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MEASUREMENT OF RESPONSE STYLES, ACHIEVEMENT-RELATED DISPOSITIONS, AND INTELLECTIVE SELF-EVALUATION

by

Charles H. Levy

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1984

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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

MEASUREMENT OF RESPONSE STYLES, ACHIEVEMENT-RELATED DISPOSITIONS, AND INTELLECTIVE SELF-EVALUATION

by

Charles Levy

Adviser: Professor Samuel Messick

Response styles were investigated in the measurement by self-report questionnaires of achievement-related dispositions and intellective self-evaluation. An exploratory factor analysis was designed which included hypothesized response style factors for agreement acquiescence, acceptance acquiescence, desirability, and defensiveness. Content factors were hypothesized for achievement orientation, test anxiety, verbal self-evaluation, mathematical self-evaluation, test anxiety/intellective self-evaluation, and intellective self-evaluation/expectancies.

An exploratory factor analysis of a combined sample of females and males (N = 341) was performed. With regard to response styles, the findings included factors of Desirability, Defensiveness, and two Acquiescence factors at the first order. With regard to content, the first-order factors were Mathematical Self-evaluation, Achievement, Test Anxiety, Verbal/Intellective Self-evaluation, and Performance Expectancies. Second-order factors were found involving combinations of Achievement with Intellective

Self-evaluation, and Test Anxiety with Intellective Self-evaluation. The correlations of the first-order factors with vocabulary, mathematics, and hidden figures cognitive measures, and sex of subject were also obtained, and showed meaningful associations.

A confirmatory factor analysis of a selected subset of measures was performed on data from the total sample. Hypothesized factors were desirability, acceptance acquiescence, agreement acquiescence, achievement, and test anxiety. The results were factors interpreted as Test Anxiety, Acquiescence, two Desirability factors, and Resultant Achievement Tendency.

Sex differences in means were found on mathematics and hidden figures cognitive measures, and on self-report measures of content, Desirability, and Defensiveness. Sex differences in correlations of cognitive measures with self-report measures, and among self-report measures were found. The evidence of sex differences in means and correlations suggested doing separate exploratory factor analyses for females (n = 231) and males (n = 106). Both parallel analysis and chi-square methods of testing the number of factors indicated more first-order factors for females than for males. A sex difference in the number of second-order factors was also found by both methods, and indicated three second-order factors in females, and one or two second-order factors in males.

In separate exploratory factor analyses, nine factors were extracted for females, and seven factors were extracted for males. The first-order factors for females and for males were compared. At the first order, the factors that were similar for females and males were labeled Test Anxiety, Achievement, Defensiveness, Mathematical Self-evaluation, Desirability, and a factor blending Acquiescence and Defensiveness. An Acquiescence factor found for females at the first order was not found for males. A factor which included intellective and verbal self-evaluation measures in both sexes was broader in males in that it also involved performance expectancies. A factor for females defined by expectancies for vocabulary, mathematics, and hidden figures cognitive performances did not closely correspond to any factor in males. At the second order, an Agreement Acquiescence factor was found for females, but not for males. A second-order factor involving Achievement, Intellective and Mathematical Self-evaluation, and Performance Expectancies was found only for females. A second-order Desirability factor was found for both sexes.

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I lovingly dedicate this dissertation to my mother and stepfather, Ann Ackerman and Sydney Ackerman.

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INTRODUCTION

Response styles and content were distinguished as two sources of variance in personality assessment by Jackson and Messick (1958). The distinction emphasized the importance of individual response consistencies that appear to have a basis not in the specific personality variable of interest to the scale constructor, but in other expressive consistencies in personality influencing the questionnaire response. Jackson and Messick (1962a) conceptualized response styles as:

> expressive consistencies in the behavior of respondents which are relatively enduring over time, with some degree of generality beyond a particular test performance to responses both in other tests and in non-test behavior, and usually reflected in response to item characteristics other than specific content. (pp. 543-544)

Bentler, Jackson, and Messick (1972) noted that acquiescence processes and other response styles "require investigation, understanding, and control for the optimal measurement of personality" (p. 109). It is important to control response styles in attempts to ascertain relationships between self-report variables. If they are not controlled their influence might spuriously contribute to apparent relationships between variables supposedly measuring the same content, and obscure discriminations between variables which actually measure different contents.

