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THE PREDICTION OF SUCCESS: EDUCATIONAL, OCCUPATIONAL AND  
FINANCIAL

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The Prediction of Success:  
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ABSTRACT

This study examined the influence of intellectual factors, personality dimensions and demographic-attitudinal variables upon educational attainment, occupational status and family income, through an ordinary least squares analyses of variance. Multiple regression equations for each dependent variable were constructed and validated through two-stage least squares analyses. Although 310 subjects completed all instruments, the deletion of subjects who were missing data for occupation and income and education, plus a listwise deletion of subjects for the independent variables resulted in a final N of 232 subjects.

Demographic/attitudinal variables had the most influence upon all three dependent variables. Of the intellectual factors, only verbal ability was predictive of only educational attainment. Personality dimensions were not predictive of any dependent variable.

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THE PREDICTION OF SUCCESS

From a broad metaphysical perspective, psychology may be viewed as "applied" philosophy. Ethics, as a special case of metaphysics, is an important area of investigation for psychologists. Ethical systems to which we subscribe, justify the use of a social and materialistic, rather than an internal state or spiritual definition of "happiness" as a dependent measure. This investigation is limited to the prediction of happiness, defined in social and materialistic terms. This does not deny the importance of spiritual or internal states of happiness, to the contrary, this is an attempt to legitimize the value of empirical investigation of ethical questions per se. Beginning with quantifiable and measureable variables seemed reasonable.

### Success: The Dependent Measure of Happiness

Among the many philosophical questions with which psychologists have been concerned, ethics has been an area of grudging and contemptuous investigation. Nonetheless, it has continued to be an area of importance due to the undeniable urgency of its role in the human "social contract" to which the psychologist is hoped to be a contributing party. What is the good life for Man? The good life for Man has usually implied that Man himself would ultimately be happy and content in the living of the good life. The paths or approaches to this good life of ultimate happiness and contentment may be extremely variant. Just as the Gautama Buddha believed that there were many paths to Enlightenment, there may be many ways to attain the good life. A dominant belief in Western culture is that happiness and contentment may be attained through being economically "successful" in life. This is true because academic disciplines which have investigated these issues use occupational and financial success as criteria and because some religious and ethical systems throughout history define the determinants of happiness economically or by social prestige.

According to theory, individual differences in intrinsic motivation or the underlying drive for competence may be the difference between successful and unsuccessful

goal reaching behavior or between "winners" and "losers", between the "good" life or the "bad" life for Man. The notions of success, competence and motivation cannot be studied in isolation. In order to make sense, they have to be studied in terms of some situation. For example, in terms of occupational success, the term success alone has little meaning. Competence or success must be studied within the framework of a situation lest it become meaningless. The widespread notion that the good life for Man is imbedded within his occupation has its roots in philosophy and religion. The underlying nexus of happiness and contentment stemming from satisfaction from a fulfilling life's work is supported by ethical systems.

The contemporary Christian view of work has its roots in the long tradition of the Hebrews. The Hebrews viewed work as a means of atoning for the original sin of man. Work is hard and necessary and represented a noble attempt by Man to restore the fundamental God-man harmony that resulted from creation. The work of Man and the work of God represented parallel efforts to develop the justice and happiness of the Kingdom of God on earth. Both intellectual contemplation and the manual labor of the common man were dignified and worthwhile in the Hebrew tradition (Zaccaria, 1970).

The Catholics, in contrast with the Hebrews, viewed work as an acceptable means to an end rather than an

activity which had intrinsic worth and dignity. Throughout the medieval period it was not life on earth that represented the major focus of the Christian, but life after death.

The Protestant Reformation gave a new emphasis to work. Work in a secular setting was viewed by the Protestants as equal to work done in a religious setting. For them, work came to be seen as an essential way of carrying out God's purpose in an individual's life. The primary purpose of work was the accumulation of material wealth which should be used to proselytize and establish religion. Thus, work must be used for self-advancement in order to further the interest of the Kingdom of God, and work became a religious duty. The earning of money, combined with the strict avoidance of all spontaneous enjoyment of life; restless continuous, systematic work in a worldly calling were seen as the highest means to religious asceticism. At the same time, the consequences of these behaviors --- financial success, were taken as the surest and most evident proof of rebirth and genuine faith. Furthermore, the unequal distribution of wealth was the sign of a special dispensation of Divine Providence, or state of grace, for the rich (Weber, 1958, pp. 39, 54, 172-178).

During the Nineteenth Century, work became universally accepted in Western civilization as the major source of society's progress. Similar traditional views emerged from

both Catholic and Protestant theologians. Moynihan (1964) identifies this point of view as Christian Humanism. Essentially, the ideal Man is one who balances his spiritual life with his secular life. The good life is one which synthesizes religious beliefs and virtuous work. Through work, Man may transform the world, perfect it, humanize it, and thereby extend and complete God's creation. Work represented one way the human personality could seek to discover and to unfold the image of God within himself. Thus, the worker who was Christian, dedicated his work to God and used his career to earn a living and to build a better Christian world. In doing so, he lived the good life for Man and earned happiness and contentment, and considered himself a success (Zaccaria, 1970, p. 14).

Thus, it has come to pass that an individual will often be judged to be successful or unsuccessful in the arena of life on the basis of his or her occupational status, and/or financial success. The corollary notion developed that in order to be happy, an individual must find a job that has a great deal of prestige or financial remuneration.

#### Problems With The Criterion Variable

Ethical systems have justified the use of occupational success as a dependent variable. Although this concept of happiness is more readily quantifiable than the concept of spiritual happiness, it is still not a simple matter. Most

psychologists agree upon their inability to adequately define the criterion variable, success on the job (Anastasi, 1972, 1978; Cronbach, 1968; Ginzberg & Herma, 1964; Matarazzo, 1978; Thorndike & Hagen, 1959; Willerman, 1979). Is success on the job to be defined by one's immediate supervisor, or the employee's productivity, or by his annual income? Supervisor ratings have notoriously low inter-rater reliability. Productivity is not a useful measure across occupations. Productivity may have meaning for measuring the success of sales personnel but is completely inadequate for measurement of success for a teacher or a preacher. Annual income is also a poor criterion. For example, it would be difficult to rate Albert Schweitzer practicing medicine in the jungle as a success by most of the given criteria.

Another problem in defining the criterion variable for success is that of inter-job reliability within the same occupation. Attempts to equalize tasks within occupational levels among government workers have been successful only to a small degree (Anastasi, 1972). Solutions for the technical problems of operationalizing inter-task reliability may not be practicable at the present time. For example, even in jobs "for which dependable and objective criterion measures might be developed", such as Medical Technician, Cartographic Technician, and Inventory Management Specialist, the criterion measures were work

samples, a job knowledge test, and supervisory ratings. (Gorham & Messick, 1973, p. i). There was no way to evaluate work output. Although the best measure would have been those based on actual job performance over a designated minimum time period, such indices presented serious practical difficulties. The conditions under which individual workers carry out their job functions may vary so much and introduce excessive error variance into objective output records. In many jobs there are no objective output records and none may be feasible (Anastasi, 1972, pp. 80-81). Thus, although the job title may be similar across situations, the situations may vary so much that the criterion tasks involved within each condition are intrinsically different.

#### Prediction of Job Performance

A basic hypothesis of this investigation is that almost everyone assumes that occupational prestige and income are the perquisites of the more productive and competent of our society. The dearth of empirical studies using job performance as a criterion measure attests to the ludicrousness of such a hypothesis. The bulk of research is given to the prediction of academic success (cf. McClelland, 1973). Similarly, there is a great deal of research concerning preferences, hobbies, interests of job incumbents and the occupational preferences of adolescents (cf. Brown,

1970; Herr, 1970; Sinick, 1970; Zaccaria, 1970; Zytowski, 1970). The following is a review of one attempt to define competence, which illustrates the practical difficulties in the prediction of job performance.

In late 1966, a study was initiated by Campbell, Crooks, Mahoney, and Rock (1973) to investigate the sources of bias in the prediction of job performance. The six-year study was conducted jointly by the Educational Testing Service, the U.S. Civil Service, and was supported by the Ford Foundation. The investigation was limited to three occupations mentioned in the previous section. Although their major purpose was to investigate the fairness of testing practices for minorities, the basic design and methodology, as well as the practical problems the investigators encountered, speak directly to the obstacles of quantifying competence and worthiness.

Anne Anastasi (1972, pp.79-99) presented an initial technical critique of the six-year study, and while she commended the investigators on their tremendous effort and high level of professional competence, she pointed out some major problems of procedure and methodology. First, the problem of using voluntary incumbents in validation studies, although necessary, presents problems of:

(a) restriction of range in job relevant variables because of preselection which lowers validity coefficients of predictors.



(b) volunteer subjects lead to systematic differences between those incumbents who opted to participate and those who did not.

(c) incumbents differ from job applicants in test taking motivation.

(d) possible carryover effects from job experience on both predictor and criterion scores.

Second, the problem of choice of criterion variables in job performance such as:

(a) optimum choice of criterion variable varies with the nature of the job.

(b) criterion measures based upon job performance over designated time (speed and efficiency) are usually not feasible because there are no reliable records or because of the excessive variance in work conditions.

(c) standardized work sample tests require inter-rater reliability as well as standardized job functions which may not be feasible.

(d) job-knowledge tests although appropriate for factual job knowledge can only be a supplement; furthermore they are biased toward intellectual functioning.

(e) ratings as criterion measures are notoriously biased (in fact, this was a major finding of the Campbell, et al. study).

Anastasi concludes by saying:

I can think of few, if any, real-life

situations providing the time, facilities, and technical personnel to permit the kind of test validation represented by this study (1972, pp. 87-88).

### Summary

The identity of occupational prestige or income with competence and worthiness has its roots in our belief in the work ethic. In addition, a review of the literature reveals methodological and practical problems imbedded in the measurement of competence which appear to justify the use of prestige and income as dependent measures of success, competence, and happiness.

It is not difficult to understand the dearth of research using competence as a criterion measure. Nonetheless, it does not negate the importance and the basic logical validity of such a criterion. The fact that predictive studies of success which use status and income as criterion measures are a compromise and are reflections of competence, is more often than not lost in the de facto usage of such research results. The general purpose of this study is an attempt to capture a clearer and more accurate reflection of competence/success through the more precise specification of predictive variables.

### Intellective Vs. Non-Intellective Factors

Just as occupational success as measured by status or annual income has come to be viewed as a criterion variables of success, intelligence scores as measured by standardized tests have come to be viewed as predictor variables of success and therefore synonymous with competence. Either viewpoint can not withstand close scrutiny. Intelligence as a hypothetical construct must be assessed through the observation of intelligent behavior. The ability to avoid problems and the ability to complete tasks efficiently and well, as well as the ability to define words to solve verbal analogies must be considered intelligent behavior. Standardized intelligence tests do not measure the former very well. Nevertheless, standardized tests, especially IQ tests, are for all practical purposes, used as the major basis for economic and social decisions.

### Intelligence: What Is It?

The concept of intelligence has become reified in our society due to our ethical beliefs, our system of dispersal of economic resources and social pressure. Matarazzo (1972) succinctly summarizes this phenomenon:

Intelligence, or intellectual potential, is not regarded by society as a psychological concept. It is in every sense of the word a precious,

tenaciously guarded social concept with vast overtones which will profoundly affect the life of every human being who is assessed for this quality of his behavior (1972, p. 22).

The social consequences alone of the results of an ability assessment has such vast implications that Matarazzo and others like him (Anastasi, 1978; Cronbach, 1968) urge that it never be done in isolation. (Other reasons will be discussed in this section.) Specifically, such an assessment should include an individual's whole personality with a variety of tests. He further stipulates that it requires the free and open cooperation of the client. Matarazzo likens the experience of doing an assessment to the acceptance and conferring of a holy trust upon the psychometrist. He says:

It hopefully is clear to the reader that such global assessment requires a professional psychologist broadly educated and trained in all segments of assessment and not solely trained or specialized in so-called "intelligence testing". He must be first and foremost a high level consultant-clinician. He hopefully will be a broadly educated individual who has been exposed to, and thereby sensitized by teachings relative to mankind's earlier and current cultural and philosophic heritage and values (p. 23).

Matarazzo's credo of ability assessment is the result of over sixty years (ca. 1900 to 1960) of scientific investigation and debate. Modern ability assessment is based upon the belief that ability is composed of intellectual (the mind's ability to do intellectual work) and non-intellectual (e.g. persistence, incentive, attitude) factors. This was a basic conclusion reached as a result of the Spearman vs. Thorndike-Thurstone debate. The most hotly debated issue during this time was whether intelligence was a global or specific ability. A second, less obvious but more important issue was whether or not the ability to do intellectual tasks as measured by intelligence tests, was the only important factor in general intelligence. Ironically, Spearman, who fought tenaciously for the acceptance of intelligence as a global ability, believed that intellectual ability was the only important factor in general intelligence. Spearman viewed "g" as measured by intelligence tests as general (or functional) intelligence (Matarazzo, 1972, pp. 83-84). Thus, he ignored non-intellectual factors such as persistence, incentive, determination, and attitude.

However, most modern psychologists would not agree. It's generally accepted that intelligent behavior is a general ability that is composed of non-intellectual factors as well as intellectual factors. That is, the capacity for social adaptation is another important element of intelligence.

The capacity to avoid problems and the ability to persevere at a task are as important as the ability to define words and perceive analogies.

