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**LA THÈSE A ÉTÉ
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BASIC INTEREST SCALE PATTERNS ON THE STRONG-CAMPBELL
INTEREST INVENTORY AS PREDICTORS OF ACADEMIC
SUCCESS AND SATISFACTION

by Dorothy M. Meuser

Thesis presented to the School
of Graduate Studies of the
University of Ottawa as partial
fulfillment of the requirements
for the Doctorate of Philosophy
degree (Psychology).

Ottawa, Canada, 1978

CURRICULUM STUDIORUM

Dorothy M. D. Meuser (nee Stern) was born in Flin Flon, Manitoba, on December 27, 1950. She was raised and educated in Vancouver, B.C., attending the University of British Columbia and receiving the Bachelor of Arts degree in 1973. The title of her thesis was The Effects of Simultaneous Visual and Auditory Encoding on Short-term Memory. In 1976 Dorothy received the Master of Arts degree (in Psychology) from the University of Ottawa. The thesis for this degree was Comparing the Vocational Interests of Arts and Science Freshmen Using the Strong-Campbell Interest Inventory.

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BASIC INTEREST SCALE PATTERNS ON THE STRONG-CAMPBELL
INTEREST INVENTORY AS PREDICTORS OF ACADEMIC
SUCCESS AND SATISFACTION ⁺

Abstract

Hypotheses based on Holland's person-environment congruency theory (1973) were tested in an academic milieu. Subjects were 164 males enrolled in third or fourth year science majors at the University of Ottawa (Chemistry N=37, Biology N=24, Geology N=15, Engineering N=62, and Mathematics N=26). Four analyses were conducted. First, the group means and standard deviations on the 23 Basic Interest Scales of the Strong-Campbell Interest Inventory were computed for each science major. Next, subjects' raw scores on these scales were compared to the mean of their major. This analysis permitted assignment of subjects to typical and atypical groups within the respective majors in accordance with the operational definition of typical interest profile discussed in the study. In the third analysis, a series of t-tests were used to determine whether typical and atypical students differ significantly ($p \leq .05$) in terms of success (final grade point

⁺ Dorothy M. Meuser, doctoral thesis presented to the School of Graduate Studies of the University of Ottawa, Ontario, April, 1978.

average) and satisfaction in their major (College Student Questionnaire). Significant differences in success were found between typical and atypical students in all the science majors except Mathematics. Typical and atypical students in all majors were found to differ statistically on the measure of satisfaction. Lastly, a full model multiple regression analysis was employed to determine whether Basic Interests predict success and satisfaction, and which scales, if any, contribute most to the prediction paradigm. Basic Interests were found to predict both variables in all groups tested. The multiple correlation for the prediction of the criterion in each major being significant at the .01 level of probability. Furthermore, different scales were found to predict success and satisfaction. In each science major, regression equations were derived using both the standardized and unstandardized regression coefficients of the predictive scales ($p < .10$). The results of the study supported the hypotheses being tested, and provided a measure of validity to Holland's (1973) theory in an academic environment.

INTRODUCTION

The nature and prediction of academic success and satisfaction are classic problems in vocational research. Over the years, investigations have emphasized such varied predictive factors as intelligence, aptitude, motivation, previous grade point average, and measures of personality to name a few. In particular, the research of many recent authors has focused on how an individual's interest patterns are related to various measures of success and satisfaction. Indeed, this is the primary concern of the present investigation.

The fact that characteristic interest patterns can be found in specific groups is supported in the literature and discussed in the following chapter. As will be shown, there are many individuals who find themselves in specified groups, yet do not themselves manifest the interests of the group per se. Research suggests that these differences can be useful in predicting aspects of success and/or satisfaction for members of such groups.

The present study seeks to examine the utility of Basic Interest pattern measurement in

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predicting the academic success and satisfaction of science freshmen at the University of Ottawa. Previous research indicated that the interests of science freshmen could be discriminated as being typical or atypical for that curriculum (Meuser, 1977), and that being congruent with one's environment plays a considerable role in determining success and satisfaction within that environment (Holland, 1973).

These findings suggest that having congruent or typical interests with a university major may serve as a useful predictor of which students are more likely to be successful and/or satisfied within that major field of study.

In summary, this study employs t-test analyses and the multiple regression paradigm to determine whether students with typical Basic Interest Scale patterns for their science major are more successful and/or satisfied with their major than those with atypical patterns. For the purpose of assessing such patterns, the Basic Interest Scales of the Strong-Campbell Interest Inventory (SCII, 1974) are employed, with the contribution of the scales alone or in combinat-

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ion being assessed in terms of their predictive value in each Science major.

The literature relevant to this study is presented in the first chapter. This chapter also discusses the problems investigated and the hypotheses being tested. The second chapter presents the research design and specifically describes the tools, the subject population, and the methods of data analysis. The results of the study are presented and discussed in chapter three along with suggestions for further research.

CHAPTER I

REVIEW OF THE LITERATURE

This chapter presents a review of the literature relevant to the present study. It begins in section one by discussing numerous investigations utilizing factors, other than interest, to predict academic success and satisfaction. The second section is concerned with studies which have specifically related vocational interest with measures of success and satisfaction. Section three presents research whose focus has been to differentiate individuals within groups on the basis of inventoried interests. The relevance of this differentiation process to the present investigation is discussed in the fourth section. The chapter concludes, in section five, with a brief summary of the study and a statement of the hypotheses being tested.

1. Predicting Success and Satisfaction with Variables Other Than Inventoried Interests

Within any university major, it may be observed that aside from intellectual differences, certain students appear to be more successful in their studies than others. Within that same group,

varying degrees of satisfaction may also be detected. Contrary to popular expectation, the most successful students are not necessarily the most satisfied. The following section examines a number of investigations which have attempted to unravel the cardinal factors involved in predicting who will be successful and/or satisfied with their academic pursuit. Research related to success is dealt with first, followed by studies expressly concerned with predicting satisfaction.

An early review of the literature on the prediction of university success was compiled by Harris in 1940. Among the many factors which he found as effecting college grades were high school grades, family background, personality and attitude, the type of school (i.e., private vs. public), study habits, incentives, sex, age, extracurricular activities, and individual motivation. From his survey, Harris personally concluded that the essential factors in student achievement were in the order of their importance: (i) ability (intelligence or scholastic aptitude), (ii) effort (drive or degree of motivation), and (iii) circumstance (personal, social,

economic, academic, etc.). In a number of early studies, intelligence test scores alone were found to be the best predictive device for college grades (Taylor, 1933; Watson, 1934). Various investigations reported correlations between intelligence and grades ranging from .33 to .64 (Cuff, 1930; Reitz, 1935; Schmitz, 1937).. A more recent review of the literature indicated that the effect of the intelligence factor is ever with us (Lenning, Munday, Johnson, VanderWell, & Brue, 1974).

While intelligence has often been viewed as the factor of prime importance in success, some investigators have found that high school grades and motivation show a higher correlation with college grades than did intelligence or any other factor (Molvat & Ross, 1962; Finch & Nemzek, 1934; Garrett, 1934). The correlations reported by these authors were mostly in the .60's and .70's.

In their book, The Prediction of Achievement and Creativity, Cattell and Butcher (1968) examined the intellectual factors involved in academic success in terms of types of primary mental abilities. They found that of the primary mental abilities

ies the verbal meaning factors were the best predictors of school achievement and generally tended to predict almost all forms of achievement better. Those which were less predictive, such as word fluency, were found to be relatively ineffective against all criteria of success.

Although numerous studies have examined the validity of intelligence and aptitude measures as predictors of university performance, few have investigated the validity of these for different socioeconomic levels or races. Pfeifer, Jr., (1976) examined the relationship between university climate as perceived by blacks (N=138) and whites (N=550) and tests of academic ability with two criterion measures (grade point average or G.P.A.), and intention to stay in school long enough to receive a degree. He found that Scholastic Aptitude Test (SAT) scores appeared to be valid predictors of G.P.A. ($p < .01$) for both blacks and whites. However, the validity of the SAT did not extend to the prediction of who would receive a degree. These findings were in agreement with other studies in the area (Hills, 1964; McKelpin, 1965; Pfeifer, Jr., & Sedlacek, 1971).

To study the influence of socioeconomic status (SES) on the predictability of college performance, Wright and Bean (1974) took a sample of 1,631 freshmen attending a large urban university and divided it into homogeneous subgroups on each of three measures: (i) family income, (ii) father's occupation, and (iii) mother's education. Verbal and Quantitative Scholastic Aptitude Test scores and high school class rank were used to predict freshmen grade point averages within each subgroup. The predictive validity of these factors was found to vary with different socioeconomic levels. For example, high school performance was of relatively less predictive value for students of lower socioeconomic status. This study demonstrated that even socioeconomic variables can be used to define differentially predictive subgroups.

In a similar study, Seashore (1962) found that sex plays an important role in predicting academic success. In a sample of 520 high school students, he found that girls' grades were more predictable from Differential Aptitude Test (DAT) scores than boys' grades. This trend seemed to be

somewhat stronger in the social studies than in the sciences. After examining similar research with college populations (Berdie, Dressel, & Kelso, 1950; Berdie, Layton, & Swanson, 1954; Juola, 1961), Seashore (1962) found that aptitude test scores were also better predictors of academic standing for women at higher levels of education. Indeed, Seashore observed that the trend was more pronounced at the university level than at the secondary school level.

Taking a more complex approach, Worthington and Grant (1971), using multivariate analysis, found combinations of factors affecting academic success. In a similar study on combined predictor variables, Burton (1976) found an interesting cluster of factors in predicting college success in terms of grade point average (N=229). In order of their predictive value were: high school grades; SAT score; sex; race; father's education; size of home town; number of colleges attended; and perception of family emphasis on discipline, independence, materialism, community, and social activities.

The above review has cited research dealing with students having a normal distribution of abilities. However, a number of recent studies have focused

REVIEW OF THE LITERATURE

on predicting success for those students who possess high aptitudes. Initial research in this area suggested that the Scholastic Aptitude Test (SAT) and high school rank had only low efficiency for predicting the grades of a high aptitude sample (Holland, 1958). As a continuation of this investigation, Holland (1959) examined the usefulness of the California Psychological Inventory (CPI) and SAT, alone and in combination, as predictors of scholastic achievement for exceptionally talented freshmen from 291 colleges and universities. Holland found that while both measures were useful for predicting grades, the CPI was more efficient than the SAT. From these findings, Holland suggested that at a high level of scholastic ability, personality variables may yield validity coefficients two to almost three times as great as those obtained using aptitude measures alone. His findings were supported by the observation of Hogan and Weiss (1974), that achievement and underachievement among gifted individuals was a specific facet of personality in general.

A correlational study with undergraduates of superior scholastic aptitude (N=953) by Holland

and Astin (1962) found that academic achievement was correlated with self-control, persistence, socialization, and super-ego strength. These results appeared to be consistent with the findings of several earlier studies. For example, Gough (1953) found that creative performance in science and art was associated with self concept and vocational interest. Taylor, Smith, Ghiselin, and Ellison (1961) reported that creative people saw themselves as original, and Barron (1953) and McKinnon (1960) found that such individuals obtained higher scores on originality measures.

In their 1962 article, Holland and Astin compared the predictive efficiency of different types of variables and found that, next to past achievement, the best predictors of academic success in a high aptitude group were self and teacher ratings, interest inventories, and simple checklists of creative activities and interests. With some exceptions, true-false type personality and originality scales were next in importance. Lastly, parental attitude scales and scholastic aptitude were the least efficient predictors of later achievement.

