DIFFERENTIATION OF UNIVERSITY FRESHMEN IN ARTS AND SCIENCE ON THE GENERAL OCCUPATIONAL THEMES OF THE STRONG-CAMPBELL INTEREST INVENTORY[1]

PETER E. MEUSER and CHARLES E. McINNIS
University of Ottawa

Abstract

Occupational personality types of Arts and Science freshmen were compared employing the six General Occupational Themes of the Strong-Campbell Interest Inventory in a multiple-discriminant analysis. Subjects were 202 male and 158 female freshmen registered in either Arts or Science faculties at the University of Ottawa. Univariate analyses of variance between groups on all Themes indicated significant mean differences. Chi-square analyses determined each discriminant-function to be significant in its differentiating power. Discriminant- and classification-function coefficients were established for each Theme, making possible correct classification of each individual with a greater degree of accuracy than could be expected by chance. The .01 level of probability was applied in all instances where significance was tested. Findings suggested that male Arts, male Science, female Arts, and female Science freshmen were distinctly different from each other in terms of personality types, and that indiscriminate counselling may overlook important differences.

Résumé

Cette étude présente une analyse discriminante multiple selon les six thèmes occupationnels du Strong-Campbell Interest Inventory. Deux cent deux étudiants et cent cinquante huit étudiantes de la Faculté des Arts ou de la Faculté de Science et l'Université d'Ottawa ont participé à cette étude. Les analyses de variance à une variable reflètent des différences significatives pour tous les thèmes. Le chi-carré est aussi significatif pour chacune des fonctions discriminantes. Les coefficients de discrimination et de classification pour chaque thème permettent de classifier chacun des individus avec plus de précision que ne le ferait le hasard. Le niveau .01 de probabilité a servi à toutes les analyses statistiques. Les résultats démontrent que les types de personnalité sont différents tant pour les étudiants et les étudiantes inscrites aux Arts que ceux inscrits aux Sciences. Le conseiller devrait en tenir compte.

Personality, as defined by Allport (1937), is ". . . the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment" (p. 48). As such, personality plays a predispositional role in our development as individuals and subsequently in making educational and vocational decisions.

In a variety of research settings, numerous authors have successfully linked personality characteristics with educational interests and choices (Sarbin & Berdie, 1940; Tyler, 1945, 1964; Darley & Hagenah, 1955; Sternberg, 1955; Goldschmid, 1965). Recently, evolving theoretical developments cementing comprehensive relationships between interest development and personality have culminated in a "theory of careers" with far-reaching implications (Holland, 1959, 1966, 1973). Extensive research with personality- and environmental-types has followed Holland's assertions that interests are expressions of personality, and that persons, environments, and their interactions may be assessed by categorizing them in terms of one or a combination of six basic types (O'Dowd & Beardslee, 1960, 1967; Astin, 1968; Marks & Webb, 1969; Baird, 1970; Richards, Seligman, & Jones, 1970). A number of studies along this vein have indicated that "typical" and "atypical" personality types can be determined within some college faculties (Holland, 1964, 1968; Holland & Nichols, 1964; Abe & Holland, 1965).

[1]This article is based on Peter Meuser's Master's dissertation completed at the University of Ottawa under the direction of Charles McInnis, Ph.D. Requests for reprints should be sent to Peter Meuser, University of Ottawa Guidance Center, 540 King Edward Avenue, Ottawa, Ontario.

These findings suggest that certain faculties may actually be comprised largely of students whose personality types as a group are distinctly different from those of student groups in other faculties.

Research in the area of personality types has, among other factors, played an instrumental role in a revision of the Strong Vocational Interest Blank (SVIB) into the Strong-Campbell Interest Inventory (Campbell, 1974). This revision incorporated Holland's (1973) theory of careers in developing the General Occupational Themes, and in addition, employed his six idealized types as a framework for the entire Strong-Campbell Interest Inventory (SCII).