W.P. Alexander (1935) was among the first to study non-intellective factors. He experimentally tested evidence for and against the Thurstone and Spearman arguments. He wanted to know if test results support the view that "practical" intelligence and verbal intelligence were distinct and independent capacities or whether both types of intelligence were essentially the same in that they were independent but different only with respect to non-intellective (or specific factors). Alexander's results agreed with Spearman in that there was only one common factor. However, this factor was not sufficient to explain the variance between tests. In addition to the common factor, there appeared to be other broad communal factors which formed clusters but were not similar to the common factor. Nor were they similar to Spearman's "s" factors. These clusters of ability (functional unities such as verbal ability) were correlated to each other, which meant they weren't the independent specific abilities of Thurstone. Furthermore, they differed from Spearman's "s" factors because they contributed to the total variance.

Subsequent scientific investigation went on to corroborate and expand Alexander's original findings. Notably, both Guilford and R.B. Cattell have challenged the

concept of a unitary "g" as measured by intelligence tests. Guilford challenged the concept of a unitary "g" by stating that intelligence is made up of 120 or more identifiable and measureable abilities (6 procedures X 5 operations X 4 contents). Cattell challenged Galton's concept of genetically fixed and transmitted intelligence as well as Thurstone's concept of a unitary intelligence. The Cattell-Horn formulation proposes that no matter how many independent abilities are revealed, they will be shown to reflect either largely inherited (fluid) or largely learned (crystallized) group factors. Both fluid and crystallized group factors will be found to be heavily correlated with temperament, personality, and motivational characteristics of the individual (Matarazzo, 1972, p. 58).

In summary, it may be said that intelligence tests measure only part of general intelligence. The unmeasured part of intelligence plays an important role in intelligent behavior.

#### Intelligence As A Predictor Of Success

The reliance upon intelligence scores as a measure of competence is inadequate because extant tests only sample a part of intelligent behavior. Intelligence scores are reflections of only a particular type of intelligence (Alexander, 1935; Anastasi, 1978, 1972; Cronbach, 1968; Matarazzo, 1972; McClelland, 1973; Terman, 1916 ; Thorndike

et al. 1927; Tuddenham, 1963; Wechsler, 1940, 1943, 1950;)). IQ scores alone are not predictive of an individual's ability to cope with or adapt to his environment, whatever that environment may be.

The original purpose for the measurement of intelligence by Binet and Simon was to discriminate the intellectually less able from the intellectually normal. There is no doubt that tests of measured intelligence have achieved validation in reference to that criterion. The landmark 1959 statement by the American Association on Mental Deficiency states that a measure from such tests constitutes one of the two critical and necessary ingredients for the appraisal of mental retardation (Heber, 1959, 1961). However, even though low IQ scores are part of criterion for the evaluation of mental retardation, they are not considered sufficient. IQ scores coupled with an appraisal of the individual's socioadaptive behavior constitute the two necessary elements for such a diagnosis.

Are IQ scores alone sufficient to predict academic success? Are officials justified in discriminating among prospective students based upon IQ scores alone? There is strong empirical evidence that IQ scores and academic performance are highly related ( $r = .50$ ). IQ scores are also highly related to years of educational attainment ( $r = .70$ ). In addition to intellectual factors, a large part of the variance of educational attainment may be reasonably



attributed to "non-intellective" factors (Matarazzo, 1972, pp. 281-289). Thus, non-intellective factors are taken into consideration by most admissions committees, albeit indirectly. For example, extracurricular activities such as athletics and community activity (as indirect indices of personality traits) are considered. The clear and simple admissions choice is the candidate who has good grades, high scholastic aptitude scores, and evidence of successfully executed extra-curricular activities. The less clear cut and more difficult admissions choices are made between candidates who have high scholastic aptitude scores and poor grades and candidates who have low scholastic aptitude scores and good grades. Although IQ scores are stable predictors of academic performance they do not account for a large part of the variance. They are necessary but insufficient. IQ scores coupled with an estimation of socicadaptive behavior constitute the two necessary elements for admission.

#### Intelligence and Occupation

Willerman (1978), in his book on individual differences, discloses the following information. Many studies have reported positive relationships between intelligence test scores and occupational attainment (cf. Duncan, Featherman, & Duncan, 1972). Ratings of occupational prestige correspond closely to the mean IQ's of those in the

occupations. An important study by Thorndike and Hagen (1959) obtained the test scores of about ten thousand aviation cadet training during World War II. The examination was primarily a scholastic aptitude test, with an emphasis on technical and mechanical matters. The cut-off scores were set at approximately 50 percent. Thus, the cadet trainees were above average in their general educational and intellectual achievement. Twelve years later, these ten thousand men were located and asked to complete a questionnaire on their current occupational status. The mean scores obtained 12 years later correlated with occupations showed distinctive ability profiles. For example, accountants have high scores on numerical fluency and low scores on the mechanical test. College professors showed high scores on the general intellectual test and low scores on the mechanical tests. In general, the ability profiles corresponded with our notions of abilities and skills required for entry into each occupation. The fact that the ability tests were administered before most of the men had entered their occupations suggests that individuals tend to enter or remain in occupations that call for specific abilities. Note that the data do not justify the conclusion that specific abilities are necessary or that they predict success in particular occupations.

After reviewing studies on correlates of IQ, Matarazzo (1972) provided a table with approximate average

correlations of IQ with various occupational and educational outcomes. The lowest correlation in the table is for IQ and job success ( $r = .20$ ). According to Willerman (1978, p. 165), this occurs partly because the range of ability is restricted within an occupation (incumbents have been preselected for ability) and partly because of the difficulty in establishing reliable and valid criteria for job success. Willerman adds:

It would be too much to ask that intelligence be the sole source of adequacy in job performance. Motivation, carefulness, and many other non-intellective factors should and do contribute to job success (p. 165).

### Summary

The robustness of IQ scores as predictors of academic success has strong empirical support. Measured intelligence may be partitioned in many ways, genetic vs learned; functional unities; etc. IQ, although a reliable indicator of job success, does not account for much of the variance (.04). An interesting interaction effect with job success might be found if measured intelligence were analyzed according to one or more of the partitions (factors). Therefore, the Wechsler Adult Intelligence Scale, partitioned accordingly, will be one of several predictor variables for occupational success.

If IQ or intellectual factors alone do not fully predict occupational success, then what other factors are necessary? Non-intellectual factors such as determination, persistence, incentive, and socio-economic background have been proposed. A review of the literature of these non-intellectual follows in the following sections.

### Intrinsic Motivation

Psychology has developed a large body of literature investigating the concept of intrinsic motivation under which is subsumed personality and incentive theories. A discussion of theories of intrinsic motivation follows.

Why are some people successful in their endeavors and others are not? Is this variance due to innate qualities of the individual or due to the lack of opportunity within the environment? It appears to be reasonable and logical to correlate persistence and determination and self satisfaction with successful achievement. This is supported by the popular literature (Bernstein, 1979; Christiansen, 1979; Schlesinger, 1978; Taylor, 1979) and by some empirical studies (Digman, 1972; Digman & Takemoto, 1979).

Persistence and determination may be conceptualized as parts of the larger, more encompassing construct of internal motivation which also includes the notion of competence.

Koch (1956, 1961) in his apologia for the study of internal motivation suggested that internally motivated activities totally absorb the individual, and elicit total commitment as well. The individual can tolerate substantial fatigue and suppress primary drives such as hunger. Koch further suggested that intrinsically motivated behavior is highly organized and energized. He strongly urged the recognition of these factors by the incorporation of them into theories of motivation.

### History

Thus, a review of theories of internal motivation is in order. The following review of the psychological bases of intrinsic motivation relies heavily upon the work of Edward L. Deci (1975). The commonly accepted definition of intrinsic motivation is explained in terms of an activity, because the construct, intrinsic motivation, can not be directly observed. Intrinsically motivated activities are ones for which there is no apparent reward except the activity itself. People appear to engage in some activities for their own sake and not because they lead to an extrinsic reward. One can observe that there is no apparent reward and that the person is deriving enjoyment from the activity. However, in a more general sense it is an inadequate definition because it does not help to explain the psychological basis of intrinsic motivation. In strict

experimental terms, an activity in and of itself can not logically or meaningfully reinforce itself without becoming a tautology. What may be happening is that the activity is bringing about certain internal consequences which the individual experiences as rewarding (Perlyne, 1971). Therefore, a meaningful definition of internal motivation has to address itself to those internal consequences. The following section contrasts various conceptualizations of intrinsic motivation. Deci points out that a "precise definition of intrinsic motivation will depend on which conceptualization one chooses".

The basic phenomenon that intrinsic motivational theories try to account for is the seemingly contradictory behaviors engaged in by both humans and infrahumans. For example, the phenomena of curiosity and manipulative behavior discovered in the experimental laboratories with animals have given rise to a plethora of theories attempting to explain the apparently contradictory behaviors of animals who seem to be creating and increasing a need or drive arousal while simultaneously satisfying or diminishing it. According to Deci, these explanations have ranged from Woodworth's behavior-primacy theory (Woodworth, 1918, 1958); exploratory drive (Montgomery, 1954); boredom or avoidance (Myers & Miller, 1954); manipulation drive (Harlow, 1953); sensory drive (Isaac, 1962); visual exploration (Butler, 1953) optimal incongruity based on psychological processes

(Berlyne, 1971; Dember & Earl, 1957; Hunt, 1971; McClelland et al, 1953); optimal arousal based upon physiological processes (Fiske & Maddi, 1961; Hebb, 1955; Leuba, 1955); uncertainty reduction in terms of resolution of uncertainty, (Kagan, 1972); uncertainty reduction in terms of dissonance reduction (Festinger, 1957); and uncertainty reduction per se (Lanzetta, 1971); effectance (White, 1959); self-determination (Angyal, 1941); personal causation (De Charms, 1968); and competence and self-determination (Deci, et al, 1974; Phares, 1976; Rotter, 1954, 1975).

Adequate theories of motivation must be able to account for behaviors that are reinforced for seeking stimulation and reducing stimulation. The reinforcement of such behavior must also be able to account for rewards that do not reduce tissue needs or primary drives (Eisenberger, 1972). Drive naming theories are inadequate in their explanations of intrinsic motivation even when concepts of secondary reinforcement and anxiety are introduced. Drive naming theories (e.g. Harlow and Montgomery) do not adequately explain the acquisition and maintenance of intrinsically motivated behaviors. Reduction of uncertainty theories (e.g. Kagan, Lanzetta) fail to tell us why people and animals seek stimulation although they give a good explanation of how stimulation is reduced.

The three theories which most adequately handle the issues of acquisition, maintenance, and reduction, are

optimal arousal theories (e.g. Hebb and Leuba), optimal incongruity theories (e.g. Hunt), and competence and self-determination theories (e.g. De Charms, Deci, McClelland, Phares, and Rotter, and White).

Those theories of intrinsic motivation which are psychologically based are most germane to this study. Although physiologically based theories of optimal arousal such as theories of cortical bombardment are worth investigating they are not the major interest of this study. I agree with Woodworth and White that organisms need to be able to manipulate their environment effectively to survive psychologically and physically. Although Woodworth's theory dealt with biological needs and White's theory dealt with psychological needs, both assumed the underlying need for competence. White pointed out that in young children, effectance motivation is quite undifferentiated. However, with experience, the motives become more distinct and differentiated into specific motives for mastery, cognizance or achievement. Anqyal (1941), who preceded White (1959), attached a great deal of importance to the notion of competence in dealing with one's environment. However, for Anqyal the tendency toward self-determination is the essence of intrinsic motivation.

#### Need Achievement

Other theorists have investigated concepts of intrinsic



motivation which have obvious similarities to those theories of Anqval, de Charms, Heider, and White. Henry Murray's theory of needs (1938) postulated two types of needs, (1) primary or unlearned needs, such as the need for food, water, sex, and (2) secondary or learned needs, such as achievement motivation. McClelland (1953, 1955) proposed to assess these secondary needs by measuring the need for achievement (n Ach) through the administration of the Thematic Apperception Test, a projective test. Although there is a vast literature regarding the TAT and n Ach, there are major methodological flaws in internal validity with the use of the TAT. First, there are problems of scoring. The stories are not easy to score and people must be trained in the scoring (Penner, 1978). Second, the test-retest reliability of this measure of n Ach is not very high (Penner, 1978). Third, the pictures themselves may influence the amount of n Ach which is expressed in the story a subject tells. For example, if the people in the picture are facing one another, subjects will express a higher level of n Ach than if the people are not facing each other (Alper & Greenberg, 1967). Pictures of women elicit lower n Ach than pictures of men (Lesser, 1973). Finally, it appears to be highly susceptible to demand characteristics of the Experimenter. McClelland and his co-workers (1953) aroused achievement motivation experimentally in subjects to determine its effect on their

stories. When subjects were told that their abilities or leadership were being evaluated, they wrote stories that showed far higher achievement than did subjects under a control group. The extent of achievement imagery seemed to be a direct result of this instructional set. For these reasons, the results of n Ach studies must be considered suspect at least until another more reliable and valid measure may be found. Therefore n Ach will not be used as a predictor variable in this study.