Response styles are important to understand because of their connections with personality. The associations of response styles with important behavioral dispositions distinguish variance associated with response styles from method variance (Wiggins, 1962), the latter involving "trivial response biases" (Jackson & Messick, 1962a, p. 543). In a review of factor analytic research linking response styles to independently measured personality variables Damarin and Messick (1965) noted:

> In the more general study of self-description and self-evaluation . . . response styles may be essential features of the self-referent processes under study. Thus, when we ask how response styles are related to personality traits, we are asking in part how central aspects of personality affect the way one understands oneself and the way one presents oneself to others in a specific type of evaluative situation. (p. 1)

The notion of construct validity provides an orientation to the issues that will be addressed. Construct validity has been defined as "the degree to which a test measures the construct it was designed to measure" (Lord & Novick, 1968, p. 278). Two aspects of construct validity are convergent and discriminant validity (Campbell & Fiske, 1959) which involve assessing the degree to which a measure is similar to other measures of the same construct, and different from measures of other constructs. Construct validation also involves determining the meanings of the construct by investigating its relationships with other theoretically relevant constructs (Cronbach & Meehl, 1955; Messick, 1975).

There are two main purposes of the present research. One intent is to provide evidence concerning the existence and magnitude of response styles using factor analytic and statistical methods. This may be regarded as an extension of previous research which has shown the influence of response styles in various self-report variables. A second purpose is to evaluate the possible involvement of response styles in self-report measures of achievement, test anxiety, performance expectancies, and intellective self-evaluation. Here the concern is with the construct validity of these measures, and the question of whether they measure contents distinguishable from spurious effects of response styles. Subsidiary goals are to develop measures of intellective self-evaluation for college students which include some controls for response styles; to explore possible relationships of measures of intellective self-evaluation with self-report measures of achievement, test anxiety, and performance expectancies; and to investigate possible sex differences and differences involving the cognitive style field independence-dependence.

A preliminary view of the issues that will be addressed will be given here. The problem with which this research began was the development of a measure of intellective self-evaluation. Self-evaluation was conceptualized in the manner of Diggory (1966) as an individual's evaluation of his or her powers to attain goals, and linked to

expectations of attaining goals. In the present research, intellective self-evaluation was conceived as a self-evaluation referring to intellectual abilities such as mathematical and verbal abilities, and possibly associated with expectations for performance cn abilty tests.

A question that arose was the extent to which intellective self-evaluations might be veridical. That is, to what degree may self-reported evaluaticns cf intellectual abilities correspond with the measured abilities? It was recognized that individuals may be unable or unwilling to accurately report about their abilities. Thus, it is necessary to consider psychological processes which bias intellective self-evaluations or cause them tc be inaccurate.

When individuals' abilities are tested, as in taking a standardized intelligence test, anxiety about evaluation is aroused. Surely, when individuals are asked to evaluate their abilities anxiety about that evaluation may be also elicited. Anxiety might affect cognitive aspects of self-evaluations, depending on individuals' cognitive styles (Messick, 1964). One of the most studied cognitive styles is field independence-field dependence, which is considered below as having possible effects on the relations of intellective self-evaluations with anxiety about evaluation. Achievement motivation may be also aroused when individuals evaluate their abilities. Moreover, test anxiety and

achievement motivation are expected to be related to intellective self-evaluations because of their implications for level of performance in achievement situations.

Inaccuracy and biases in self-evaluation may arise from defensiveness and biases in self-perception, variables which are linked to response styles. Since defensiveness and response styles might be involved in intellective self-evaluations and self-reports regarding test anxiety and achievement, their contaminating influence must be taken into account. Thus, an attempt will be made to differentiate clearly between content and stylistic determinants in the assessment of intellective self-evaluation and achievement-related dispositions, and to appraise each separately.

