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A DECISION THEORETIC APPROACH TO THE STUDY OF VOCATIONAL BEHAVIOR: INTRASUBJECT PREDICTIONS OF VOCATIONAL PREFERENCE

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A decision theoretic approach to the study of vocational behavior: Intrasubject predictions of vocational preference

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Carlyn J. Monahan

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INTRODUCTION

Why do people enter different vocations? The problem of explaining this can be approached from various perspectives. One may investigate, for example, the psychological characteristics of individuals and the processes of motivation that govern their vocational choices. For this purpose, the social and economic structures are considered conditions which merely impose limits within which these psychological processes operate. It is also possible to examine the ways in which changes in the wage structure and other economic factors channel the flow of the labor force into different vocations, in which case the psychological motives through which these socioeconomic forces become effective are usually treated as minimally influential. Still another approach would focus upon the stratified social structure, rather than upon either the psychological makeup of individuals or the organization of the economy, and would analyze the effects of parental social status upon the occupational opportunities of children. Each of these perspectives, by the very nature of the discipline from which it derives, excludes from consideration some important variables which may affect vocational preference and selection. The common denominator of these perspectives is the focus on the content of vocational choice or preference regardless of which factors influencing that choice are examined. Vocational decision content pertains to which vocation a person prefers or chooses. Vocational decision process refers to how the decision was made. In other words, content refers to outcome, process to strategy. One of the goals of the present

study was to examine the strategies utilized by individuals expressing vocational preferences via the methodology of behavioral decision theory.

Behavioral Decision Theory

Psychologists have demonstrated considerable interest in the processes of information acquisition, organization, and utilization by human decision makers. The term "behavioral decision theory" has been applied to the study of human judgment and decision processes. Decision theory represents an attempt "to describe in an orderly way what variables influence choices" (Edwards & Tversky, 1967, p. 7). Through the development of mathematical representations of decisions, it offers a tool with which to describe the strategy used by a decision maker. Research usually focuses on the individual as the unit of analysis and the individual's method of combining information in decision-making tasks.

The analysis of the decision process consists of three steps: (1) Identification of the judgment problem and the relevant information (cues) available to the decision maker on which the judgment will be based. (2) Judgments (decisions) made on a number of representative cases of the problem, with each case representing various combinations of the cues. (3) The statistical relationship between the cues and the judgment, most commonly ascertained through the application of least-squares regression or the analysis of variance (Wilcox, 1972).

The methodology has been applied to a wide variety of judgment tasks: physicians' judgments (Stewart, Joyce, & Lindell, 1975); water

resource planning (Flack & Summers, 1971); nuclear safeguards (Brady & Rappoport, 1973); labor-management negotiations (Balke, Hammond, & Meyer, 1973); legislators' land use policies (Muchinsky, 1980); graduate admissions committees (Hirschberg, 1977); and hypothetical shieks selecting a harem (Christal, 1968).

Decision-making can be studied from the perspective of either the outcome or accuracy of the judgment, or the process by which judgments are formed. The emphasis in more recent years has shifted to the understanding of process (Kaplan & Schwartz, 1977). More specifically, researchers have increasingly sought to apply mathematical models of behavioral decision theory to describe individual differences in weighting and integrating information and the strategies of the decision makers.

Policy capturing

Policy capturing is a variant of behavioral decision theory research in which the goal is to summarize the strategy used by a decision maker in rendering judgments. Policy capturing studies are based on the assumption that judges perceive cues to be differentially important and consequently do not weight them equally. An equation can be derived to represent each individual's weighting policy and thus the judgment process. Judges may subsequently be grouped or clustered in terms of the homogeneity of their judgment policies (Naylor & Wherry, 1965; Maguire & Glass, 1968; Dudycha, 1970).

Multiple regression is a common statistical technique used to predict an outcome (the dependent variable) from a number of pieces

of information (the independent variables). Multiple regression is a method commonly used in policy capturing. However, the equation is, in essence, worked backwards. A judge is presented with various decision tasks. Information to be combined in making the decision is controlled by the researcher and assigned some quantitative value. The judge is asked to make decisions based on the information (cues) presented. A regression equation is then applied to the data (the judgments and the cues) from a series of judgments in order to derive the weight each piece of information (cue) contributes to the judgment. The weights presumably represent the importance of the cues to the individual decision maker. In this way, a model is constructed of an individual's cognitive system (a judgment policy). Instead of using a mathematical model to predict behavior (such as choice or preference), policy capturing infers a person's strategy (or policy) for using information in arriving at a judgment. By controlling the input (cues) to a decision maker and observing the output (judgment), an inference is drawn about the nature of the cognitive process mediating the relationship between input and output, cues and judgments. That "cognitive process" is the individual's decision-making strategy for that task.

When cues are highly intercorrelated, as they usually are in representative judgment tasks, the results of the analysis are ambiguous because the weights cannot be clearly interpreted. For example, cue #1 may appear to be minimally utilized by a judge by virtue of its small beta weight in the judgment policy equation when, in reality, it is very

important to the judge. A small beta weight may be derived for cue #1 merely as a result of its correlation with cue #2. Observation of significant beta weights in a policy equation, therefore, do not necessarily imply the importance of the cues when the cues are highly intercorrelated. As a result, description of a judge's policy can be misleading. Beta weights are heavily influenced by the nature of the variables in the regression equation; that is, weights in a multiple regression equation can change (even in sign) by the addition or removal of a predictor variable (cue) which is correlated with the others (Darlington, 1968). For this reason, researchers often create orthogonal cue structures from which statistically derived weights can be used to describe their role in the judge's policy.

Some researchers take exception to this method of information presentation. Cues are generally intercorrelated in the real world, or in decision theory terminology, the environment. A model which attempts to describe the parameters of judgment tasks in the environment is derived from Brunswik's lens model (Brunswik, 1952, 1956; Hammond, 1966). The lens model assumes that individuals do not have direct access to the true state of the world (the distal state). Instead, individuals must make judgments about the true state based on inferences from observable proximal cues in the environment. A given cue may be utilized by the individual in a way which either does or does not reflect its true relationship to the distal state (its ecological validity). According to this model, there is a criterion value which can be predicted by knowledge of selected cues and their

corresponding validity. A decision maker will use these cues to make estimations or predictions of the criterion, reflecting cue utilization. Cues may be combined linearly to predict either the actual criterion value (environmental predictability) or the decision maker's judgment. Unlike with the lens model, in policy capturing there is no criterion. The policy which is modeled is the method of cue utilization in human judgment.

Linear model

A variety of methods have been used in the study of how individuals combine information in decision-making. A majority of the investigations dealing with decision-making processes have focused on determining the extent to which the linear model predicts judgments and captures judgmental policies. Although variants of the linear model have been proposed (for example, Fishbein, 1967; Rosenberg, 1956), basic to all linear models are two components that are thought to account for judgment: (1) a belief that an alternative may be described by some attribute and, (2) an evaluation of that attribute. Algebraically, this model can be expressed as follows (Slovic & Lichtenstein, 1971):

$$J(X) = b_i X_i + \ldots + b_k X_k \quad , \; i = 1,2,\ldots k$$

where, $J(X)$ = overall judgment of an alternative, X

X_i = amount of attribute i possessed by an alternative

b_i = weight of the i^{th} attribute

To illustrate the linear model, consider how a student might aggregate information in selecting a college. For purposes of illustration, it will be assumed that four attributes affect this decision: good curriculum, low tuition, East Coast location, and low student-faculty ratio. First, the weights are determined for each attribute. In Fishbein's version of the linear model, this is achieved by having the individual rate the consequences of each attribute from positive to negative on a Likert-type scale. Alternatively, the weights may be determined by having the individual rate the importance of each attribute on a scale ranging from important to unimportant. Whatever the procedure used to obtain attribute weights, let it be assumed that the weights shown in Table 1 have been obtained. Next, each of the four colleges being considered is evaluated on each of the attributes. This may be done on a seven-point scale ranging from one (does not meet requirements at all) to seven (fully meets requirements). As can be seen from Table 1, College A was perceived as meeting the requirement of curriculum and tuition attributes quite well (six and five, respectively) and was perceived to be less adequate on the location and student-faculty ratio (two and four, respectively). The student's evaluation of the other three colleges on the four attributes is also shown in Table 1.

Given the data presented in Table 1, the use of linear models leads to the selection of College A. This conclusion is derived by multiplying each attribute weight by the student's evaluation of a particular college on that attribute and summing over all four attributes.

College A achieved a score 48, whereas the next closest college, College B, achieved a score of 43 (Table 1).

A basic feature of the linear model is that decision making is viewed as a compensatory process; that is, a particular alternative may be selected despite relatively poor performance on a particular attribute, if that poor performance is compensated by relatively good performance on some other attribute. For example, College A is judged to be superior to College B even though College B is judged to fulfill the location requirement much better than College A. In essence, College A's relatively poor performance on the location attribute is compensated by performance that is superior to that of College B on the more important curriculum attribute.

Table 1. Organizing information using the linear model

Attributes	Attribute Weight	Decision Alternatives			
		College A	College B	College C	College D
Curriculum	4	6	4	6	6
Tuition	2	5	5	2	1
Location	1	2	5	7	1
Student-Faculty Ratio	3	4	4	2	5
College A		48 = (4)(6) + (2)(5) + (1)(2) + (3)(4)			
College B		43 = (4)(4) + (2)(5) + (1)(5) + (3)(4)			
College C		41 = (4)(6) + (2)(2) + (1)(7) + (3)(2)			
College D		42 = (4)(6) + (2)(1) + (1)(1) + (3)(5)			

The linear model examined to this point is an additive linear model. Overall, judgment is determined by adding the weighted evaluation on each attribute. An alternative form of the linear model involves averaging (Anderson, 1965). This is achieved by summing the weighted evaluation on each attribute and dividing by the number of attributes. Using the data in Table 1, the averaging model would yield a score of 12 (48/4) for College A; 10.75 (43/4) for College B; 10.25 (41/4) for College C; and 10.50 (42/4) for College D.

The consistent finding is that the linear model provides a reasonably accurate prediction, whether an additive or averaging version of the linear model is used (Slovic & Lichtenstein, 1971; Wilkie & Pessemier, 1973). Nevertheless, there are reasons for questioning whether the linear model describes the way individuals actually aggregate information. For example, by having individuals verbalize the procedures they use to arrive at a judgment, it has been found that information organization often does not proceed in accordance with the linear model (Einhorn, 1970). In addition, when decision makers were asked to compare the linear model and other strategies, they reported that the linear strategy was one that was difficult to implement and one that they used infrequently (Wright, 1975). It is probable that the linear model is highly descriptive of some judgmental tasks and not of others, or of some judges and not of others. It may also be true that people find it very difficult to describe the manner in which they utilize information in arriving at judgments so that they may verbalize a nonlinear cognitive process when, in fact, a linear process is used.

The predictive power of the linear model reported in many studies is due to the fact that the attributes investigated have an ever-increasing relationship to overall judgment (Dawes & Corrigan, 1974). In the example of choosing a college, the better the curriculum, the more positive the judgment; the lower the tuition, the more favorable the judgment. In such cases, the correlation between the student's evaluation on specific attributes and overall judgment are high. For this reason, the correlation between the actual and predicted evaluation is high. Adding other attributes, which enhance evaluation as they increase, would also yield high correlations between predicted and actual evaluations. Thus, the linear model is a good predictor of individuals' evaluations in cases where the attribute has a monotonic relationship to evaluation.

Another condition must be present in order for the linear model to provide an accurate description of how decision makers organize information. The situation must be one where the decision maker uses relatively few attributes in evaluating alternatives. This is because the organization task would be unwieldly with many attributes.

Non-linear models

Regression Regression analysis assumes that the underlying relationships among the variables are linear and additive. However, there are many occasions for which simple linear models are inadequate. In such cases, the use of the usual multiple regression equation will yield inaccurate $\hat{Y}$ estimates. The fit of the regression will not be as good as it could be if interactions between the independent

variables were taken into account. The most widely used approach to the problem of interaction is the inclusion of multiplicative terms in the regression equation. As the name implies, a multiplicative term is a product of two or more other terms. It is a new predictor variable created by multiplying scores on one predictor by corresponding scores on one or more others. For example, the equation

$$\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_1X_2$$

includes the two predictors X_1 and X_2, and the cross-product term X_1X_2 created by multiplying X_1 scores by corresponding X_2 scores. While this latter equation is still "additive" in form, the multiplicative term represents the "joint effect" of X_1 and X_2 over and above the sum of b_1X_1 and b_2X_2.

By adding multiplicative terms to a multiple regression equation, R^2 can only be increased. This implies that the fit of the equation to the data will improve with the addition of multiplicative terms. However, the increase in R^2 may not always be substantial. The researcher's goal is generally to obtain the most parsimonious equation that adequately describes a relationship. The conceptual simplicity and descriptive power of the general linear model make it an important tool for social scientists.

Analysis of variance An alternative approach to multiple regression is to perform an ANOVA on the individual's judgments. Analysis of variance, an alternative formulation of the general linear model (Cohen, 1968), provides a mechanism for describing not only linear, but also curvilinear and configural aspects of a judgmental process.

A linear function would describe a situation in which a judge's responses varied systematically with cue X_1 as the levels of other cues were held constant; that is, a significant main effect for X_1. If the main effect can be divided into quadratic, cubic, etc., trends (that is, exponential terms are included as predictors of the judge's policy equation), the cue is said to be related to the judgment in a curvilinear manner. If a judge's weighting of a cue varies according to the nature of other available cues, that is, a significant interaction exists between two cues, information is said to be combined in a configural manner.