#### Locus Of Control

E. Jerry Phares (1976) and Julian Rotter (1954, 1966) approached the phenomenon, intrinsic motivation, from an opposite point of view from that of Murray or McClelland. While the latter two experimenters looked at what motivated competent behavior, Phares and Rotter investigated what made people feel competent and secure, as well as what motivated competent behavior. Phares and Rotter attempted to discover why apparently competent and successful people felt unhappy and distressed about themselves. Rotter questioned the adequacy of a purely Skinnerian explanation of human behavior. The Skinnerian point of view proposes that people respond to stimuli in the environment. If these responses are rewarded, they will repeat the behaviors. Thus, if one knows a person's reinforcement history, one can predict that person's behavior. Rotter (1975) argued that the

probability of a person engaging in certain behaviors is affected by:

(1) his expectancy that this behavior will produce a reinforcer for him and

(2) the value the person places on the reinforcer.

The key concept of locus of control grew out of studies regarding the factors which influence expectancies. There are two classes of variables which determine a person's expectancies. First, there are cues which are specific to the situation. Second, there are estimates of success in achieving specific goals. The estimate of how much control an individual has over his reinforcers is called locus of control (Rotter, 1966). Thus, both Phares and Rotter view intrinsically motivated behavior, or the lack thereof, as the result of the estimated expectancy of control over one's environment, which is learned. Some people have an internal orientation, while others have an external orientation. People with an internal orientation tend to see the things that happen to them as being due to their own actions. That is, they are responsible for what happens to them. People with an external orientation tend to see the things that happen to them as being unrelated to (or non-contingent upon) their own actions. They are due to factors beyond their control. Further, the amount of influence this generalized expectancy will have on a person's behavior depends upon the clarity of available situational cues and

how much previous experience the person has had with the situation. In a new situation without any definite cues, this generalized expectancy will have considerable effect (Lefcourt, 1966). Phares reiterates:

Perceived locus of control may be viewed as a somewhat narrow expectancy arising out of a specific situation or it may be viewed as a relatively stable characteristic that persons carry with them from situation to situation. While individuals' generalized beliefs about control affect their behavior, so does the structure of the specific situation (1976, p.6).

### Self-Determination

Like Phares and Rotter, Deci also finds a Skinnerian explanation inadequate. In a series of empirical studies with school aged children, Deci and his colleagues (Deci, 1971, 1972(a), 1972(b); Deci, Benware & Landy, 1972; 1974; Deci & Casio, 1972; Deci, Cascio, & Kruskell, 1973, 1975) found that the reinforcement of functionally autonomous behavior decreased rather than increased them. In an approach which integrates theories, Deci accepts White's basic assumption of the need for feelings of competence and Anqval's assumption of the need for self-determination. The apparently conflicting behaviors of approach and avoidance

to novel stimuli, and the seeking of increase and reduction of stimulation are well explained. The organism's need to feel competent and self-determining motivates two general classes of behavior. The first includes behaviors of individuals who seek out situations that provide a reasonable challenge to the individual. If he is bored, he will seek an opportunity to use his creativity and resourcefulness. If he is overchallenged, he will seek a different situation (avoid the present situation). That is, the organism seeks situations of optimum challenge. The second class of behaviors which are similarly motivated includes behaviors of individuals who seek to conquer challenges or to reduce stimulation, or "reduce uncertainty" or to reduce dissonance". In other words, a person will feel competent and self-determining when he is able to both seek out and deal with challenging situations effectively.

### Summary

It may very well be that individuals may have either generalized (learned) or innate (biological) tendencies in seeking out challenging situations as well as the need for mastery over situations. The need for mastery over situations or the need for competence probably involves the personality dimensions of persistence and determination. Whether behavioral tendencies are generalized or innate, a personality test which assays these qualities should be

predictive of success. The perception of locus of control or causality by the individual should also have important interaction effects in terms of personality constructs correlated with success. Thus, second order factors from Cattell's Sixteen Personality Factors Inventory (Cattell, Eber, Tatsuoka, 1974) Modernity, which assays the tendency to actively select challenging situations (Gough, 1975, 1976, 1977); Future Orientation vs. Immediacy Factor, which assays determination and persistence (Digman & Takemoto, 1979); and Rotter's locus of control scale which assays perception of causality (Rotter, 1966 ); will be used as predictor variables in this study.

### Socio-Economic Factors

A basic assumption of this investigation is that almost everyone wants a high-status job, both as an end in itself and as a means to other ends, such as wealth, power, and happiness. This assumption may be questioned because entering a high-status occupation is no guarantee of job satisfaction or high income. Nonetheless, it is still important to understand why some people end up in high-status occupations while others do not. The following section relies heavily upon Jencks, et al. (1972) in the interpretation of their own research as well as that of

others (e.g. Coleman).

### The Effects Of Educational Credentials

Occupations that require a lot of schooling generally have higher prestige than occupations that require very little schooling (Reiss, 1961). Furthermore, as the competition for jobs increases, the level of required educational credentials for job entry increases. Because of this, a positive correlation between educational attainment and occupational status is inevitable. Although the correlation between occupational status and educational attainment is consistently found, it is an arbitrary social artifact. It implies that Americans are impressed by educational credentials, and that credentials confer status arbitrarily, and may not be accurate measures of competence or job performance (Jencks, et al. 1972, p. 180). For example, Eckland (1979) in his review of sociodemographic consequences of minimum competency testing, found that the high school diploma is much more predictive of employability than are standardized test scores in reading and mathematics. In effect, diplomas are gate passes to employability, although they are not indices of competence. Competent individuals without diplomas have much lower probabilities of employment than do less competent individuals with diplomas because they are screened out on the basis of that lack.

There is a great deal of evidence that employers prefer workers with more education to workers with less. Professional associations usually establish elaborate educational requirements for becoming a practitioner. Jencks et al. report evidence that preference of the former and the practice for the latter are essentially an arbitrary rationing system, whose primary function is to keep the number of people trying to enter high-status occupations in balance with the number of positions available. The strongest reason they cite for this is that once people enter a particular occupation, those with additional education do not make appreciably more money than others within that occupation. Within any given occupation, an extra year of school or college was associated with an average salary advantage of only 2 or 3 percent. Furthermore, for men who have similar test scores and are in the same occupation, there is virtually no relationship between schooling and earnings. This strongly suggests that men with extra education make more money largely because they enter lucrative occupations, not because education increases their earning power thereafter (1972, pp. 181-200).

The examination of the lower end of occupational prestige and economic remuneration reveals more evidence in support of the hypothesis that employer preference for educational credentials is arbitrary and based upon



rationing. Eckland (1979) in a four year longitudinal study found that:

If a student does not go to college, what he or she scores on a basic competency test in math or reading simply does not matter economically....Being able to read or to compute will help you find a job, but only if you are Black, and it will not help you to earn more money, whether you are White or Black.

However, Thomas and his colleagues found that:

There is a very strong and almost monotonic relationship between test scores and who goes to college....Scores (NLS) are more predictive of who goes to college than any other background or school related variable we have examined, with the exception of a student's stated plans as a senior for after graduation (Thomas, Alexander, & Eckland, 1979).

### The Inheritance Of Status

It has been argued that "pull" or family background has a great deal of effect upon an individual's performance on IQ tests and career. The evidence does not consistently support this hypothesis. McClelland (1973) in his article,

argued that IQ tests, upon which important social decisions are based, are biased and reflected socioeconomic advantages. He based his argument upon a critique of Terman's studies of genius.

Johnson (1974) in a re-examination of Terman's data (1925, 1959) pointed out that if getting a high IQ results from socioeconomic status then:

(a) The parents of the gifted group should have been "rich" and "powerful" They were not. Their mean occupational rating score corresponded to ratings for stenographer, librarian in a small city, or primary teacher.

(b) The children of the gifted parent group should have scored higher than their parents. They did not. The mean IQ score of the children was well over one standard deviation lower than that of their parents.

In conclusion, Johnson states:

The question is: "Does advantage account for the preponderance of the variance in IQ and pull for much of the variance in occupational success".... It seems doubtful that such is the case (p. 58).

What about the inheritance of occupational status? The correlation between a father's occupational status and his son's is less than .50 (Blau, 1967). For example, if two fathers' statuses differ by 20 points, their sons' statuses will differ by an average of 10 points, their grandsons'

statuses will differ by about 5 points and so on. Fathers pass on about half of their occupational advantage or disadvantage to their sons. Forty percent of the men whose fathers are in the top fifth of the occupational hierarchy end up there themselves. It follows that the amount of occupational mobility in American society depends upon the time span considered. For a single generation, there is a lot of "short distance" mobility, but relatively little mobility from the very bottom to the very top or vice versa. If more than a single generation is considered there will be more top to bottom and vice versa mobility (Jencks, et al., 1972, p. 179).

Jencks, et al. in a more recent work which reanalyzed twelve different longitudinal studies apparently now finds that fathers' occupational statuses contributes a great deal to sons' occupational statuses (Yankelovich, 1979).

### Summary

Occupational status is strongly related to educational attainment. Americans are impressed by people with a lot of schooling, and they are deferential toward occupations that require extensive schooling. According to Jencks, if occupational prestige is an important goal for an individual, then the attainment of educational credentials is important (1972, p. 191). However, he goes on to say that neither family background, cognitive skill, educational

attainment, nor occupational status explains much of the variance in men's incomes (Jencks, p. 226). Jencks attributes much of the variance to chance or luck in his 1972 study, but changes his view in his 1979 study. In the 1979 study, he reports a complex interaction of SES variables, including father's occupational status, which are highly predictive of status.

Whether or not SES factors contribute a great deal to the prediction of income and status is not clear at present. I believe these factors to be important "nuisance" variables which should be controlled. Therefore, they will be statistically controlled by specifying them first into the regression equation.

### METHOD

There is a widely held view that intelligence equals competence, that competence equals merit, and that merit equals occupational and/or financial success (Jencks, 1972). Although this may be intuitively clear, this is not consistently the case. In fact, empirical studies reveal that intellectual prowess is not necessarily equivalent to competence, and that competence is not necessarily rewarded by financial success or prestige (Coleman, 1975; Eckland, 1979; Mader & Nairn, 1980; Porter & Slack, in press). IQ, the standard measure of intellectual prowess, is biased by the measurement of a limited concept of ability and intellectual functioning (Alexander, 1935; Anastasi, 1978, 1972; Cronbach, 1968; Matarazzo, 1972; McClelland, 1973; Pines, 1979; Rice, 1979; Sternberg, 1979; Terman, 1916; Thorndike et al. 1927; Tuddenham, 1963; Wechsler, 1940, 1943;). Educational institutions which accept students for specialized training for professions limit their acceptance of applicants for training on the basis of standardized test scores or other similarly biased standardized intellectual scores. Members of the professions in turn, determine acceptance of colleagues into their groups on the basis of their educational credentials,

i.e. their test taking ability.

Thus, acceptance into the professions is highly biased in favor of standardized test scores, despite the fact that high scores are not necessarily indicative of occupational or financial success (Matarazzo, 1972). American society, however, continues to operate as though IQ, competence, and merit, were equivalent in determining occupational success. IQ is probably a necessary but insufficient index of occupational success. Other indices of success such as demographic variables and personality dimensions have been studied. However, the majority of studies have dealt with the prediction of academic success of some kind, e.g. grade point average, IQ, or levels of educational attainment. The amount of variance that is explained by demographic variables, such as parental socio-economic status that account for academic success is equivocal (Jencks, et al. 1972, Johnson, 1974).

There is a dearth of empirical studies dealing with the prediction of occupational or financial success as contrasted to academic success. Therefore, it seems worthwhile to investigate a sample of the population with a moderate but varied amount of educational credentials to determine the amount of variance factors other than IQ contribute to occupational and financial success.

### Research Questions

Is intellectual prowess a necessary and sufficient factor in achieving success? If intellectual processes are necessary, is it a general intellectual ability that is important, or, is it some primary mental ability that is more important? Furthermore, if intellectual processes are insufficient in the prediction of success, then, what are some of the non-intellectual factors that would predict success?

The experimental research question asked was "How much of the variance is explained in the prediction of academic, economic and occupational success by measures of intellectual and non-intellectual factors?" Statistically, the following questions were investigated in this study:

(a) The prediction of educational achievement by measures of factors such as intelligence, personality dimensions, sex differences, educational and ethnic differences.

(b) The prediction of financial success by factors such as intelligence, personality dimensions, sex differences, educational and ethnic differences.

(c) The prediction of occupational success by factors such as intelligence, personality dimensions, sex differences, educational and ethnic differences.

### Subjects

Subjects who had already participated in a previous study, at Behavioral Biology Laboratory, were asked to volunteer to participate in this study through the mail. Subsequently, they were asked to answer each questionnaire (Cattell's Sixteen Personality Factors and an Alcohol Questionnaire) by themselves, without discussing their respective responses to the survey instruments with one another. Questions regarding the instruments, mailing, payment, etc. were encouraged by BEL and fielded according to APA ethics standards regarding research with human subjects.

Although 310 subjects completed all instruments, the deletion of subjects who were missing data for occupation and income, and education, plus a listwise deletion of subjects for the independent variables resulted in a final N of 232 subjects.

These particular subjects were "textbook" or classic examples of a middleclass work ethic American society. About 90% of them owned their own homes on Oahu, and had been employed for most or all of their work-eligible lives. For example, 60-year-olds had been working from 35 to 40 years and 27-year-olds had been working five to eight years of their lives. Most of the subjects were married (218), two were divorced, and 37 had never been married. The great



majority of subjects (198) had schooling beyond the high school level, either in a trade school, college, or post graduate work. The racial makeup of the sample was not reflective of the general population of the State: Caucasian (43.6% vs. 26.2%), Japanese (32.3% vs 25.2%) Chinese (15.2% vs. 4.2%), and Other (8.9% vs. 44.4%). Filipinos, who comprised 9.7% of the population, and part-Hawaiians, who comprised 18.9% of the population, were under represented in this sample (Hawaii, 1979). There were 130 males (50.6%) and 127 females (49.4%) whose age range was 20 to 68 years, with an approximate mean of 42. About eighty-eight percent of the subjects had a family income of 15,000 dollars or more per annum, about fifty-three percent of them had 25,000 dollars or more per annum for 1975.