These findings were replicated by Holland and Nichols (1964) using a sample of 2,108 National Merit Finalists. They found that scales developed from everyday activities and interests were generally superior to other kinds of variables and equalled the efficiency of the best multiple regression equations. Thus, the authors concluded that for predicting academic performance, at least with high aptitude groups, we should abandon construction of sophisticated inventories and concentrate more on securing records of past achievement, systematic reports of self-concept, and measures of vocational interest. While the primary concern of Holland and Nichols' research was to predict success with high aptitude groups, their findings also suggested similar directions for research with normal samples. Although the present investigation limits itself to the study of students in science majors, the use of interests for predicting academic success with other university groups is also seen as a valuable avenue of research.

In comparison with the research dealing with measures of success, investigations concerned with the prediction of satisfaction have been sparse. So little

is known about satisfaction that a systematic study of the phenomenon seems imperative if effective methods of dealing with student discontent are to be formulated (Schmidt & Sedlacek, 1972):

Conceptualizing the problem in terms of the interactions between an individual student and his educative environment would seem to be an appropriate way of approaching the issue. (p. 233)

The present study focuses on this very issue by examining the relationship between having congruent or typical interests with fellow students and being satisfied with that university major. The hypotheses of the dissertation are based in part on the finding that the better the "fit" between an individual and his college environment, the more satisfied he will be (Pervin, 1967; Richardson, 1969).

Lewis (1969) found that congruence between ideal and real perceptions of university was also positively related to satisfaction.

Diedrich and Jackson (1969) investigated the relationship between satisfaction and a number of other variables and found that dissatisfied students, as seen

by their teachers, tended to violate common expectations in the classroom, in that their behaviors were unpredictable. At the same time, the authors found that satisfaction was unrelated to measures of achievement or ability.

Waterman and Waterman (1969) and Grieneeks (1969) investigated ego identity status in relation to satisfaction and found that high ego identity was related to some forms of satisfaction (i.e., academic) but not to others.

Feldman and Newcomb (1970) summarized a number of studies that provided support for the common notion of "sophomore slump" (i.e., a low point of satisfaction during sophomore year). For this reason, the present study included only third and fourth year students.

French (1961) conducted an investigation into the relationship of aptitude and interest scores with satisfaction in different college majors. He found that in a sample of 1,761 students, the largest proportions of satisfied students were in the natural sciences while the social science major fields yielded the largest proportions of dissatisfied individuals. Each university major had a pattern of average aptitude test scores that might be expected for it, however, satis-

faction was found not to be predictable from these patterns. Students' grades revealed low and often negative correlations with satisfaction. On the other hand, average interest scale patterns were found to have positive correlations with reported satisfaction.

Having briefly discussed research employing variables other than interests to predict academic success and satisfaction, it becomes evident that new directions for further investigations are needed.

One of the main criticisms attributed to traditional research is its concentration on the academic aspect of performance while placing less emphasis on the variable of satisfaction (Fishman & Pasanella, 1960; Sanford, 1962; Davis, 1964; Hoyt, 1965; Richards, Holland, & Lutz, 1966a, 1966b; Feldman & Newcomb, 1970; Campbell, 1971; Lenning, Munday, Johnson, VanderWell, & Brue, 1974).

The present study takes into account this criticism and hence incorporates a measure of satisfaction (College Student Questionnaire - Satisfaction with Major Scale) in addition to that of success (grade point average). Indeed, the dimension of satisfaction is viewed by the author as an integral aspect of the

academic experience.

In keeping with the focus of the present investigation, the following section reviews research concerned with the relationship between vocational interest patterns and measures of success and satisfaction.

2. Relationships Between Vocational Interests and Measures of Success and Satisfaction

Much research has been devoted to the specification of interests to differentiate one group of individuals from another (Strong, 1943, 1955; Berdie, 1944, 1955, 1965; McArthur, 1954; Korn, 1962; Notling, 1970; Campbell, 1971, 1972, 1974; Huth, 1973; Dunteman, 1974; Meuser & Edwards, 1977; Meuser & McInnis, 1977).

The following section reviews studies which have related specifiable interests to measures of success and satisfaction. In terms of counseling, these findings provide valuable information for making vocational and academic decisions, thereby increasing the likelihood of achievement and enjoyment.

For example, Melville and Frederiksen (1952) investigated the relationship between measures of first

year academic achievement and scores on the Strong Vocational Interest Blank for Men for a group of Princeton engineering students ($N=95$). The measures used included scores on all of the Strong scales for Men, the average of all grades obtained during the freshman year, and an adjusted achievement measure, called the adjusted average grade. This last measure being the difference between the predicted average grade (based on a multiple regression equation involving College Entrance Exam marks and achievement in secondary school) and the obtained average grade.

The authors found that the average engineering student had relatively high interest in activities associated with occupations stressing scientific work and low interests in business sales and administration. Eight of the correlations (ranging from .20 to .32) between freshman average grade and the Strong scales were significant at the five per cent level of probability or better. These results were interpreted to suggest that academic success for engineering students was directly related to interest in activities associated with men in scientific occupations, and inversely related to interest associated with men in occupations stressing bus-

iness detail and sales.

In recent years, several new scales have been developed from Strong Vocational Interest Blank (SVIB) items to aid in the prediction of college achievement and in understanding the factors associated with academic success. Each of these scales has survived cross-validation study in at least one setting.

For instance, Martin (1964) constructed a series of academic interest scales (both long and short forms) from SVIB items for males enrolled in engineering and mines at the University of Pittsburgh (N=746). The scales significantly contributed ($p < .01$) to a multiple correlation based in part upon Scholastic Aptitude Test scores and high school rank in predicting first year grades at that university.

In an earlier study, Rust and Ryan (1954) developed separate SVIB scales to predict overachievement, normal achievement and underachievement at Yale University. The scales were found to significantly differentiate ($p < .05$) between various groups of over- (N=143), normal (N=175), and underachievers (N=165). The overachievers scored significantly higher than both of the other groups on the following scales: Artist,

Psychologist, City School Superintendent, Minister, Musician, and C.P.A. They also scored higher on the Group V scales than did the underachievers and significantly higher than the normals on the Mathematician scale and Group II (technical work) and Group X (verbal) scales. Low scholastic achievement in college, on the other hand, was related to interest in sales and business occupations. These results were seen by the authors as evidence that a relationship exists between achievement and responses to the Strong items. These findings were supported by a later study conducted at Harvard University (McArthur, 1965).

A similar study by Palubinskas and Eyde (1961) examined the SVIB patterns of medical school applicants (N=1,000) and found significant interest differences ($p < .01$) between two groups of achievers (accepted-attending; accepting-withdrew) and a non-achieving group (rejected). The achievers in this study had interests similar to those held by men in occupations requiring a high level of education i.e., Physician, Chemist, City School Superintendent, Lawyer, Dentist, Engineer, Mathematician and Architect. It may be noted that these findings were closely related to those of Melville and Frederiksen

(1952) and Rust and Ryan (1954).

In 1966, Campbell and Johansson developed the Academic Achievement (AACH) Scale to differentiate between high and low achievers ($N=712$) in the College of Liberal Arts at the University of Minnesota. This scale was intended to measure preferences for "things academic" and a serious interest in studying and learning. High scores on the AACH scale were found to be associated with interest and involvement in scientific and intellectual careers, whereas low scores were more often associated with interests in business occupations and skilled trades.

The effectiveness of various academic interest scales in predicting first semester grades was examined by Johnson (1969) using a sample of 388 freshman males from the University of Massachusetts. He found that both the Rust and Ryan and the Campbell and Johansson scales contributed significantly ($p < .05$) to a multiple correlation coefficient consisting of high school rank and scholastic aptitude test scores in predicting academic performance. Although the degree of relationship between the interest scales and grades tended to be somewhat greater for "marginal students", the correl-

ations were not significantly different from those obtained with more capable students.

The clinical and statistical uses of the AACH scale of the Strong were studied by Wagman (1971) in a comparison of measures of grade point average, scholastic aptitude, and counseling progress for a group of 193 undergraduate and graduate clients at the University of Illinois Counseling Service. His statistical findings included a correlation coefficient of .35 between the AACH scale and grade point average; .39 between the AACH scale and School and College Ability Test (SCAT) total; and .39 between grade point average and the scholastic aptitude total. All of these were found to be significant at the .001 level of probability. Wagman's clinical findings indicated that relatively low AACH scale scores generally predicted changes of occupational planning toward business and other applied directions, whereas higher scores were associated with changes toward more academic and scientific areas.

Studies utilizing measures of vocational interest in prediction paradigms have primarily been concerned with the prediction of achievement. However, as Berdie (1944) asserted, college students seeking counsel-

ing desire to know in what field they will achieve, in conjunction with what they will enjoy. Thus, while fewer studies have focused on the variable of satisfaction, it is nonetheless seen as an integral aspect of the vocational and academic decision. Effective counseling should therefore consider the factors leading to the prediction of satisfaction as well as success.

In their examination of the relationship between basic interest clusters and occupational satisfaction, Kuncze, Decker and Eckelman (1976) found support for Holland's theory (1973) that interests are expressions of psychological needs. A Q-factor analytic technique was applied to the Strong Basic Interest Scale scores of 156 males yielding three bipolar factors described as: conceptual (applied vs. theoretical thinking); interpersonal (people vs. things); and volitional (autonomy vs. structure). Each individual's primary interest area and occupational status relative to the six corresponding factors were determined. The degree of fit between interests and job categorization related significantly to ratings of job satisfaction ($p < .001$).

In another study of occupational satisfaction, Perry (1967) found a potential use for the Strong as a selection device. In his study of the interests of computer programmers (N=1,003), he found that satisfied programmers obtained higher than average scores on the Physicist, Engineer, Printer, C.P.A., and Programmer keys. On the other hand, they obtained lower than average scores on the Life Insurance Salesman key. Dissatisfied programmers obtained lower than average scores on Production Manager, Accountant, Purchasing Agent and Programmer keys. They also scored higher on the Minister, Art Teacher and Musician keys. Perry felt that such information may be useful for developing a selection device for the employment of future programmers.

In another study with computer programmers, Perry and Cannon (1968) found that the vocational interests of female programmers (N=262) were quite similar to those of their male counterparts. This key was used to differentiate between satisfied and dissatisfied female computer programmers ($p < .01$).

In university settings research has often focused on students' perceptions or attitudes to the environment itself. Actual scales to measure student perception of their environment were developed by Pace and Stern

(1958) and resulted in the more recent emergence of the College and University Environment Scales (Pace, 1963). Such a measure has provided valuable information for predicting academic satisfaction and selecting a field of study (Schmidt & Sedlacek, 1972). A similar instrument is employed in the present study in terms of the College Student Questionnaire-Satisfaction with Major Scale. This scale was designed specifically to measure students' perceptions of their university major.

In order to determine whether tests of vocational interest could predict a student's satisfaction with his college curriculum, Berdie (1944) collected data from 154 engineering students at the University of Minnesota. He examined the relationships between their responses to a curriculum satisfaction blank, the SVIB, and college grades. He found that no single factor related strongly with student's satisfaction. While satisfaction was found to be significantly related to academic achievement ($p < .01$), the correlation between these was only .23. However, Berdie did find evidence that students with no primary interest pattern in engineering were least satisfied with their courses and that those who were extremely satisfied or dissatisfied could be

differentiated on the basis of the engineering key of the SVIB. He concluded that while these results do not demonstrate that interests will or will not predict curriculum satisfaction, they do suggest that this is a profitable area for further research with more heterogeneous groups. Since this early study, research in the area indicates that a predictive relationship between interests and academic satisfaction does indeed exist.

