2. Does the applicant show insight as to how well he/she relates to other people? 1 2 3

3. Is there evidence that the applicant is aware of how he/she learns? 1 2 3

4. Is there evidence that the applicant can take responsibility for his/her own learning? 1 2 3

5. Has the applicant clearly portrayed appropriate motivation for wanting to enter the McMaster B.Sc.N. programme? 1 2 3

6. Has the applicant considered ways in which he/she is particularly suited for the McMaster programme? 1 2 3

7. Has the applicant stated his/her reasons for wanting a nursing career? 1 2 3

8. Is there evidence that the applicant has sufficient motivation and enthusiasm to successfully complete the B.Sc.N. course? 1 2 3

9. Was the applicant's letter organized, concise, and easy to understand? 1 2 3

Global Score

a) Do you think this applicant is suitable for the McMaster B.Sc.N. programme? Please circle one of the following:

1 = Unacceptable	5 = Good
2 = Major Reservations	6 = Very Good
3 = Some Reservations	7 = Outstanding
4 = Acceptable	

b) Would you accept this applicant into the programme? Yes or No

APPENDIX E

Personal Interview Assessment Form

McMASTER UNIVERSITY
School of Nursing

UNDERGRADUATE NURSING PROGRAMME

Interview Date -

APPLICANT:	ASSESSOR: TEAM NUMBER:
CRITERIA ASSESSMENTS	COMMENTS
MOTIVATION Has the applicant portrayed relevant motivation for wanting to enter this programme? very unclear — clear — very clear	
AWARENESS OF LEARNING APPROACHES AT McMASTER SCHOOL OF NURSING Has the applicant considered in what ways he/she is particularly suited to the Undergraduate Nursing Programme at McMaster? little awareness — adequate awareness — strong awareness	
PROBLEM-SOLVING ABILITY When presented with a problem, does the applicant, given the limits of his/her resources: a) sense a problem exists? b) define the problem's dimensions? c) select appropriate information? poor ability — adequate awareness — outstanding ability	

CRITERIA ASSESSMENTS	COMMENTS
SELF-APPRAISAL ABILITY In discussion of his/her strengths and weaknesses, does the applicant demonstrate personal insight? poor ability — average ability — outstanding ability	
ABILITY TO RELATE Does the applicant show sensitivity to the needs and feelings of others? Does the applicant indicate flexibility in the acceptance of others' differences? poor ability — average ability — outstanding ability	

GLOBAL SCORE

Do you think this applicant is suitable for the McMaster Undergraduate Nursing Programme?

1	2	3	4	5	6	7
Unsuitable. Do not accept.		Suitable in some areas. Major reservations.		Suitable in most areas. Acceptable.		Suitable in all areas. Outstanding.

COMMENTS:

SUMMARY STATEMENTS:

APPENDIX F

Questionnaire for Students Terminating Their Enrollment in the School of Nursing

McMASTER UNIVERSITY
School of Nursing

The purpose of this questionnaire is to identify the reasons why enrolled students make the decision to leave the School of Nursing. We ask that all terminating students complete the following form and in so doing, assist us to identify the common reasons and/or difficulties that students encounter. We will also use this information to evaluate our admissions process and attrition rate. By having this information, McMaster University School of Nursing can strive to work toward resolution of students' concerns. Information provided on this questionnaire will remain confidential and will not be placed on students' files.

Undergraduate Nursing Admissions Committee
McMaster University School of Nursing

Return completed questionnaire to:

Assistant Registrar
Health Sciences Centre, Room 1B6
McMaster University
1200 Main Street West
Hamilton, Ontario
L8N 3Z5

Please check all appropriate responses.

1. a) How have the academic demands of this programme compared with your expectations on entrance to the programme?

   b) How have the emotional demands of this programme compared with your expectations on entrance to the programme?