### Instrumentation

Three different measurement instruments were used, the Wechsler Adult Intelligence Scale (Wechsler, 1955), the Sixteen Personality Factors Scale (Cattell, Eber, Tatsuoka, 1974) and the Alcohol Questionnaire (Johnson, McClearn, & Wilson, Note 1). In addition, a battery of fifteen cognitive tests was administered.

The WAIS was chosen because of its high levels of reliability and validity (Matarazzo, 1972). In addition,

the WAIS, particularly in terms of diagnosis and prediction, is amenable to the analysis of variance of some types of cognitive function, e.g. crystallized and fluid ability. A battery of cognitive tasks, consisting of the Primary Mental Abilities Vocabulary test; Visual Memory (immediate); Things, a fluency test constructed by ETS; Sheppard-Metzler Mental Rotations (modified by Vandenberg), a spatial visualization task; Subtraction and Multiplication a perceptual speed test constructed by ETS; The shortened form of the Elithorn Mazes (lines and dots), a spatial ability test; Word Beginnings and Endings constructed by ETS; Card Rotations which was constructed by ETS; Visual Memory (delayed) constructed by BBI; Primary Mental Abilities Pedigrees a reasoning test; Hidden Patterns, a spatial visualization task by ETS; Paper Form Board, a spatial visualization task by ETS; Number Comparisons, a highly speeded perceptual task; Whiteman Test of Social Perception; and Raven's Progressive Matrices (modified), a spatial ability test were also administered. This battery of tests, including the WAIS, was administered by a BBL team of psychologists.

The Sixteen Personality Factor questionnaire (16 PF) was used to measure personality dimensions. In an earlier study (Tatsuuchi, Johnson, Ahern, 1979), second order factors were derived from a factor analysis of the 16 PF, which differs from the traditional higher order factors reported by Cattellian studies (Cattell, Eber, & Tatsuoka,

1974).

The Alcohol Questionnaire (AQ) developed by Johnson, McClearn, & Wilson (Note 1) provided demographic information as well as scores on the Adult Nowicki Strickland Scale of Internal-External locus of control. The ANSIE purports to control for the effects of social desirability, the denial of psychopathology, the confounding of personal, social, political and ideological causation, as well as adjusting the difficult reading level for non-college populations (Nowicki, undated, p.2).

The three dependent variables were educational attainment, family income for 1975, and occupational status. Educational attainment was measured by having subjects respond by filling in the appropriate number for the following question:

How much formal education did you have?

1. none
2. elementary school
3. intermediate school
4. some high school
5. high school graduate
6. technical/trade or business school
7. some college
8. college graduate
9. college beyond Bachelor's degree

Family income for 1975 was measured by having subjects respond by filling in the appropriate number for the following question:

What is your family income?

"Total Income" includes income from wage, salary income, self-employment income, farm income, social security income, public assistance income, and income from all other sources.

1. less than 3,000
2. 3,000 to 4,999
3. 5,000 to 9,999
4. 10,000 to 14,999
5. 15,000 to 24,999
6. 25,000 to 34,999
7. 35,000 or more

In the interest of accuracy and in order to preserve interval sizes, the categories 2 through 7 were recoded to 3,000, 5,000, 10,000, 15,000, 25,000, 35,000 respectively. Category 1 was not recoded, as no subjects fell within this category.

Occupational status was measured by having subjects write in a description of their "present" occupation. These responses were subsequently recoded to conform to the

standard Duncan Socio-economic Status Scale (Robinson, Athanasiou, & Head, 1976).

### Data Collection

The data used in this study were gathered by the Behavioral Biology Laboratory at the University of Hawaii at Manoa in 1975-1976. Data were collected in two stages. Initially, a large family study of cognition was done. A number of cognitive and physiological tests were administered. The cognitive tests are described above, under the section "Instrumentation" on page 40. During the second stage, a sub-sample from this larger family study of cognition was canvassed. Subjects from the large survey were asked to volunteer again. They were paid ten dollars upon the completion of the Alcohol Questionnaire and the 16PF. These questionnaires are also described under "Instrumentation". Three hundred and ten subjects completed the questionnaires. Survey data (A.C.) from the second stage were collected by a professional survey company, which ensured that a number of different ethnic groups were represented, that the number of respondents obtained from each ethnic group constituted an adequate sample size, and that there would be maximum probability that the obtained samples of respondents were representative of the

socioeconomic characteristics of their respective Oahu ethnic populations. The personality data and IQ data were collected by Behavioral Biology Laboratory, University of Hawaii at Manoa.

### Statistical Analysis

A review of the literature reveals a substantial amount of controversy concerning the importance and the variety of factors that predict success (Coleman, 1965, 1975; Jencks, 1972, 1979; Jensen, 1979; Yankelovich, 1979). What is universally agreed upon, however, is that there are many independent variables, some of which are highly intercorrelated (e.g. IQ and educational credentials) that may contribute to a valid prediction. Due to the uncertainty of theoretical models and the controversial results of empirical research, the actual implementation of the statistical analysis becomes extremely complex. The choice, number, and order of independent variables to be specified into the regression equation become problematic. Because of this uncertainty, an exploratory multiple regression (MR) analysis (with both a hierarchical decomposition of beta weights, and stepwise decomposition of beta weights) was used as the general statistical approach in this study.

It is possible for different multiple regression analytic models to evaluate the statistical contribution individual variables make toward the prediction of a dependent variable in different ways. However, all models share some inherent problems. The problem of shrinkage or "bouncing beta weights" which limits the generalizability of results is a problem common to all MR models. Solutions suggested by different authors are cross-validation, ratios of thirty or more to one (Kerlinger & Pedhazur, 1973); forty to one (Cohen & Cohen, 1978) of subjects to independent variables (depending upon the type of MR used) and Winsorizing (removal of outliers) the sample observations (Tukey, 1977).

The highly probable existence of substantial correlation among independent variables to be used in this study creates problems regarding the interpretation of partial coefficients and their sampling stability. Multi-collinearity may be a problem for any data set, no matter what model is used. Take the following example: Variable Xa and variable Xb are highly correlated within a data set. In stepwise regression, Xa is brought into the equation first and is not significant. Variable Xb removes the variance that would have been predicted by Xa. The result is that both Xa and Xb are removed from the equation although Xb should have been included. The statistic that hints at the existence of multi-collinearity is an unusually

large variance or covariance of beta weights. A large variance or covariance would result in no significant differences in the computation of an F or t statistic. To quote Cohen and Cohen:

Interpretation of the partial coefficients of independent variables from the results of such a set of variables which ignores their multicollinearity will necessarily be misleading. Attention to the  $R^2$  of the variables may help, but these do not indicate the source of redundancy of each  $X_i$ .... A superior solution to this problem is the use of the hierarchical rather than the simultaneous model of MRC (Multiple Regression Correlation) (Cohen & Cohen, 1978, p. 116).

Thus, an a priori ordering of independent variables is a double-edged sword. While it alleviates the problem of multi-collinearity, it requires the investigator to hypothesize a causal structure which accounts for their correlation. The hypothesis of such a causal structure for the prediction of success is itself the crucial problem, the center of controversy, the unknown, the research problem in psychology.

Cohen and Cohen consider the a priori ordering of



independent variables vastly superior to "an indiscriminate" partialling of effects. On the other hand, Draper and Smith (1966, pp. 163-194) recommend the use of a stepwise multiple regression analysis.

We believe this (stepwise m.r.) to be the best of the variable selection procedures discussed and recommend its use. As with all the procedures discussed, sensible judgment is still recommended in the initial selection of variables and in the critical examination of residuals (p. 172).

This procedure is, in fact, an improved version of the forward-selection procedure discussed in the previous section. The improvements involve the re-examination at every stage of the regression of the variables incorporated into the model in previous stages. A variable which may have been the best single variable to enter at an early stage may, at a later stage, be superfluous because of the relationships between it and other variables now in the regression. To check on this, the partial  $r^2$  criterion for each variable in the regression at any stage of calculation is evaluated and

compared with a preselected percentage point of the appropriate F distribution. This provides a judgment on the contribution made by each variable as though it had been the most recent variable entered, irrespective of its actual point of entry into the model. Any variable which provides a nonsignificant contribution is removed from the model. This process is continued until no more variables will be admitted to the equation and no more are rejected (p. 171).

In an exploratory analysis such as this, cross-validation to accommodate "shrinkage" is a statistical and experimental imperative (Cohen & Cohen, 1978; Kerlinger & Pedhazur, 1973). However, the sample size of this study (310) limits the practicality of such an endeavor. Therefore, variables were grouped according to intuitively logical groups such as socio-economic, intellectual, and personality dimensions. Although, there was no a priori ordering within groups, there was such an ordering between groups. Socio-economic variables were introduced into the regression equation first, in order to handle "noise". Furthermore, measures of intellectual factors were introduced into the equation last in order to test the hypothesis. There is the need for cross-validation or

replication of the analysis on a subsequent sample before the results may justifiably be recognized as "robust". Conclusions concerning the nature of contributing factors to success, are therefore tentative.

Some stabilization of the beta weights can be insured, however, by the ratio of subjects to independent variables. Cohen and Cohen suggest a 40:1 ratio for the more liberal stepwise MR and Kerlinger and Pedhauzer suggest 30:1 ratio for regression analyses to insure stabilization of beta weights. As important and valid as it is to protect alpha levels while making comparisons, the ratio proposed by both sets of authors above, appear to be extreme. The number of independent variables were limited to fifteen or less.

#### The General Outline Of Analysis

1. The independent variables were divided into three general groups: socio-economic, intellectual, and personality. The selection of independent variables was based upon relationships which appeared to be logically causative. Furthermore, the initial correlation matrix of variables was examined for unusually high correlation coefficients.

2. Each group of the factors above was analyzed separately, using three different dependent measures:

educational attainment, family income, and occupational status.

3. The ratio of independent variables to subjects was initially limited by the investigator on logical theoretical grounds.

4. Both a hierarchical decomposition and a stepwise decomposition of beta weights were used in a multiple regression analysis for each analysis mentioned in step 2, above.

5. The residuals of each dependent variable were examined for normality of distribution.

6. Each equation was examined for possible suppression effects.

7. Each equation was examined for possible effects of multi-collinearity.

8. Independent variables were removed from an equation, as it appeared to be warranted by the amount of variance they predicted.

9. Three separate prediction equations employing the dependent variables educational attainment, family income, and occupational status were constructed. The three groups of independent variables, socio-economic, intellectual, and personality factors were included within each prediction equation.

10. Two-stage least squares analyses were employed because of possible simultaneous equation biases.

## ANALYSES AND RESULTS

The experimental research question: "Is intellectual prowess a necessary and sufficient factor in the prediction of success?" was approached statistically through ordinary least squares analyses of variance. For this study, "success" was defined educationally, occupationally and financially, and measured by scores on scales of educational achievement, occupational status and family income.

Conceptually, the scores of the dependent variables were seen as the result of the function of some combination of demographic-attitudinal variables plus personality variables plus intellectual variables. For example:

$$\text{EDUCATION} = f(\text{Demo/Att} + \text{Person} + \text{IQ})$$

$$\text{OCCUPATION} = f(\text{Demo/Att} + \text{Person} + \text{IQ})$$

$$\text{INCOME} = f(\text{Demo/Att} + \text{Person} + \text{IQ})$$

Each regression statement required the judicious pruning of independent variables. This was accomplished either statistically or by the examination of the logical relationship between the independent variable and the respective dependent variable. The selection of independent variables presented the problem of under and over inclusion. The omission of important variables was to be avoided. However, the inclusion of irrelevant and/or redundant

variables was to be avoided as well.

The choice of independent variables included intellectual, personality and demographic-attitudinal factors. The initial reduction of the number of variables was accomplished in one of two ways. One, the number was reduced statistically through factor analyses. Two, the number was reduced through selection based upon the logical probability that the independent variable would have some influence upon one or another of the dependent variables.

#### Demographic/Attitudinal Variables

Employing both a hierarchical and a stepwise decomposition of beta weights, the demographic-attitudinal variables were included in three initial regression equations. The following prediction equation was postulated for demographic-attitudinal variables:

$$Y_n = f(A_n + B1Ed + B2Occ + B3Marital + B4Sex + B5Home + B6Birthplace + B7Background + B8Children + B9Age + B10TVHRS + B11Readhrs + B12Relfa + B13Relmo + B14Residence + B15Race + B16Religion + B17Height + B18Weight + E_n)$$

Where  $n$  = education, occupational status,  
family income

The following variables were included in each initial regression equation: occupational status, and family income, marital status, sex, home ownership, birthplace, background (rural, suburban, urban, other) number of offspring, age, number of hours spent watching television, number of hours spent reading, relationship with one's father and mother, number of years resident of the state, race (American Chinese Ancestry, American European Ancestry, American Japanese Ancestry, Other), religion (Buddhist, Catholic, Protestant, Other), height and weight.