For example, a recent article by Nafziger, Holland, and Gottfredson (1975) emphasized student-college congruence as an important aspect of student satisfaction and was seen by the authors as a valuable factor in effective counseling. Their research was based on the same theoretical framework as the present dissertation, following Holland's hypothesis (1973) that:

student satisfaction is
the outcome of the congruency between a student's personality type and his college environment and of the consistency and differentiation of his personality pattern. (p. 132)

The Nafziger et al. study included 1,878 subjects who were given the Self-Directed Search Questionnaire before their freshman year, followed by a satisfaction questionnaire one or three years later. Two analyses were conducted. These included a 3-factor analysis of variance (school, sex, and congruence level being independent variables) and a 4-factor analysis (school, sex, consistency, and differentiation as independent variables). Three college satisfaction measures served as the dependent variables.

The authors found statistical main effects ($p < .05$) for school, sex, and congruence, but not for consistency and differentiation. The results were viewed by the authors as supportive of Holland's satisfaction-congruence hypothesis but not his differentiation and consistency hypotheses.

These results also suggest that congruence with one's subenvironment, i.e., major field, is a good predictor of satisfaction with that environment and are consistent with former studies using the older definitions of personality type with the Vocational Preference Inventory (VPI).

In a longitudinal study with a group of National

Merit Finalists (N=1,000), Holland and Nichols (1964) attempted to determine if changes in college major choices from the twelfth grade to the end of the freshman year in college were related to students' personality types as measured on the VPI. Their results supported the contention that students staying in their chosen major field resembled typical ("VPI typical") students in that field, while students changing their majors were dissimilar to typical students in that field.

In a similar investigation, Morrow Jr., (1971) found that satisfaction with major was significantly related ($p < .01$) to personality type among students majoring in mathematics (N=147), but not among those majoring in sociology (N=176). However, the pattern of satisfaction expressed by four of the six personality types in sociology agreed with theoretical expectations.

The evidence for and against the congruency hypothesis for other outcomes, such as satisfaction with college, achievement, or stability of choices, has been reviewed by Holland (1973) and Walsh (1973). Those studies producing ambiguous results have been criticized on the basis of methodological problems rather than in light of the theoretical construct

(Feldman & Newcomb, 1970; Astin, 1970a, b; Walsh, 1973).

The present investigation seeks to cast some light on the controversy. While it examines Holland's satisfaction-congruency hypothesis in a similar perspective to the Nafziger et al. study previously cited, it differs in several aspects. Firstly, their research considered person-environment congruence in terms of Holland's six personality types. This dissertation follows Holland's concept (1973) that interests are a measure of personality itself, using the Basic Interest Scales of the Strong Campbell Interest Inventory to define the personality of students in each major and thus to define the environment of the university major.

Secondly, the concern of this study does not limit itself to the variable of academic satisfaction, but includes that of success, each being an important premise in Holland's theory of congruence.

Lastly, Nafziger et al. examined congruence in terms of student-college whereas this dissertation views it between student and university major. While the previous authors found that college-student congruence affected satisfaction, it would appear that congruence with major plays an even more vital role,

as it is here that the individual interacts most closely with his environment.

The need for further research in this area is reiterated by the authors of the article just discussed:

The positive results for the main congruency hypothesis suggest that other outcomes - achievement and stability of vocational choice may be more predictable and interpretable via the revised theory. Only a new investigation with a large sample of colleges will make possible more definitive tests of the congruency hypothesis. (p.138)

The value of which being:

Counselors, using the Self-Directed Search or the new form of the Strong Vocational Interest Blank, could estimate the degree of congruency for students considering specific major fields and give that information to students . . . in order to select one that would be more consonant with their interests. (p. 138)

The previous section reviewed the literature on vocational interests and their relationship to success and satisfaction. In order to utilize these interests for predictive purposes, it is of importance to be able to differentiate groups, such as university majors, on the basis of their interest patterns. For this reason, the following section briefly surveys research employing this differentiation process and discusses the relevance of this to the investigation at hand.

3. Differentiation of Individuals Within Groups on the Basis of Inventoried Interests

Determining the interest patterns for members of specific groups is a major concern when predicting occupational or academic choice, stability, success, and satisfaction. Of critical importance to such predictive research, and to this study in particular, is the fact that individuals within these groups can be differentiated according to their inventoried interests. Thus, not only is it possible to define a group on the basis of its' interests, but also to differentiate such variables as who will be successful and/or satisfied

within the group itself. This differentiation process thereby provides predictive measures, which when adequately examined, provide the basis for improved vocational and academic counseling. The following section briefly reviews research which has employed this differentiation process for predictive purposes.

Campbell and Johnnasson (1966) found that the Academic Achievement Scale (AACH) of the Strong Vocational Interest Blank predicted, to some extent, the eventual occupations of their subjects (N=712). Using test-retest reliabilities over 2 weeks, 30 days, 3 years, 22 years, and 30 years, they found that AACH scores increased during college, especially graduate school, and remained stable after the age of twenty-eight. However, the authors emphasized that this score is more indicative of occupations selected and satisfaction than of actual job-performance.

The variables which determine the choice of college major and responses to interest inventory items are extremely complex. There is evidence for example that individuals in certain college majors have similar psychological characteristics. Sternberg (1959) is one of many investigators who found that individuals in re-

lated college majors shared greater similarity in interests and personality-trait characteristics than individuals in other majors (N=270).

Korn (1962) conducted a study differentiating the interests of freshmen majors in engineering (N=156) and physical science (N=55) on the basis of the California Psychological Inventory and the Strong Vocational Interest Blank. The results of chi-square analyses indicated significantly different primary interest patterns between groups. On the basis of these data, Korn concluded that we should describe the interests of students within majors, not only in terms of what interests they share, but also according to what interests are absent:

students will choose a major, not only in terms of the interests they think it might satisfy, but also in terms of the interests they think will not be demanded. (p. 311)

A study exemplifying the usefulness of the Strong Vocational Interest Blank for counseling purposes was conducted by Dunteman (1966). A multiple discriminant function analysis was used to success-

fully distinguish between groups of women majoring in Occupational Therapy (N=46), Medical Technology (N=41), Physical Therapy (N=27), Nursing (N=61), and Education (N=25). Dunteman was able to differentiate these groups from each other on the basis of 29 Strong Scales for females. Furthermore, two discriminant analyses using 11 scales also indicated successful discrimination ($p < .001$) and accounted for approximately 92% of the variation among groups. From his findings, Dunteman suggested that the discriminant analysis approach with the Strong is useful for developing prediction equations for other college majors as well. The author felt that this differentiation process:

should yield more information about the SVIB than has been yielded in the past by the more traditional types of analyses.
(p. 515)

This is the method of analysis employed in the study by Meuser and Edwards (1977), which led to the formulation of the hypotheses presently being tested.

Borgen (1972) illustrated the usefulness of the Occupational and Basic Interest Scales for predict-

ing career choices of college men. High ability men who were winners of National Merit Scholarships in 1966 were selected to study the capacity of pre-college SVIB scores to predict major and career choices at the end of college. Criterion groups included 1,031 men in 16 major fields and 780 men planning to enter 10 career fields. The Basic Interest and Occupational Scales were compared using univariate and discriminant function predictive methods. Borgen found that the Basic Interest Scales, as a predictor set, performed as well as the Occupational Scales. This finding has important implications for the present study as the Basic Interest Scales, being fewer in number, are more amenable to the analyses carried out. Borgen's results support the use of the Basic Interest Scales for such purposes.

Differentiation between high ability females (N=1,039) and women-in-general (N=530) attending the same university was made by Faunce (1971). Results of t-test analyses indicated that mean differences existed for 35 of the 44 Strong Vocational Occupational Scales and for 3 of the 4 Non-occupational Scales. She concluded that the differences obtained reflected three salient dimensions: academic orientation, conformity,

and social conscience. High ability females were interpreted to be more independent, liberal, occupationally competitive and oriented to theoretical and aesthetic ideas.

In examining the interests of professional groups, level of education has also been a factor of consideration. For example, Rossmann, Lips and Campbell (1967) found that sociologists with Ph.D.'s were more closely oriented towards scientific and numerical occupations while non-Ph.D.'s had more social service interests. This scientific versus numerical orientation was also found more in university than in liberal arts or state college sociologists. It was further shown that sociologists could be differentiated from psychologists on the basis of the Strong Vocational Interest Blank. Whereas sociologists scored higher on the social service and cultural occupations, psychologists scored higher in scientific and business occupations.

In a study of the interests of first year arts and science students (N=360), Meuser and Edwards (1977) found students in arts to have significantly different interests from those in science ($p < .01$). This

finding in itself is not too suprising. However, a further analysis of the data indicated that men and women within each curriculum had significantly different interests as well ($p < .01$). Discriminant function analyses revealed what may be considered as "typical" versus "atypical" interests for each sex within arts and within science. Prediction into group membership on the basis of the discriminant scores yielded 90.6% correct classifications for science males, 79.2% for arts females, 50.9% for science females, and 43.4% for arts males.

These findings led to the formulation of the present dissertation for, according to Holland (1973), differentiating between students having typical interests (congruent with the group) and those with atypical interests (incongruent with the group), relates to the prediction of who will be successful and satisfied in the group.

The following section considers how this differentiation of typical versus atypical interests pertains to the present investigation.

4. Focus of the Present Study

As has been discussed in previous sections, a number of authors have found specifiabile relationships between vocational interests and measures of success and satisfaction (Martin, 1964; McArthur, 1965; Campbell & Johansson, 1966; Stahmann, 1969; Wagman, 1971; Nafziger, Holland & Gottfredson, 1975; Kuncze, Decker, & Eckelman, 1976).

In particular, the research of Holland (1962, 1963, 1963-64, 1966a,b, 1968) has focused on how these factors are closely related to the congruence between the person and his environment. In his book, Making Vocational Choices, Holland (1973) asserts, "Vocational satisfaction, stability and achievement depend on the congruence between one's personality and the environment (composed largely of other people) in which one works." According to Holland, the congruence of a person and his environment is analogous to the concept of compatibility. A person who is congruent finds the environment reinforcing and satisfying when the environmental pattern resembles his personality pattern. How this may be related to the present study is seen explicitly stated in Holland's

book:

The hypotheses derived from the personality types about educational behavior resemble those for vocational behavior. The choice of, stability in, satisfaction with, and achievement in a field of training or study follow the identical rules outlined for vocational behavior. (p. 43)

Thus, according to Holland, the concept of congruence applies in academic environments as well as vocational settings. This is precisely what the present study seeks to investigate. Namely, does Holland's theory apply at the academic level?

The primary concern of the present dissertation is thus to determine the relationship between an individual's congruence with his university environment and his success and/or satisfaction in that field of study. Personality types and environments (science majors) are defined by the responses of students in given science majors to the Strong-Campbell Interest Inventory.

The justification for using interest measures to define personality rests on the writings of several authors, Holland among them, who have construed that vocational interests are a measure of personality itself (Forer, 1948; Holland, 1963, 1973; Baird, 1970; Darley & Hagenah, 1955; Super, 1972). The environment then becomes a representation of the combined personalities of its members. "Thus, where people congregate, they create an environment that reflects the types they are, and it becomes possible to assess the environment in the same terms as we assess people individually" (Holland, 1973, p.3).