2. Why did you select nursing as the profession you wished to study?

   - ☐ parental influence
   - ☐ have always wanted to be a nurse
   - ☐ good salary
   - ☐ job security
   - ☐ enjoy working with people
   - ☐ like sciences
   - ☐ want to help people
   - ☐ did not know what else to choose
   - ☐ other (please elaborate) _____

3. a) Why did you select McMaster School of Nursing?

   - ☐ wanted university education
   - ☐ close to home
   - ☐ already registered here in another course
   - ☐ programme recommended by _____
   - ☐ other (please elaborate) _____

   b) Was McMaster School of Nursing: 1st choice ☐
   2nd choice ☐
   3rd choice ☐

   c) Was there a special reason for your choice?

4. a) Did you attend any of the following before entering the School of Nursing?

☐ Health Sciences Information Sessions

☐ Faculty Counselling Session

☐ Other (please elaborate) _____

b) Did you find these sessions helpful? Yes ☐

No ☐

c) Do you have any suggestions for improvement of the information sessions or individual faculty counselling sessions?

5. a) Have you contemplated leaving the School of Nursing prior to this time?

b) If so, why and when during the programme did this occur?

c) Why did you not leave at this time?

6. What were your reasons for leaving at this time?

☐ finances

☐ teachers

☐ grades

programme workload
too light — too heavy

science courses
too light — too heavy

clinical component
too light — too heavy

☐ family/personal difficulties

☐ nursing is different than I had expected

☐ self-directed approach was not congruent with own learning style

☐ unable to adjust to university life

☐ other (please elaborate) _____

7. a) With whom have you discussed present plans for leaving the programme?

☐ tutor

☐ year/course co-ordinator

☐ programme chairman

☐ Dean

☐ McMaster Counselling Service

☐ parents

☐ classmates

☐ friends

☐ other (please elaborate) _____

b) Did you make use of this person(s) to discuss your plans in the early stages of your decision-making?

☐ Yes

☐ No

If not, why?

8. a) Was your decision to leave McMaster precipitated by:

☐ one event

☐ an accumulation of many events

b) Please describe what led to your decision to leave.

9. After leaving the McMaster School of Nursing, what are your future plans?

- ☐ plan to remain registered in the programme part-time and return to full-time in 19__
- ☐ plan to transfer to another faculty at McMaster University
- ☐ plan to transfer to another university nursing programme
- ☐ plan to transfer to a diploma programme
- ☐ do not know
- ☐ other (please elaborate) _____

10. a) What do you believe are the strengths of this programme?

    b) What areas need improvement?

11. a) Would you recommend this professional nursing programme to others?

- ☐ Yes
- ☐ No

    b) Please give your reasons.

12. Are there any further comments you wish to make?

Thank you for answering this questionnaire. We hope the information you have given us will help others. Good luck in your future endeavours.

Student Number _____

Undergraduate Nursing Admissions Committee

McMaster University School of Nursing

APPENDIX G

Tutor Rating of Student Performance

For each (first year/second year) student in your clinical group, please rate him/her in the following four areas. Please circle the appropriate rating.

Self-Directed Learning

1 2 3 4 5 6 7
poor average excellent

1 Cannot cope in new situations.

4 Needs minimal guidance to adapt.

7 Rapidly adapts to new and complex situations.

Interpersonal Relations

1 2 3 4 5 6 7
poor average excellent

1 Does not demonstrate effective communication.

4 Needs minimal assistance for effective communication.

7 Highly sensitive and effective in communication.

Problem-Solving

1 2 3 4 5 6 7
poor average excellent

1 Needs assistance in problem-solving most of the time.

4 No assistance in problem-solving simple situations.

7 Applies problem-solving in increasingly complex clinical situations.

Self-Evaluation

1 2 3 4 5 6 7
poor average excellent

1 Unable to evaluate self realistically.

4 Inconsistent use of self-evaluation in pursuing learning.

7 Highly effective use of self-evaluation.

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