Like the regression method the ANOVA method of analysis can be used to detect nonlinear information utilization. A disadvantage is that, unlike the regression method, ANOVA requires a factorial design. The judgment tasks must represent all possible combinations of the different levels of each information cue. This can result in an unreasonably large set of cases for an individual to make judgments about. In addition, some of the cases generated may be nonrepresentative of real-life.

Lexicographic model In light of the great degree of cognitive processing that is required to combine bits of information using a linear model, individuals may use strategies that are less taxing than the linear model to evaluate their preferences, particularly in complex decision-making situations. One such simplifying strategy is the lexicographic model. Using this model involves sequential evaluation. The decision maker must first order the attributes in terms of their importance. Once this is achieved, the choice alternatives are compared on the single most important attribute. If one

of the alternatives is superior on this attribute, that alternative is selected. If, however, the individual cannot discriminate among alternatives on the most important attribute, those alternatives which are comparable are evaluated on the second most important attribute. Thus, the lexicographic model entails evaluating alternatives, one attribute at a time, until one alternative emerges as superior.

In contrast to the linear model, which involves evaluation of the choice alternatives across all relevant attriubtes, the lexicographic model entails evaluation of an alternative on a specific attribute. Furthermore, poor performance on an important attribute cannot be compensated for by superior performance on some other less important attribute. In essence, the decision maker who uses a lexicographic model is attempting to insure that the chosen alternative outperforms other alternatives on the important attributes.

Conjunctive model This model conceives the decision maker's strategy as one aimed at insuring that the alternative selected is satisfactory on all attributes. In using the conjunctive model, the decision maker evaluates performance on all important attributes. In other words, an alternative must achieve a certain minimum level on all attributes, implying a multiple cutoff procedure. This enhances the likelihood that an individual will select the preferred choice regardless of whether the final choice entails a linear or lexicographic mode of information organization.

Disjunctive model The disjunctive model entails establishing a cutoff standard on each attribute, and selecting the alternative or

alternatives that surpass the cutoff on any attribute. Considering the evaluations of the four colleges presented in Table 1, suppose a student sets a cutoff at 5.5 on all attributes. In this case, Colleges A, C, and D are acceptable because they surpass the cutoff on at least one attribute. In effect, the disjunctive model with a cutoff standard set at 5.5 serves to reduce the number of alternatives requiring further consideration from four to three.

The limited research examining the disjunctive model suggests that it is used by at least some decision makers as a basis for choice (Einhorn, 1970, 1971). Moreover, there are many everyday situations in which it seems likely that a disjunctive model is employed. Consider, for example, the football coach's selection of players for his team. In choosing players, the coach is likely to select individuals who meet a certain standard in running or catching or blocking ability. If he finds that two or more players are equally proficient in running, he may then use a conjunctive or linear model to make a decision about which player to keep (Dawes, 1964).

To summarize the discussion to this point, the linear model is the most prominent mathematical model developed to describe the way individuals combine the pieces of information they have acquired to make a decision. Studies indicate that the linear model provides a relatively accurate prediction of choice (e.g., Dudycha & Naylor, 1966; Hammond, Hursch, & Todd, 1964; Goldberg, 1970). However, the linear model may not describe the way people go about making their decisions unless a decision is made on the basis of a few attributes that have

a monotonic relationship to overall evaluation. When these conditions are not present, nonlinear models such as the disjunctive and conjunctive models may be used in the initial stages of decision making to reduce the choice set to a manageable number of alternatives. Furthermore, regression or analysis of variance may be applied to an individual's judgments in order to detect nonlinear decision processes.

Decision-making Models and Vocational Behavior: Previous Research

Decision-making models have previously been used to describe vocational behavior (Tiedeman & O'Hara, 1963; Hilton, 1962; Vroom, 1964; Hsu, 1970; Fletcher, 1966; Katz, 1963, 1966; Gelatt, 1962; Kaldor & Zytowski, 1969). However, they have usually described (or prescribed) the development of vocational choice rather than the strategy of the decision maker at one point in time. That is, previous research largely sought to identify various stages in the decision-making process rather than examining only the current situation.

A large body of research exists on job attractiveness and vocational choice. Those studies most directly relevant to the present investigation are those which have attempted to describe concurrent vocational decision-making policies within a regression framework. Three such policy capturing studies are summarized in Table 2.

Singh (1975) used decision theory to examine job attractiveness and job satisfaction. Undergraduate engineering students were given job descriptions containing eight items of information: pay, working conditions, security, interpersonal atmosphere,

Table 2. Summary of empirical research using policy models to predict vocational preference and choice

Investigator	Subjects	Dependent Variable
Sidowski & Anderson (1967)	college students	preference
Huber, Daneshgar, & Ford (1971)	school teachers	preference and choice
Singh (1975)	engineering students	attractiveness and satisfaction

recognition, responsibility, advancement, and task content. The first four items comprised the context factor; the last four items, the content factor. Subjects were asked to rate the job described according to (a) how much they would like to accept the job and (b) how satisfied they would feel with that job. A linear additive model was used to describe the decision strategy. Results indicated that subjects paid equal attention to all eight items in the job description, but that context and content factors were differentially important for both judgments of liking and satisfaction.

Sidowski and Anderson (1967) asked college students to judge the attractiveness of working at a certain occupation (doctor, lawyer, teacher, or accountant) in each of four cities. The cities were prechosen by each student as ranging from high to low in attractiveness as places to live. The judgment of each city-occupation combination was hypothesized to be a sum of the values of the two components (city and occupation) weighted for their relative importance; that is, an additive combination of the attractiveness of the occupations and the

attractiveness of the cities. The hypothesis was supported for the occupations of doctor, lawyer and accountant, but not for teacher. When data for an analysis of variance were run including all data, the occupations X cities interaction was significant. When teacher data were excluded, the interaction was nonsignificant. The multiplicative relationship between the attractiveness of teaching and living in the different cities was inferred to result from the teachers tendency to be in more direct contact with the socio-economic conditions in cities, and the effects of unattractiveness of cities is nonlinear.

In the study by Huber, Daneshgar, and Ford (1971), fifteen experienced and fifteen inexperienced school teachers rated 30 hypothetical jobs in terms of how satisfactory each would be. The five characteristics of each of the hypothetical jobs (e.g., salary and location) were used as dependent variables and the 30 ratings as the dependent variables to yield a regression equation for each teacher. The equation represented a model of the teacher's job preference policy. The multiple regression coefficient indicated how well the equation accounted for the satisfaction ratings. The coefficients for the inexperienced teachers were much lower than for the experienced teachers, and fewer were significant for the inexperienced group. The results also reflected differential ability of the regression model to predict actual job choices. The regression model did not predict well for inexperienced teachers, but worked fairly well for experienced teachers.

Whereas Sidowski and Anderson (1967) implied the efficiency of the linear model may be influenced by the task, Huber et al. suggested

"that the validity associated with various models also may be a function of the type of subjects whose preferences are being predicted" (1971, p. 280).

The Present Investigation

In the present study, the judgment problem was selecting a vocational environment. The researcher's goal was to capture the decision strategy employed by an individual in rating the desirability of a vocational environment. The aim was to uncover individual differences in decision making strategies. Individuals were asked to rate hypothetical vocational environments in terms of how attractive each would be to them. Using these ratings, Y_i, as the dependent variables and the values of the $k = 1$ to n characteristics of each of the hypothetical environments as independent variables, regression analysis was performed to yield a policy equation for each individual. The equation is, in theory, a model of the person's vocational environment evaluation policy:

$$Y_i = a + b_1 X_1 + b_2 X_2 + \ldots + b_n X_n$$

where Y_i is the degree of preferability for a vocational environment; a is the intercept; b_k is the relative importance of the dimension; and X_k is the magnitude of the dimension.

The multiple correlation coefficient, R, is the correlation between the predicted judgment, $\hat{Y}_i$, and the observed judgment, Y_i. It is an indication of how well the equation is able to account for the preference ratings. That is, if R is high, the equation is considered

an adequate representation of the individual's evaluation policy. The beta weights, b_k, indicate the contribution of each of the cues to the judgment.

The present study will investigate vocational preference policies within the framework of Holland's (1973) theory of vocational preferences. Holland's model was chosen for its clearly defined assumptions, firm base in empirical research, and direct attention to vocational environments. Holland (1966) described six major dimensions to classify vocational environments by personality type. These six dimensions represent one of the simplest skeletal versions of the common dimensions used to classify occupations and vocational preferences.

The area of vocational preference and choice readily lends itself to a study of process; however, studies have concerned themselves for the most part with outcomes. Holland's model, like most studies of vocational preference, has examined the content of preference and choice. The present study will apply the methodology of decision theory to the study of preferences for particular vocational environments as defined by Holland's typology. The goal of the study will be to describe the process of vocational decision-making (decision-making strategies) as well as the content (outcome) using the methodology of policy capturing.

Holland's Vocational Typology

Holland's theory of vocational behavior elaborates on the hypothesis that career choices represent an extension of one's personality. Holland believes that people project their views of work and of themselves onto

vocational preferences. Holland observed that people tend to view work in terms of vocational stereotypes. He hypothesized that when an individual possesses little knowledge about a particular vocation, the stereotype that person holds reveals information about him/her, much like a projective test. Thus, a list of occupational titles was developed as a device onto which a person could project his/her preferred life style. Individuals could then be assigned to modal personality types according to their preferences for, or feelings against, the occupational titles.

Holland's theory, originally explicated in a journal article (1959), has been modified as a result of his own research (1962, 1966, 1973). The theory is based on three major assumptions.

First, within American society, most persons can be categorized as one of six personality types: Realistic, Investigative, Artistic, Social, Enterprising, or Conventional (Table 3a). An individual's personality type is determined by which of the six theoretical types he/she most closely resembles. A personality pattern is formed by examining an individual's resemblance to each of the six types. That is, a profile is developed describing the individual's similarity and dissimilarity to each of the six personality types. Presumably, personality is a result of genetic and environmental influences. As a result of these influences, a person initially develops preferences for certain activities; these activities become interests, and interests lead to particular competencies. According to Holland, these interests and competencies result in a personal orientation which leads the individual to think and act in certain ways. If one orientation is

Table 3a. Description of personality types (From Holland, 1973)

Type	Personality
Realistic	Is characterized by aggressive behavior, interest in activities requiring motor coordination, skill and physical strength, and masculinity. People oriented toward this role prefer "acting out" problems; they avoid tasks involving interpersonal and verbal skills and seek concrete rather than abstract problem situations. They score high on traits such as concreteness, physical strength, and masculinity, and low on social skills and sensitivity.
Investigative	Main characteristics are thinking rather than acting, organizing and understanding rather than dominating or persuading, and a sociability rather than interpersonal contact, though the quality of their avoidance seems different from their Realistic colleagues.
Artistic	Manifests strong self-expression and relations with other people indirectly through artistic expression. Such people dislike structure, rather prefer tasks emphasizing physical skills or interpersonal interactions. They are introspective and asocial much like the Investigatives, but differ in that they are more feminine than masculine, show relatively little self-control, and express emotion more readily than most people.
Social	Satisfy their needs for attention in a teaching or therapeutic situation. In sharp contrast to the Investigative and Realistic people, Social people seek close interpersonal relations, while they avoid situations where they might be required to engage in intellectual problem solving or use extensive physical skills.
Enterprising	Verbally skilled, but rather than use their verbal skills to support others as the Social types do, they use them for manipulating and dominating people. They are concerned about power and status, as are the Conventional people, but differ in that they aspire to the power and status while the Conventionals honor others for it.
Conventional	Typified by a great concern for rules and regulations, great self-control, subordination of personal needs, and strong identification with power and status. This kind of person prefers structure and order and thus seeks interpersonal and work situations where structure is readily available.

dominant over the others, the individual will seek an occupational environment that corresponds to that orientation. Thus, a person's personality type determines the primary direction of his/her vocational choice. For example, if a person resembles the Enterprising type, she is more likely to seek out Enterprising occupations such as sales or politics. She would be expected to perceive herself as popular, self-confident, and aggressive. She would be expected to have more enterprising competencies (such as leadership and persuasiveness) than investigative competencies (such as scientific and mathematical ability). She would value enterprising oriented tasks or problems, and the attainment of organizational goals or economic gain.

A second assumption of Holland's theory is that work environments can be described by the occupations of the people who comprise them: Realistic (carpenters, farmers), Investigative (physiologists, mathematicians), Artistic (musicans, photographers), Social (interviewers, clergy), Enterprising (purchasing agents, realtors), and Conventional (clerical workers, bank tellers). Each environment is characterized by physical settings which present special problems and stresses, and each environment is dominated by a particular personality type. Consequently, the largest percentage of the population in the Artistic environment resembles most closely the Artistic types of people. Artistic environments are dominated by Artistic types; Realistic environments are dominated by Realistic types; etc.

Different types have characteristic interests, competencies, and values. People tend to associate themselves with people, materials,

and problems which are congruent with those interests, competencies, and values. Therefore, where people gather, an environment is created which reflects the types they are.

Third, people seek congruence between their environment and personality type. People seek out environments that allow them to exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles. Realistic types seek Realistic environments; Enterprising types seek Enterprising environments; etc. The practical, persistent, mechanically oriented young woman will thus choose to become an air traffic controller and the aggressive, verbal ambitious woman will decide on a law career. If environmental factors interfere with the implementation of the first clear-cut orientation, the individual will then seek an occupational environment appropriate to her second strongest orientation. A student blocked in her attempts to implement her Investigative choice of oceanography because her financial resources will not support her through the necessary graduate training might well select the field of mechanical engineering representing her second major orientation, the Realistic.

Secondary assumptions of Holland's (1973) theory fundamental to its development and elaboration concern the personality constructs of consistency, differentiation, and congruence.