The present investigation sought to explore the usefulness of the General Occupational Themes of the SCII to discriminate between students in Arts and Science faculties, and between males and females within these faculties. The following hypotheses were central to this study:

Hypothesis 1. Arts and Science students differ in terms of their occupational personality types.

Hypothesis 2. Males and females within Arts and Science faculties differ in terms of their occupational personality types.

Hypothesis 3. Certain of the General Occupational Themes differentiate between groups more effectively than others.

Hypothesis 4. The usefulness and accuracy of employing the General Occupational Themes as discriminators in this investigation is signified by the ability to correctly classify individuals solely on the basis of knowledge about group differences (through use of classification-function coefficients).

METHOD

Subjects

A total of 371 Arts and Science freshmen were tested at the University of Ottawa during the Spring of 1975. Of these, 11 were eliminated from the study due to improperly completed answer sheets. Of the remaining 360 subjects, 202 were males and 158 were females. The Arts group consisted of 154 members (54 males, 101 females), while 206 subjects constituted the Science group (149 males, 57 females). Subjects were selected on the basis of the following criteria: (a) They had to be freshmen students at the University of Ottawa; (b) They were required to have sufficient competence in English to successfully read and comprehend the instructions and questions in the SCII test booklet; (c) They had to be enrolled in either a compulsory Arts or a Science freshmen course. Upon completion of the requirements for this investigation, each participant received a personal copy of his interest profile and 3,500-word interpretive statement as prepared by the scoring agency.

Instruments

The instrument employed in this investigation was the Strong-Campbell Interest Inventory. This test provides three basic forms of information: (a) General Occupational Themes; (b) Basic Interest Scales; (c) Occupational Scales.

The General Occupational Themes, with which this investigation was concerned, provide a global view of the respondent's occupational orientation. High scores on one or more Themes suggest the general kind of activities the person may enjoy, the type of environment the person may find most comfortable to work in, the kinds of problems that person may be most willing to tackle, and the kinds of people who may be found most appealing as co-workers by that person. In other words, the General Occupational Themes tap broad aspects of a respondent's personality.

Reliability and validity of the SCII rest firmly upon more than 40 years of research with the SVIB (Campbell, 1971, 1974), and 20 years of research with occupational personality types (Holland, 1973).

Procedure

SCII tests were administered to nine complete classes within the faculties of Arts and Science according to the accepted testing procedures specified in the test Manual (Campbell, 1974). Completed answer sheets scored by National Computer Systems in Minneapolis, provided both raw and standardized scores for each subject.

Multiple discriminant- and classification-function analysis carried out in a step-wise manner was chosen as the test statistic because it most completely answered the questions: (a) Is it possible to discriminate different faculties and sexes on the basis of their scores on the General Occupational Themes? (b) If so, which Theme or combination of Themes best accomplishes this discrimination? (c) How successful is each discrimination, employing the number of correctly classified group members as a measure? The chosen computer program was from *Statistical Package for the Social Sciences* (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975).

The analyses required: (a) Group means and standard deviations for each Theme; (b) Univariate analyses of variance to determine whether group differences on each Theme were statistically significant; (c) Step-wise selection of each Theme into