Chapter 1 reviews the literature on response styles, and Chapter 2 surveys literature on measurement of achievement-related dispositions and intellective self-evaluation. Chapter 1 first examines research on acquiescence. Factor analytic and item-reversal studies of the Minnesota Multiphasic Personality Inventory (MMPI) which provided evidence of acquiescence in self-report personality variables are discussed. The hypothesis that there are two kinds of acquiescence, agreement acquiescence and acceptance acquiescence, is described. Recent studies of agreement acquiescence, acceptance acquiescence, and content by factor analysis and estimation of variance components are then

reviewed. The literature on desirability is then considered. Factor analytic research which differentiated desirable responding and defensiveness is surveyed, and psycholcgical processes involved in these factors are noted.

Chapter 2 reviews literature cn measurement of achievement-related dispositions and intellective self-evaluation. Self-report measures cf achievement and test anxiety are considered with regard tc issues cf validity of measurement. Research and theory linking achievement-related dispositions, expectations of success, and intellective self-evaluation is described. Finally, the possibility is considered that these linkages might be moderated by sex differences and the cognitive style field independence-field dependence.

The fcllowing chapters empirically address questions ccncerned with response styles and content. With regard to response styles, a major question is whether response styles are involved in measures of achievement-related dispositions and intellective self-evaluation. A subsidiary problem is whether response style factors of agreement acquiescence and acceptance acquiescence can be found in this domain. With regard to content, the problem is whether factors pertaining to achievement-related dispositions and intellective self-evaluation can be found when response styles are controlled by separately extracting response style factors. Subsidiary questions are concerned with the structure of intellective

self-evaluations, i.e., the differentiation of mathematical self-evaluation and verbal self-evaluation, and the relationships between achievement-related dispositions, intellective self-evaluations and performance expectancies when response styles are controlled.

Chapter 3 reports on the development of measures of intellective self-evaluation which contain separate subscales of items keyed agree and disagree, thus affording an evaluation of the influence of acquiescence. Factor analyses of 12 measures of response styles, intellective self-evaluation, test anxiety, and self-esteem on data from a sample of 156 female undergraduates are reported. Analyses of acquiescence and desirability in intellective self-evaluation items are described, and the intellective self-evaluation measures are developed further so as to control for desirability and to permit appraisal of both agreement acquiescence and acceptance acquiescence.

Chapter 4 through Chapter 7 report factor analytic studies of 33 response style and content self-report questionnaire measures on a sample of 341 undergraduate students. Chapter 4 describes the design and data collection procedures. The construction and selection of measures is structured by hypotheses for response styles and content. For response styles, the hypothesized factors are agreement acquiescence, acceptance acquiescence, desirability, and defensiveness. For content, the

hypothesized factors are achievement tendency, test anxiety, verbal self-evaluation, mathematical self-evaluation, a factor asscciating test anxiety with intellective self-evaluation, and a factor associating intellective self-evaluation with performance expectancies.

Chapter 5 describes an exploratory factor analysis of the total sample. The correlations of first-crder factors with vocabulary, mathematics, and hidden figures cognitive measures, and sex of subject are also given. Chapter 6 describes sex differences in means, correlations, and factor structures. The associations of the factors with cognitive measures are also given for females and males separately. Chapter 7 reports a confirmatory factor analysis of a selected subset of measures.

Chapter 8 summarizes the results, and offers some theoretical interpretations and implications for research on response styles, achievement-related dispositions and intellective self-evaluation.

RESPONSE STYLES

Conceptions of response styles arose from considerations for the possibility that response biases might interfere with the measurement of content. These conceptions were gradually linked to psychological theories and concepts of personality traits (Damarin & Messick, 1965).

Acquiescence

Acquiescence was first detected in tests of ability and achievement, but has since been studied in personality tests such as the California F-scale, MMPI, and Personality Research Form (PRF). Cronbach (1942) proposed that acquiescence was the source of differences in the psychometric properties of true- and false-keyed items on true-false tests of knowledge. Cronbach (1946, 1950) suggested that acquiescence and other response sets might be inferred from nonuniform choices among available response categories. These sets were regarded as threats to the validity of the measurement of content. Cronbach distinguished between sets that operate in a specific testing situation and more stable response biases that are characteristic of the test taker. These latter stable

response biases have been called response styles by Jackson and Messick (1958).