Consistency It has become clear that the types are differentially related to each other. Some pairs of personality types or environment types are more closely related than others. For example,

Enterprising-Social have more in common than Realistic-Social. If an individual's personality pattern is inconsistent it contains opposing traits. For example, a pattern such as Conventional-Artistic entails such oppositions as conformity and originality, control and expressiveness, and is thus said to be inconsistent. The degree of consistency is assumed to affect the stability of vocational preference. If the pattern is consistent, preferences are likely to be stable; if the pattern is inconsistent for a vocational environment, then preferences are likely to be unstable. Inconsistent patterns combine diverse interests, competencies, and values. These individuals have a more extensive repertoire of possible behaviors and thus are less predictable than persons with consistent personality patterns.

Differentiation An individual who closely resembles a single type and shows little resemblance to other types, or an environment dominated largely by a single type, is said to be highly differentiated. If an individual resembles two or more types to the same or nearly the same degree, the individual will vacillate in selecting an occupational environment.

Congruence Different types of personalities require different environments. The same-type environment is necessary to provide the opportunities and rewards congruent with the individual's preferences and abilities. A Social type in a Social environment can explore the activities she likes, has social competencies the environment demands, and can perform the tasks she values.

Holland serendipitously discovered that the intercorrelational matrix for the Vocational Preference Inventory scales (an instrument

used to describe an individual according to vocational preferences) could be approximated by the distances in a hexagon. The results of a major investigation of the relationships between the six types (Holland, Whitney, Cole, & Richards, 1969) confirmed the hexagonal arrangement (Figure 1). The outer rim of the hexagon reveals the psychological relationship between environments. Highly correlated environments, similar to one another, are closer together than those with low correlations. Realistic is close to Investigative on the one hand and Conventional on the other (correlations of .46 and .36, respectively) but fairly remote from Social, which is completely across the hexagon and correlates .21. Artistic is next to Investigative and Social (correlations of .34 and .42, respectively) but very distant from Conventional across the hexagon (correlation of .11). While the shape would not conform exactly to the hexagon if plotted in scale, it is close enough to be intriguing, and to lend vitality to Holland's attempt to relate the types to one another differentially. Subsequent studies by other researchers (Wakefield & Doughtie, 1973; Hanson, Lamb, & English, 1974; Toenjes & Borgen, 1974) have supported the hexagonal arrangement.

The relations among types, among vocations, and between types and vocations are estimated according to this hexagonal arrangement. The hexagonal model arranges both types and vocations according to their psychological similarities and differences. According to the hexagonal model, the similarity of the types is inversely related to the distance between them as described previously. The hexagonal model is also used to estimate degrees of person/job congruency. For example, a Realistic

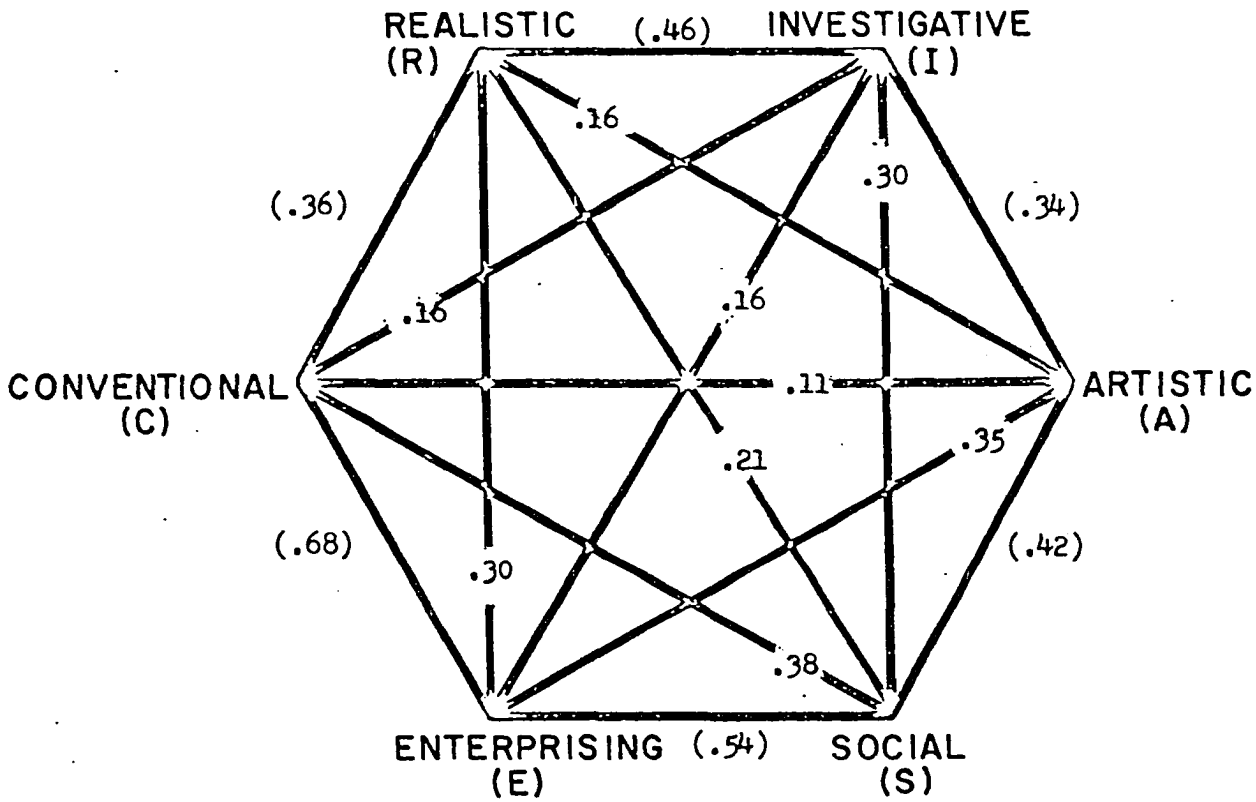

Figure 1. A hexagonal model for defining the psychological relatedness among occupational groups and personality types

person in a Realistic job is in a more congruent situation than a Realistic person in an Investigative job; a Realistic person in a Social job is in the most incongruent situation possible; and so on.

Validity of the theory

Almost all the early attempts to validate the theory through research conducted by Holland and his associates used a population of National Merit Scholarship finalists, but more recent efforts have studied more representative groups. Holland's approach to the study of vocational selection within his theoretical framework has been very comprehensive. His research has frequently been longitudinal, and he has attempted to assess a wide variety of personal, family, social, and achievement correlates that are pertinent to his theoretical construction. A basic feature in the research has been the idea that occupational titles, while stereotypic, are congruent with reality. More importantly, Holland proposes to use "like" versus "dislike" responses to occupational titles as projective data about the respondent on the assumption that vocational preferences represent a major facet of an individual's personality (Holland, 1961). The history of the use of the Strong Vocational Interest Blank (SVIB) and Kuder Preference Record leads to such an inference.

The Vocational Preference Inventory (VPI) (Holland, 1958) was actually developed prior to the theory, and is a personality inventory closely tied to vocational interests. Until the development of the Self-Directed Search (SDS), the VPI had been the primary tool for the measurement of personality types. The inventory consists of

occupational titles to which the subject is instructed to express his interest or disinterest. Although other approaches have been used as well (Holland, 1963; Holland & Nichols, 1964), Holland has used the VPI in several studies to assign personal orientations to his subjects. The orientations (personality types) served as independent variables. After scoring the VPI on the six scales relevant to personal orientations, Holland took the scale on which the highest score was earned, called that the high point code, and assigned the subject to the appropriate corresponding group.

Considerable interest has developed in relating the VPI to other interest measures. One approach has been the application of canonical correlation analysis to some combination of interest measures. Navran and Kendall (1971) performed a canonical correlational analysis of the VPI, SVIB, and the Edwards Personal Preference Inventory (EPPS) based on data from 277 freshmen in a military college. They concluded that the SVIB and VPI are related more to each other than to the EPPS, but that enough differences exist between the two interest inventories to make the use of both worthwhile. Haase (1971) performed a canonical correlation between the VPI and SVIB based on 176 male college students and found six common factors. Cole and Hanson (1971) attempted to assess the structural relationships between the SVIB, the Kuder Occupational Interest Survey, the VPI, the Minnesota Vocational Inventory, and the ACT Vocational Interest Profile. All these instruments were found to be similar. Moreover, some evidence was found supporting the circular configuration of interests along the lines Holland suggests.

The development of the General Occupational Themes of the Strong-Campbell Interest Inventory (SCII), the most recent revision of the SVIB, was guided by the occupational taxonomy devised by Holland. Scales using SCII items were developed for Holland's six basic categories of occupational types, and then applied to Strong's data (Campbell & Holland, 1972; Hansen & Johansson, 1972). On the strength of this research, Holland's system was used to organize the profile scores for the SCII (Campbell & Hansen, 1981).

Extending the theory to occupational workers, Gaffey and Walsh (1974) administered the VPI, SDS, and the Holland scales from the Strong to employed adults in eight different occupations. Similar codes and patterns were found on each inventory for men employed in the same occupation. Lacey (1973) attempted to extend Holland's theory to a sample of employed men representing each of the six types described by the theory. Except for those individuals classified as Realistic, the VPI and the occupational activitiy engaged in by these men were consistent with the theory.

In terms of Holland's theory, congruence has been defined as the degree of consistency between an individual's high point code and the occupational environment of his preferred or planned field. Several studies have examined congruence in student or employed populations. In a study of adult part-time students, Andrews (1973) found evidence that people search for jobs that are compatible (congruent) with their personalities. Gilbride (1973) found that 80% of resigned priests continued to work in social jobs, in other words, have made an

"intraclass" job change. In a study by Scott, Fenske, and Maxey (1974) men and women who changed majors tended to stay in the same Holland category. Mount and Muchinsky (1978) reported that individuals who were in vocations congruent with their personalities reported significantly higher levels of job satisfaction than those individuals in vocations incongruent with their personalities.

The research program testing Holland's theory has been extensive. Holland (1973) summarizes more than 100 empirical studies about the characteristics attributed to the six VPI scales, or to people categorized as one of the six types. According to Holland (1973), more than 90 of these investigations yielded supportive evidence. Holland's model of vocational behavior has remained a major stimulus for research throughout the past decade.

Policy Capturing and Vocational Preference

Based on Holland's model, hypothetical work environments were constructed in terms of six dimensions: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Environments were described as being composed of varying degrees of these dimensions. For example, a particular environment may entail a high amount of the Enterprising and Social dimensions, almost no Investigative, Realistic or Artistic dimensions, and a moderate amount of the Conventional dimension. Individuals presented with a number of such hypothetical environments were asked to judge how attractive each environment would be to them as a permanent work environment. In terms of policy capturing, the judgments are the dependent variables. The values of

the six dimensions of each of the hypothetical environments (cues) are the independent variables. The equation derived from a regression analysis models a person's vocational environment evaluation policy. The squared multiple correlation coefficient, $\underline{R}^2$, indicates how well the policy model accounts for the judgments by correlating the actual judgments ($\underline{Y}$) with the predicted judgments ($\hat{\underline{Y}}$) across all trials. The beta weights represent the importance of each of the six dimensions to the individual in influencing the judgment policy.

The content of an individual's preferences "captured" by the policy model should closely match the preferences indicated by the VPI scales. If a profile derived from the VPI shows a "high point" on the Realistic scale, a very low point on the Social scale, and other scale points in the middle range, the policy capturing profile should show similar peaks and valleys. Regression analysis should result in large significant beta weights for the Realistic and Social dimensions, the Realistic weight being positive, the Social, negative. Ideally, the patterns would also be similar in terms of the degree of differentiation. A well-differentiated profile has sharp peaks and low valleys. Differentiation can be expressed numerically as the absolute difference between a person's highest and lowest scale scores on the VPI. It could also be expressed as the difference between a policy model's most extreme beta weights. The degree of differentiation as measured by one method should predict the degree of differentiation measured by the other.

The decision-making model can capture the decision process as well as decision content. For example, the policy models of two

people may indicate they both prefer a highly Realistic vocational environment. (A significant beta weight is associated with the Realistic dimension.) However, different decision making strategies may be employed. For example, one judgment policy may have nearly equal weights assigned to all cues (dimensions) and all information may be used in terms of a positive linear function. In this case, although the Realistic dimension may be most heavily weighted in the decision policy, all other dimensions are also important to the individual. The person finds the most attractive environments to be those which involve a substantial degree of all six dimensions. Another judgment policy may have differential weights assigned to cues and employ different function forms (i.e., a positive linear function for cue #1, a negative function form for cue #4). This individual prefers a vocational environment which is high on the Realistic dimension (cue #1), and would avoid an environment which emphasizes the Social dimension (cue #4).

The content of the policy model (which dimensions are most important to an individual) may be differentially related to interests indicated by the VPI and expressed interests. "Expressed preferences" are indicated by a direct verbal statement of an interest in an occupation. Expressions of vocational interests or preferences may be written or verbal. They may be elicited in a variety of ways, but usually involve direct questions concerning occupational preferences or choices. "Inventoried interests", in contrast, employ a variety of types of items and scoring procedures. The Strong-Campbell Interest

Inventory (SCII) is an example of an interest inventory. An SCII score on an occupational scale is an index of the extent to which an individual has made those item responses that have been found to discriminate between members of occupations or occupational groups.