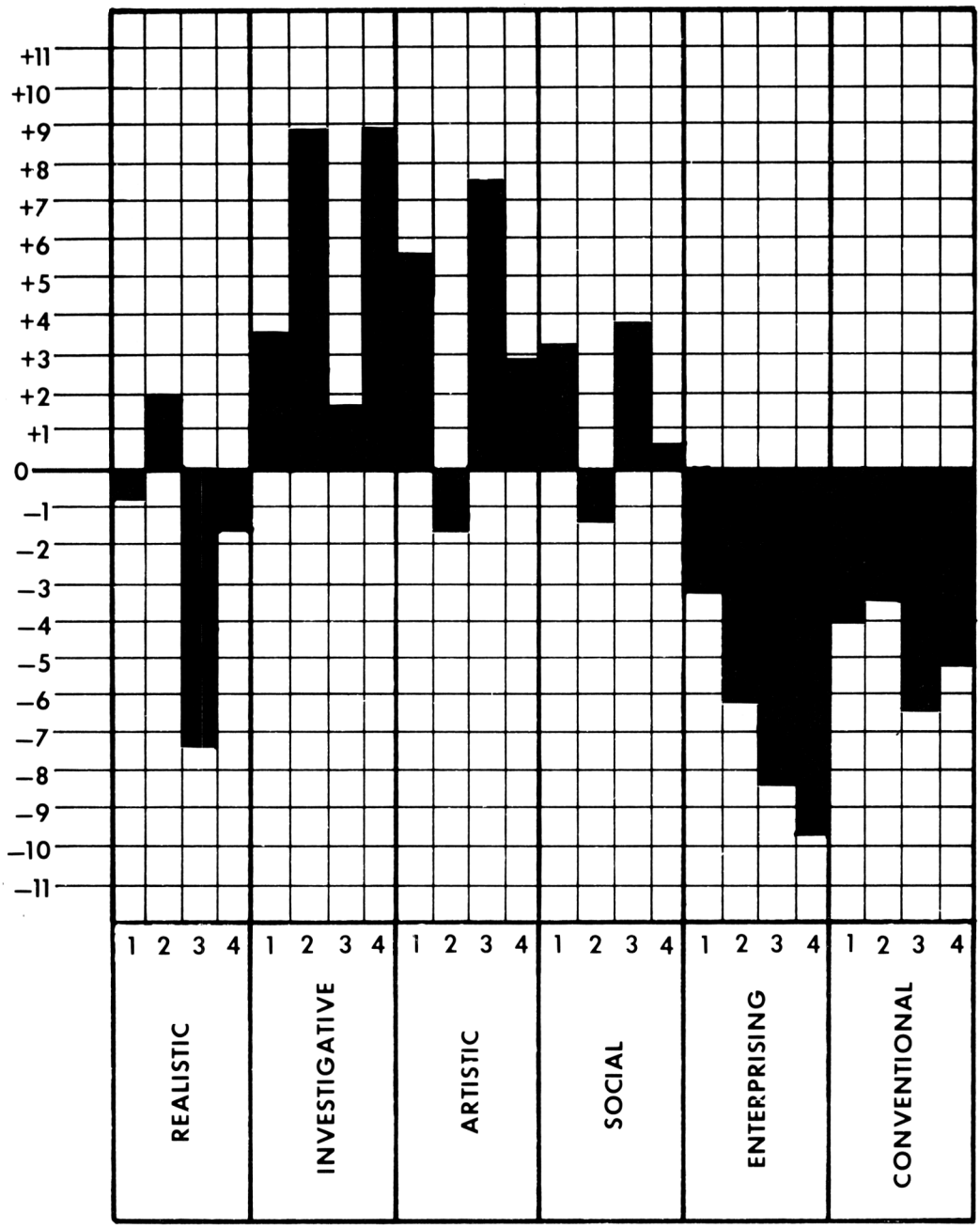

FIGURE 1. GENERAL OCCUPATIONAL THEMES. group means.

legend arts males (n=53) arts females (=101)
science males (n=149) science females (n=57)

the discriminant analysis to eliminate less differentiating ones; (d) Summarizing the analysis into discriminant-functions and testing each for significance by chi-square approximation; (e) Derivation of discriminant-function coefficients to determine group centroids and dispersion along each function for a visual representation of the data; (f) Derivation of classification-function coefficients to allow classifica-

tion of each individual into groups solely on the basis of their personality type differences as determined by the analysis; (g) Analysis of correct classifications or "hit-rate" in relation to that expected by chance as a measure of group differentiation employing the method of discriminant analysis.