For the purpose of the present study, possession of congruent or compatible interests will be determined by whether the individual's Basic Interest pattern on the Strong-Campbell Interest Inventory is typical with that of his fellow students enrolled in a given science major. Hence, students whose interests are typical for that university major may be expected to be more congruent and therefore more successful and satisfied in that major than students whose interests are atypical or incongruent.

An operational definition of typical versus

atypical interests is given in the procedure section of the following chapter. Success is considered in terms of grade point average at the end of the university year and satisfaction is assessed by the score obtained on the Satisfaction with Major Scale of the College Student Questionnaire.

Holland's theory (1973) suggests that the findings of such a study may serve a useful function in the prediction of success and satisfaction for students in these groups. If high levels of prediction are possible, the results of the study may provide information towards the development of a counseling instrument for students considering various science major options.

The following section will summarize the focus of the present investigation and restate the problem in terms of the hypotheses being tested.

5. Summary and Hypotheses

To summarize, it has been indicated by a wide range of research that numerous variables may be utilized in the prediction of vocational and academic success and satisfaction. Among these, many investigators have appraised inventoried interest patterns as an asset towards predicting who will be successful and/or satisfied in a chosen field (Melville & Frederiksen, 1952; Rust & Ryan, 1954; Palubinskas & Eyde, 1961; Johnson, 1969; Stahmann, 1969; Wagman, 1971). In particular, congruence between an individual's interests and his environment has been viewed as an integral component in the prediction paradigm (Holland, 1962, 1963-64, 1966, 1968, 1973; Nafziger, Holland & Gottfredson, 1975; Kunce, Decker & Eckelman, 1976).

As has been discussed previously, Holland (1973) hypothesized that a person's congruence with his environment, be it vocational or educational, is directly related to his success and satisfaction in that environment. This theory is based on numerous studies and hypotheses which have been critically re-

viewed and revised over the years.

The present study then, involves the application of Holland's (1973) theory of person-environment congruence on an educational level. Specifically, the Strong-Campbell Interest Inventory is employed to delineate the Basic Interest patterns of students enrolled in different university science majors. Typical and atypical interest patterns of students in each major are determined and related to measures of success and satisfaction within the respective science major ¹.

Having established the theoretical and research background, the problems posed by this study are presented in terms of the expected outcome of the hypotheses being tested:

- 1.1 Students who have congruent or typical interests in a given science major will be more successful in it than students with incongruent or atypical interest patterns.

¹ See Appendix 7 for operational definition of interests.

- 1.2 Students who have congruent or typical interests in a given science major will be more satisfied in it than students with incongruent or atypical interest patterns.

Support for these hypotheses possess implications for counseling students about to embark upon or transfer into, a university science major. For example, if the hypotheses are not rejected, subsequent research may lead to an interest measuring instrument based upon typical interest patterns of different science majors, and delineating individual deviancies. Students whose interests appear most congruent with particular patterns might consider them as desirable alternatives, wherein they stand a good chance of maximizing both their success and satisfaction.

Conversely, students disenchanted with their science major might discover interest pattern incongruence as a possible explanation for dissatisfaction or lack of achievement. Such individuals may then be counseled in terms of more congruent science majors with an eye to increasing the probability of achieve-

ment and satisfaction.

The present study is thus viewed as an initial phase of assessing Holland's person-environment congruence hypothesis in an educational setting. If the hypothesis appears viable as an aid in predicting success and/or satisfaction in science majors, the theory's applicability to other educational groups might become an attractive and useful research venture.

The following chapter presents the instruments, subjects, procedures, and analyses employed in this investigation to test the hypotheses cited.

CHAPTER II

RESEARCH DESIGN

This chapter presents the design of the study. It opens, in section one, with a description of the tools and a discussion of the rationale for their use. The second section deals with the subjects who participated in the study. Section three discusses the data collection procedures. The chapter concludes with the fourth section examining the statistical procedures used to analyze the data.

1. The Tools

The measurement instruments used in this study were the Strong-Campbell Interest Inventory: Basic Interest Scales (Campbell, 1974) and the College Student Questionnaire: Satisfaction with Major Scale (Educational Testing Service, 1965). An example of the Strong-Campbell questionnaire and answer sheet are provided in Appendix 1 and 2. Questions comprising the Satisfaction with Major Scale are presented in Appendix 3. A copy of the permission form to obtain grade point average ap-

pears in Appendix 4.

The Strong-Campbell Interest Inventory was seen as best suited to the purposes of the present investigation both because of its popularity as a counseling tool and its foundation on extensive research. The Strong-Campbell is the most recent revision (1974) of the Strong Vocational Interest Blank (SVIB), which itself has withstood over fifty years of use and research. The present version emerged to meet demands for the amelioration of separate male and female forms (Rossman & Campbell, 1965; Harmon, 1967, 1969; Gump, 1972; Peterson, 1972; Cole, 1973; Huth, 1973). The Strong-Campbell now offers the best items from both of the previous SVIB forms, combined in a single profile, allowing members of either sex to compare themselves to the other on the majority of scales. Campbell (1974) cited social trends towards greater freedom for women's vocational choice as a major factor contributing to the revision.

The Basic Interest Scales include 23 homogeneous scales constructed by gathering those clust-

ers of statistically related items, highly consistent in content. These are: Adventure (nine items), Agriculture (seven items), Art (14 items), Athletics (12 items), Business Management (14 items), Domestic Arts (ten items), Law/Politics (12 items), Mathematics (nine items), Mechanical Activities (24 items), Medical Science (eight items), Medical Service (nine items), Merchandising (13 items), Military Activities (five items), Music/Dramatics (14 items), Nature (11 items), Office Practices (16 items), Public Speaking (ten items), Religious Activities (nine items), Sales (12 items), Science (17 items), Social Service (11 items), Teaching (nine items), and Writing (14 items).

The scales were normed against a general reference sample of 300 men and 300 women. Each scale having a mean of 50 and standard deviation of 10.

The correlations between Basic Interest Scales and Holland's General Occupational Themes of the Strong-Campbell are provided in the Manual for the SVIB-SCII, Second Edition (Campbell, 1977),

and are too numerous to cite here. The range for females (N=201) is .00 to .91 and for males (N=200) .01 to .91. The average correlation being approximately .65 for both groups. As stated in the Manual:

The Basic Interest Scales falling into each Holland category in most cases have at least moderate correlations with each other, and in some cases correlate so highly that the decision to create two scales instead of one was arbitrary. For example, the Sales and Merchandising scales, both of which fit easily into Holland's Enterprising category ... they were kept separate, even though their intercorrelation is .76, because they have somewhat different item content. (p. 39)

The construction of the Basic Interest

Scale items emphasizes their content validity (Handbook for the SVIB, Campbell, 1971). The concurrent validity of the scales rests on earlier research with the Strong Vocational Interest Blank. The data include scores of more than 300 occupational samples (N ranging from 13 to over 1,000, median = 250). The results of these studies suggest that responses to Strong scales are positively related to the occupations that people pursue. The SVIB Handbook (Campbell, 1971) also lists numerous studies supporting the predictive validity of the Basic Interest Scales. Two studies exemplifying the predictive validity of these scales were conducted by Berdie (1960) and Schletzer (1963). Berdie conducted a four year follow-up of students who graduated from the University of Minnesota but who had completed the SVIB as high school seniors. Subjects were enrolled in Accounting (N=24), Dentistry (N=30), Journalism (N=21), Law (N=32), Mechanical Engineering (N=38), and Physics (N=26). Berdie's report indicated substantial relationships (median correlation .56) between their high school SVIB profiles and curriculum selected.

In Schletzer's study, the same students were retested four years after graduation from the University of Minnesota, approximately eight to ten years from the initial high school testing. The scales with the highest scores for both test and retest, were significantly related to the work they were in. The exceptions usually being on the Adventure scale which is known to change with age. As an example, accountants scored highest on business related scales such as Office Practices, Sales and Merchandising. Dentists and Physicians scored highest on the Medical Service and Science scales. A complete discussion of the reliabilities and validities of the Strong-Campbell is given in the Manual for the SVIB-SCII (Campbell, 1977) and the Handbook for the Strong Vocational Interest Blank (Campbell, 1971).

The College Student Questionnaire is published and distributed for research purposes only by the Educational Testing Service, Princeton, New Jersey. The Satisfaction with Major Scale was designed by the authors to assess the degree of student satisfaction with a major field of study.

The scale consists of ten items with four alternative answers for each statement. Each alternative has a weight ranging from one for the first alternative to four for the fourth. Thus, the lowest possible score on the scale would be ten for a subject choosing the first alternative for all items. The lower the score, the less satisfaction reported. Conversely, the highest possible score (40) would be obtained by a subject who reports complete satisfaction with all aspects of his major.

The normative data for the Questionnaire is based on a subsample of 700 students drawn from a sample of 6,680 undergraduates from 16 colleges in the spring of 1963. The subsample was stratified according to enrollment figures to be representative of American college students.

Satisfaction with Major was found by Peterson (1968) to be positively correlated with a number of other scales found on the College Student Questionnaire: Satisfaction with Faculty ($r = .39$); Satisfaction with Administration ($r = .33$), and Satisfaction with Students ($r = .14$). Satisfaction with Major also correlated .21 with grades and .24

with "definite graduate school expectations".

According to Peterson, the chief evidence for the construct validity of this scale lies in the pattern of relationships for students in various major field groupings. For example, responses in engineering and the natural sciences, as majors, are positively associated with Satisfaction with Major scores as these students were viewed to have deep and long-standing commitments to their discipline. Furthermore, Satisfaction with Major correlated .31 with the statement "the source of greatest personal satisfaction in the past academic year has been course-work in my field of major interest".

A comparison of scholastic achievers (N=115) with non-achievers (N=118) points to the validity of the Satisfaction with Major Scale to differentiate between the two groups ($p < .001$).

2. The Subjects

The present study is based on the participation of 164 males enrolled in third and fourth year

science majors at the University of Ottawa. Majors were: Chemistry (N=37), Biology (N=24), Geology (N=15), Engineering (N=62), and Mathematics (N=26).

Incentive for subject participation was given in the form of their SCII profiled results as well as a workshop on interpretation. Subjects who sought further guidance were advised to use the facilities of the University of Ottawa Counseling Centre.

3. The Procedure

The purpose of this dissertation was discussed with the Dean of the Science Faculty, who provided a list of professors likely to co-operate with the project. Professors within five different science majors agreed to assist by granting ten minutes of class time to introduce the study to students.

Prospective subjects were given a brief explanation of the research and informed that participation was voluntary and extracurricular. Of those approached, about 95% agreed to participate.

Questionnaires were administered to the groups by a male and female researcher, both 26 years of age. Subjects were instructed to complete the SCII,

the College Student Questionnaire - Satisfaction with Major Scale items, and to sign a permission to obtain their final grade point average from the registrar.

The data were then compiled and analyzed as described in the following section.

4. Analysis of the Data

Compiling the data involved three stages. First, the SCII answer sheets were scored by National Computer Systems in Minneapolis. Each subject's raw scores were punched onto computer cards and employed in the analyses.¹ Information on raw scores is provided in Appendix 5. An example of the profiled standard score results given to subjects may be found in Appendix 6. Next, the final grade point average for the year in question was obtained for each subject from the Registrar's records. Finally, the Satisfaction with Major Scale of the College Student Questionnaire was hand scored, providing a single raw score for each subject.

¹ Results as presented in Tables 1.1 to 1.5 are those derived from the 23 bipolar Basic Interest Scales.

Computer analyses were simplified by assigning subjects a number code to which their individual interest scale, grade point average, and satisfaction score were related.