Expressed interests have been found to be better predictors of vocational membership than inventoried interests as reflected by subjects' scores on the Strong Vocational Interest Blank (Dolliver & Will, 1977; Borgen & Seling, 1978) or Holland's VPI (Gottfredson & Holland, 1975; Holland & Lutz, 1968; O'Neil & Magoon, 1977; Touchton & Magoon, 1977). Expressed interests may also be better predictors than inventoried interests of policy model content. Vocational preferences measured by response to occupational titles may not accurately reflect preference for a particular vocational environment per se, but rather a preference for a status level associated with the occupational stereotype. Abstract vocational profiles presented sans vocational titles may result in less status contamination in the decision making task.

Vocational Indecision

For a number of reasons, an individual may express no clear vocational preference, or uncertainty regarding his preference. Data from vocational indecision literature are not easily integrated into a comprehensible pattern. Results have often been unclear and/or contradictory. The main thrust of the research has been to uncover personality or ability factors involved in indecision. Essentially, the data reveal few systematic and reliable personality or ability factors involved in decision-indecision status. Nevertheless, there

persists a belief the people who have an expressed preference are different from those who do not.

A number of researchers investigating career indecision indicate that there are different aspects of indecision and that undecided students are not represented by a single homogeneous group (Ashby, Wall, & Osipow, 1966; Baird, 1968; Greenhaus & Simon, 1977; Holland, Gottfredson, & Nafziger, 1975; Hartman, Utz, & Farnum, 1979; Holland & Nichols, 1964; Lunneborg, 1975; Slaney, Palko-Nonemaker, & Alexander, 1981; Walsh & Hanle, 1975). Crites (1969) suggests that people who remain undecided may be categorized according to three general types: multipotential, undecided, and uninterested. Multipotential people are multi-talented individuals who have difficulty narrowing their many possible choices to one. These people make many choices instead of one. Undecided individuals make no choices. These people do not lack options or motivation to make choices, but for some reason no choice is made. The person may lack self-confidence, decision-making skills, may be anxious, disorganized, etc. The uninterested person has made a choice, but is uncertain about it. This person lacks an interest pattern appropriate to the choice.

Rather than categorizing persons, Tyler (1961) delineates four factors which may account for indecision.

1. Influence from family or friends. For example, a person who prefers to be a jockey does not want to disappoint his father who wants him to be a doctor.

2. Both attraction for and repulsion by a vocation. For example, a person may like chemical research, but hate writing research reports.

3. Unwillingness to be limited to or restricted by a decision which will result in talents remaining undeveloped. For example, a person who is artistic, intellectual, and sociable may hesitate to pursue one talent at the expense of another.

4. Lack of alternative to unviable preference or choice. For example, a person who prefers a career as an attorney may be rejected by all law schools, and unable to generate interest in another vocation.

The construct of vocational "decidedness" has been addressed under a variety of names (e.g., maturity, identity, certainty) and assessed with a variety of instruments. Consistent with research suggesting multiple types of decision-making problems, Holland and Holland (1977) developed the Vocational Decision-Making Difficulty Scale (VDMD) to assess the number of reasons given by individuals for vocational indecision. The scales from the VDMD were later revised and incorportated into three scales in another diagnostic form, My Vocational Situation (MVS) (Holland, Daiger, & Power, 1980). The scales were developed to identify the degree of vocational identity, need for vocational information, and the presence of external barriers -- three factors assumed to be related to vocational indecision. Intrapsychic problems were grouped into a single scale, Vocational Identity. Vocational Identity has been defined as, "the possession of a clear and stable picture of one's goals, interests, personality, and talents [which] leads to relatively untroubled decision-making..."

(Holland et al., 1980, p. 1). It is this scale which is used in the present study.

Vocational identity and person-environment congruence

Holland's theory of careers suggests that congruent person-environment interactions tend to be associated with self-reported stability. In general, evidence indicates that congruent person-environment interactions are conducive to self-reported personal and vocational stability (Elton, 1971); Holland, 1968; Holland & Nichols, 1964; Lacey, 1973; Walsh, 1974).

Previous studies exploring the relationship between vocational decidedness and vocational preference have not always found congruent or incongruent person-environment relations to be associated with vocational decidedness variables. (Person-environment congruence has generally been operationally defined as a match between a person's inventoried preference and expressed preference.)

Using the Vocational Development Inventory (Crites, 1969) to define vocational maturity, congruent or incongruent person-environment relations tended not be be associated with vocational maturity (Walsh, Howard, O'Brien, Santa-Maria, & Edmondson, 1973). Walsh and Osipow (1973) defined vocational maturity variables using the Career Questionnaire, Form IV (Super, Bohn, Forrest, Jordaan, Lindeman & Thompson (1971) and the Vocational Development Inventory. Their findings suggested a relationship between congruence and vocational stability. Walsh and Hanle (1975), using the Career Maturity Inventory (Crites, 1973) to define vocational maturity, found that congruence tends to be

associated with the vocational maturity variable. Slaney (1980) used the OAQ as a measure of vocational indecision and found indecision to be associated with lack of congruence. In short, research on the relationship between vocational decidedness and vocational congruence has resulted in inconsistent findings. Unfortunately, the variety of measures and definitions used in different studies makes any comparison of results difficult.

The present study will explore the relationship between vocational identity as defined by Holland's MVS and the degree of agreement (convergence) among measures of vocational preference used in the study.

Vocational identity, differentiation and policy models

The fact that an individual has not delineated a clear preference for a vocation due to undefined interests and talents (i.e., low differentiation) may influence the decision strategy used. People who have no clear picture of their goals, interests, or talents would be expected to experience difficulty in judging the attractiveness of vocational environments. Inconsistent judgments would attenuate the R^2 from a regression analysis. A person with no clear interests may have a policy model with no significant beta weights; that is, no particular vocational dimension is important to the individual. This is in contrast to an undifferentiated personality, a person with many interests and talents. The policy model of this person will likely employ multiple significant beta weights, reflecting the importance of a number of vocational dimensions.

According to Holland (1973), persons with VPI profiles manifesting a high degree of differentiation should make stable vocational decisions. If a profile is not well-differentiated, vacillation in the selection of a vocational environment will occur. For example, a person with matching scale points for Investigative and Artistic may find it difficult to choose between biology and the graphic arts. If low differentiation results in inconsistent judgments as a consequence of decision ambiguity, the $\underline{R}^2$ from the policy model may be attenuated.

Attempts have been made to relate extremely high or low interest differentiation scores to vocational decision-making ability (Holland, Gottfredson, & Nafziger, 1975) and undecidedness (Holland & Holland, 1977; Lunneborg, 1975). Lunneborg (1975) found correlations of differentiation and undecidedness ranging from -.05 to 0.15, utilizing data from the six occupational scales of the VPI. Using differentiation scores derived from the SDS, Holland and Holland (1977) found no significant correlation between differentiation and undecidedness in high school or college populations. Studies by Lowe (1981) and Slaney (1980) also supported the notion that interest differentiation does not appear to be a reliable predictor of vocational undecidedness. In this case, differentiation would <u>not</u> be expected to affect the size of a policy model's $\underline{R}^2$ as originally hypothesized.

Hypotheses

The first part of the present study might be described as a "multi-instrument" validation of the six vocational typologies identified by Holland. Five measures of vocational preference were tested for degree

of convergence. Two of these measures -- expressed preferences and the VPI -- were based upon preference for a particular occupation (or occupations). Three of the measures were based upon preference for certain components of work environments (occupational dimensions).

The second part of the investigation concerned the impact of vocational identity on the convergence among the five measures.

Five specific hypotheses were tested in the present study.

1. Personality profiles derived from the VPI will be related to the content of the policy models. It should be possible to project a person's high point code according to the VPI by knowing the content of her policy model.

2. The content of policy models will be more closely related to expressed vocational preference than to VPI scales. A person's expressed vocational preferences can be more accurately classified on the basis of their policy models than their VPI scale scores.

3. Persons scoring low on the Vocational Identity scale will have a higher preference than those scoring high on the scale for graphically portrayed profiles which are "flat" in appearance. In other words, persons with low vocational identity should rate the flat occupational environment profiles higher than persons with high vocational identity.

4. When people are low in vocational identity, their judgments of the attractiveness of the vocational environments will not be highly predictable on the basis of the six dimensions described earlier. In correlational terms, there will be a positive relationship between an

individual's Vocational Identity score and the size of the $\underline{R}^2$ derived from his policy equation.

5. There will be greater convergence among various methods in assessing an individual's most preferred vocation (their high point) for people high in vocational identity than for those people low in vocational identity.

METHOD

Subjects

The selection of subjects for this study was based upon a two-step procedure. First, it was determined on an *a priori* basis that adequate statistical power in an intrasubject design could be attained with a sample of 15 subjects for each of Holland's six vocational types. Therefore, the goal of the sampling procedure was to attain a total sample size of 90. Students enrolled in undergraduate psychology courses at Iowa State University participated as subjects for the present study. They were administered all of the experimental material used in this study, but the most salient variable which determined their potential inclusion in the final sample was their high point code on the Vocational Preference Inventory (VPI). Subjects were initially placed into one of the six Holland categories based upon their high point code. While it was the experimenter's intent to obtain a final sample of 90 individuals, the sampling procedure necessitated assessing more than 90 individuals initially. That is, some individuals had multiple high point codes, and because they could not be unambiguously classified into one of the six classifications, were dropped from further study. Additionally, certain Holland types were far more prevalent among the initial subject pool than others. Thus, there was a surplus (i.e., more than 15) of certain vocational types, while for other types there was no surplus. All told, a total of 347 individuals were assessed to obtain the final desired sample of 90. Selection of the 15 subjects in those classifications

which contained a surplus was determined randomly. For one of the six Holland types (Realistic) a total of 15 individuals represented all that were available from the initial sample pool. Table 3b describes the RIASEC distribution of all subjects assessed. Of the final 90 subjects who comprised the sample, 40 were female and 50 were male. They ranged in age from 17 to 36, with an average age of 21 years.

Table 3b. Distribution of RIASEC types across all subjects assessed

Type	Female	Male	Total
Realistic	4	11	15
Investigative	5	22	27
Artistic	11	20	31
Social	24	5	29
Enterprising	42	42	84
Conventional	11	17	28
Tied High Points	61	72	133
Totals	158	189	347

As can be seen in Table 3b, there were gender-based differences in RIASEC group membership. Realistic subjects were scarce, particularly among females. The scarcity of Realistic types may in part be a reflection of the sampling procedure, which was based upon students being enrolled in psychology classes. The frequency of Realistic types would likely have been greater in engineering or agriculture classes, for example. Proportionately far more males

than females were of the Investigative type, while Social types were more often female. The Enterprising group was evenly split between males and females, with rough equivalence between the Artistic and Conventional types. Exactly 38% of both sexes had multiple high point codes, and these were excluded from the study.

Description of Instruments

Demographics

This questionnaire asked the respondent's age, gender, year in college, and major. The degree of confidence students have in their choice of major was measured by a single item: "To what degree are you confident your choice of major was the right choice for you?" on a 7-point scale (1=I have absolutely no confidence; 7=I am completely confident).

Vocational Preference Inventory (VPI)

The Vocational Preference Inventory provides a quantitative measure of vocational preference. It is a personality inventory composed of 11 scales which can be used to determine vocational interests and personality types. Of the 11 scales, the six vocational scales -- Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C) -- are the most commonly reported.[1] The VPI has been used in numerous settings with a wide variety of subjects. An individual

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[1]The five additional personality-related scales are: Self-Control, Masculinity, Status, Infrequency and Acquiescence. These scales were not dealt with in the present study.

is given a list of 160 occupations, from which he or she indicates which are personally appealing and which are unappealing. No response to an occupation would indicate the person was undecided. The inventory is scaled and profiled. The higher a person's score on a scale, the stronger the preference for the occupational "group". Ranking scale scores from highest to lowest results in a score profile. The manual reports internal consistency reliability coefficients for the R, I, A, S, E, C scales ranging from .76 to .88 and test-retest reliability coefficients for a one year interval ranging from .61 to .86 (Holland, 1975). These results suggest moderate to high reliability for the six VPI vocational scales. Summaries of research attempting to establish the VPI's construct, concurrent, and predictive validities also appear in the manual.

Occupational Alternatives Question (OAQ)

The OAQ consists of two parts: (a) "list all the occupations you are considering right now," and (b) "which occupation is your first choice? (if undecided, write undecided)." The test-retest reliability of a questionnaire that included this question was .93 (Redmond, 1973). Slaney (1980) demonstrated that the OAQ had considerable concurrent validity with other measures of career indecision when the responses were scored as follows: 1=a first choice is listed with no alternatives, 2=a first choice is listed with alternatives, 3=no first choice is listed, just alternatives, and 4=neither is listed. This scoring system was used in the present study.

This instrument was also used to determine a person's expressed preference (what occupation people say thay prefer) and the variety of occupational types they are interested in. Variety of occupational types was assessed by part "a" of the OAQ. All occupations listed were assigned a high point code using the Dictionary of Holland Occupational Codes (Gottfredson, Holland, & Ogawa, 1982). The number of different RIASEC types listed was used as a measure of the variety of occupational interests. Expressed vocational preference was indicated by part "b" of the OAQ. The occupation listed was coded according to its appropriate RIASEC category. If no occupation was listed as a first choice, the occupational type appearing most often in part "a" was used to represent expressed preference.

Vocational Identity Scale

This 18-item scale was devised to assess problems of vocational identity. Subjects respond either true or false to the items. The total score is the sum of false responses. A high score indicates a high degree of vocational identity, defined as "the possession of a clear and stable picture of one's goals, interests, personality, and talents. This characteristic leads to relatively untroubled decision-making and confidence in one's ability to make good decisions in the face of inevitable environmental ambiguities" (Holland et al., 1980, p. 1). Holland and his associates (1980) reported KR20 reliability values for this scale for male and female high school students, college students and workers ranging from .86 to .89. The scale was negatively

correlated with the number and variety of vocations an individual listed on the MVS, and positively correlated with age, training, and degree of specialization.