In addition to the problems of under-inclusion and over-inclusion, the selection of demographic-attitudinal variables presented some other interesting problems. Therefore, the report of results and analysis of demographic-attitudinal variables will take a slightly different format from that of personality and intellectual factors. First, there was the problem of systemic inter-relationships among the criterion and predictor variables. This problem will be discussed in greater detail in the section, Validation of Results. Second, there was the problem of categorization and definition of these variables.

To begin with, it was difficult to ascertain the

difference between demographic and attitudinal variables. Some variables which appeared to be clearly demographic became clearly attitudinal upon deeper consideration. For example, one's sex although traditionally categorized as demographic, is clearly associated with specific attitudinal particulars (Lee & Stewart, 1976; Money & Ehrhardt, 1972). Similarly, the other variables such as race and religion, although demographic, carry with them specific psychological attitudes (Weber, 1958). These attitudes would logically affect educational, occupational and economic attainment. These variables were not considered reflective of intellectual or of personality dimensions. Therefore, by default, rather than by active delineation and categorization, these variables were grouped together.

#### Initial Results of Demographic/Attitudinal Variables

We have viewed the results of the demographic-attitudinal variables from the perspective of the predictive variables. Let us now look at the results from the perspective of the criterion variables. In building each initial regression equation, all of the demographic-attitudinal variables mentioned above were included. However, as noted below, variables were excluded on an a priori basis. Furthermore, the decision to include a variable in the "total" regression equation, in which demographic-attitudinal, personality and IQ variables were



included, was based upon the amount of variance it accounted for, its F statistic, inspection of its beta weight and zero order correlations with meaningful variables. Rather than attempt to describe the decision making process for each variable in each stage by reporting the variance for each, the summary table for each dependent variable is fully reported.

#### EDUCATIONAL ACHIEVEMENT.

Although family income and home ownership were likely predictors, they were not included in the initial regression equation for educational achievement. Recall that the data collected were cross-sectional rather than longitudinal. Therefore, it seemed unlikely that the amount of income presently earned could have had an influence upon the past educational attainment of the individual. Home ownership/status was pruned for similar reasons.

Although all of the variables mentioned above were included in the initial regression equation, only the following variables were included in the "total" regression equation: reading hours, tv hours, marital status, sex, relationship with father, religion (Protestant, Catholic, Buddhist), birthplace (Oahu, Outer Island, Mainland, Foreign,). Table 1 reports the Summary Table for Demographic/Attitudinal Variables for educational attainment. These variables accounted for 24 percent of the

variance.

#### OCCUPATIONAL STATUS.

It was unlikely that present income could influence present occupational status, although it was likely that present income was a result of present occupation. Only the following variables were included in the "total" regression equation: educational attainment, age, sex, race (Americans of Chinese, European, Japanese and Other Ancestry), and background (rural, small town, suburb, urban). Table 2 reports the Summary Table of Demographic/Attitudinal Variables for Occupational Status. These variables accounted for 31 percent of the variance.

#### FAMILY INCOME.

Similarly, for the dependent variable, family income, although all of the variables mentioned above were included in the initial regression equation, only the following variables were included in the "total" regression equation: occupational status, sex, relationship with mother, reading hours, religion, race, birthplace, and background. Table 3 reports the Summary Table of Demographic/Attitudinal Variables for Family Income. These variables accounted for 36 percent of the variance.

#### Personality Variables.

Employing both a hierarchical and a stepwise decomposition of beta weights, the personality factors, Lability, Modernity, Orderliness, Independence, Femininity, and Externality were included in separate initial regression equations. To predict educational attainment, occupational status, and family income, a simple equation was postulated:

$$Y_n = f(A_n + B_1 \text{Lability} + B_2 \text{Modernity} + B_3 \text{Orderliness} + B_4 \text{Independence} +$$

$$B_5 \text{Femininity} + B_6 \text{Externality} + E_n)$$

Where n = education, occupational status, family income

#### Factor Analysis of Personality Variables

Personality dimensions were measured by the Sixteen Personality Factors (Cattell, Eber, Tatsucka, 1974) and the Adult Nowicki Strickland Internal External Locus of Control Scale (ANSIE), (ETS, undated). The 16PF was taken to higher order through factor analytic procedures similar to that employed with the intellectual variables. A principal axes factor analysis using PA2 from SPSS was employed. Results of the Kaiser Guttman latent roots test, a scree test, evaluation of residual correlation matrices, and inspection of the factor correlation matrix, all indicated that the optimum final solutions was a five factor orthogonal solution (Tatsuquchi, Johnson, Ahern, 1978). In the following descriptions of factors, adjectives and phrases which are presented by Cattell are used with the appropriate

scales. They are presented in the form used on the 16PF profile sheets.

FACTOR I: LABILITY.

The bi-polar scales L, O, and Q4 all loaded positively and Scale C loaded negatively on this factor. These scales were characterized by the terms Affected By Feelings (emotionally less stable, easily upset, changeable; Lower Ego Strength); Suspicious (hard to fool; Protension) Apprehensive (self-reproaching, insecure, worrying, troubled; Guilt Proneness); and Tense (Frustrated, driven, overwrought; High Ergic Tension) respectively. The polar opposite of lability appears to be stability. The underlying dimension of this factor appears to be one of personal adjustment.

This factor appears to be similar to Digman's factor "Emotionality" (Digman & Takemoto, 1978), as well as to Lorr's factor "Stable" (Lorr & Manning, 1978).

FACTOR II: MODERNITY.

The bi-polar scales E, F, H, I, and Q1 all loaded positively and Scale N loaded negatively on this factor. These scales are characterized by the terms Assertive (aggressive, stubborn, competitive; Dominance); Happy-go-lucky (enthusiastic; Surgency); Venturesome (uninhibited, socially bold; Parmia); Suspicious (hard to fool; Protension); Forthright (genuine, unpretentious, but socially clumsy; Artlessness); and Experimenting (liberal,

free-thinking; Radicalism) respectively. The opposite pole appears to be traditionality. The underlying dimension of this factor appears to be one of avidity for change or stimulus seeking.

This factor appears to be similar to Gough's "Modernity" factor (1976). Gough describes individual modernity as a "syndrome of attitudes and beliefs, including progressivism, secularity, optimism, future oriented perspectives, and a sense of personal efficacy. Its psychological emphasis is on achievement, autonomy, and the enhancement of individual potential (Gough, 1975, 1976, 1977). This factor also appears to overlap with Digman's Internal-External factor (Digman & Takemoto, 1978).

### FACTOR III: ORDERLINESS.

The bi-polar scales G and Q3 loaded positively on this factor. These scales were characterized by the terms Conscientious (persistent, moralistic, staid; Stronger Superego Strength) and Controlled (exacting will power, socially precise, compulsive; High strength of Self Sentiment), respectively. The underlying dimension of this factor appears to be one of persistence. It has connotations of socially positive "compulsiveness", and would most likely be highly correlated with activities which would require persistence and hard work. Competence is implied with this factor.

It is similar to Digman's "Monitor" factor (Digman &

Takemoto, 1978). Digman describes this "M" factor as one of basic competence, which includes a sense of commitment and an ability to follow through on projects. This factor was found to be highly correlated with academic success in grade school children (Digman, 1972). In addition, this factor appears to overlap with Lorr's "Controlled-Spontaneous" factor (Lorr & Manning, 1978). Controlled-Spontaneous was characterized by "a disposition to be orderly, persistent, rule bound and conscientious". The opposed pole is characterized by a "casual, planless approach to problems, a tendency to quit, expediency, and freedom from rules" (Lorr & Manning, 1978, p. 5).

#### FACTOR IV: INDEPENDENCE.

The bi-polar scales A and Q2 loaded positively and negatively respectively on this factor. These scales were characterized by the terms Reserved (detached, critical, aloof, stiff, Sizothemia) and Self-sufficient (resourceful, prefers own decisions; Self-sufficiency), respectively. Their opposite pole appears to be dependence. The underlying dimension appears to be autonomy.

This factor is similar to Lorr's "Autonomy" which is characterized by directiveness, independence and rule freeness. It also appears to be similar to Digman's

"Prosocial" factor (Digman & Takemoto, 1978).

FACTOR V: FEMININITY.

The bi-polar scales A and I loaded positively on this factor. These scales were characterized by the terms Outgoing (warmhearted, easy going, participating; Affectothymia) and Tender-minded (sensitive, clinging, over-protected; Premia), respectively. The underlying dimension of this factor appears to be one of feelings and behavior traditionally associated with sex roles. The opposite pole appears to be that of the traditional male sex role, e.g. The John Wayne role.

This factor appears to be similar to Lorr's second higher-order factor which is characterized by directiveness, sociability, help seeking and nurturance (Lorr & Manning, 1978).

Initial Results of Personality Variables

Table 4 reports the Summary table of Personality Factors for the dependent variable educational achievement. The personality variables for the dependent variable, educational attainment, accounted for approximately seven percent of the total variance. Externality and Femininity accounted for approximately five percent. They were included in the initial total regression equation.

Table 5 reports the Summary Table for the dependent variable, occupational status. Personality variables

accounted for approximately four percent of the variance. Independence and Externality accounted for most of this variance (3.5 percent). They were included in the initial total regression equation.

Table 6 reports personality variables for the dependent variables, family income, accounted for only two percent of the variance. No personality variables were included in the initial total regression equation for family income.

### Intellective Variables

Employing both a hierarchical and a stepwise decomposition of beta weights, the intellective factors, Spatial Ability, Perceptual Speed, Spatial Intelligence, Verbal Intelligence and Memory, were included in separate initial regression equations. To predict educational attainment, occupational status, and family income, a simple equation was postulated:

$$Y_n = f(A_n + B_1\text{Spatial} + B_2\text{Verbal} + B_3\text{Perceptual} + B_4\text{Memory} + E_n)$$

Where n = educational attainment, occupational status, family income

### Factor Analysis of Intellective Variables

Scores from the battery of cognitive tasks (15) and scores from the WAIS subtests (11) were subjected to



principal axes factor analyses (with squared multiple correlations in the diagonals). The scores were analyzed by PA2 from SPSS (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1976, Version 8) on an IBM 370/158 for the original N (310). The number of factors extracted was determined by two considerations: the Kaiser-Guttman latent root of one criterion and interpretability of factors.

Five factors were demonstrated to exist by the Kaiser-Guttman latent root of one criterion was five factors. However, inspection of the factor loadings revealed a trivial fifth factor. (The highest loading for a variable on the fifth factor was .34.) A second run, forcing four factors, yielded highly interpretable factors. A Varimax rotation was completed on the four factor matrix in order to achieve simple structure (Table 7). Of the twenty-six variables only those that loaded higher than plus or minus .39 are reported. Only two WAIS subtests, and one from the cognitive battery did not meet criterion.

FACTOR I: SPATIAL.

The first factor clearly involved spatial ability and accounted for 63 percent of the variance. Variables which involved spatial visualization and manipulation had high loadings. For example, the Sheppard-Metzler Mental Rotation had a loading of .70 and the WAIS Object Assembly had a

loading of .71.

FACTOR II: VERBAL.

Factor II was clearly a verbal factor that accounted for 16 percent of the variance. Most of the WAIS Verbal Subtests loaded on this factor as well as those that involved obviously verbal faculties from the Primary Mental Abilities test, such as Vocabulary.

FACTOR III: PERCEPTUAL SPEED.

Factor III, although a clear one that accounted for 12 percent of the variance with variables with high loadings (.48 to .73), was difficult to name. This factor appears to involve more than one ability, one of problem solving and one of numerical ability.

FACTOR IV MEMORY.

Only two variables loaded on Factor IV, Visual Memory Immediate and Visual Memory Delayed. This factor accounted for eight percent of the variance. Furthermore, these two variables had little or no correlation with the other 24 tests. Neither did they correlate well with the WAIS Performance, nor Verbal nor total IQ scores. Memory was not included in the initial total regression equation.

Initial Results of Intellectual Factors

Table 8 reports the Summary Table of Intellectual Factors for the dependent variable, educational attainment. Intellectual factors accounted for approximately 32 percent

of the variance. Verbal Intelligence accounted for 28 percent of this variance. The combined effects of Spatial Intelligence and Perceptual Speed accounted for approximately four percent more of the variance after the effects of Verbal Intelligence were removed. These three factors were included in the initial total regression equation.

Table 9 reports the Summary Table for the dependent variable occupational status. Intellective factors accounted for approximately eight percent of the variance. Perceptual Speed and Verbal Intelligence accounted for approximately seven percent of that variance and they were included in the initial total regression equation.

Table 10 reports the Summary Table for the dependent variable, family income. Intellective factors accounted for approximately ten percent of the variance of family income. Perceptual Speed accounted for more than eight percent of that variance. It was the only intellective factor included in the initial total regression

The number of independent variables was reduced on a psychological and/or statistical basis. The intellective factors, Verbal, Spatial and Perceptual Speed, were selected on a statistical basis. The personality variables, Externality and Femininity were included in the prediction of educational achievement. Independence was included in the prediction of Occupational Status. No personality

variables were included in the prediction of Family Income.

Education = (Sex, Religion, Background, Television Hours, Reading Hours) + (Externality, Femininity) + (Verbal, Spatial, Perceptual Speed)

Occupation = (Education, Race, Birthplace, Background) + (Independence, Externality) + (Perceptual Speed, Verbal)

Family Income = (Occupation, Education, Religion, Race, Birthplace, Background) + (Perceptual Speed)

### Final Multiple Regression Equations

The final multiple regression equations for the dependent variables, education, occupational status, and family income were resolved through a stepwise decomposition of beta weights. During this phase, variables were removed from the regression equations as was justified by inspection of beta weights, variance contributed, and F statistics and zero order correlations with meaningful variables.