Data analysis began by determining the interest patterns of subjects in each science major on the 23 Basic Interest Scales. For this purpose, an aggregate program was conducted to establish the group mean and standard deviation on each of the scales and then to compare the Basic Interest scores of each subject to the group mean of their science major. A typical interest scale score was operationally defined as one which falls within one standard deviation of the mean. In order for a subject to be classed as having a typical profile pattern, at least 16 of his 23 scale scores had to meet the above criterion.¹ Likewise; an atypical profile was defined as one in which 15 or less of the Basic Interest Scales meet the above criterion.

¹ Although this was an arbitrary procedure, the purpose was to consider more than half of the scales as being similar to the group mean. In this case, two-thirds of the scales were chosen.

On this basis, subjects with typical and atypical profiles were differentiated in each major. The next step involved a series of t-tests to determine if there indeed were significant differences in grade point average and satisfaction between subjects with typical versus atypical interest profiles in the respective science majors.¹

Finally, a full regression analysis was performed to determine which of the Basic Interest Scales, alone or in combination, contributed to the prediction of success and of satisfaction for each science major. The results of these data were not cross-validated due to insufficient sample size.

To summarize, this research design first established the typical and atypical Basic Interest Scale patterns for each science major. Then, all other analyses were employed to answer the following questions for each major:

1. Is a subject with a typical Basic Interest profile more successful than one with an atypical profile?

¹ I.Q. was not studied as an intervening variable in this investigation because of the relatively small variance in intelligence scores normally associated with senior university science groups.

2. Is a subject with a typical Basic Interest profile more satisfied than one with an atypical profile?

3. Which Basic Interest Scales are the best predictors of success?

4. Which Basic Interest Scales are the best predictors of satisfaction?

The results of these analyses are presented and discussed in the following chapter. One closing comment is appropriate at this point, however. It should be noted that, although the data of this study were gathered concurrently, they are judged to have predictive implications (Campbell, 1974).

CHAPTER III

PRESENTATION AND DISCUSSION OF RESULTS

The first section of this chapter presents the results of the analyses performed on the data. The second section discusses the implications and limitations of these findings. The third and concluding section offers suggestions for further research and provides a brief summary of the study.

1. Presentation of Results

The analyses of the data were carried out in four steps. First, the group means and standard deviations on the 23 Basic Interest Scales were obtained for each science major. The results of these analyses are presented in Tables 1.1 through 1.5.

Next, on the basis of the above, each subject's raw Interest Scale score was compared to the mean of his science major on that scale. Consequently, scores falling within one standard deviation of the group mean on a scale were assigned a code of 1. Those falling outside of this range were assigned a code of 0. Thus, following the operational definition of typical profile pattern, cited in the previous

Table 1.1

Basic Interest Scale Group Means and Standard
Deviations for Chemistry Students⁺

Basic Interest Scale	Mean	Standard Deviation
Agriculture	0.70	2.46
Nature	3.11	4.01
Adventure	2.22	4.58
Military Activities	-1.59	3.14
Mechanical Activities	10.95	9.76
Science	10.22	4.58
Mathematics	5.24	3.04
Medical Science	2.11	4.06
Medical Service	-1.81	3.19
Music/Dramatics	-2.14	6.29
Art	-1.86	5.90
Writing	-1.30	7.64
Teaching	1.86	4.03
Social Service	-2.59	3.73
Athletics	2.46	4.91
Domestic Arts	-2.30	4.09
Religious Activities	-3.95	3.84
Public Speaking	-1.97	5.13
Law/Politics	-0.78	5.82
Merchandising	-3.14	4.79
Sales	-5.08	4.42
Business Management	0.54	6.08
Office Practices	-8.14	5.36

⁺ N = 37

Table 1.2

Basic Interest Scale Group Means and Standard
Deviations for Biology Students⁺

Basic Interest Scale	Mean	Standard Deviation
Agriculture	-0.33	2.50
Nature	3.33	4.22
Adventure	2.75	4.41
Military Activities	-2.50	2.95
Mechanical Activities	-1.08	10.30
Science	7.83	6.36
Mathematics	0.92	4.95
Medical Science	5.33	2.04
Medical Service	-0.08	3.03
Music/Dramatics	-1.71	5.74
Art	-2.88	7.43
Writing	-0.21	7.20
Teaching	2.79	3.84
Social Service	-0.29	4.63
Athletics	2.83	4.86
Domestic Arts	-4.08	3.19
Religious Activities	-4.42	4.36
Public Speaking	-1.92	4.03
Law/Politics	-0.46	4.78
Merchandising	-7.25	4.92
Sales	-8.08	3.36
Business Management	-4.75	5.27
Office Practices	-12.25	3.69

⁺ N = 243

Table 1.3

Basic Interest Scale Group Means and Standard
Deviations for Geology Students⁺

Basic Interest Scale	Mean	Standard Deviation
Agriculture	1.73	2.91
Nature	4.13	3.74
Adventure	4.73	3.41
Military Activities	-1.80	3.21
Mechanical Activities	7.20	9.11
Science	10.13	3.23
Mathematics	1.87	4.61
Medical Science	-0.07	3.88
Medical Service	-3.60	3.09
Music/Dramatics	-6.67	5.50
Art	-6.53	5.08
Writing	-5.00	6.49
Teaching	0.20	3.71
Social Service	-5.33	3.11
Athletics	1.07	6.33
Domestic Arts	-4.13	3.85
Religious Activities	-6.00	2.27
Public Speaking	-4.13	3.44
Law/Politics	-3.93	5.09
Merchandising	-7.87	5.40
Sales	-7.47	4.16
Business Management	-7.93	5.75
Office Practices	-12.33	3.60

⁺ N = 15



Table 1.4

Basic Interest Scale Group Means and Standard
Deviations for Engineering Students⁺

Basic Interest Scale	Mean	Standard Deviation
Agriculture	0.16	3.08
Nature	1.71	4.99
Adventure	1.87	4.53
Military Activities	-2.21	2.95
Mechanical Activities	11.76	8.63
Science	7.76	5.88
Mathematics	4.16	3.19
Medical Science	-0.18	4.15
Medical Service	-2.87	3.30
Music/Dramatics	-3.26	6.04
Art	-3.32	6.85
Writing	-4.06	7.01
Teaching	0.77	4.31
Social Service	-2.52	4.42
Athletics	1.15	5.08
Domestic Arts	-3.21	3.74
Religious Activities	-4.10	3.71
Public Speaking	-2.16	4.53
Law/Politics	-1.82	5.89
Merchandising	-3.98	5.59
Sales	-5.84	4.55
Business Management	-0.19	6.60
Office Practices	-10.47	4.31

⁺ N = 62

Table 1.5

Basic Interest Scale Group Means and Standard
Deviations for Mathematics Students⁺

Basic Interest Scale	Mean	Standard Deviation
Agriculture	0.00	3.38
Nature	0.73	4.49
Adventure	3.58	4.67
Military Activities	-3.15	2.33
Mechanical Activities	4.31	10.83
Science	6.42	5.20
Mathematics	3.77	3.55
Medical Science	-1.04	3.99
Medical Service	-4.50	2.77
Music/Dramatics	-2.58	6.59
Art	-2.65	7.80
Writing	-1.50	8.05
Teaching	1.77	4.10
Social Service	-4.54	3.65
Athletics	0.19	5.44
Domestic Arts	-4.35	4.15
Religious Activities	-5.73	3.54
Public Speaking	-3.92	4.93
Law/Politics	-3.04	6.00
Merchandising	-7.15	5.28
Sales	-8.31	3.77
Business Management	-4.92	6.42
Office Practices	-11.73	4.15

+ N = 26

chapter, a typical profile received sixteen code 1's or more. This system permitted assignment of subjects to typical and atypical groups within their respective majors.

In order to test hypotheses 1.1 and 1.2, the third analysis, a series of t-tests were used to determine whether typical and atypical students within a major differ statistically ($p < .05$) in terms of success (grade point average) and satisfaction (score on the Satisfaction with Major Scale). The t-test results, means, and standard deviations for each major are presented in Tables 2.1 through 2.5.

The results of the Chemistry typical and atypical comparison yielded a t of 4.76 on grade point average (G.P.A.) ($df=35$; $p < .001$) and a t of 5.86 on satisfaction ($df=35$; $p < .001$). Similarly, comparisons of typical and atypical groups within the other majors yielded: in Biology, a t of 3.35 on G.P.A. ($df=22$; $p < .01$), and 3.51 on satisfaction ($df=22$; $p < .01$); in Geology, a t of 2.98 for G.P.A. ($df=13$; $p < .02$) and 4.04 for satisfaction ($df=13$; $p < .01$); in Engineering, a t of 4.06 on G.P.A. ($df=60$; $p < .001$) and 8.09 on satisfaction ($df=60$; $p < .001$). The G.P.A.



Table 2.1

Summary of t-test Analyses Comparing the Averages of
Typical (N=17) and Atypical (N=20) Chemistry
Students on Success and Satisfaction

Variable	Mean		SD		<u>t</u>	<u>p</u>
	Typ	Atyp	Typ	Atyp		
Success	83.00	68.75	7.04	10.50	4.76	.001
Satisfaction	30.94	22.60	3.86	4.66	5.86	.001

df = 35

Table 2.2

Summary of t-test Analyses Comparing the Averages of
Typical (N=12) and Atypical (N=12) Biology
Students on Success and Satisfaction

Variable	Mean		SD		<u>t</u>	<u>p</u>
	Typ	Atyp	Typ	Atyp		
Success	79.92	62.08	9.50	15.79	3.35	.01
Satisfaction	28.67	23.08	2.54	4.89	3.51	.01

df = 22

Table 2.3

Summary of t-test Analyses Comparing the Averages of
Typical (N=9) and Atypical (N=6) Geology
Students on Success and Satisfaction

Variable	Mean		SD		<u>t</u>	<u>p</u>
	Typ	Atyp	Typ	Atyp		
Success	82.56	73.67	3.94	7.66	2.98	.02
Satisfaction	31.33	22.83	2.35	5.71	4.04	.01

df = 13

Table 2.4

Summary of t-test Analyses Comparing the Averages of
Typical (N=31) and Atypical (N=31) Engineering
Students on Success and Satisfaction

Variable	Mean		SD		<u>t</u>	<u>p</u>
	Typ	Atyp	Typ	Atyp		
Success	84.10	72.13	8.40	14.09	4.06	.001
Satisfaction	29.77	23.58	2.46	3.48	8.09	.001

df = 60

Table 2.5

Summary of t-test Analyses Comparing the Averages of
Typical (N=16) and Atypical (N=10) Mathematics
Students on Success and Satisfaction

Variable	Mean		SD		<u>t</u>	<u>p</u>
	Typ	Atyp	Typ	Atyp		
Success	77.75	68.10	14.46	8.14	1.94	n.s. ¹
Satisfaction	28.50	23.50	2.78	3.75	3.90	.001

df = 24

¹. As the assumption of homogeneity of variance was violated in this case, this particular t-test must be interpreted with caution.

of typical and atypical Mathematics students did not yield a significant difference ($df=24$; $t=1.94$). However, a significant difference ($p < .001$) was found on satisfaction between typical and atypical students in this major ($df=24$; $t=3.90$).

Hypothesis 1.1 of this study states that students who have congruent or typical interests in a given major will be more successful ($p < .05$) in it than students with incongruent or atypical interest patterns. The above findings support this hypothesis with reference to the science majors, except in the case of Mathematics, where no significant difference was found.¹ However, in each of the other majors, the hypothesis was supported since typical students in these groups were found to be more successful, on the average, than atypical students. This is represented graphically in Figure 1.