Occupational Uncertainty (OU)

Three true-false questions were used by the researcher as a measure of occupational uncertainty:

OU_1: I'm not really interested in anything.

OU_2: I'm more certain of occupations I don't want than what I do want.

OU_3: I haven't thought much about what occupation I might prefer.

An answer of "true" indicates occupational uncertainty.

Vocational Environment Profiles

The vocational environment profiles measure is a booklet containing 60 descriptions in graphic form of hypothetical environments in which people may work. Each of the 60 descriptions contains information on six variables or dimensions. The labels of the dimensions are taken from Holland's model: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Each dimension is described in Table 4. The 60 environmental profiles contain varying levels of each of the six dimensions. An example of a vocational environment profile is given in Figure 2. A dimension with a value of "1" indicates the absence of that factor from the environment; a value of "9" indicates the environment's heavy emphasis on that dimension. The height of the six points in Figure 2 indicates that this particular vocational environment would

Table 4. Six dimensions used to construct hypothetical vocational environments

Realistic (R)	The demands and opportunities of this dimension entail the explicit, ordered, or systematic manipulation of objects, tools, machines, and animals. The atmosphere encourages people to see themselves as having mechanical ability; encourages them to see the world in simple, tangible, and traditional terms; and rewards people for the display of conventional values and goods (money, power, possessions).
Investigative (I)	The demands and opportunities of this dimension entail the observation and symbolic, systematic, creative investigation of physical, biological, or cultural phenomena. The atmosphere encourages people to see themselves as scholarly, as having mathematical and scientific ability; encourages them to see the world in complex, abstract, independent, and original ways; and rewards people for the display of scientific values.
Artistic (A)	This dimension is characterized by demands and opportunities that entail ambiguous, free unsystematized activities and competencies to create art forms or products. The atmosphere encourages people to see themslves as expressive, original, intuitive, nonconforming, independent, and original ways; and rewards people for the display of artistic values.
Social (S)	The demands and opportunities of this dimension entail the manipulation of others to inform, train, develop, cure, or enlighten. The atmosphere encourages people to see themselves as liking to help others, understanding of others, cooperative, and sociable; encourages them to see the world in flexible ways; and rewards people for the display of social values.
Enterprising (E)	This dimension is characterized by the dominance of environmental demands and opportunities that entail the manipulation of others to attain organization of self-interest goals. The atmosphere encourages people to see themselves as aggressive, popular, self-confident, sociable, and as possessing leadership and speaking ability; encourages people to see the world in terms of power, status, responsibility; and rewards people for the display of enterprising values and goals (money, power, and status).
Conventional (C)	This dimension is characterized by the dominance of environmental demands and opportunities that entail the explicit, ordered, systematic manipulation of data, such as keeping records, filing materials, reproducing materials, organizing written and numerical data according to a prescribed plan, operating business and data processing machines. The atmosphere encourages people to see themselves as conforming, orderly, and as having clerical competencies; and rewards people for the display of conventional values (money, dependability, conformity).

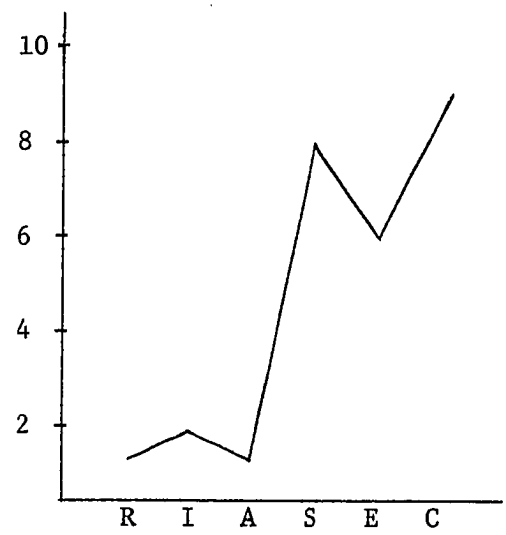

Figure 2. Example of a vocational environment profile

entail a high amount of the Conventional and Social dimensions, almost no Realistic, Investigative or Artistic dimensions, and only a moderate amount of the Enterprising dimension.

The decision studied was how attractive each of the 60 environments was to the subject in terms of permanent employment. For each profile, subjects indicated the attractiveness of the vocational environment on a 1 to 9 scale where "1" indicated an environment the individual would definitely avoid, and "9" indicated an extremely attractive environment in which to work.

The cues were generated using the Ohio State Correlated Score Generation Method (Wherry, Naylor, Wherry, & Fallis, 1965). This is a Monte Carlo generation program which generates multi-variate normal statistical distributions with specified psychometric properties. Among the parameters which are subject to researcher specification

are the sample size, the mean and variance of each variable, the intercorrelation among the variables, and the intercorrelation tolerance limit (i.e., the amount of tolerable variation in the intercorrelations among the variables). Procedurally, the program generates a block of variables of specified magnitude, and then analyzes the generated distributions to see if they conform to the specified parameters. The process is repeated in an interactive manner until a block of variables is generated with the desired psychometric properties. For this study one block of 60 stimuli were generated to approxmate (±.17)) the theoretically desired interrelationships among the stimuli, which are shown in Table 5.

Table 5. Correlations among the six environmental cues[a]

Cue	R	I	A	S	E	C
R	-	.00	.00	.00	.00	.00
I	.02	-	.00	.00	.00	.00
A	.10	.03	-	.00	.00	.00
S	-.04	.01	.01	-	.00	.00
E	.01	.07	-.07	-.17	-	.00
C	-.11	.02	.00	-.05	.12	-

[a]Correlations above the main diagonal represent the theoretical matrix; correlations below the main diagonal represent the empirical cue matrix (df=60).

That is, hypothetical vocational environments were computer generated such that, across the 60 profiles, the correlation between stimuli (dimensions) was near zero. Within sampling error, each cue had a mean of 5 and a standard deviation of 2. The orthogonal cue structure was created to facilitate interpretation of the results, which is greatly impeded if consistent nonzero relationships exist among the cues (Schenk & Naylor, 1968). Although correlations between dimensions may exist in natural environments, it was believed that the purpose of the study, to determine which dimensions are most important to people in judging the attractiveness of a vocational environment, was best served by this constraint.

After scanning each profile, the subject responded with respect to the attractiveness of the vocational environment depicted. Reliability (immediate test-retest) of the instrument was assessed by repeating a random sample of 15 of the 60 profiles, increasing the total number of profiles to be judged to 75.

After responding to all the profiles, the subject (1) rank ordered the six dimensions from most to least attractive with respect to the dimension's possible inclusion in his or her occupation, and (2) rated each dimension on a scale from -10 to +10, where -10 indicated the dimension was extremely unattractive and +10 indicated the dimension was extremely attractive. This provided two measures of the subjective importance (or weight) of each dimension, as opposed to the analysis of the 60 judgments from which dimension importance is <u>inferred</u> (the objective weight).

A person's highest scale score on the VPI is referred to as his "high point". For consistency, the highest positive beta weight in a policy model will be called a policy model high point, the occupational dimension ranked most important as a ranked high point, and the highest rated dimension as a rated high point. In 23 cases, two or more occupational dimensions were rated equally high. In those cases, the "high point" was assigned to the tied dimension which was ranked most important in the ranking procedure.

Procedure

Data were collected during two periods of time separated by an interval of approximately six weeks. All instruments were administered during the subjects' first session held sometime between December 1982 and March 1983. Seventy-two subjects returned to a second session in April 1983 to complete an occupational classification instrument not used in this study and to respond a second time to the question regarding the degree of confidence in major.

Upon being seated in the data collection room, subjects were instructed to read the instructions for completing the instruments and asked if there were any questions. Half of the subjects were instructed to complete the VPI first, while the other half completed the Vocational Environment Profiles first. This precaution was taken as a control for potential order effects. The time to complete all instruments was approximately 60 minutes.

After the data were collected, the subjects' responses to the VPI were scored and their six vocational scale scores were computed.

Six separate groups were then formed in the following manner: subjects whose highest score was on the Realistic scale were identified as belonging to the Realistic group; those subjects with a highest score on the Artistic scale belonged to the Artistic group; and so forth for the remaining four scales. Only 15 subjects were categorized as Realistic. Of the remaining 332 individuals assessed, 15 were randomly selected from each Holland category, resulting in a final sample size of 90 for the present study.

Statistical Analyses

Test-retest reliabilities were computed for the question measuring confidence in major and for the Vocational Environment Profiles.

The following analyses were performed to assess each of the five hypotheses.

Hypothesis 1

The first analyses concerned an examination of the relationship between the VPI, policy models, rankings and ratings.

A multiple regression analysis was performed for each subject utilizing data from judgments of the vocational profiles. The dependent variable (the criterion), denoted by $\underline{Y}$, was the judgment. The independent (predictor) variables, denoted by $\underline{X}_1$, $\underline{X}_2$, . . . $\underline{X}_6$, were the values of the six dimensions of each of the hypothetical environments. The purpose of the multiple regression method was to derive weights $\underline{b}_1$, $\underline{b}_2$, . . . $\underline{b}_6$ for the variables $\underline{X}_1$, $\underline{X}_2$, . . . $\underline{X}_6$. The resulting multiple regression equation is, essentially, a weighted composite, $\hat{\underline{Y}}$.

$\hat{Y}$ is derived to correlate maximally with Y. That is, weights are computed which result in the best prediction of the dependent variable. The correlation is represented by R. R^2, therefore, represents the sum of variance in Y accounted for by the six predictor variables.

The equation describes the subject's policy of combining and weighting the information presented in assessing the profiles (Hoffman, 1960). Given the restrictions outlined by Darlington (1968), the weights can be used to indicate the importance of each independent variable (that is, the degree to which each dimension contributes to the decision). The multiple correlation coefficient indicates the degree to which the subject's judgments can be predicted by a linear combination of variables and the degree of consistency of the judgments.

In this study, the standardized beta weights were used to indicate the contribution of each of the six occupational dimensions to the judgment of the occupation's attractiveness. The R^2 was an indication of how well the policy model was able to account for the judged attractiveness of the Vocational Environment Profiles.

Three stepwise multiple discriminant analyses were used to investigate the relationships between policy model content, rankings, ratings, and VPI scores. Where the actual group membership of cases is known, this statistical technique can be used to identify the likely group membership of a case based on the case's "discriminating variables" (the independent variables). By comparing predicted group membership with actual group membership, one can empirically measure the success in discrimination by observing the proportion of

correct classifications. The purpose is to see how effective the discriminating variables are in predicting group membership. Also, from the classification table, one can tell where the errors of classification occur. Detection of a pattern in misclassification indicates similarity between groups; that is, the groups are too indistinct to be correctly differentiated. In all three discriminant analyses, the VPI high point code was the dependent variable (the "actual" or "known" group membership). In the first analysis, beta weights from the policy models were the discriminating variables. In the second, occupational dimension rank-order values were the discriminating variables. In the third analysis, the ratings attached to each dimension were used as the discriminating variables. The purpose of conducting three multiple discriminant analyses was to ascertain which of the three sets of predictor variables (e.g., beta weights, ranks, or ratings) most accurately predicted VPI high point code.

In order to determine the extent to which high points derived from one instrument correspond with the high points derived from other instruments, tables were consturcted indicating the frequency and percentage of high point "matches". That is, the degree of overlap or communality between the various methods in categorizing individuals according to their high point code was assessed. This analysis provides a measure of cross-method convergence in assessments of vocational preference.

Hypothesis 2

It was hypothesized that although both the VPI scale scores and the policy model beta weights should predict a person's expressed vocational preference, expressed preference would be most accurately predicted by the policy model.

Two multiple discriminant analyses were performed in which the dependent variable was expressed preference. In the first analysis, beta weights from the policy models were the discriminating variables. In the second analysis, the VPI scale scores were the discriminating variables.

Tables were constructed indicating the congruence (matches) between high points derived from policy models and expressed preferences, and congruence between high points derived from VPI scale scores and expressed preferences. Tables were also constructed of expressed preferences by ranked high points and rated high points to determine which of the four instruments used to derive vocational preference was most congruent with expressed preference.

Hypothesis 3

The experimental booklet containing descriptions of the 60 hypothetical vocational environments contained six profiles in which the six dimensions were relatively undifferentiated. That is, all six points representing the six dimensions were of nearly equal magnitude, varying only 2-3 scale points. These were referred to as "flat profiles" and were composed of mid-range scale values. It was

hypothesized that persons with low vocational identity would express a higher preference than persons with high vocational identity for the flat vocational environment profiles. For purposes of this analysis, high vocational identity was defined as a score of 14 or higher on the Vocational Identity scale. Low vocational identity was defined as a score less than 8. Student's *t* was used to test the null hypothesis that the mean ratings on the flat profiles were the same for both groups ($H_o: \mu_1 = \mu_2$). The alternative hypothesis stated that those low in vocational identity rated flat profiles higher than those high in vocational identity ($H_1: \mu_1 < \mu_2$).

Hypothesis 4

A correlation was computed between Vocational Identity scores and policy model R^2s. It was hypothesized that persons low in vocational identity, would be inconsistent (unpredictable) when judging the attractiveness of the vocational environments, resulting in a low R^2. The correlation computed between the two variables was, therefore, expected to indicate a positive relationship.

Hypothesis 5

It was hypothesized that the consistency in assigning high point codes based on the various instruments might vary depending upon the level of vocational identity, or the response to the true-false question "I'm more certain of occupations I *don't* want than what I *do* want" (OU_2). Tables were constructed to indicate whether persons low in vocational identity (or answering "true" to the above question)

were less accurately classified according to expressed preference by the various high points than persons high in vocational identity (or answering "false").