RESULTS

The discriminant- and classification-function analysis provided support for each of the hypotheses. As predicted in Hypotheses 1 and 2, mean differences between male Arts, male Science, female Arts, and female Science groups on the General Occupational Themes were significant. Univariate analyses of variance indicated group differences on Realistic, Investigative, Artistic, Social, and Enterprising Themes significant at the .001 level, F (3,356) = 31.53, 27.07, 22.16, 12.09, and 11.06, respectively, $p <$ .001. Group differences on the Conventional Theme were significant at the .01 level, F (3,356) = 5.16, $p <$ .01. This Theme, however, was dropped from the step-wise analysis because it did not meet the minimum F value of .001 for inclusion in the discrimination. Figure 1 presents raw scores for each group on the six Themes.

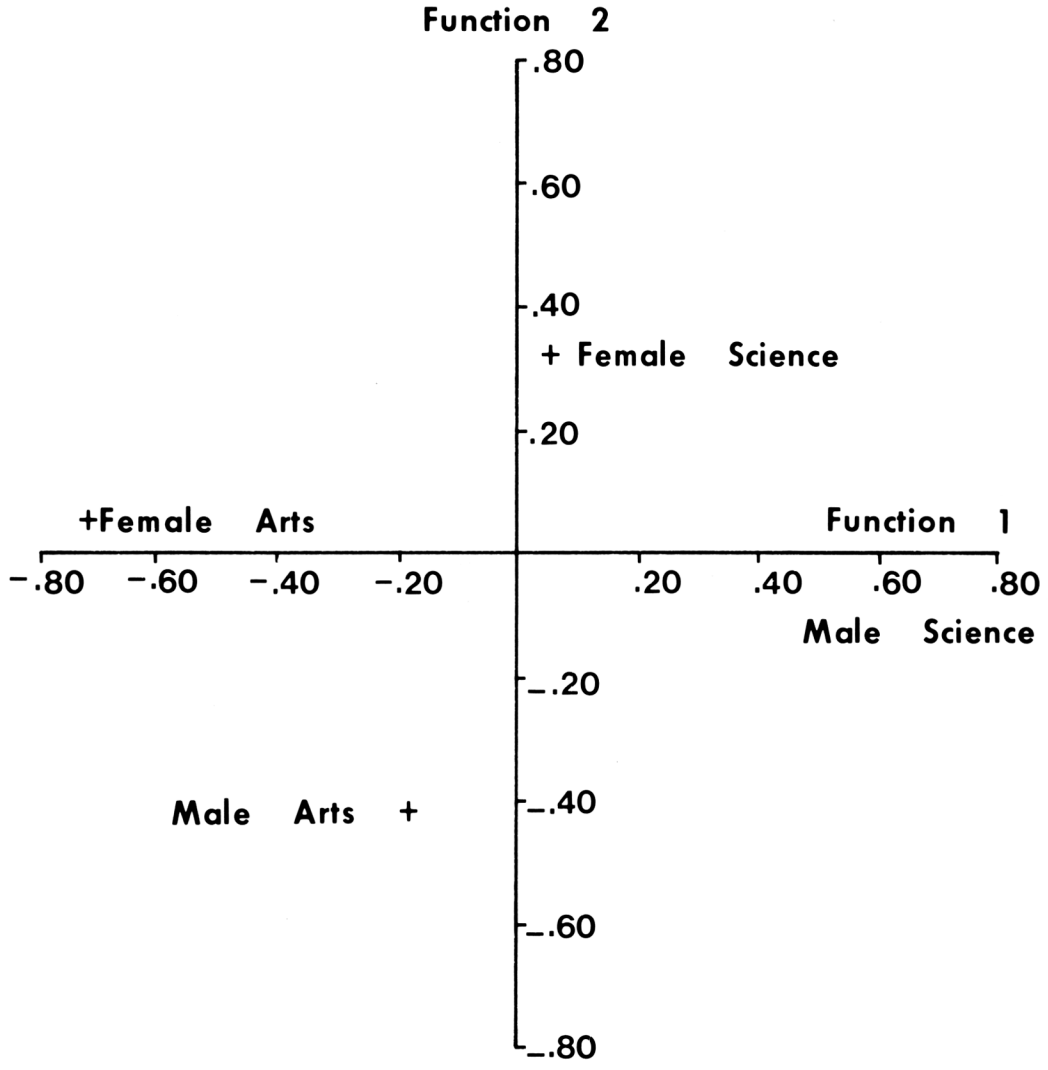

Figure 2. Centroids of the four groups in the discriminant function space for the Male Arts, Male Science, Female Science, Female Arts discrimination.