Hypothesis 1.2 states that students having congruent or typical interests in a science major will be more satisfied ($p < .05$) than students with incongruent or atypical interests. The results support this hypothesis in terms of the science majors studied since typical students were found to be more satisfied,

¹ Refer to the footnote on page 66.

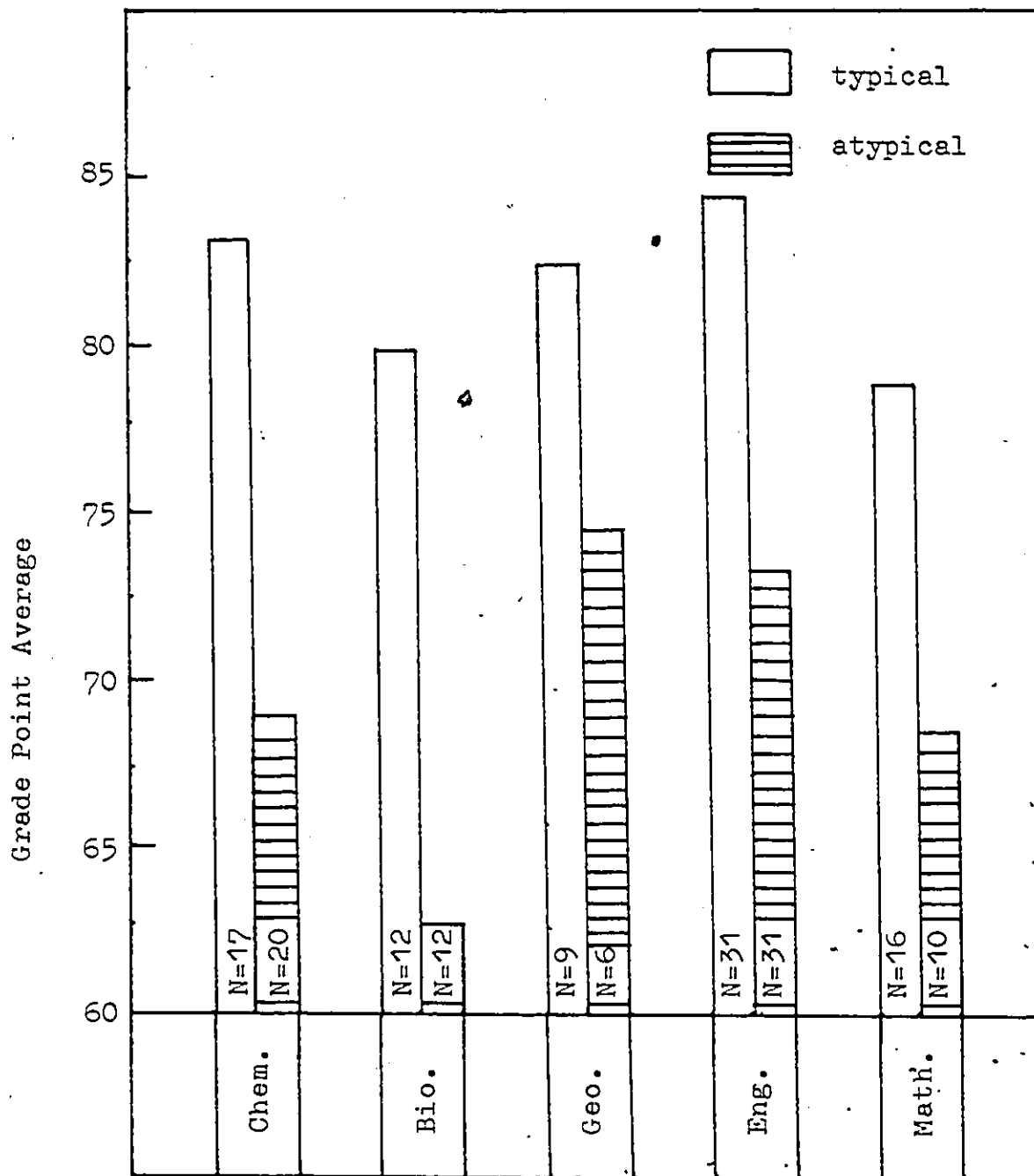


Figure 1. Success with Major:Group Means for Typical and Atypical Science Students.

¹ For clarity of presentation, the Y-axis, providing typical and atypical scores in each major, is plotted starting from a point higher than zero.

on the average, than atypical students. Figure 2 graphically presents the mean differences on the satisfaction measures between these groups in each science major.

A full model multiple regression was employed to assess whether interest scales predicted success and satisfaction, and if so, which scales contributed most to the predictability. Interest scales having correlations of less than .15 with the criterion were excluded from the analyses as they did not significantly contribute to the multiple correlation.

The results of the linear regression analysis for predicting success are presented in Tables 3.1 to 3.5. Similarly, the results for predicting satisfaction are documented in Tables 4.1 to 4.5. These tables include the standardized and unstandardized regression coefficients for the predictor variables, the simple correlation coefficient of each predictor scale, as well as the multiple correlation of the significant scales with the criterion. Standardized and unstandardized regression equations for predicting success and satisfaction in each major are provided on each respective table.

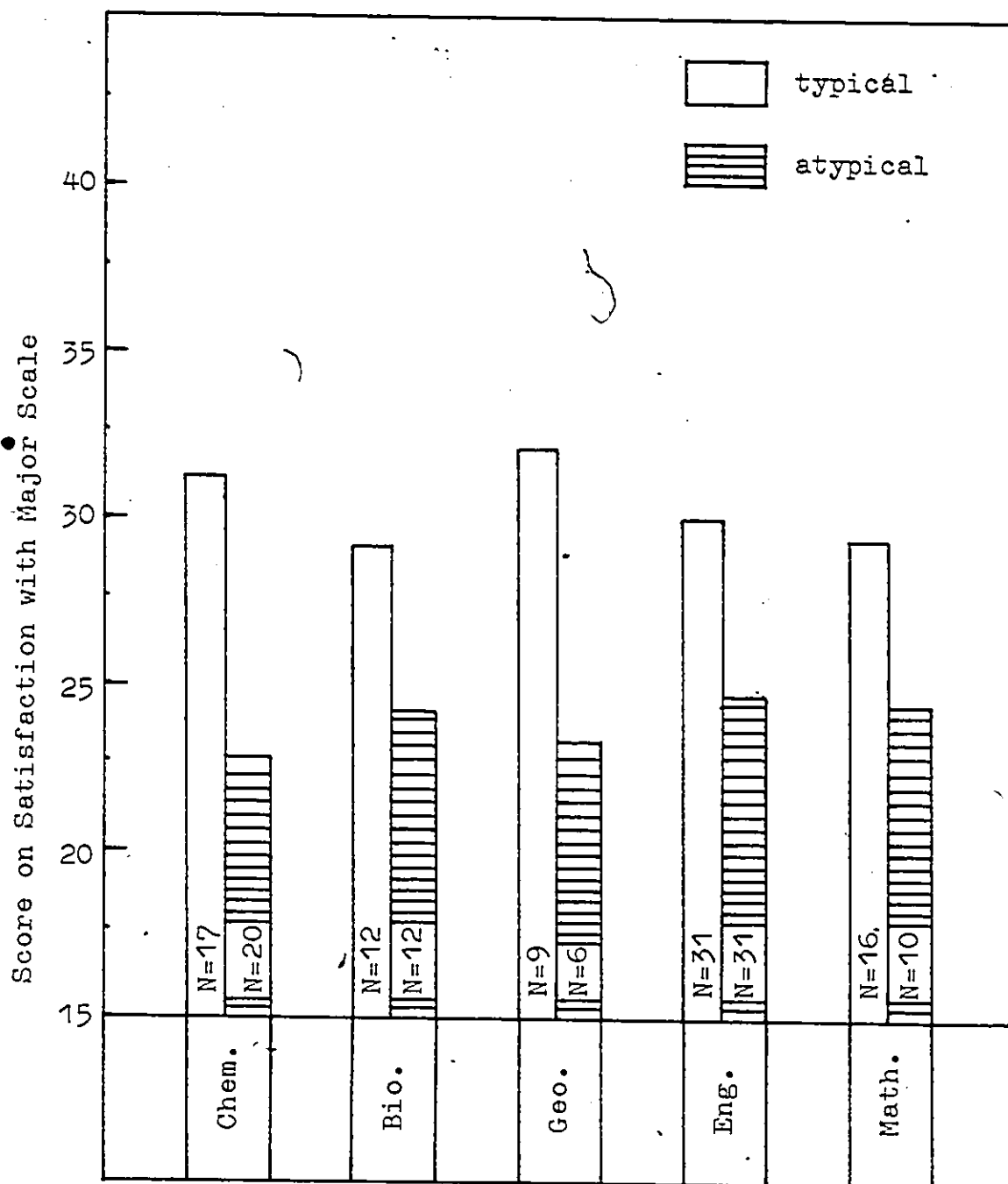


Figure 2. Satisfaction with Major:Group Means for Typical and Atypical Science Students.¹

¹ For clarity of presentation, the Y-axis, providing typical and atypical scores in each major, is plotted, starting from a point higher than zero.

Table 3.1

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Success for
Chemistry Students (N=37)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Medical Science	0.333	0.941	0.31	.10
2. Science	0.313	0.784	0.16	n.s.
3. Adventure	-0.135	-0.337	-0.16	n.s.
4. Law/Politics	0.159	0.313	-0.17	n.s.
5. Public Speaking	-0.262	-0.587	-0.18	n.s.
6. Mathematics	0.094	0.357	0.19	n.s.
7. Domestic Arts	0.182	0.510	0.21	n.s.
8. Medical Service	-0.040	-0.144	-0.15	n.s.

Summary Data:

1. Multiple Correlation = .51; $p < .01$

2. $a_Y = .333 X_1$

3. $b_Y = .941 X_1 + (68.14)$

Table 3.2

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Success for
Biology Students (N=24)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Medical Science	0.247	1.900	0.39	.10
2. Medical Service	0.303	1.565	0.18	n.s.
3. Agriculture	0.480	3.001	0.26	n.s.
4. Sales	0.191	0.892	0.19	n.s.
5. Office Pract.	-0.295	-1.255	-0.21	n.s.
6. Teaching	-0.233	-0.951	-0.22	n.s.
7. Art	-0.030	-0.634	-0.22	n.s.
8. Nature	-0.121	-0.449	0.18	n.s.
9. Military Act.	-0.030	-0.161	-0.16	n.s.

Summary Data:

1. Multiple Correlation = .64; $p < .01$

2. $a_Y = .247 X_1$

3. $b_Y = 1.900 X_1 + (57.40)$

Table 3.3

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Success for
Geology Students (N=15)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Sales	0.420	0.716	-0.28	n.s.
2. Mathematics	0.751	1.153	0.60	.02
3. Nature	-0.467	-0.884	-0.30	n.s.
4. Military Act.	-0.426	-0.940	-0.29	n.s.
5. Teaching	0.140	0.268	-0.22	n.s.
6. Merchandising	-0.256	-0.336	-0.33	n.s.

Summary Data:

1. Multiple Correlation = .81; $p < .01$

2. $a_Y = .751 X_2$

3. $b_Y = 1.153 X_2 + (81.45)$

Table 3.4

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Success for
Engineering Students (N=62)

Basic Interest Scale	Stand Coeff	Unstand Coeff.	Simple r	p
1. Science	0.222	0.491	0.31	.02
2. Medical Science	0.016	0.513	0.21	.10
3. Teaching	0.108	0.325	0.20	n.s.
4. Agriculture	0.145	0.610	0.16	n.s.
5. Sales	-0.112	-0.321	-0.15	n.s.