Other analyses

In terms of the VPI, the differentiation score is the absolute difference between the highest and lowest vocational scale scores. According to Holland (1973) a high differentiation score indicates that an individual closely resembles a single occupational type. A differentiation score can also be computed for a policy model (the absolute difference between the two extreme beta weights) and for the rated vocational dimensions (the absolute difference between the highest and lowest ratings). These three differentiation scores were denoted by $DIF\text{-}VPI_{hl}$, $DIF\text{-}PM_{hl}$, and $DIF\text{-}RATE_{hl}$, respectively. For the purpose of this study, another type of differentiation was defined: the absolute difference between the two highest VPI scores ($DIF\text{-}VPI_{hh}$), beta weights ($DIF\text{-}PM_{hh}$), or ratings ($DIF\text{-}RATE_{hh}$).

The interrelationships between differentiation scores was determined from a matrix of Pearson product-moment correlations. The degree of differentiation indicated by one instrument should predict the degree of differentiation measured by the other.

A correlation matrix was constructed to indicate relationships among a number of variables. Specifically, interrelationships were hypothesized to exist among the following: variety of interests, vocational identity, OAQ, OU_2, and confidence in choice of major.

Regression analyses were performed to determine the proportion of variance in (a) variety of occupational interests, (b) vocational identity, (c) OAQ, (d) OU_1, (e) OU_2 and (f) confidence in major which could be attributed to selected variables. Six separate forward stepwise regression analyses were performed utilizing all 90 cases (Barr, Goodnight, Sall, & Hellwig, 1976) to determine which of 21 variables should be included in the final regression models, that is, to determine the best predictors for each of the variables a-f above. A cross-validation procedure was then employed (Mosier, 1951) to assess stability in the results of the analyses. The sample was split to create two groups, a developmental (D) and hold-out (HO) group, each consisting of 45 subjects. The regression equations derived from the stepwise analyses were applied to each of the two groups. The five best predictors were included in each equation. In order to get stable regression weights it has been suggested that there be at least a ten-to-one ratio between observations and variables in a regression analysis (Nunnally, 1978). In this study, the equations were originally derived from the full sample of 90 cases, a ratio of 18/1. However, there were only 45 observations in each of the validation groups, a ratio of 9/1. Therefore, including more than five predictor variables in the regression model would likely result in less stable cross-validation results.

RESULTS

Reliability Estimates

After a six-week interval, test-retest reliability for degree of confidence in choice of major was high (.92). The immediate test-retest reliability of the Vocational Environment Profiles instrument was computed for each subject. Coefficients were moderate to high, ranging from .44 to .97, with a mean of .72.

Hypothesis 1

Tables 6-8 describe the results of the multiple discriminant analyses investigating the best set of variables used to predict VPI-RIASEC group membership. The percent of cases correctly classified ranged from 58.9% to 61.1%, representing approximately a 43% increase in absolute improvement over chance expectation

Table 6. Summary of classification results -- VPI-RIASEC group membership predicted from policy models

Actual Group	# of Cases	R	I	A	S	E	C	% Correct
R	15	9	4	0	0	1	1	60.0
I	15	1	10	0	1	2	1	66.7
A	15	1	0	13	0	1	0	86.7
S	15	0	0	1	9	4	1	60.0
E	15	1	2	1	3	6	2	40.0
C	15	0	1	0	3	3	8	53.3

Percent of "grouped" cases correctly classified: 61.1%

Table 7. Summary of classification results -- VPI-RIASEC group membership predicted from rankings

Actual Group	# of Cases	R	I	A	S	E	C	% Correct
R	15	11	2	0	0	0	2	73.3
I	15	4	8	0	0	1	2	53.3
A	15	1	1	11	1	0	1	73.3
S	15	0	0	0	11	2	2	73.3
E	15	1	1	4	5	2	2	13.3
C	15	1	2	0	2	0	10	66.7

Percent of "grouped" cases correctly classified: 58.9%

Table 8. Summary of classification results -- VPI-RIASEC group membership predicted from ratings

Actual Group	# of Cases	R	I	A	S	E	C	% Correct
R	15	9	4	0	0	0	2	60.0
I	15	2	12	0	0	0	1	80.0
A	15	0	2	11	1	0	1	73.3
S	15	0	1	0	8	5	1	53.3
E	15	1	0	1	4	6	3	40.0
C	15	2	2	0	0	3	8	53.3

Percent of "grouped" cases correctly classified: 60.0%

(17%, 1 out of 6). These results represent approximately a 253% relative improvement in predictive accuracy, as measured by the absolute gain divided by the base rate (43%/17%). In all three analyses, the Enterprising group was the least predictable, with the percent of cases correctly classified ranging from 13.3 to 40.0.

Table 9 summarizes the percentage of high point matches among assessments of vocational preference. (More detailed cross-tabulation results are in the Appendix.) The highest degree of convergence was between the rating and ranking methods; the lowest between the policy model and VPI. In general, the VPI exhibited the least amount of convergence with the other measures.

Table 9. Summary of percent of cases with matching high point codes among four measures of vocational preference

Measure	VPI	Policy Model	Ranking	Rating
VPI	-	52.2	55.6	54.4
Policy Model		-	82.2	83.3
Ranking			-	98.9%
Rating				-

Hypothesis 2

The results of the multiple discriminant analyses in which expressed vocational preference was predicted from policy models and VPI scale scores are summarized in Tables 10 and 11. As hypothesized, the policy model was more predictive than the VPI. A closer examination of the

tables reveals that, just as with the discriminant analyses predicting VPI-RIASEC group membership, the least predictable Holland category was the Enterprising.

The results of the cross-tabulations of expressed preference by VPI and policy model high points (Tables 12 and 13) were congruent with the discriminant analyses. However, a higher percentage of cases were matched between expressed preference and ranked high point or expressed preference and rated high point (Tables 14 and 15). Rated high points appeared to be most closely related to expressed preferences.

Table 10. Summary of classification results -- Expressed preference predicted from VPI-RIASEC scale scores

Actual Group	# of Cases	R	I	A	S	E	C	% Correct
R	7	6	0	0	0	1	0	85.7
I	24	4	14	2	1	2	1	58.3
A	6	0	0	5	0	0	1	83.3
S	17	0	2	3	10	1	1	58.8
E	28	1	1	4	4	10	8	35.7
C	8	1	1	0	1	0	5	62.5

Percent of "grouped" cases correctly classified: 55.6%

Table 11. Summary of classification results -- Expressed preference predicted from policy models

Actual Group	# of Cases	Predicted Group Membership R	I	A	S	E	C	% Correct
R	7	5	1	0	0	1	0	71.4
I	24	2	17	1	0	2	2	70.8
A	6	0	0	6	0	0	0	100.0
S	17	0	0	1	13	1	2	76.5
E	28	0	1	3	3	19	2	67.9
C	8	1	0	0	1	0	6	75.0

Percent of "grouped" cases correctly classified: 73.3%

Table 12. Crosstabulation of expressed preference by VPI high point

Expressed Preference	# of Cases	VPI High Point R	I	A	S	E	C	% Matches
R	7	6	0	0	0	1	0	85.7
I	24	6	12	2	1	2	1	50.0
A	6	0	0	6	0	0	0	100.0
S	17	0	2	3	10	1	1	58.8
E	28	2	0	4	3	11	8	39.3
C	8	1	1	0	1	0	5	62.5

Percent of cases with matching high point codes: 55.6%

Table 13. Crosstabulation of expressed preference by policy model high point

Expressed Preference	# of Cases	Policy Model High Point R	I	A	S	E	C	% Correct
R	7	5	1	0	0	1	0	71.4
I	24	1	16	3	2	0	2	66.7
A	6	0	0	6	0	0	0	100.0
S	17	0	0	0	14	2	1	82.4
E	28	1	1	3	1	19	3	67.9
C	8	2	0	0	1	0	5	62.5

Percent of cases with matching high point codes: 72.2%

Table 14. Crosstabulation of expressed preference by ranked high point

Expressed Preference	# of Cases	Ranking High Point R	I	A	S	E	C	% Matches
R	7	5	1	0	1	0	0	71.4
I	24	2	19	1	1	1	0	79.2
A	6	0	0	6	0	0	0	100.0
S	17	1	0	0	16	0	0	94.1
E	28	3	0	3	1	19	2	67.9
C	8	2	1	0	1	0	4	50.0

Percent of cases with matching high point codes: 76.7%

Table 15. Crosstabulation of expressed preference by rated high point

Expressed Preference	# of Cases	Rating High Point R	I	A	S	E	C	% Matches
R	7	5	1	0	1	0	0	71.4
I	24	1	20	1	1	1	0	83.3
A	6	0	0	6	0	0	0	100.0
S	17	1	0	0	16	0	0	94.1
E	28	3	0	3	1	19	2	67.9
C	8	2	1	0	1	0	4	50.0

Percent of cases with matching high point codes: 77.8%

Hypothesis 3

Those low in vocational identity were expected to rate flat vocational environment profiles higher than persons high in vocational identity. Results of Student's *t* test are reported in Table 16. The *t*-value, -1.99, was statistically significant ($p < .05$), supporting the hypothesis.

Table 16. Student's *t*

Group	# of Cases	Mean	Standard Deviation	*t* value	d.f.	*p*
High Identity	24	4.20	1.04	-1.99	43	.03
Low Identity	21	4.84	1.15			

Hypothesis 4

The correlation between vocational identity scores and policy model $\underline{R}^2$ was .23 ($\underline{p} < .05$, df=89). This indicates that the higher people are in vocational identity, the more consistent are their judgments of the attractiveness of the Vocational Environment Profiles.

Hypothesis 5

Table 17 supports the hypothesis that convergence among measures of vocational preference is differentially related to high and low vocational identity. Convergence also varies according to occupational uncertainty. In all instances (except the relationship between expressed preference and VPI high point) individuals with low vocational identity were less accurately classified according to expressed preference by the various high points than persons high in vocational identity. Similarly, individuals who answered "true" to OU_2 were less accurately classified than those who answered "false".

Other Analyses

Relationships between the various measures of differentiation are shown in Table 18. The strongest between-instrument relationships were between differentiation scores derived from policy models and scores derived from ratings.

A list and description of the variables used in this study is provided in Table 19. Table 20 is an intercorrelation matrix of all variables in this study. Of the five variables predicted to be

interrelated -- variety of occupational interests, vocational identity, OAQ, OU_2, and confidence in choice of major -- statistically significant correlations were observed among all five.

Regression analyses indicated that at least 33% of the variance in six different variables could be explained by five-variable models (Table 21). For example, over half of the variance (55%) in vocational identity was attributable to confidence in major, OU_1, OU_2, the reliability of responses to the vocational environment profiles, and the variety of expressed occupational preferences. Cross-validation (Table 22) resulted in no shrinkage in the prediction of OAQ scores, and the greatest shrinkage for the model predicting confidence in major.

Table 17. Summary of crosstabulations of expressed preference by VPI, policy model, ranked and rated high points, as moderated by level of vocational identity and occupational uncertainty

High-Point Measure	% cases with matching high points			
	Low Identity (N-21)	High Identity (N=24)	OU_2=True (N=54)	OU_2=False (N=36)
VPI	67%	50%	52%	58%
Policy Model	86%	92%	67%	81%
Ranked	86%	88%	74%	81%
Rated	86%	92%	74%	83%

Table 18. Intercorrelation matrix of measures of differentiation (N=90)

	VPI_{hl}	VPI_{hh}	PM_{hl}	PM_{hh}	$RATE_{hl}$	$RATE_{hh}$
VPI_{hl}	-	.52**	.13	.22*	-.09	-.02
VPI_{hh}			.07	.27**	-.01	.28**
PM_{hl}				.52**	.46**	.37**
PM_{hh}					.17	.47**
$RATE_{hl}$						.20*
$RATE_{hh}$						-

Table 19. Delineation of variables used in study

Variable	Description
OU_1	Occupational Uncertainty question #1: I'm not really interested in anything.
OU_2	Occupational Uncertainty question #2: I'm more certain of occupations I don't want than what I do want.
OU_3	Occupational Uncertainty question #3: I haven't thought much about what occupation I might prefer.
$DIF\text{-}VPI_{hl}$	Differentiation score: The absolute value of the difference between VPI's highest and lowest scale scores.
$DIF\text{-}VPI_{hh}$	Differentiation score: The absolute value of the difference between VPI's two highest scale scores.
$DIF\text{-}PM_{hl}$	Differentiation score: The absolute value of the difference between policy model's highest and lowest beta weights.
$DIF\text{-}PM_{hh}$	Differentiation score: The absolute value of the difference between policy model's two highest beta weights.
$DIF\text{-}RATE_{hl}$	Differentiation score: The absolute value of the difference between the highest and lowest rating.
$DIF\text{-}RATE_{hh}$	Differentiation score: The absolute value of the difference between the two highest ratings.
RATE-TIE	Number of high points in subject's rated dimensions.
r	Test-retest reliability for policy model.
R^2	The proportion of variance in ratings of hypothetical occupational profiles explained by the six occupational dimensions (RIASEC).
$BETA_{pos}$	Number of statistically significant positive beta weights in policy model.
$BETA_{neg}$	Number of statistically significant negative beta weights in policy model.
$BETA_{non}$	Number of non-significant beta weights in policy model.

Table 19. (continued)

Variable	Description
CONFIDENCE	Confidence in major: On a scale of 1 to 7, to what degree are you confident your choice of major was the right choice for you?
IDENTITY	Score ranging from 1-18 on Vocational Identity scale from My Vocational Situation.
OAQ	Score ranging from 1-4 on Occupational Alternatives Questionnaire.
VARIETY	Variety of expressed occupational interests.
AGE	Subject's age.
YEAR	Subject's year in college.