### Educational Attainment

The independent variables sex, religion, birthplace, television hours, reading hours (demographic-attitudinal); femininity (personality); verbal (intellective) were

selected statistically. Table 11 reports the Summary Table of the Final Multiple Regression Equations for Education.

#### Occupational Status

The independent variables education, sex, marital status, race, background, (demographic-attitudinal); perceptual speed (intellective) were selected statistically. Table 12 reports the Summary Table of the Final Regression Equations for Occupational Status.

#### Family Income

The independent variables, occupational status, educational attainment, religion, race, birthplace, and background were selected statistically. Table 13 reports the Summary Table of the Final Regression Equation for Family Income.

#### Validation of Results

The selection of demographic-attitudinal variables presented an additional problem. Unlike the sets of predictors of intellective subject to a systemic inter-relationship within that set itself. This was due to the use of the variables educational attainment,

occupational status, and family income, which fall within the set of predictors and within the set of criterion variables. Thus, endogenous variables appear on both sides of the equation. Consider the income determination model consisting of an education function, an occupation function and an income identity:

$$\text{EDUCATION} = A + B_1X_1 + B_2X_2 + B_3X_3 + \dots +$$

$$B_nX_n + E$$

$$\text{OCCUPATION} = A + B_1Ed + B_nX_n + E$$

$$\text{FAMILY INCOME} = Ed + \text{OCCUPATION} + X_n + E$$

When  $X$  is a set of variables determined outside the model, such as IQ or personality scores, then Education, Occupation & Income are classified as endogenous variables and  $X_n$  as exogenous variables. This state of affairs results in biased results and a violation of the assumption of independence of error terms (Johnston, 1972, p. 343). In order to validate the Multiple Regression Results, two-stage least squares analyses were applied to the model.

It now seems appropriate to address a problem corollary to that of tautologous solutions (cf. p. 73 this study). The problem of simultaneity of choice and the interrelationship of dependent measures pointed to the need for a simultaneous equation method. Consider the following: does an individual choose an occupation and then follow a

pattern of educational attainment in order to fulfill that goal, or does an individual enter a pattern of educational attainment and then choose an occupation? Or is the choice of educational attainment and occupation made simultaneously? Consider further, whether occupation and income are chosen serially or simultaneously. The single equation procedure used in this study might be methodologically and statistically valid in the first case. However, in the latter case, prediction is untenable due to the simultaneous nature of the decision. The occupation one chooses usually sets limits on the income one receives, and vice versa. The simultaneity of choice results in correlated error terms and biases results (Johnston, 1972, pp. 341-345). Furthermore, it is easy to see, as discussed above, that this equation is embedded in a system of relationships.

There are several simultaneous equation methods:

Methods of estimation for simultaneous systems are single-equation methods, which can be applied to each equation of the system separately, or complete system methods, which are applied to the system as a whole. Examples of the former are two-stage least squares (2SLS) and limited-information single-equation (LISE) and of the latter three-stage least-squares (3SLS) and full information maximum likelihood (FIML)

(Johnston, 1972, p. 330).

Thus, it seemed important to ascertain the extent to which the simultaneous nature of the relations among the criterion variables (educational attainment, occupational status, family income) invalidated the single-equation procedures that were used in this study. The two-stage least squares method was deemed appropriate for this study because it met the identity criteria. The results of the 2SLS and ordinary least squares analyses differed only slightly in magnitude (cf. Tables 14 and 15) and thus implied no differences in conclusions. Although the results of the 2SLS analysis are more precise the results of the OLS analyses were used as the basis of reporting and discussion because the latter have clearer explanatory estimates of statistics.

### Summary of Analyses and Results

The problem of over and under inclusion of predictor variables was resolved in two ways. First, theoretically meaningful variables were included on the basis of logical relationships with the dependent variables. Second, predictor variables were reduced through factor analyses (personality and intellectual factors), initial regression analyses, and initial "total" regression analyses.



Each independent variable was differentially predictive in the final solutions of educational achievement, occupational status or family income. As a group, demographic-attitudinal variables were more consistent predictors than either personality or intellectual variables. Personality variables were extremely poor predictors across the three criterion variables. Verbal Ability was highly predictive of only academic success. However, Verbal Ability was not highly predictive of occupational status nor of family income. For this group of men and women, intellectual ability measured by standardized intellectual tests was not predictive of success other than academic attainment. This is somewhat contradictory of Jencks' findings that:

Tests of academic ability predict economic success better than other tests....

The correlation of test scores with educational attainment, occupational status, and earnings appears to have remained fairly stable in the in the United States since shortly after the turn of the Century... (Jencks, et.al. 1979, pp. 85-86).

## DISCUSSION

Experimentally, this study focused on the prediction of success. Success was measured through numerical transformations of individual scores of educational attainment, occupational status, and family income. Statistically, this study focused on the amount of variance that was accounted for by such factors as intellectual ability, personality dimensions, and demographic-attitudinal variables. This procedure of experimentally defining and statistically solving problems in psychology is a standard and straightforward one. However, such a procedure may lead to tautologous solutions. Because such procedures involve quantification, hypothesis testing and statistical analysis, the solutions are often accepted as demonstration of proof for causal relationships. For example, the use of a hierarchical versus a stepwise decomposition of beta weights in the statistical analysis was considered for this study. The former necessitates the postulation of causal relationships among the variables and the latter necessitates the acceptance of a purely mathematical solution. Neither was completely satisfactory since the causal relationship between the dependent and independent variables was itself a question that needed to be addressed.

The problem of tautologous solutions pervades psychology. Theory is more often than not, supported by empirical evidence which was obtained through biased methodology (Bowers, 1973; Rychlak, 1968). The general problem of tautologous solutions was specifically demonstrated in this study. For example, past research has indicated that educational attainment, occupational status, and income may be strongly influenced by demographic, person, and intellectual factors (Coleman, 1966; Jencks, 1972, 1979; Jensen, 1979; Moynihan, 1964; Futter, Maughan, Mortimore, Cusston, with Smith, 1979). However, the number, order and magnitude of effects are still very much in question. In order to study the effects of predictor variables, causal direction was assumed among the dependent variables for individuals within this cross-sectional study. It appeared reasonable to assume that educational attainment influenced occupational choices and that occupational choices influenced family income. Note, however, that given a generational longitudinal study, it would have been equally reasonable to assume an opposite direction of influence. That is, family income and the occupational status of one's parents influenced one's educational attainment, which in turn influenced one's occupational choice and income. Thus, in the case of the dependent variables, causal direction was decided a priori on logical grounds.

Causal direction within the independent variables could not reasonably be assumed, even with a cross-sectional study. The question is, does intellectual prowess influence personality dimensions, which in turn influence demographic-attitudinal dimensions of the individual? Or do demographic-attitudinal dimensions influence the personality dimensions of the individual, which in turn influences the intellectual prowess of the individual? Thus, although it did not seem reasonable to assume causal direction between the independent variables, it seemed reasonable to assume a causal direction between the independent and dependent variables, and statistically ascertain the magnitude of effects.

The results of the analyses demonstrated that a respectable amount of the variance was explained. The total amount of the variance explained by the regression equations for educational attainment (.38), occupational status (.33), and family income (.37) varied somewhat. The different "sets" of independent variables (demographic-attitudinal, personality, and intellectual) were of differential importance to each dependent variable. For example, although Protestants (religion) generally have higher levels of occupational status, Americans of Japanese and Chinese ancestry (race) have higher levels of family income.

### The Predictive Variables

#### Personality Dimensions.

Second order factors of Cattell's 16PF and Externality from the Adult Nowicki Strickland Scale of internality and externality, were poor predictors for all dependent variables. Out of six personality factors, only "Femininity", a sex role dimension, was included. Even then, it contributed very little to the total amount of variance after the effects of demographic-attitudinal variables were partialled out. In fact, it was removed from the equation. This resulted in no difference in the total amount of variance explained by the predictors.

There were several explanations for the poor showing of the personality factors. In the first place, there is the person versus situation controversy. A situational theorist would have predicted such a poor showing on the grounds that it is the situation rather than the person that accounts for behavior (Mischel, 1965, 1968). However, Sarason, Smith, and Diener (1975) reviewed four of the more prestigious psychology journals. They found that there was no significant difference in the low percentage of variance that was accounted for by person, situation or interaction between the two. Sarason and his colleagues argue that psychological factors are relatively subtle and would

therefore show little effect. Furthermore, they argue that if an independent variable can account for a large amount of the variance, it would be of little interest because it would have been too obvious. Although one could agree with the former argument, agreement with the latter would be more difficult. Most researchers would be delighted to find such an "obvious" variable.

Another possible explanation for the poor showing of personality factors as predictors may be that we haven't yet developed an instrument that is sensitive or precise enough. Furthermore, it may have been that although our instrument was precise enough, it just did not measure the requisite dimensions for the criterion variable. The latter possibility is more thoroughly discussed in a following section of this paper (Demographic/Attitudinal Predictors).

A third explanation is based upon methodological considerations. Our sample of subjects was composed of volunteers and was self-selected. This self-selection may have resulted in a truncated distribution which in turn resulted in the lack of prediction. In other words, our sample may have been too homogeneous, e.g. the differences in personality dimensions were not divergent enough to be of predictive value. On the other hand, although this was an attenuated sample, there was a wide range of attainment educationally (elementary to post B.A.), occupationally (50 ranks), and in family income (3000 to 35000).

A fourth and final alternative explanation is the lack of importance of personality dimensions in the prediction of educational achievement, occupational status, or family income. It may simply be that differences of individual attainment are not influenced by personality variables at all. Instead, these differences may be due to differences of intellectual ability or demographic-attitudinal variables. However, this explanation is intuitively difficult to accept because it contradicts common, everyday observation. Everyone knows individuals with high intellectual ability from reasonably similar socio-economic backgrounds, who differ greatly in attainment. Furthermore, there is empirical evidence which contradicts the explanation that differences in individual attainment are not influenced by personality variables. The fifty-year longitudinal study on Terman's "whiz kids" (Sears, R., 1977; Sears, P. & Barbee, A.H., 1978) would disagree with such an explanation. These studies investigated sources of life satisfaction for intellectually gifted men and women, respectively. Both studies found that:

Some personality characteristics are quite stable over long periods of time and some are not. The issue must be considered with respect to both the kinds of behavior examined and the age at which they are observed (1977, p.128).

An interactionist would agree with the situationist, that personality dimensions would be poor predictors. However, it would be on the grounds that neither person nor situation factors alone account for much of the variance. The interactionist would argue that interaction of person and situation variables account for most of the variance (Bowers, 1973; Endler, 1973). To the contrary, the longitudinal study on Terman's "whiz kids" (Terman & Oden, 1959) that examined mid-life achievements, found differences between their "A" (high achievers) and "C" (low achievers) that were reflective of personality differences. For example, the "A's" were generally highly motivated, active, and optimistic people in comparison with "C's".

#### Intellective Factors

All four intellective factors, Spatial, Verbal, Perceptual Speed and Memory, were considered for the regression equations. In the last analysis, only the Verbal Factor was predictive of any criterion variable. Furthermore, the Verbal Factor was clearly predictive only of educational attainment. Spatial ability, perceptual speed, and memory were not predictive of any criterion. Verbal ability accounted for the greatest amount of variance (.20 of .37) in the prediction of educational attainment, even when the effects of sex, religion, and demographic-attitudinal variables were removed. Perceptual



Speed, a problem solving factor which involved numerical facility, appeared to have an indirect effect upon the other two criterion measures, occupational status and family income, after the effects of demographic-attitudinal variables were removed.

It was difficult to explain the differential effects of the intellectual factors upon the three criterion variables. Clearly, verbal ability is important for academic success, but surely other intellectual factors should account for success in occupation and income. For example, Spatial Ability, which accounted for most of the shared variance in the factor analysis of the intellectual variables (cf. this study, pp. 63-64), did poorly as an explanatory variable. Furthermore, it would appear logical that problem solving ability would be important in most occupations. Therefore, it was surprising that the factor, Perceptual Speed, predicted so poorly.

One explanation could be the global nature of the criterion variable, occupational status. Perhaps if occupations had been categorized according to skills required, as well as status, greater effect would have been evident. However, the enormity of such an endeavor was not within the scope of this study (cf. this study, pp. 6-11).

Although no conclusions may be reached as to the reason for the differential effects of intellectual predictors upon criterion variables, several hypotheses may be considered. First, the intellectual skills required for educational success are more specifiable than for occupational or financial success. The ability to speak, read, and write clearly and succinctly are skills which generalize through grade and school levels. The intellectual skills required for performance in different jobs may vary from verbal to spatial to perceptual to memory or some combination thereof. Second, the lack of prediction of verbal ability for occupational status and family income could also have been explained by the fact that the amount of variance accounted for by verbal ability was taken up by the predictor, educational attainment, which in turn was included in subsequent equations. However, in this case, initial prediction equations which included only intellectual factors, resulted in their explaining very little of the variance for occupation and family income. Thus, the hypothesis that intellectual factors were represented in the

subsequent equations predicting occupational status and family income by the education variable is not viable. Third, the most likely explanation is that intellectual factors are not accurate measures of job performance or financial competence. Note, that this hypothesis goes one step beyond Jencks' (1972, p. 180) hypothesis that credentials may not be accurate measures of competence or job performance. Jencks postulated that the correlation between occupational status and educational attainment was an arbitrary social artifact. He proposed that the correlation occurs because Americans are impressed by educational credentials, and that credentials confer status arbitrarily. Support for the hypothesis that intellectual factors are not accurate measures of job performance or financial competence, may also be interpreted from the results of competence studies by Eckland (1979). Eckland found that individuals without a high school diploma, who scored higher in standardized tests of reading and mathematics than individuals with a high school diploma, had a much lower probability of employment. A recent issue of the APA Monitor (Feb, 1980) reported two studies (Nader & Nairn, 1980; Porter & Slack, in press) by separate researchers seriously challenged the predictive validity of standardized examinations such as the Scholastic Aptitude Test, the Law School Admission Test, the Graduate Management Admission Test, and the Graduate Record Examinations. Both

independent teams of researchers agreed that the tests add little to the predictive value of grades by themselves. Furthermore, student scores can be improved with coaching.