Summary Data:

1. Multiple Correlation = .37; $p < .01$

2. $\hat{a}_Y = .222 X_1 + .016 X_2$

3. $\hat{b}_Y = .491 X_1 + .513 X_2 + (72.10)$

Table 3.5

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Success for
Mathematics Students (N=26)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Nature	-0.302	-0.881	-0.32	n.s.
2. Military Act.	-0.597	-3.355	-0.37	.10
3. Writing	-0.051	-0.833	-0.29	n.s.
4. Public Speak.	0.068	0.181	-0.29	n.s.
5. Law/Politics	-0.199	-0.435	-0.24	n.s.
6. Merchandising	1.057	2.618	-0.22	n.s.
7. Teaching	-0.398	-1.269	-0.22	n.s.
8. Sales	-0.537	-1.863	-0.37	.10
9. Office Pract.	-0.050	-0.158	-0.24	n.s.
10. Mechanical Act.	-0.198	-0.240	-0.21	n.s.

Summary Data:

1. Multiple Correlation = .68; $p < .01$

2. $aY = -.597 X_2 + -.537 X_8$

3. $bY = -3.355 X_2 + -1.863 X_8 + (68.04)$

Table 4.1

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Satisfaction for
Chemistry Students (N=37)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Medical Science	0.534	0.788	0.34	.05
2. Science	0.421	0.551	0.20	n.s.
3. Adventure	-0.226	-0.295	-0.20	n.s.
4. Mechanical Act.	0.178	0.109	0.18	n.s.
5. Law/Politics	0.282	0.291	-0.20	n.s.
6. Public Speak.	-0.164	-0.191	-0.23	n.s.
7. Mathematics	0.080	0.157	0.21	n.s.
8. Writing	-0.192	-0.151	-0.17	n.s.

Summary Data:

1. Multiple Correlation = .61; $p < .01$
2. $a_Y = .534 X_1$
3. $b_Y = .788 X_1 + (20.75)$

Table 4.2

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Satisfaction for
Biology Students (N=24)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Medical Science	0.408	0.954	0.55	.01
2. Medical Service	0.173	0.271	0.37	.10
3. Writing	0.122	0.804	-0.29	n.s.
4. Sales	0.086	0.121	0.20	n.s.
5. Teaching	-0.204	-0.253	-0.19	n.s.
6. Art	-0.528	-0.338	-0.39	n.s.
7. Music/Dramatics	0.348	0.288	-0.21	n.s.
8. Athletics	0.034	0.331	0.23	n.s.

Summary Data:

1. Multiple Correlation = .67; $p < .01$

2. $^aY = .408 X_1 + .173 X_2$

3. $^bY = .954 X_1 + .271 X_2 + (21.94)$

Table 4.3

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Satisfaction for
Geology Students. (N=15)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Sales	-0.541	-0.752	-0.74	.01
2. Mathematics	0.376	0.471	0.56	.05
3. Religious Act.	-0.151	-0.385	-0.29	n.s.
4. Social Service	-0.088	-0.163	-0.60	.02
5. Domestic Arts	0.036	0.541	-0.29	n.s.
6. Business Manage.	0.153	0.153	-0.55	.05
7. Merchandising	-0.088	-0.947	-0.68	.01

Summary Data:

1. Multiple Correlation = .82; $p < .01$

$$2. \hat{a}_Y = -.541 X_1 + .376 X_2 + -.088 X_4 + .153 X_6 +$$

$$-.088 X_7$$

$$3. \hat{b}_Y = -.752 X_1 + .471 X_2 + -.163 X_4 + .153 X_6 +$$

$$-.947 X_7 + (18.95)$$

Table 4.4

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Satisfaction for
Engineering Students (N=62)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Office Pract.	-0.110	-0.110	-0.22	.10
2. Science	0.147	0.108	0.15	n.s.
3. Medical Science	0.343	0.356	0.16	n.s.
4. Military Act.	-0.340	-0.498	-0.18	n.s.
5. Merchandising	0.003	0.216	-0.18	n.s.
6. Mathematics	-0.193	-0.261	-0.17	n.s.
7. Athletics	-0.068	-0.580	-0.16	n.s.

Summary Data:

1. Multiple Correlation = .45; $p < .01$

2. $a_Y = -.110 X_1$

3. $b_Y = -.110 X_1 + (24.82)$

Table 4.5

Summary of a Multiple Regression Analysis Using
Basic Interests to Predict Satisfaction for
Mathematics Students (N=26)

Basic Interest Scale	Stand Coeff	Unstand Coeff	Simple r	p
1. Religious Act.	-0.475	-0.534	-0.59	.01
2. Nature	-0.125	-0.111	-0.53	.01
3. Writing	-0.113	-0.557	-0.40	.05
4. Science	-0.270	-0.207	-0.27	n.s.
5. Public Speak.	0.281	0.227	-0.41	.05
6. Law/Politics	-0.359	-0.238	-0.34	n.s.
7. Teaching	-0.174	-0.168	-0.45	.02
8. Domestic Arts	0.188	0.180	-0.26	n.s.
9. Social Service	0.095	0.104	-0.29	n.s.
10. Music/Dramatics	0.142	0.855	-0.28	n.s.
11. Agriculture	-0.269	-0.316	-0.47	.02

Summary Data:

1. Multiple Correlation = .74; $p < .01$

2. $a_y = -.475 X_1 + -.125 X_2 + -.113 X_3 + .281 X_5 +$
 $-.174 X_7 + -.269 X_{11}$

3. $b_y = -.534 X_1 + -.111 X_2 + -.557 X_3 + .227 X_5 +$
 $-.168 X_7 + -.316 X_{11} + (26.79)$

The multiple correlations between Basic Interests and the criteria are comprised only of those scales whose simple correlations were found significant at less than the .10 level, hence including only those scales which contribute maximally to the prediction equation.

The multiple correlations between Basic Interests and success in each major are: Chemistry $r=.51$, Biology $r=.64$, Geology $r=.81$, Engineering $r=.37$, and Mathematics $r=.68$ ($p < .01$). The interest scales contributing most to the prediction of success include: The Medical Science scale for Chemistry ($r=.31$; $p < .10$) and Biology majors ($r=.39$; $p < .10$); Mathematics scale for Geology majors ($r=.60$; $p < .02$); Science ($r=.31$; $p < .02$) and Medical Science scales ($r=.21$; $p < .10$) for Engineering majors; and Military Activities ($r=-.37$; $p < .10$) and Sales scales ($r=-.37$; $p < .10$) for Mathematics majors.

The multiple correlations between Basic Interests and satisfaction in each major are: Chemistry $r=.61$, Biology $r=.67$, Geology $r=.82$, Engineer-

ing $r=.45$, and Mathematics $r=.74$ ($p<.01$). The Basic Interest Scales contributing most to this prediction paradigm vary according to the major. Also, certain majors have several additional scales contributing to the prediction of satisfaction that are not seen in predicting success. In predicting satisfaction the scales include: the Medical Science scale ($r=.34$; $p<.05$) for Chemistry majors; Medical Science ($r=.55$; $p<.01$) and Service scales ($r=.37$; $p<.10$) for Biology majors; Sales ($r=.74$; $p<.01$), Merchandising ($r=.68$; $p<.01$), Social Service ($r=.60$; $p<.02$), Mathematics ($r=.56$; $p<.05$), and Business Management ($r=.55$; $p<.05$) for Geology majors; Office Practices ($r=.22$; $p<.10$) for Engineering majors; and Religious Activities ($r=.59$; $p<.01$), Nature ($r=.55$; $p<.01$), Teaching ($r=.45$; $p<.02$), Agriculture ($r=.47$; $p<.05$) for Mathematics majors.

The results of the multiple regression analysis indicate that to some extent, Basic Interest patterns predict success and satisfaction in the science majors tested ($p<.01$). Furthermore, certain Basic Interest Scales on the Strong-Campbell predict the criterion better than others.

Having presented the findings of the analyses conducted, the following section provides a discussion of the results in terms of their implications and limitations.

2. Discussion of the Results

The primary focus of this discussion is on the statistical comparisons of typical and atypical science students, since these analyses refer to the major purpose of the study, that is, to establish whether typical and atypical interest differences are related to university success and satisfaction. In addition, results of the multiple regression analysis are discussed briefly in terms of the predictive value of the Basic Interest Scales for each major examined. All findings were interpreted cautiously in view of the limited sample size, which did not permit cross-validation.

Comparing the grade point average of typical and atypical students within each major indicates that statistically, typical students are more successful than atypical students in all majors except Mathematics ($p < .05$). In this group, when typical and atypical

students are contrasted, the difference is not statistically significant.

Thus, in four of the five majors tested, the results support the first hypothesis of this study. More specifically, they lend support to Holland's (1973) theory that individuals whose interests are congruent with their environments are more likely to be successful in that environment.

One factor contributing to the prediction of success is Basic Interest. This is seen in the multiple correlations between the interest scales and grade point average. The findings suggest that the predictability of success varies according to the science major. For example, in the Geology major (multiple correlation .81), approximately 65 per cent of the variance in success is predictable from the variance in Basic Interest. On the other hand, in Chemistry (multiple correlation .51), we know only 26 per cent of what we need to know to make a perfect prediction. While low correlations such as this limit prediction, they are none the less meaningful as they indicate directionality for prediction. In other words, the relationship between in-

terest patterns and success is not random. Further investigation may lead to the addition of other interest measures which increase the value of prediction equations found here.

In this study, the individual scales contributing to the prediction paradigm are of particular interest. As discussed in the previous section, certain scales contribute more than others depending on the science major. For instance, in the Chemistry major, only the Medical Science scale contributes significantly ($p < .10$) to the prediction of success. In the Engineering major, both this and the Science scale contribute significantly to the prediction equation ($p < .10$ and $.02$, respectively). While it is almost expected that a positive correlation would exist between interests on these scales and success for Chemistry, Engineering and Biology majors, it is somewhat surprising to find that the negative correlations between success and Military Activities and Sales contribute most to the prediction of the criterion in the Mathematics major. These findings suggest that arbitrary decisions can not be made as to which scales should be included in other predictive studies. Scales

which might appear best suited to the prediction paradigm do not always fit.

With the knowledge of which scales contribute significantly, albeit modestly, to the prediction of success in each major, a validation study may be pursued utilizing the regression coefficients found in this dissertation or better yet, establishing new coefficients by conducting a similar study with a larger sample of students. These coefficients form a prediction equation into which another subject's score may be plugged. Standard scores are employed with the standardized coefficient (aY) and raw scores with the unstandardized coefficient (bY). For example, in the Chemistry major (Table 3.1), the Medical Science scale contributes significantly ($p < .10$), albeit modestly, to the prediction of success. In a validation study, a subject's standard score on this scale would be placed in the standardized equation $^aY = -.333 X_1$, where X_1 is the score on that scale, and a prediction of his success in that major made on that basis. Similarly, if a raw score is employed, it would be placed in the unstandardized equation where a constant is added: $^bY = -.941 X_1 + (68.14)$.

To summarize, the findings lend support to the hypothesis that typical students are more likely to be successful than atypical students in their science major. Furthermore, the results of the multiple regression analysis provide some measure of predictability between Basic Interests and success. The results suggest an avenue for further research to assess the application of Holland's theory (1973) with larger samples of students in a variety of settings, including universities and community colleges. Investigations which include other measures of interest may be able to derive equations which provide a higher level of prediction with the criterion than found in the present study.