Table 20. Intercorrelation matrix of 21 variables

	OU_1	OU_2	OU_3	DIF-VPI_{hl}	DIF-VPI_{hh}	DIF-PM_{hl}	DIF-PM_{hh}	DIF-$RATE_{hl}$	DIF-$RATE_{hh}$	RATE-TIE
OU_1	-	.20*	.36**	-.06	.04	.19*	.16*	.13	.28**	-.11
OU_2		-	.10	-.17*	-.04	.00	-.35**	.14	-.12	.07
OU_3			-	-.20*	-.08	.10	-.09	.19*	.15	-.05
DIF-VPI_{hl}				-	.52**	.13	.22*	-.09	-.02	-.03
DIF-VPI_{hh}					-	.07	.27**	-.01	.28**	-.15
DIF-PM_{hl}						-	.52**	.46**	.37**	-.02
DIF-PM_{hh}							-	.17	.47**	-.10
DIF-$RATE_{hl}$								-	.20*	.04
DIF-$RATE_{hh}$									-	-.50**
RATE-TIE										-
r										
R^2										
$BETA_{pos}$										
$BETA_{neg}$										
$BETA_{non}$										
CONFIDENCE										
IDENTITY										
OAQ										
VARIETY										
AGE										
YEAR										

*$p < .05$.

**$p < .01$.

r	R^2	$BETA_{pos}$	$BETA_{neg}$	$BETA_{non}$	CONFIDENCE	IDENTITY	OAQ	VARIETY	AGE	YEAR
.15	.08	-.07	.10	-.01	-.18*	-.35*	.18*	.34**	-.02	.00
-.09	-.16	.13	.24*	-.28**	-.21*	-.45**	.30**	.23*	-.18*	-.23*
.25**	.16	.09	.16	-.18*	-.18*	-.20*	.09	.27**	-.04	-.05
.13	.17	.00	.02	-.01	-.08	.03	-.04	-.18*	.02	.02
.13	.16	-.13	-.04	.13	-.11	.06	-.04	-.16	.01	.15
.35**	.72**	-.32**	.44**	-.04	.04	.15	-.05	.04	.28**	.21*
.14	.39**	-.57**	-.07	.50**	.10	.22*	-.19*	-.20*	.19*	.24*
.07	.19*	-.21*	.40**	-.11	-.01	.02	.03	.15	.06	.15
.28**	.31**	-.26**	.07	.16	.22*	.31**	-.24*	-.14	.19*	.17
-.11	-.04	.05	-.02	-.04	-.25**	-.26**	.13	.10	-.12	-.15
-	.49**	.08	.11	-.13	.14	.28**	-.04	.1277	.28**	.16
	-	.06	.25**	-.20*	.06	.23*	-.10	.08	.25**	.26**
		-	-.06	-.74**	-.01	-.03	.07	.10	-.12	-.18*
			-	-.62**	-.05	-.06	.10	.12	-.02	-.13
				-	.04	.07	-.11	-.15	.10	.23
					-	.56**	-.41**	-.25**	-.08	.17
						-	-.37**	-.38**	.19*	.15
							-	.47**	.02	-.10
								-	.19*	-.03
									-	.28**
										-

Table 21. Six models and $\underline{R}^2$s derived from regression analyses ($\underline{N}$=90)

Dependent Variable	Predictors by order of utility in the stepwise regression analyses and direction of associated beta weight 1	2	3	4	5	$\underline{R}^2$
OU_1	OU_3(+)	IDENTITY(-)	DIF-PM_{hh}(+)	VARIETY(+)	OU_2(+)	.33
OU_2	IDENTITY(-)	DIF-PM_{hh}(-)	DIF-PM_{h1}(+)	R^2(-)	YEAR(-)	.36
IDENTITY	CONFIDENCE (+)	OU_2(-)	OU_1(-)	r(+)	VARIETY(-)	.55
CONFIDENCE	IDENTITY(+)	OAQ(-)	AGE(-)	DIF-VPI_{hh}(-)	YEAR(+)	.43
OAQ	VARIETY(+)	CONFIDENCE(-)	OU_2(+)	DIF-$RATE_{hh}$(-)	OU_3(-)	.35
VARIETY	OAQ(+)	OU_1(+)	AGE(+)	DIF-PM_{hh}(-)	IDENTITY(-)	.39

Table 22. Cross-validation results from six regression analyses presented in Table 21

Dependent Variable	R^2 (N=90)	R^2_D (N=45)	R^2_{HO} (N=45)	Shrinkage $R^2_D - R^2_{HO}$
OU_1	.33	.39	.29	.10
OU_2	.36	.35	.38	.03
IDENTITY	.55	.62	.51	.11
CONFIDENCE	.43	.37	.50	.13
OAQ	.35	.35	.35	.00
VARIETY	.39	.46	.33	.13

DISCUSSION

Convergence among Measures of Vocational Preference

Five indices of vocational preference were used in this study:

1. Vocational Preference Inventory. An inference was made regarding personality type from a person's occupational interests. Persons were assigned "high point codes" reflecting membership in one of six personality categories.

2. Policy model. By performing a multiple regression analysis on each person's judgments of hypothetical vocational environments, a determination was made of the role each of six vocational dimensions played in those judgments. Standardized beta weights were used as objective measures of the weight of each dimension. The largest positive beta weight was termed a person's high point and reflected a preference for one of Holland's six vocational environments.

3. Ranked dimensions. The vocational dimensions represented in the hypothetical vocational environments were placed in rank order from the dimension the individual would most like to have included in his occupation to the dimension he would least like. The dimension "most liked" was referred to as the ranked high point and indicated a subjective preference for a particular vocational environment.

4. Rated dimensions. The same six dimensions were rated on a 21-point scale according to whether the individual definitely wanted

the dimension or not in his occupation. This was a second subjective indicator of vocational environment preference (rated high point).

5. Expressed vocational preference. A direct expression of vocational preference was derived from responses to the OAQ. This represented a subjective measure of preference for a particular type of vocation and was coded, as were the other measures, according to the Holland typology.

Because the reliability and validity of the VPI in assessing vocational preference has been established, the results of the other measures were compared with the VPI. In the first set of discriminant analyses, the VPI high point code was treated as the criterion variable. The full policy model (or full set of ranking or ratings) was used to make a single, categorical prediction. According to Borgen and Seling (1978), this method may be preferable to a simple matching of high points such as the cross-tabulations. In a counseling situation, the user would attend to the full range of scores, not only the one high point. A comparison of the two types of analyses -- cross-tabulations and discriminant analyses -- indicated that the classification of one type of analysis was highly predictable from the results of the other. The results of the two types of analyses were consistent, although the cross-tabulations produced a slightly lower percentage of "hits".

The three measures of preference as indicated by preference for vocational dimensions (policy model high point, ranked high point, rated high point) converged to a greater degree with each other than with the VPI high point. High points derived from policy models,

rankings and ratings were sufficiently similar that the high point derived from one measure could accurately predict the high point from another at least 80% of the time. The relationships between the VPI and the other measures of vocational preference used in this study were clearly positive. However, enough differences existed to make an estimation of VPI responses from the other measures highly questionable. This should not be surprising since the first three directly measure preference for a vocational environment, a preference which is inferred from the VPI personality classification.

Expressed preference was the criterion variable for the second set of discriminant analyses and cross-tabulations. Although there has been a long-standing prejudice against the utility of expressed preferences, published studies have shown expressed vocational preferences to be at least equivalent and often superior to inventoried measures of vocational preferences in predicting ultimate employment (e.g., Borgen & Seling, 1978; Dolliver, 1969; Gottfredson & Holland, 1975; Holland & Lutz, 1968). The goal of these analyses was to determine the best predictor of expressed preference. The results from the discriminant analyses were again consistent with the cross-tabulations: expressed preference could be accurately predicted from the VPI about 56% of the time. This is comparable to the results of a study by Gade and Soliah (1975) who found approximately a 50% agreement between VPI high point and expressed preference. Correct classification of expressed preference from policy models increased nearly 100% relative to the VPI. Classification results were even more accurate when expressed

preference was classified according to rated high point. The procedure used to assign high point codes based on ratings attenuated the match between rated high points and expressed preferences. In nine cases where the rated high point did not match the expressed preference, an occupational dimension rating which tied with the rated high point did match expressed preference.

Matching expressed preference with rated high points essentially constitutes a match between two self-reports, two subjective measures of preference. Slaney (1978) also found a subjective measure of vocational preference superior to an inventoried measure in predicting expressed preference. In Slaney's study, subjects were given a card sort task, including descriptions of the six Holland personality types. As part of the card sort, subjects ranked descriptions of the six Holland personality types in the order in which they were self-descriptive. The card sort was found to be a significantly better predictor of expressed preferences than was the SCII. However, the 58% hit rate for the card sort was only slightly higher than the VPI in the present study, and a hit rate far below the rating and ranking procedures used in the present study.

Ratings and rankings were both, essentially, forms of expressed preferences indicating a preference for vocational dimensions rather than specific vocations. It may not be surprising that one form of expressed preference (rating, ranking) is highly predictive of another form (expressed occupational preference). It is, perhaps, more notable

that an inventoried measure of preference for vocational dimensions (policy models) was equally predictive of expressed occupational preference, and there was a high degree of convergence among weights derived from policy models, ratings and rankings. Cochran (1983) found that subjective values of occupational preference were only weakly related to derived, objective, values. In fact, for the majority of cases in his study, there was no relationship between subjective and objective weights. However, the task required of Cochran's subjects was more complex than the present study, utilizing ten cues instead of six in the decision task.

While the psychological literature at one time supported the superiority of inventoried preferences over expressed preferences, more recently researchers have demonstrated the usefulness and accuracy of the self-report. The decision theory literature is divided on the usefulness and accuracy of subjective indications of people's judgments. Cook and Stewart (1975) suggested that the nature of the task -- whether it is meaningful and realistic -- may affect the usefulness of subjective weights. They also suggested that the use of a large number of cues might influence differences between objective and subjective methods. The less familiar the judge is with the prediction task and the more complex the task, the less one might expect convergence between subjective and objective weights. Sidowski and Anderson (1967) implied the task may influence the validity of the policy model (the objectively derived weights).

On the other hand, it has been suggested that a particular decision model may be valid for one type of subject, but not another (Huber et al., 1971). Future research may suggest a greater convergence between objective and subjective weights for certain Holland personality types. For example, Holland, Gottfredson, and Power (1980) suggested that some personality types are more consistent than others. This is shown in the present study in the results of the discriminant analyses and the high-point cross-tabulations. The "hit rate" for classifying Holland categories from the various measures is not constant across typologies.[2]

The results of the present study clearly support the hypothesis that substantial positive relationships exist between different measures of vocational preference incorporating Holland's vocational typology. Further support for convergence among measures is found in the table of intercorrelations between differentiation measures. Differentiation as measured by one instrument was related to differentiation measured by another. The closest inter-measure relationships were between policy models and ratings.

It is plausible that the high degree of convergence among the five measures of vocational preference was due (at least in part) to the use of a single method. The vocational preference measures were all paper-and-pencil tasks. Although based on a common method,

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[2]The comparison of matches in each RIASEC group from one table to another can be misleading because of differences in base rate membership among the groups.

the tasks required were very different (e.g. rating hypothetical profiles, completing personality inventory, ranking vocational dimensions). Practically speaking, the only way to assess a person's preference is to ask in some way. Therefore, the construct examined in this study, vocational preference, lends itself only to some form of written or verbal measure.

Correlates of Vocational Decidedness

The present study supports the hypothesis that there will be greater convergence among measures of vocational preference for people high in vocational decidedness than for people low in vocational decidedness. "Decidedness" was defined by measures of vocational identity and occupational uncertainty. A higher degree of vocational identity implies a crystallized set of goals and interests, self-knowledge of talents and abilities. This would enable a person to respond more coherently, more consistently, to a variety of different measures.

The concept of "decidedness" may be indexed by, or at least associated with, other concepts in the vocational behavior literature. Seemingly, both strength of preference and clarity of preference would be related to decidedness. Individuals who are decided in their vocational preference would logically feel a substantial degree of conviction over their preference. Furthermore, while they may be unclear on their preference for a particular job (e.g., newspaper reporter) within a vocational type (e.g., Investigative), they may be certain of their preference for the general vocational type itself. It might also be hypothesized

that the strength of decidedness is associated with the band-width of acceptable jobs within a vocation. That is, highly decided individuals may have narrowed their preferences down to a few jobs, moderately decided individuals may have narrowed their preferences to a vocation, while undecided individuals have not been able to formulate any clear preferences.

A number of studies have searched for correlates of some form of vocational decidedness. Table 20 describes the correlates of vocational identity and occupational uncertainty found in the present study.

At least 50% of the variation in vocational identity can be described by five variables (Table 22). Persons low in vocational identity tend to have less confidence in their majors, have less reliable responses to the vocational environment profiles, are more sure of which occupations they don't want than what they do want, and express a larger variety of occupational preferences. In general, it appears that people higher in vocational identity are more predictable than those low in vocational identity.

More than one-third of the variation in OU_2 is explained by five variables. Persons who express occupational uncertainty are characterized by lower vocational identity, a lower degree of differentiation, fewer years of education, and less consistent responses to the vocational environment profiles (lower R^2s). Inspection of the correlation matrix in Table 20 indicates no relationship between DIF-PM_{hl} and OU_2. However, in the regression equation, DIF-PM_{hl} acts as a suppressor variable, being uncorrelated with occupational uncertainty yet enhancing its prediction.