Hypothesis 3 predicted certain Themes to be more effective than others in differentiating between groups. This was indeed the case, although several intermediary steps were necessary. First, discriminant analysis determined that groups were maximally differentiated by placing them along two Functions, or continua, comprising a two-dimensional discriminant-function space. Second, positive and negative standardized discriminant-function coefficients for each Theme on each Function determined which Themes made up the extremities of each Function. From this, it was determined that the positive end of Function 1 consisted of the Investigative and Realistic Themes, representing the male Science group. The negative pole of Function 1 was comprised of the Artistic and Social Themes, representing the female Arts group. Similarly, the positive end of Function 2 consisted of the Investigative Theme, representing the female Science group, while the negative end of that Function consisted of the Enterprising and Realistic Themes, representing the male Arts group. Hence, General Occupational Theme differences were manifested in positive and negative scores on two discriminant-functions, of which Function 1 accounted for 88 per cent of the variability among groups, and Function 2 accounted for the remaining 12 per cent. Figure 2 summarizes these data by presenting group centroids in the discriminant-function space.

Hypothesis 4 predicted that correct classification of group members based upon knowledge of group differences would follow from successful discrimination of groups with the General Occupational Themes. The classification phase of the analysis correctly identified and classified members of each group, with accuracies that ranged from just better than chance (male Arts and female Science groups) to very concise predictions (male Science and female Arts groups). Classification data are summarized in Table 1.

DISCUSSION

At least three definite statements can be made concerning the findings of this investigation: (a) Five of the six General Occupational Themes of the SCII were found to be useful in discriminating between Arts and Science freshmen and sexes within these faculties; (b) Different Themes or combinations of Themes characterized each of the four groups; (c) Male Science and female Arts groups were more clearly defined and classified because of strong Theme differences when compared to the male Arts and female Science groups.

Although hardly profound, these findings suggest that occupational personality pattern differences exist not only between Arts and Science faculties, but more importantly, also between males and females *within* each of the faculties. If interests are indeed expressions of personality (Darley & Hagenah, 1955; Holland, 1973), and interests are the guide posts by which we negotiate educational and vocational paths (Strong, 1943, 1955; Berdie, 1955; Korn, 1962; Meuser, in press), then it follows that personality differences are among the key underlying factors in faculty selection by students.

As males and females within faculties were found to differ personality-wise, it may well be possible that different sexes may choose the same faculty, but for different reasons. Similarly, a faculty may enroll both males and females, yet provide each sex with different challenges and satisfactions. Consider, for example, the differences between this study's males and females in the Arts faculty. The male Arts group tended to cluster at the Enterprising and Realistic end of Function 2, a continuum ranging from Investigative types (female Science) to Enterprising and Realistic types (male Arts). The female Arts group, however, clustered at the Artistic and Social end of Function 1, which represented a continuum ranging from Investigative and Realistic types (male Science) to

Table 1

Correct and Incorrect Prediction Results for the Male Arts, Male Science, Female Science, Female Arts Discrimination

Actual Group	N	Prior[a] Probability	Correctly Classified	Incorrectly Classified
MA	53	14.7%	17.0%	83.0%
MS	149	41.4%	85.2%	14.8%
FS	57	15.8%	17.5%	82.5%
FA	101	28.1%	83.2%	16.8%

[a]Percentages refer to relative group sizes, hence indicate probability of group membership if membership were assigned by chance.