Statistical comparisons of typical and atypical students on satisfaction indicate that, in each major, typical students are more satisfied, on the average, than atypical students. This supports the second hypothesis of the dissertation. More precisely, the findings substantiate Holland's theory (1973) that individuals whose interests are congruent with their environment are more likely to be satisfied with that environment.

Again, Basic Interest is found to be a moderate predictor of satisfaction as revealed in the multiple correlations between interest and satisfaction scores ($p < .01$). The findings of which scales contribute to the prediction paradigm may have implications for further research in the area. For example, in three of the five majors examined, the same Basic Interest Scales contribute to the prediction of both success and satisfaction ($p < .10$). However, in the Engineering and Mathematics majors, different scales contribute to the prediction of the criterion i.e., in Engineering, the Science and Medical Science scales contribute to the prediction of success and the Office Practices scale contributes most to the prediction of satisfaction. Also, in three of the five majors, a greater number of scales are found contributing to the prediction of satisfaction than success i.e., in the Mathematics major, six scales contribute to the prediction of satisfaction and only two scales to that of success.

These findings suggest that prediction of success and satisfaction can not always be made on the basis of the same interest scales. Nor can in-

tuitive decisions be made as to which scales are best suited to the prediction equation. Future research may be guided by the scales seen here as contributing most to the prediction of the criterion. Also, it may be beneficial to consider the findings that success and satisfaction are more readily predicted in certain majors than others. For example, there is a higher predictive relationship between Basic Interest and satisfaction in the Geology major (multiple correlation .82) than in the Engineering major (multiple correlation .45).

The finding that students with typical interests are more likely to be successful and satisfied in their studies than those with atypical interests holds important implications for the individual considering a number of academic options. In view of Holland's theory (1973) that people whose interests are congruent with their environment are more likely to be successful and satisfied, and in light of the present study, it would appear that an individual is best advised to enter an academic option in which his interests would be typical with that of his fellow students. Thereby, maximizing the potential for both success and satisfaction in his academic choice.

Interpretation of the results is restricted by the limited sample size, and also by the fact that only male subjects were included in the study. Previous research on the interest patterns of male and female science students (Meuser & Edwards, 1977; Meuser & McInnis, 1977) indicates that the sexes differ significantly ($p < .05$) in terms of their interest patterns, suggesting that the results of the present investigation can not be generalized to a female population.

In conclusion, the salient findings of this dissertation are that significant differences ($p < .01$) occur between typical and atypical students in success and satisfaction with their science major. The results support the hypotheses of the study and provide a measure of verification for Holland's congruence theory (1973) in an academic milieu. These findings are in agreement with other research in the area (Holland, 1968, 1973; Morrow, 1971; Super, 1972; Nafziger, Holland & Gottfredson, 1975; Kuncze, Decker & Eckelman, 1976) and provide a basis for further research.

The next section discusses possibilities for future research followed by a summary of the present investigation.

3. Suggestions for Further Research

While the findings of the present study are significant ($p < .05$) in terms of differences between typical and atypical students on success and satisfaction in their science major, interpretation of the results is restricted by the limited sample size. Therefore, a similar study employing larger groups of students is required. If the results of the present study are substantiated, a validation study could be undertaken to assess the predictive value of the Basic Interest Scales in another group of science majors, both in university and college settings. Thus, Holland's theory (1973) may be assessed in a variety of academic environments. Furthermore, validation research supporting the predictive value of Basic Interests, and including other scales as well, may provide a basis for developing a counseling instrument based upon the congruence theory. Such a tool would allow students to contemplate majors in which their interests are most congruent, thereby maximizing the probability of success and satisfaction. Similarly, students who are unsuccessful or dissatisfied in one option may consider a more congruent major to be rewarding.

The type of investigation undertaken in this dissertation may be extended not only to other settings i.e., university or college campus, but also to other academic majors such as education and arts. Furthermore, the utility of other Strong-Campbell Interest Scales may be assessed for predictive purposes. Thus, depending upon the major under consideration, a variety of scales may be combined for optimal prediction of success and satisfaction, possibly leading to the emergence of a counseling instrument from this.

Future research should also be guided by the findings of sex differences in relation to interest patterns (Meuser & Edwards, 1977; Meuser & McInnis, 1977). Thus, when males and females are found in one major, the sexes may not necessarily be combined simply because they exist in the same environment together. Closer examination of sex differences may reveal particular male and female patterns of interest in relation to success and/or satisfaction in a major. For example, it becomes of interest in a male dominant environment, such as engineering, to determine whether females who are successful and satisfied in the major have the same typical interest patterns as their male counterparts. This possible avenue of research

broaches an important aspect of Holland's congruence theory (1973) which states that the environment is composed of people and that their interest patterns thereby form the environment. Does a successful and satisfied female engineering student then have the same interest patterns as the typical male engineering student? Only further research will shed light on this question. With females gaining more and more interest in male dominated studies and vocations, the need for such research becomes imperative.

These have been but a few suggestions for further investigation. Hopefully, future research will be directed towards information which will be useful for counseling purposes.

SUMMARY AND CONCLUSIONS

The main purpose of this study was to test the application of Holland's person-environment congruence theory (1973) in an academic setting. Specifically, Holland's theory states that individuals whose interests are congruent (typical) with their environment, are more likely to be successful and satisfied in that environment. Thus, it was hypothesized that science students having interest patterns which are typical with their university major are more likely to be successful and satisfied in the major than students having atypical interests.

The findings of this dissertation were based on the raw scores obtained from 164 males on the Basic Interest Scales of the Strong-Campbell Interest Inventory and the Satisfaction with Major Scale of the College-Student Questionnaire. Success was measured by the final grade point average (maximum score 100 points), obtained from the registrar by a signed permission from each student. Subjects were enrolled as either third or fourth year science majors at the University of Ottawa (Chemistry N=37; Biology N=24; Geology N=15; Engineering N=62; and

Mathematics $\bar{N}=26$).

Four analyses were conducted. The first established group means and standard deviations on each of the 23 Basic Interest Scales for the respective science majors. Subjects in each major were then assigned to typical and atypical groups following the operational definition of a typical scale score being one that falls within one standard deviation of the group mean on that scale. For an individual student to be classed as having a typical profile pattern, at least 16 of his 23 scale scores had to meet this operational criterion. The third analysis, a series of t-tests, indicated that significant differences ($p < .05$) in success and satisfaction, respectively, exist between typical and atypical students. In the case of the Mathematics major, typical students scored higher on grade point average than atypical students, however, the difference was not statistically significant. These results were seen as supporting the hypotheses of the dissertation and adding a measure of validity to Holland's theory of congruence (1973) in an academic environment. Furthermore, the findings imply that individuals making academic

decisions are more likely to be successful and satisfied with their option if their interests are congruent with the academic environment.

The final statistical procedure was a full model multiple regression analysis. The results of which indicate that Basic Interests, to some extent, predict success and satisfaction in the majors examined, and that certain scales contribute more than others to the prediction of the criterion. The analysis also provided regression equations for predicting success and satisfaction. It was suggested that these be compared to equations derived from a larger sample of students, and that in the event of similar results, the equations be employed in a cross-validation study.

The present findings were interpreted cautiously in view of the limited sample size. Also, the testing of a male sample was seen as restricting the generalizability of results to male populations.

Suggestions for further research concentrated mainly upon establishing cross-validation data necessary in the development of a counseling instrument, and in the application of the present equations to a new sample.

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APPENDIX 1

STRONG-CAMPBELL INTEREST INVENTORY

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APPENDIX 3

COLLEGE STUDENT QUESTIONNAIRE - ✓

SATISFACTION WITH MAJOR SCALE

SATISFACTION WITH MAJOR QUESTIONNAIRE

Name _____ Major _____

The following questions are concerned with your feelings of satisfaction with your present major field of study. Please circle the response which best suits you.

1. Would you say there is anything approaching a "group spirit" or a feeling of common identity among the students in your department?
 - i) No, practically none
 - ii) Yes, but is rather weak
 - iii) Yes, to a moderate degree
 - iv) Yes, it is quite strong
2. Would you agree that the department or division in which you are doing your major work tends to reward conformity and punish individualism?
 - i) Strongly agree
 - ii) Agree, but not strongly
 - iii) Disagree, but not strongly
 - iv) Strongly disagree
3. What is your general impression of the intellectual ability of most of the students in your major department or division?
 - i) Most of them are below average on this campus
 - ii) Most of them are near the average on this campus
 - iii) Most of them are above the average on this campus
 - iv) The students in my field are among the brightest on campus

(over)

- 2 -

4. Would you agree that the division in which you are doing your major work has too many purely formal requirements which are more in the nature of initiation rituals than of genuine learning incentives?
- i) Strongly agree
 - ii) Agree, but not strongly
 - iii) Disagree, but not strongly
 - iv) Strongly agree
5. How certain are you that your present major field is the one you really want?
- i) Very uncertain
 - ii) Somewhat uncertain
 - iii) Fairly certain
 - iv) Very certain
6. In your department, how satisfied are you with your present academic standing insofar as you can estimate it?
- i) Very dissatisfied
 - ii) Somewhat dissatisfied
 - iii) Fairly satisfied
 - iv) Very satisfied
7. So far this term how interesting have you found the course work in your major field?
- i) Rather dull for the most part
 - ii) So-so
 - iii) Fairly interesting
 - iv) Very interesting

- 3 -

8. In relation to the kind of education you are seeking, how satisfied are you so far with the various competencies and specialties of the faculty in your present major field?
- i) Very dissatisfied
 - ii) Somewhat dissatisfied
 - iii) Fairly satisfied
 - iv) Very satisfied
9. In relation to the kind of education you are seeking, how adequate would you say is the choice of courses and the availability of suitable facilities (i.e., laboratory) in your department?
- i) Very inadequate
 - ii) Somewhat inadequate
 - iii) Fairly adequate
 - iv) Very adequate
10. Would you say that the major specialty you are in has prestige among the student body as a whole?
- i) It does have the prestige most other majors have
 - ii) Its prestige is neither particularly high nor low
 - iii) Its prestige is fairly high
 - iv) It has a great deal of prestige on this campus

APPENDIX 4

PERMISSION FORM TO OBTAIN GRADE

POINT AVERAGE

Permission to Obtain Grade Point Average:

I _____ hereby grant permission
(print surname & given)
to Dorothy Meuser to obtain from the Registrar, my
grade point average for this year. It is under-
stood that this information will be used for re-
search purposes only.

Signed, _____

Date: _____

APPENDIX 5
RAW SCORE INFORMATION FOR
THE SCII RESULTS

The raw scores for each subject are available on computer cards and may be obtained from the author on request.

APPENDIX 6
STANDARD SCORE PROFILED RESULTS
FOR THE SCII

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APPENDIX 7

OPERATIONAL DEFINITIONS OF SUCCESS.

SATISFACTION, AND INTEREST

OPERATIONAL DEFINITIONS

Success

A student's final third or fourth year grade point average as obtained from the Office of the Registrar at the University of Ottawa.

Satisfaction

The degree to which individuals find the academic environment reinforcing and compatible with their interests. Here, satisfaction is represented by a single score derived from the Satisfaction with Major Scale of the College Student Questionnaire.

Interest

A relatively stable preference for activities considered by the individual to be most stimulating. A single score on each of the 23 bipolar Basic Interest Scales is derived from the response "like" or "dislike" to specific activities. The level of this score shows how consistently the individual answered "like" to activities in that area (Campbell, 1974).