Thus, it may be true that Americans reward those who do well on entrance examinations (standardized intellectual tests), although these skills may have little to do with competence or job performance.

#### Demographic/Attitudinal Variables

The demographic-attitudinal variables were the first set of independent variables to be entered into the final regression equation in order to handle "noise" from possible nuisance factors. However, this set of "nuisance" variables, which has been viewed by traditional experimental psychologists as "error", or lack of experimental control and rigor, accounted for the greatest amount of variance for the dependent variables occupational status (31% of 33%), and family income (36% of 37%). Furthermore, it contributed a substantial amount of variance to the dependent measure, educational status (17% of 38%).

In fact, as a predictor, this set of variables did much better than the set of intellectual factors (cf. Tables 1, 2, 3 vs. 8, 9, 10). Recall that intellectual factors, scores from standardized intelligence tests, are consistently used as criteria for social and financial

rewards in America (cf. Intellectual vs. Non-Intellectual Factors). Further, recall that while standardized tests reliably measure the ability to define words and perceive analogies, they do not measure social adaptability, i.e. the capacity to avoid problem situations and the ability to persevere at a task. While the ability to persevere at a task may be indirectly measured through personality inventories, the idea of attempting to measure a "non-behavior" (avoidance of problem situations) appears hopeless. However, consider for a moment the nature of appropriate avoidance behavior and the repertoire of cognitive skills that may be involved. First, one would need to be able to "see" that there was a potential problem in the situation. Second, one would need to be able to quickly assess the probable consequences of getting involved in such a situation. Third, one would need to be able to assess the alternative solutions and their applicability to the situation. Fourth, one would need to assess one's ability to handle such a situation. Fifth, one would need to assess the probability of success in such a situation. Sixth, one would have to actively choose not to participate in the situation, to withdraw, or turn away. Finally, one has to have the "courage of one's convictions" in order to "follow through" on turning away.

It is highly likely that components of the first five steps of appropriate avoidance behavior are assayed in

standardized intelligence tests (perhaps it's the "g" factor). However, it is highly unlikely that components of the last two stages, final decision making and sticking to the decision, would be tapped by such tests. Let us examine the last two stages a little further. If the potential problem situation (such as lying, cheating, becoming involved in an illicit affair), violated an ethical standard, it would follow that the decision-making stage would invoke prior learning by the individual of some type of ethical system. It seems reasonable to assume that such variables as race, religion, and background would tap such ethical systems. If one further assumes that the potential problem situation involved intellectual processes alone (e.g. refusing to get involved in a get rich quick scheme), the capacity to stick by the decision in face of heavy pressure, even ridicule by peers or supervisors, may be tapped by such variables as race, religion, and background. In either case, it would seem likely that these demographic-attitudinal variables tap social adaptability, an intellectual function that is not measured by standardized intelligence tests. Thus, the data may be interpreted as support for our experimental hypothesis, that intellectual prowess may be a necessary but insufficient

factor in success.

### Educational, Occupational And Financial Success

Let us now turn to more specific aspects of the data in the prediction of educational attainment, occupational status and family income. In the prediction of educational attainment, males tended to have more education than females and Protestants more education than other religious groups. People born on Oahu have less education than people born on the outer islands, the mainland, or in foreign countries. These findings were not surprising. Males generally have higher levels of educational attainment across our Nation (Jencks, 1972; 1979). In general, individuals born on the outer islands who now live on Oahu, would have moved to "the City" due to occupational opportunities unlocked by their educational credentials. It is not an uncommon occurrence for outer-island youngsters to get university degrees, return to the Islands and settle in jobs on Oahu, since it holds the centers of commerce and State and Federal governments. Furthermore, because Hawaii has a high cost of living, individuals who were head of households, without skills or educational credentials would have a difficult time settling here. Therefore, it would follow that most people with families from the mainland, who have settled on Oahu, would have a higher level of educational attainment than the general population. The foreign born who

participated in this study were a select sample of foreign born individuals. They had to have a good command of the English language in order to participate. Thus, these individuals were also likely to be highly educated.

Interestingly, two variables that measured activity, number of hours spent watching television (5 percent of the variance) and number of hours spent reading (4 percent of the variance), accounted for substantial amounts of the variance even after the effects of sex, religion, etc. were removed. TVHRS was negatively correlated and READINGHRS was positively correlated with educational attainment, but they were not correlated with each other ( $r = .05$ ). Individuals who read a lot and individuals who did not watch a lot of TV had high levels of educational attainment. However, they were not necessarily the same people; that is, the amount of reading the individual did had little to do with the amount of TV he watched. Individuals who do not watch a lot of TV, do not necessarily spend that time reading. It may be that they spend the time in extra-curricular activities. This result hints at the importance of measuring actual life behavior and activities. These results could be interpreted as support for results reported by Terman and Oden (1959), that successful individuals have active extra-curricular lives (pp. 109-113).

The importance of verbal ability is reflected by the strength and (if it is true that verbal ability is the only



influential factor) magnitude of the Verbal factor in the prediction of educational attainment. This result corroborates the extant literature on the predictive power of verbal ability in academic success (Matarazzo, 1972, pp. 281-289). This indirectly supports the hypothesis that intellectual ability is necessary but insufficient for success. However, the data can not be interpreted to mean that other intellectual abilities are not influential of success. It may be that the measures of Spatial and Perceptual Speed were imprecise, although that is unlikely (cf. Analysis and Results: Intellectual Factors). If we may depend upon the reliability and validity of these factors, and to the extent that it is true that verbal ability is the only necessary factor for success, then perhaps we should speculate upon the worth of a credentialing system that relies so heavily upon one type of mental ability.

The prediction of occupational status was largely composed of demographic-attitudinal variables. Predictably, educational attainment (16 percent) and sex (6 percent) contributed the largest amount of variance. Indeed, it is not surprising since men generally receive more education, and since educational credentials are the entre to higher status jobs, that individuals who scored high on occupational status would have more educational credentials than individuals who scored low.

Interestingly, racial background and place of birth

also accounted for substantial amounts of the variance. As a group, Americans of European ancestry had higher status occupations than any other racial group in the Islands. This would be consonant with the finding that Protestants have higher educational levels than any other religious group. A finding that was a little more difficult to explain was that individuals raised in small towns had higher occupational status than those raised in rural, urban, or suburban communities. A number of hypotheses come to mind, but none seems to be more viable than the other. For example, individuals raised in small towns may have a stronger sense of internality or power over the consequences of their behavior and therefore reached higher occupational levels. On the other hand individuals raised in small towns who now live on Oahu, may have had more access to educational opportunities. Perhaps, individuals raised in small towns have a greater need for achievement, or alternatively, have a greater need for occupational status. The possibilities considered here are but a small list of possibilities, none of which is determinable on the basis of the present data.

The prediction of family income, like that of occupational status, was composed of demographic-attitudinal variables. Again, we have some highly predictable results and some surprising ones as well. Occupational status had a heavy influence upon family income (11 percent of the

variance). However, educational attainment, even with the effects of occupational status removed, was also important (three percent). Religion influenced family income, just as it did educational attainment. However, within religion, Buddhists rather than Protestants tended to make more money. Racial background influenced family income, just as it did occupational status. Furthermore, being an American of Japanese or Chinese ancestry predicted a higher level of family income than being an American of European or any other racial ancestry.

The differential importance of these predictors, religion and race, upon educational attainment, occupational status and family income give rise to interesting speculations. To state it another way, Protestants usually have higher educational credentials than Buddhists or Catholics (who are predominantly Japanese or Chinese). Furthermore, although Americans of European Ancestry generally hold jobs with higher occupational status, they have less income as a family group than the Japanese or Chinese. Recall for a minute, our earlier assumption that demographic-attitudinal variables reflect prior learning of an ethical system. If this is true, then the ethical systems would influence life styles. There is a high level of working wives in Hawaii. Two salaries, in contrast with one, generally result in larger family income. The majority of such wives are of Oriental racial background. Therefore,

it could be that the "haole" ethical system requires that the man be the sole bread winner, which in turn would result in motivating the need for higher educational credentials and occupational status. "Haole" wives may not be expected to work on a life-time basis. On the other hand, in Japanese and Chinese cultures, it may be that men are not required to be the sole bread winner, and that their wives are expected to contribute to the family income on a life-time basis.

The variance predicted from the demographic-attitudinal variables, birthplace (after the removal of previous effects) supports the above speculation. Americans of European Ancestry, who were born on the mainland ( $r = .80$ ) tend to make less than other groups as families. Because family income was a conglomerate measure of both husbands and wives, sex did not predict levels of income. However, if incomes had been reported separately for husbands and wives, we should have expected a great deal of variance. Consider the following facts: the national median wage or salary income of year-round full-time women workers of minority races was 73 percent that of minority men, and 54 percent that of white men in 1974 (U.S. Department of Labor, 1975); the Hawaii State median wage or salary income for all women workers fourteen years of age or older was 43 percent that of all men workers fourteen years of age or older (Hawaii, 1979, p. 212).

Thus, it seems to appear that the data support the hypothesis that demographic variables reflect prior learning of ethical systems, which influence people's lifestyles.

### Summary And Conclusion

The purpose of this study was to investigate the hypothesis that intelligence is a necessary but insufficient factor for success. The results of the analysis demonstrated that for a multi-ethnic group of male and female subjects, only Verbal Ability had a great deal of influence upon academic success. On the other hand, Verbal Ability, Spatial Ability, and Perceptual Speed had little influence upon occupational status or family income. The question then arises: "If intellectual abilities do not consistently account for most of the variance in the prediction of success, what does?" Personality dimensions were also poor predictors of success. Demographic-attitudinal variables, that have been viewed by traditional experimental psychologists as "nuisance variables" or "noise in the data", were consistently predictive of success.

Thus, the results generally support the extant literature that intellectual ability is predictive of

academic success. However, when the measures of intellectual ability were factored into scores of specific abilities, the pattern that emerged generated more questions. Several unanswered questions arose out of this study. First, how is that Spatial Ability and Perceptual Speed (a problem solving ability which included numerical facility) had little or no effect upon the prediction of success? Second, how is it that personality dimensions had little or no effect upon the prediction of success? Third, were the demographic-attitudinal variables reflective of measures of social adaptability? i.e. were they really global measures of intellectual skills and personality? Fourth, were the demographic-attitudinal measures (race, religion, sex, etc.) reflective of innate or learned qualities?

This investigator has no immediate answers or solutions to these questions. Furthermore, she is reluctant to prefer the concluding research cliché that "More research in the area is needed", since more research is obviously being done. But, the suggestion for a different approach or perspective in the measurement of person variables may be in order. For example, the observation and measurement of the utility of time by individuals and the correlation of genetic variation therein, and using measures which view subjects as active rather than passive agents, may be useful.

The truncated nature and size of the sample necessarily urges caution in generalizing the results of this study. However, the results do support recent research (Mader & Nairn, 1980; Porter & Slack, in press) that seriously questioned the validity of a system of rewards that relies so heavily upon scores of intellectual ability. Furthermore, it may also raise the reasonableness of questioning the efficiency of a system of testing different abilities for purposes of prediction. Testing for Verbal Abilities alone may be sufficient for that purpose.

Once again, the advantages as well as the inadequacy of research have been demonstrated. The magnitude and statistical significance of the effects of predictive variables were assayed. The importance of some measures of intellectual factors personality dimensions and demographic-attitudinal variables for a specific sample of people is now available as data.

On the other hand, the inadequacy of such data is pointed out by the number of unanswered questions that remain. Psychological research begs the underlying philosophical question "what is success?" by operationally defining it, in order to measure it. The question that this dissertation does not and can not answer is what does success mean to the individual? Perhaps no one has more concretely or clearly illustrated this than the poet, Frances Bacon, writing in the early Seventeenth Century.

## Life

The World's a bubble, and the Life of Man

Less than a span:

In his conception wretched, from the womb

so to the tomb;

Curst from the cradle, and brought up to years

with cares and fears.

Who then to frail mortality shall trust,

But limns the water, or but writes in dust.

Yet since with sorrow here we live oppress'd,

What life is best?

Courts are but only superficial schools

To dandle fools:

The rural parts are turn'd into a den

Of savage men:

And where's a city from all vice so free,

But may be term'd the worst of all three?

Domestic cares afflict the husband's bed,

Or pains his head:

Those that live single, take it for a curse,

Or do things worse:

Some would have children: those that have them moan

Or wish them gone:



What is it, then, to have, or have no wife,  
But single thralldom, or a double strife?  
del

Our own affections still at home to please

Is a disease:

To cross the sea to any foreign scil,

Perils and toil:

Wars with their noise affright us; when they cease,

We are worse in peace;--

What then remains, but that we still should cry

Not to be born, or, being born, to die?