Artistic and Social types (female Arts). It may be hypothesized from this differential clustering that the Arts faculty provided stimulations, challenges, and satisfactions congruent with the special interests, competencies, and dispositions of two *different* groups of people in terms of personality types (male and female Arts students). It could not be concluded, however, that a student who is considering enrollment in the Arts faculty and has an occupational personality pattern typical of the opposite sexed Arts student, will necessarily find satisfaction within that faculty. The same statements, of course, apply equally well to discussions of male-female differences in the Science faculty.

This line of reasoning supports Holland's (1973) research concerning congruence between personality and environmental types. It raises questions, however, about whether educational and vocational groups are actually as cohesive in terms of personality and background as some researchers have suggested (Laurent, 1951; Chaney & Owens, 1964). Holland himself states that ". . . members of a vocation have similar personalities and similar histories of personal development" (Holland, 1973, p. 9). Although it is true that an Arts or Science faculty is not a vocation as such, it appears reasonable to speculate that personality differences between males and females exist beyond the confines of an educational setting. If this were so, then notable ramifications for the individual counselling setting become evident. Males and females may become plumbers or doctors, but each might bring to the task different special expectancies and demands, and reap from their careers different special satisfactions. The counsellor's task, then, is to become aware of differences between sexes, attempt to isolate the important ones, and employ these data in educational and vocational counselling. To this end, the SCII now provides a combined form from which a counsellee might benefit by both same and opposite sex comparisons of interest strengths.

Some groups appeared to be more clearly defined and easier to classify than others. Male Science and female Arts freshmen, for example, were much more readily identified than their female Science and male Arts counterparts. The relatively high discriminating power of Function 1 (88 per cent), and low power of Function 2 (12 per cent), necessarily resulted in high correct classifications of 85.2 per cent and 83.2 per cent for the male Science and female Arts groups, respectively, and only 17.0 per cent and 17.5 per cent for the female Science and male Arts groups, respectively.

It may be hypothesized that in terms of Holland's (1973) model of personality types, male Science and female Arts group members were both more "consistent" and well-"differentiated" in their typologies. However, it may also be true that there simply were not emough male Arts and female Science group members to determine clearer personality patterns. When considering that out of the 154 Arts students, only 54 were males, and of the 206 Science students, only 57 were females, the latter hypothesis has its merits.

Besides the many obvious and useful contributions of a technique such as discriminant analysis in studies of this nature, a number of limitations may be encountered. One major drawback arises when, as in this investigation, the sample from which prediction equations are derived also served as the validation sample. This is somewhat analogous to a self-fulfilling prophecy, in that errors made during the equation-development phase of the program will support matching errors during the classification phase. Obviously, separate samples would overcome this difficulty. A second problem stems from the very nature of the classification system employed in discriminant analysis. Statistically, individuals are compared to groups through use of classification equations which provide probabilities of group membership. The group with the highest probability score for any given individual is the one into which that individual will be classified by the program. The rule of highest probability, however, defines a very tight dividing line. Consider, for example, an individual in this study having a .51 probability of being in the male Arts group, and a .49 probability of classification into the male Science group. Although this subject would be locked into the male Arts category by the program, the choice is rather unclear as the individual is not truly similar to either side. A possible alternative might provide a cut-off probability figure, below which subjects are eliminated from the sample, and thereby providing a "purer" picture of the factors which discriminate the groups.

Besides replication and compensation for the methodological limitations discussed above, further investigation might delve further into the differences between various faculties and sexes within these faculties by assessing whether having a "typical" group personality (or interest) pattern goes hand-in-hand with measures of "success" within that faculty. It may well be possible that those students who possess "atypical" patterns tend to drop out or change faculties.

References

Abe, C., & Holland, J. L. *A description of college freshmen: II. Students with different vocational choices*. ACT Research Report No. 4. Iowa City: The American College Testing Program, 1965.

Allport, G. W. *Personality: A psychological interpretation*. New York: Holt, 1937.

Astin, A. W. *The college environment*. Washington, D.C.: American Council on Education, 1968.

Baird, L. L. The relation of vocational interests to life goals, self-ratings of ability and personality traits, and potential achievement. *Journal of Counseling Psychology*, 1970, *17*, 233-239.