Acquiescence was first considered seriously as a personality variable in connection with the California F-scale (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 1950). Acquiescence was found to be a component on the F-scale in several studies (e.g., Chapman & Bock, 1958; Jackson, Messick, & Solley, 1957). Methodological critics of the F-scale pointed out that acquiescence was confounded with authoritarianism, because the authoritarian response is always keyed true. Although it was argued that this is appropriate if acquiescence is itself an authoritarian trait, only a moderate relationship was found between acquiescence and authoritarianism when they were appraised independently.

An acquiescence factor was found on subscales of the MMPI in a set of factor analyses of different populations (Jackson & Messick, 1961, 1962a, 1962b). The factor was broad, in that it was involved in a wide range of content scales. Thus, the studies showed that it is important to control acquiescence in a wide range of content scales. The breadth of the factor accorded with an interpretation of acquiescence as a response style.

The pattern of correlations among acquiescence measures suggests that there is more than one type of acquiescence (Damarin & Messick, 1965). Damarin and Messick reviewed

studies in which acquiescence measures were factor analyzed along with self-report and objective test data. These studies indicated that there is more than one acquiescence factor, each involving different clusters of dispositions. A study by Morf (1969; Morf & Jackson, 1972) reviewed below provided factor analytic evidence of two kinds of acquiescence in experimental personality measures.

Factor Analyses of MMPI Subscales

In a series of factor analytic investigations performed on three different samples Jackson and Messick (1961, 1962a, 1962b) identified two large stlylistic dimensions on the MMPI accounting for more than 75% of the common variance. Smaller factors, some of which were interpreted in terms of content, were also found. One of the two large dimensions was highly associated with the desirability scale value of the items and was called desirability. The other large dimension completely separated *true*- and *false*-keyed scales and was identified as acquiescence.

Block (1965) argued that when certain MMPI scales are split into separate subscales composed of items keyed *true* and items keyed *false* the content of the items differs on the subscales. For instance, Block suggested that the items keyed *true* in the *Pa* scale primarily involve ideas of external influence and poignancy, while the items keyed *false* primarily involve moral virtue. Further, Block

proposed that the Acquiescence factor might involve content common to all the scales defining it. Block found that the factor structure of the MMPI is unchanged when scales with an equal number of items keyed true and false are used. This gave the impression that the relationships which had been attributed to acquiescence should in fact be ascribed to content.

However, Block's approach of balancing the number of items keyed true and false may have failed to control for acquiescence. Such a failure would explain the correspondence between the factor structures obtained by Block and the structures obtained when acquiescence and social desirability are uncontrolled. Consider the following simple model for the effects of acquiescence, content, and other response styles. Assume that the item response is a weighted linear combination of acquiescence, content, and other stylistic latent variables. The weights are factor loadings. Assume for this discussion that acquiescence is uncorrelated with content and other response styles, a simplification that may not be true for all scales. In forming a total scale from a set of such items by summing across items, variance due to acquiescence could be eliminated in the total if the sum across items of the weights of the acquiescence latent variable were equal to zero.

The absolute value of the loadings on acquiescence of items keyed true and false may differ systematically (Messick, 1967). Significant differences in response accuracy have been found between positively and negatively worded items (Schriesheim & Hill, 1981), which supports a view that acquiescence is differently elicited by these item types. Thus, in Block's study the sum of the acquiescence factor loadings of the items comprising a scale may have differed from zero, even though there were an equal number of items keyed true and false.[1]

Block also supported his interpretations by showing behavioral correlates of the purportedly acquiescence-controlled and desirability-controlled factors which accorded with his interpretations. However, Bentler et al. (1971) noted that the existence of the two large MMPI dimensions, implicating virtually all MMPI items and scales, is not consistent with any published account of the rationale on which scale construction for the original MMPI was based. Further, none of the interpretations in terms of content provide a plausible explanation for "a kind of reciprocity between acquiescence and desirability for a given scale--as desirability or undesirability of content increases from neutrality, the acquiescence component

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[1] Block also formed scales on which the variance of the sum of the true and false keyed items were equal. This still may not eliminate acquiescence. The variance equalization may have been achieved by the existence of opposite reciprocal relationships between acquiescence and desirable responding.

becomes smaller" (Jackson & Messick, 1962a, p. 547).