(Francis Bacon, 1961, pp. 32-33.)

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LIST OF TABLESTABLE 1

Summary Table For Educational Attainment  
With Demographic/Attitudinal Variables

MULTIPLE R	.49	R SQUARE	.24
ADJUSTED R SQUARE	.17	STANDARD ERROR	1.38

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQ</u>	<u>F</u>
REGRESSION	22	140.70	6.40	3.36
RESIDUAL	234	445.46	1.90	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
READGHR	.05	.22	.20
TVHRS	.05	-.21	-.23
MARITAL	.02	-.12	-.25
SEX	.01	-.13	-.17
RELFA	.01	-.13	-.10
NUMCHILD	.01	.06	-.04
WEIGHT	.00	.05	-.06
HEIGHT	.00	.08	.05
RELMC	.00	-.07	-.03
PRCT	.04	.19	.18
YRBOEN	.00	-.10	.05
CATH	.00	-.16	-.04
BUDD	.00	-.04	-.04
ACA	.00	.06	.17
AJA	.00	.01	.17
AEA	.00	.03	-.01
CAHU	.02	-.17	-.13
MAINID	.00	.11	.13
SMIWN	.00	-.04	-.09
OUTER	.00	.08	.05
RURAL	.01	.05	-.09
SUREUR	.00	-.00	.03



TABLE 2

Summary Table For Occupational Status  
With Demographic/Attitudinal Variables

MULTIPLE R	.55	R SQUARE	.31
ADJUSTED R SQUARE	.24	STANDARD ERROR	8.79

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	22	8012.76	364.22	4.71
RESIDUAL	234	18091.51	77.31	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
ED	.14	.38	.36
YREORN	.04	-.24	-.16
SEX	.00	-.24	-.22
WEIGHT	.01	.07	-.07
REIFA	.01	-.09	-.08
RELMC	.00	-.11	-.03
READHRS	.00	.07	-.02
MARITAL	.00	-.16	.04
NUMCHILD	.00	.16	.02
HEIGHT	.00	.10	.03
BUDD	.00	.12	.06
CATH	.00	-.06	-.00
PECT	.00	.02	.04
AEA	.02	-.18	-.14
AJA	.00	.11	-.01
ACA	.00	.10	-.05
OAHU	.01	.09	.10
MAINLD	.00	-.16	-.07
OUTER	.00	-.09	-.04
SMTWN	.03	.17	.18
SUEURB	.00	-.19	-.07
RURAL	.00	-.02	.01

TABLE 3

Summary Table For Family Income  
With Demographic/Attitudinal Variables

MULTIPLE R	.60	R SQUARE	.36
ADJUSTED R SQUARE	.30	STANDARD ERROR	6973.30

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	24	6445218163.57	268550756.82	5.52
RESIDUAL	232	11281435532.93	48626877.30	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
OCCNCW	.12	.34	.23
WEIGHT	.03	-.15	-.04
ED	.02	.26	.12
RELNC	.01	-.14	-.10
READGHRS	.01	.13	.08
YREOBN	.01	-.16	-.06
MARITAL	.00	-.07	.08
NUMCHLD	.00	.13	.09
HEIGHT	.00	-.05	.02
RELFA	.00	-.07	.01
TVHRS	.00	-.08	-.02
BUDD	.02	.20	.08
SEX	.00	.01	.08
PRCT	.01	.06	.14
CATH	.00	-.15	-.00
AJA	.04	.34	.37
ACA	.01	.08	.20
AEA	.00	-.29	.39
MAINID	.04	-.34	-.28
OUTEF	.01	.29	.20
OAHU	.00	.07	.01
RURAL	.01	-.04	-.14
SMTWN	.01	.05	-.08
SUEURB	.00	-.07	.03

TABLE 4

Summary Table For Educational Attainment  
With Personality Factors

MULTIPLE R	.26	R SQUARE	.07
ADJUSTED R SQUARE	.04	STANDARD ERROR	1.48

	<u>DF</u>	<u>STM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	6	38.51	6.42	2.93
RESIDUAL	252	552.08	2.19	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
ANSIEEXT	.03	-.18	-.15
FEMINITY	.01	.12	.12
LABILITY	.01	-.15	-.10
MODERNITY	.01	.10	.08
INDEPEN	.00	-.03	-.06
ORDER	.00	-.00	-.02

TABLE 5

Summary Table For Occupational Status  
With Personality Factors

MULTIPLE R	.21	R SQUARE	.04
ADJUSTED R SQUARE	.02	STANDARD ERROR	9.97

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	6	1113.08	185.51	1.87
RESIDUAL	252	25092.44	99.32	

  

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
INDEPEN	.02	-.13	-.15
ANSIEEXT	.02	-.11	-.11
LABILITY	.01	-.10	-.08
FEMINITY	.00	-.03	-.05
MODERNIT	.00	-.01	-.03
ORDEF	.00	.04	.01

TABLE 6

Summary Table For Family Income  
With Personality Factors

MULTIPLE R	.15	R SQUARE	.02
ADJUSTED R SQUARE	-.00	STANDARD ERROR	1.09

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	6	7.08	1.18	1.00
RESIDUAL	252	297.67	1.18	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>ETA</u>
MODEFNITY	.01	-.08	-.10
ANSIEEXT	.01	-.06	-.10
ORDER	.00	-.04	-.06
INDEPEN	.00	-.06	-.06
FEMININITY	.00	.06	.05
LABILITY	.00	-.00	.01

TABLE 7

WAIS And Cognitive Abilities Scales  
Varimax Rotated Factor Loadings

FACTOR I: SPATIAL

MENRCT	.70	Sheppard-Metzler Mental Rotation
LAD	.54	Elithorn Mazes (Lines & Dots)
CR	.74	Card Rotation by ETS
HP	.60	Hidden Pattern-Spatial Visual by ETS
PFB	.61	Paper Form Bd-Spatial Visual by ETS
DMS	.55	Raven's Progressive Matrices
WAIS ARITHS	.39	WAIS Verbal Subtest
WAIS PICCMS	.52	WAIS Performance Subtest
WAIS BLOCKS	.71	WAIS Performance Subtest
WAIS OBJS	.57	WAIS Performance Subtest

FACTOR II: VERBAL

VOC	.68	Primary Mental Abilities Vocabulary
T	.48	Things, Fluency Test by ETS
PED	.40	Primary Mental Abilities Pedigrees- a Reasoning Test
SPV	.55	Whiteman's Test of Social Perception
WAIIINFOS	.73	WAIS Information
COMPS	.63	Verbal Subtest Comprehension
ARITHS	.41	Verbal Subtest Arithmetic
SIMIS	.60	Verbal Subtest Similarities
VOCAS	.90	Verbal Subtest Vocabulary

FACTOR III: PERCEPTUAL SPEED

SAM	.68	Subtraction & Multiplication (perceptual test by ETS)
PED	.48	Primary MA Pedigrees, (Reasoning)
NC	.73	Number Comparisons-a highly speeded perceptual test by ETS
SYMB5	.68	Symbols a WAIS Performance subtest

FACTOR IV: MEMORY

VMI	.81	Visual Memory Immediate
VMD	.56	Visual Memory Delayed

TABLE 8

Summary Table For Educational Attainment  
With Intellectual Factors

MULTIPLE R	.57	R SQUARE	.33
ADJUSTED R SQUARE	.32	STANDARD ERROR	1.25

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	4	173.27	43.32	27.60
RESIDUAL	228	357.80	1.57	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
VERBAL	.28	.53	.51
SPATIAL	.03	.20	.16
PERCEPSPD	.02	.19	.15
MEMORY	.00	.02	-.03

TABLE 9

Summary Table For Occupational Status  
With Intellectualive Factors

MULTIPLE R	.29	R SQUARE	.08
ADJUSTED R SQUARE	.06	STANDARD ERROR	9.72

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SC</u>	<u>F</u>
REGRESSION	4	1970.88	492.72	5.22
RESIDUAL	228	21537.13	94.46	

  

<u>VARIABLE</u>	<u>RSC CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
PERCPSPD	.04	.21	.20
VERBAL	.03	.18	.15
SPATIAL	.13	.13	.12
MEMORY	.00	-.00	-.05



TABLE 10

Summary Table For Family Income  
With Intellectual Factors

MULTIPLE R	.32	R SQUARE	.10
ADJUSTED R SQUARE	.08	STANDARD ERROR	1.04

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQ</u>	<u>F</u>
REGRESSION	4	27.13	6.79	6.26
RESIDUAL	228	246.10	1.08	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
PERCESPD	.03	.29	.28
SPATIAL	.01	.11	.09
VERBAL	.01	.10	.07
MEMORY	.00	.03	-.03

TABLE 11

Summary Table For Educational Attainment  
On Final Solution

MULTIPLE R	.61	R SQUARE	.38
ADJUSTED R SQUARE	.35	STANDARD ERROR	1.21
SP 2			

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQUARE</u>	<u>F</u>
REGRESSION	10	196.20	19.62	13.43
RESIDUAL	222	324.44	1.46	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
SEX	.02	-.14	-.18
PROT	.04	.18	.12
CATH	.00	-.11	.03
BUDD	.00	-.03	.03
OAHU	.01	-.15	.13
OUTER	.00	.09	.23
MAINID	.00	.08	.07
TVHRS	.05	-.23	-.19
READGHRS	.04	.20	.02
VERBAL	.20	.53	.53

TABLE 12

Summary Table For Occupational Status  
Final Solution

MULTIPLE R	.53	R SQUARE	.33
ADJUSTED R SQUARE	.30	STANDARD ERROR	8.19

	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>MEAN SQ</u>	<u>F</u>
REGRESSION	10	7309.39	730.94	10.90
RESIDUAL	222	14890.48	67.07	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
ED	.16	.40	.34
SEX	.06	-.29	-.27
MARITAL	.02	-.18	-.11
AEA	.04	-.19	-.23
AJA	.00	.11	-.08
ACA	.00	.11	.01
SMTWN	.04	.17	.19
SUEURB	.00	-.13	.00
RURAL	.00	-.03	.02
PERCFSPD	.01	.20	.13

TABLE 13

Summary Table For Family Income  
Final Solution

MULTIPLE R	.61	<u>R SQUARE</u>	.37
ADJUSTED R SQUARE	.33	<u>STANDARD ERROR</u>	696 1.78

	DF	SUM OF SQ	MEAN SQ	F
REGRESSION	15	6108920186.74	407261345.78	8.40
RESIDUAL	217	10517208568.63	48466398.93	

<u>VARIABLE</u>	<u>RSQ CHANGE</u>	<u>SIMPLE R</u>	<u>BETA</u>
OCCNCW	.11	.33	.18
ED	.03	.30	.16
BUDD	.03	.21	.09
PBCT	.01	.06	.13
CATH	.00	-.15	-.01
AJA	.06	.36	.41
ACA	.02	.09	.26
AEA	.00	-.30	.41
MAINLD	.04	-.35	-.31
OUTEF	.01	.30	.18
DAHU	.00	.08	-.02
RUFAL	.02	-.05	-.14
SMTWN	.00	.05	-.05
SUBUEB	.00	-.04	.03
PERCESPD	.00	.27	.10

TABLE 14

Two-Stage Least Squares Analysis  
For Occupational Status

MODEL: OCCNOW2

DEPENDENT VARIABLE: OCCNOW

SSE	14658.23	F RATIO	8.75
DFE	221	APPROX P>F	.0001
MSE	66.33	R-SQUARE	.30

<u>VARIABLE</u>	<u>PARAMETER ESTIMATE</u>	<u>STANDARD ERROR</u>	<u>T RATIO</u>	<u>APPROX P&gt;T</u>
Intercept	69.29	6.30	11.00	.0001
OccnowB.Ed	2.31	.64	3.60	.0004
Marital	-2.57	1.68	-1.54	.1262
Sex	-5.26	1.14	-4.66	.0001
Ownhse	-2.82	1.52	-1.86	.0640
ACA	-0.42	2.44	-.17	.8645
AEA	-4.45	2.13	-2.09	.0379
AJA	-2.12	2.19	-.97	.3326
Rural	.61	1.86	.33	.7441
Smtwn	4.44	1.39	3.21	.0015
Suburb	.28	1.53	.18	.8550
Perccspd	1.48	.74	1.99	.0474

TABLE 15

Two-Stage Least Squares Analysis  
For Family Income

MODEL: FAMINC2

DEPENDENT VARIABLE: FAMINC75

SSE	11178963985	F RATIO	8.78
DFE	221	APPROX P>F	.0001
MSE	50583547	R SQUARE	.30

<u>VARIABLE</u>	<u>PARAMETER ESTIMATE</u>	<u>STANDARD ERROR</u>	<u>T RATIO</u>	<u>APPROX P&gt;T</u>
Intercept	5759.48	5110.00	1.13	.2610
FamincB.Ed	1661.28	608.48	2.73	.0068
ACA	5495.10	2171.45	2.53	.0121
AEA	6391.49	2451.64	2.61	.0098
AJA	7478.94	1908.08	3.92	.0001
Oahu	-773.79	2592.65	-.30	.7656
Outer	3072.55	2835.79	1.08	.2798
Mainld	-6149.74	2143.84	-2.87	.0045
Rural	-3141.44	1654.70	-1.90	.0589
Smtwn	-125.00	1263.07	-.10	.9213
Suburb	304.79	1271.16	.24	.8107
Perceptpd	1007.36	637.89	1.58	.1157