Berdie, R. F. Aptitude, achievement, interest, and personality tests: A longitudinal comparison. *Journal of Applied Psychology*, 1955, *39*, 103-114.

Campbell, D. P. *Handbook for the Strong Vocational Interest Blank*. Stanford: Stanford University Press, 1971.

Campbell, D. P. *Manual for the Strong-Campbell Interest Inventory, T325, Merged Form*. Stanford: Stanford University Press, 1974.

Chaney, F. B., & Owens, W. A. Life history antecedents of sales research and general engineering interests. *Journal of Applied Psychology*, 1964, *48*, 101-105.

Darley, J. G., & Hagenah, T. *Vocational interest measurement*. Minneapolis: University of Minnesota Press, 1955.

Goldschmid, M. L. *The prediction of college major in the sciences and the humanities by means of personality tests*. Unpublished Doctoral Dissertation, University of California, 1965.

Holland, J. L. A theory of vocational choice. *Journal of Counseling Psychology*, 1959, *6*, 35-45.

Holland, J. L. Explorations of a theory of vocational choices: IV. Vocational preferences and their relation to occupational images, daydreams, and personality. *Vocational Guidance Quarterly*, 1964, *12*(1), 17-24.

Holland, J. L. *The psychology of vocational choice: A theory of personality types and model environments*. Waltham: Blaisdell, 1966.

Holland, J. L. Explorations of a theory of vocational choice: VI. A longitudinal study using a sample of typical college students. *Journal of Applied Psychology*, 1968, *52*, 1-37.

Holland, J. L. *Making vocational choices: A theory of careers*. Englewood Cliffs: Prentice-Hall, Inc., 1973.

Holland, J. L., & Nichols, R. C. Explorations of a theory of vocational choice: III. A longitudinal study of change in major field of study. *Personnel and Guidance Journal*, 1964, *43*, 235-242.

Korn, H. A. Differences between majors in engineering and physical sciences on CPI and SVIB scores. *Journal of Counseling Psychology*, 1962, *9*, 306-312.

Laurent, H., JR. *A study of the developmental backgrounds of men to determine by means of the biographical information blank the relationship between factors in their early backgrounds and their choice of professions*. Unpublished Doctoral Dissertation, Western Reserve University, 1951.

Marks, E., & Webb, S. C. Vocational choice and professional experience as factors in occupational image. *Journal of Applied Psychology*, 1969, *53*, 292-300.

Meuser, D. M. Comparing the vocational interests of arts and science freshmen using the Strong-Campbell Interest Inventory. *Canadian Counsellor*, 1977, *11*(3), 123-127.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. *Statistical package for the social sciences*, (2nd ed.). New York: McGraw-Hill, 1975.

O'Dowd, D. D., & Beardslee, D. C. *College student images of a selected group of professions and occupations*. USOE, Co-operative Research Project No. 562 (8142). Middletown: Wesleyan University, 1960.

O'Dowd, D. D., & Beardslee, D. C. *Development and consistency of student images of occupations*. USOE, Co-operative Research Project No. 5-0858. Oakland University, 1967.

Richards, J. M., JR., Seligman, R., & Jones, P. K. Faculty and curriculum as measures of college environment. *Journal of Educational Psychology*, 1970, *61*, 324-332.

Sarbin, T. R., & Berdie, R. F. Relation of measured interests to the Allport-Vernon Study of Values. *Journal of Applied Psychology*, 1940, *24*, 287-296.

Sternberg, C. Personality trait patterns of college students majoring in different fields. *Psychological Monographs*, 1955, p. 403.

Strong, E. K., JR. *Vocational interests of men and women*. Stanford: Stanford University Press, 1943.

Tyler, L. E. Relationships between Strong Vocational Interest scores and other attitude and personality factors. *Journal of Applied Psychology*, 1945, *29*, 58-67.

Tyler, L. E. The antecedents of two varieties of vocational interests. *General Psychological Monographs*, 1964, *70*, 177-227.