The present study provided limited support for the assumption that differentiation is related to vocational "decidedness". When Holland's definition of differentiation was used, there was no relationship. This definition of high differentiation, a large range between extreme VPI scale scores, does not negate the possibility of two or more scales tied for the high point code. When $DIF\text{-}PM_{hh}$ and $DIF\text{-}RATE_{hh}$ were used to define differentiation variables, differentiation was related to the number of positive beta weights in the policy model, the size of the policy model's R^2, and vocational identity (Table 20). People described as highly differentiated (a single beta weight or rating much higher than any other) were likely to have fewer positive beta weights in their policy models, reflecting a preference for fewer vocational dimensions. They also tended to have higher R^2s, reflecting more consistent judgments. Higher differentiation was also associated with higher vocational identity. Presumably persons who prefer one vocational dimension over the other five have a clearer sense of their goals, interests and talents; and are more predictable in their responses to a measure of vocational preference. These results conflict with findings from previous studies which found no relationship between vocational decidedness and differentiation. However, the previous studies used $DIF\text{-}VPI_{hl}$ to define the differentiation variable.

Another analysis suggested a link between vocational identity and differentiation. Persons with low vocational identity expressed a greater preference than persons with high vocational identity for the flat (undifferentiated) vocational environment profiles. One explanation

for this result is that persons who are low in vocational identity, who do not have a clear picture of their goals or interests, are more attracted to "noncommittal" profiles, profiles which allow them to "keep their eggs in more than one basket".

Relationships were found between vocational identity and a number of other variables used in this study. The fact that more than 50% of the variation in vocational identity could be described by five variables is particularly noteworthy. These findings provide strong support for the construct validity of vocational identity.

CONCLUSIONS

Much of the research on vocational preference and choice has focused on the proper match between people and jobs. People have been classified through assessment of personality, abilities and values, and are then compared to persons who are already in various occupations. The abilities, traits, or interests of people already in an occupation are used to guide others into the appropriate occupation. The goal is to match parallel environments and persons.

A different approach is to focus on the choice process itself. The emphasis in this case is on how an individual uses information about particular occupations in order to make a choice. How do people choose their occupations?

The present study was an effort to integrate these two approaches. Policy models were a manifestation of that integration. Holland's theory of vocational behavior was used as the framework for the decision-theoretic methodology. Ratings and rankings were used as subjective measures of an individual's choice process.

Dolliver (1969) promoted the development and use of measures of expressed preferences. Similarly, Noeth and Jepsen (1981) advised developing self-report items based on Holland's high-point-code system. The SDS represents one vocational preference inventory which has incorporated self-reports. Rating vocational dimensions as in this study illustrates a measure of expressed preferences developed from Holland's vocational typology. A brief self-report measure such as this is quick to administer and easy to interpret. Studies have

indicated that even simple, direct questions elicit expressions of vocational preference which have predictive validity. Because the dimensions rated are based on Holland's high point code, it can be easily related to occupations categorized according to Holland's typology. Work environment dimension ratings can be used to construct occupational alternatives. Thousands of occupations have been catalogued into three-letter subgroups according to the three RIASEC categories which best describe them. Accordingly, the three highest rated dimensions can be translated into specific occupations. Those occupations can be viewed as viable alternatives to be assessed by the individual. The Dictionary of Occupational Titles (DOT; U.S. Department of Labor, 1977) can be used to collect information relevant to the occupations and the skills required to attain them. This "occupation preview" is analogous to a job preview. Porter and Steers (1973) suggested that a job preview (information about what a job is really like) provides more realistic expectations and therefore facilitates a rational decision process. A number of studies show that people often become less satisfied with their chosen occupation after they have entered it (e.g., Vroom & Deci, 1971; Lawler, Kuleck, & Rhode, 1975). If persons obtain more accurate information about what occupations are really like, they will be able to make more informed and (hopefully) more satisfactory choices.

Noeth and Jepsen (1981) also advocated consideration of vocational behavior criteria other than ultimate choice. Choice may not necessarily

be the proper criterion to assess the best occupational alternative for an individual. Convergence between preference and choice may not necessarily be appropriate (Betz, 1977; Salomone & McKenna, 1982; Super & Hall, 1978). Convergence among a variety of vocational preference measures may be a more appropriate vocational behavior criterion. A "good" decision may be defined as one which leads to a satisfactory outcome for the individual making that decision. Evidence suggests that congruence is conducive to satisfaction (Brown, 1968; Holland, 1968; Mount & Muchinsky, 1978; Walsh, Howard, O'Brien, Santa-Maria, & Edmondson, 1973). If results of measures are inconsistent, a counselor may help to clarify one's goals and interests as well as assess talents and abilities. The ratings, themselves, provide a means for organizing and integrating a large amount of vocational information. The process of working through this preference measure, assigning values to occupational dimensions, may help to crystallize occupational values for persons vocationally undecided, or increase commitment for those already decided. Crystallization of values and preferences should enhance vocational identity and convergence among preference measures, ultimately leading to more satisfactory vocational choices.

It is possible that some persons may be unable to respond to questions about specific occupational preferences. But if those people are presented with components of occupations, they may be able to express preferences. The notion of having people evaluate components of jobs (instead of extant jobs or occupations) in vocational preference is analogous to two other well-developed bodies of research in

industrial/organizational psychology. The first comes from the area of personnel selection, and is reflected by the technique of synthetic validation. This technique directly addresses the multidimensionality of the work environment. In the synthetic validation process, overall job performance is broken down into constituent components. Selection tests are identified which correlate with success in each of these components. The components are then reconstituted in proportion to their representation in defining total job performance. Thus, in the synthetic validity paradigm people are hired based upon their predicted performance in selected job components, as opposed to the traditional method of forecasting overall job performance (Lawshe,1952; Guion, 1965).

The second body of research that has found utility in decomposing jobs into components is the recent research on job enrichment, one approach to job design. In the pursuit of identifying what constitutes "meaningful", intrinsically rewarding, and stimulating work, psychologists have revealed the existence of certain key job attributes which seemingly comprise enriched work. Proponents of the Job Characteristics model of enriched work (Hackman & Oldham, 1976) have identified five such attributes: skill variety; task identity; task significance; autonomy; and task feedback. These attributes are hypothesized to be the critical components of "meaningful" work. In trying to design or redesign jobs to be stimulating and rewarding to incumbents, researchers (e.g., Aldag & Brief, 1979) have proposed structuring work in such a way as to possess high degrees of these desirable attributes. In other words, jobs may be redesigned to envelop such job components. This presumably

affords a better match between employee needs and work attributes. Similar to the synthetic validity paradigm, current research and theory in job enrichment advocates using selected job components (as opposed to total jobs) as the nucleus for improving the quality of work life.

It is this paradigmatic shift toward decomposing overall jobs into components, attributes, or dimensions that may also prove useful in the area of vocational selection. If having individuals evaluate (total) jobs produces potential problems of social desirability or sex bias in job titles, and/or unfamiliarity with certain jobs, it may be prudent to use a decompositional approach. The RIASEC categories could provide a theoretical basis for describing "types" of work (e.g., artistic) to which individuals could indicate a degree of preference, as opposed to the methodology of such instruments as the VPI which require individuals to evaluate complete occupations (e.g., interior decorator).

Work content to be performed, the qualifications required to perform it, and returns and rewards for performing it constitute the work environment components described by the Holland classification scheme. Occupations are viewed as consisting of the job components in different combinations and to different degrees. Job design is concerned with alternative arrangements of those components of the work environment. Employee selection is concerned with the proper match between work content and worker qualifications. Vocational counseling, employee selection, and job design all play an integral role in the process of matching individual needs, objectives and goals with work requirements and rewards. The decompositional approach to decision making has established utility in

other areas of industrial/organizational psychology, and may be of value in the area of vocational development.

One-third of the subjects in the present study indicated they were more certain of occupations they didn't want than what they did want. This indicates that even though people may not have clear preferences, they may have clear dislikes. In such a case, no job dimension would be likely to receive a high positive rating, and Holland's model could be worked backwards. Occupations representing disliked dimensions could be eliminated from consideration and occupations representing dimensions least related to disliked dimensions could be explored.

If a person responds with several high ratings, a counselor can determine which type of vocation is most suitable for the person, matching abilities and opportunities. A counselor can also determine which combination of high ratings is most likely to be found in the world of work.

Holland has frequently voiced the opinion that not all clients for vocational counseling need the same treatment. Interest inventories need not be a routine component of the counseling process. "It seems unwise to continue to believe that interest inventories are always needed in the sense that one always needs a yearly physical examination" (Holland & Lutz, 1968, p. 434). The results of the present study suggest that the Vocational Identity scale can be used to assess the merits of alternate treatments. The subjective measures developed for the present study may be viable supplements to, or alternatives for,

inventories now used with vocational counseling. The degree of agreement between expressed preference and the measures of preference developed for this study meets or exceeds the convergence among measures reported in the literature to date. In addition, the links they provide with other measures of vocational preference make them valuable tools for further research on vocational behavior.

SUGGESTIONS FOR FUTURE RESEARCH

Borgen and Seling (1978) noted that it is the persons without defined vocational preferences who most frequently seek counseling. They asserted that expressed preferences may have little relevance for those without developed preferences. It appears likely that persons unable to specify a preferred occupation would be able to meaningfully rate or rank preferences for occupational components. Inventoried preferences have been said to work best when needed least (Campbell, 1971). It is possible that methods utilizing expressed preferences for attributes of the work environment can provide a better means for helping those who need it most. However, research is needed on the predictive validity of this measure of expressed vocational preference.

Results from all measures of vocational preference may differ from one point in time to another. Presumably, as a person's interests crystallize and preferences stabilize, congruence between measures will increase. Longitudinal research is needed to determine which measure of vocational preference is most stable: a measure of preference for an occupation or a measure of preference for occupational components.

Previous results indicated that scores on the Vocational Identity scale are related to personality type (Holland, Gottfredson, & Power, 1980). Walsh (1974) found person-environment congruence related to personality type. Results of the present study suggested that

convergence among occupational preference measures may be related to type of occupational preference. Further research is suggested to explore these relationships.

According to Holland's theory of careers, people seek work environments which match their personal orientations. Using self-reports seems to be an efficient means of verifying this assumption. Self-report data have been gaining credibility in psychology (Holland, 1974; Tyler, 1973). Mischel (1977) has argued that people are the best experts on themselves. The rating and ranking tasks used in the present study are clearly relevant for expressions of vocational preference. Slaney (1978) found that Holland's descriptions of RIASEC personal orientations could be reliably rank-ordered in terms of how self-descriptive subjects found them. Finding both measures to yield similar results -- rating vocational preferences and rating personal orientations -- would provide further support for Holland's theory.

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APPENDIX

Table A1. Crosstabulation of VPI high point by policy model high point

VPI High Point	# of Cases	Policy Model High Point						% Matches
		R	I	A	S	E	C	
R	15	5	7	0	0	3	0	33.3
I	15	0	9	2	2	0	2	60.0
A	15	2	0	9	3	1	0	60.0
S	15	0	0	0	10	2	3	66.7
E	15	1	2	1	1	9	1	60.0
C	15	1	0	0	2	7	5	33.3

Percent of cases with matching high point codes: 52.2%

Table A2. Crosstabulation of VPI high point by ranked high point

VPI High Point	# of Cases	Ranking High Point R	I	A	S	E	C	% Matches
R	15	7	6	0	9	2	0	46.7
I	15	0	11	0	2	1	1	73.3
A	15	2	1	8	3	1	0	53.3
S	15	0	0	1	11	2	1	73.3
E	15	1	1	1	3	9	0	60.0
C	15	3	2	0	1	5	4	26.7

Percent of cases with matching high point codes: 55.6%

Table A3. Crosstabulation of VPI high point by rated high point

VPI High Point	# of Cases	Rating High Point R	I	A	S	E	C	% Matches
R	15	6	7	0	0	2	0	40.0
I	15	0	11	0	2	1	1	73.3
A	15	2	1	8	3	1	0	53.3
S	15	0	0	1	11	2	1	73.3
E	15	1	1	1	3	9	0	60.0
C	15	3	2	0	1	5	4	26.7

Percent of cases with matching high point codes: 54.4%

Table A4. Crosstabulation of ranked high point by policy model high point

Ranking High Point	# of Cases	Policy Model High Point						% Matches
		R	I	A	S	E	C	
R	13	8	2	0	0	3	0	61.5
I	21	0	16	3	1	0	1	76.2
A	10	0	0	9	0	0	1	90.0
S	20	1	0	0	17	1	1	85.0
E	20	0	0	0	0	18	2	90.0
C	6	0	0	0	0	0	6	100.0

Percent of cases with matching high point codes: 82.2%

Table A5. Crosstabulation of rated high point by policy model high point

Rating High Point	# of Cases	Policy Model High Point						% Matches
		R	I	A	S	E	C	
R	12	8	1	0	0	3	0	66.7
I	22	0	17	3	1	0	1	77.3
A	10	0	0	9	0	0	1	90.0
S	20	1	0	0	17	1	1	85.0
E	20	0	0	0	0	18	2	90.0
C	6	0	0	0	0	0	6	100.0

Percent of cases with matching high point codes: 83.3%

Table A6. Crosstabulation of ranked high point by rated high point

Ranking High Point	# of Cases	Rating High Point R	I	A	S	E	C	% Matches
R	13	12	1	0	0	0	0	92.3
I	21	0	21	0	0	0	0	100.0
A	10	0	0	10	0	0	0	100.0
S	20	0	0	0	20	0	0	100.0
E	20	0	0	0	0	20	0	100.0
C	6	0	0	0	0	0	6	100.0

Percent of cases with matching high point codes: 98.9%

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