In conclusion, the interpretation of one of the large dimensions on the MMPI as acquiescence is defensible. Block's critique of this interpretation was shown to have a methodological flaw. Many psychologists have considered points against the response style interpretation, and of acquiescence in particular, very damaging. However, all of these arguments are open to serious criticisms some of which are noted by Bentler et al. (1971). These criticisms sustain the theoretical and empirical value of response styles. (See also Bentler, Jackson and Messick's, 1972, criticism of Block, 1971.)

MMPI Item Reversal Studies

There have been several studies in which the effects of acquiescence and content have been investigated by reversing dichotomous items on which the response options are agree (or true) and disagree (or false). Before examining the issues raised by these studies it will be worthwhile to define original and reversed items keyed agree and disagree. Some of the examples will be drawn from Appendix A.

For dichotomous items on which the responses are agree (true) or disagree (false) the keying of an item refers to whether the scoring of the response agree (true) or disagree (false) is taken to indicate presence of the trait being measured. Items are usually keyed in terms of the content of the scale which they comprise. Thus, the items in

Appendix A in the categories Positive, Agree and Negative, Agree are keyed agree, and those in the categories Positive, Disagree and Negative, Disagree are keyed disagree. Investigators who are primarily interested in response styles may key items in terms of properties other than content. Examples of scales whose items are keyed in terms of response styles are Edwards' (1957) Social Desirability (SD) scale and Messick's (1962) Acquiescence 1 and Acquiescence 2 scales.

A reversed item is one which has the same content as an original item, but which is opposite in meaning in terms of that content. Two different types of reversals have been employed in item reversal studies. Negation reversals are simple grammatical insertions of a negation like not or don't. Polar opposite reversals involve reversing the semantic sense of a sentence. In the item-reversal studies and the factor analytic studies discussed below item keying is in terms of content. Table 1.1 provides a summary of reversals and conventional item keying for an original item, I'm smart.

When an original item is keyed agree and its reversal is keyed disagree, an individual who agrees to both items has a keyed response to the original item and a response that is not keyed to the reversal. Thus, the original and reversed items have opposite factor loadings on a hypothesized Agreement Acquiescence factor. This would

Table 1.1

Reversals and Keying

Item	Type	Phrasing	Keying
I'm smart.	Original	Positive	Agree
I'm dull.	Polar opposite	Positive	Disagree
I'm not dull.	Polar opposite plus negation	Negative	Agree
I'm not smart.	Negation	Negative	Disagree

contribute to a negative correlation between original and reversed items. Since the original and the reversal are both keyed in terms of content an individual who consistently responds to both items in terms of content has a keyed response to both items. Thus, the factor loadings of the original item and the reversal on a hypothesized content factor are the same. This would contribute to a positive correlation between the original and the reversal.

On many MMPI scales the preponderance of the items are keyed agree for content. If agreement acquiescence is operating on such scales it is confounded with content. An approach to determining the separate contributions of acquiescence and content is to employ reversals of MMPI items, and to examine the correlations between the original items and the reversed items.

A number of item-reversal studies showed sizable positive correlations between original and reversed forms of

MMPI items (e.g., Rorer & Goldberg, 1965). Content proponents used the findings from such item-reversal studies as support for the overall claim that acquiescence is of minor importance. However, the findings from the item-reversal studies of high correlations between original and reversed MMPI scales "do not appear to be consistent with the reported low, and sometimes negative, correlations between true and false parts of original MMPI scales" (Messick, 1967, p. 135).

Bentler et al. (1971) hypothesized two types of acquiescence. Agreement acquiescence is the response style originally construed to define acquiescence--individual differences in the tendency to agree. In the personality domain the definition would include agreement with personality statements. For example, a person high in agreement acquiescence would agree with all four items in Table 1.1. Agreement acquiescence may be linked to low verbal interpretive skill. Damarin and Messick (1965) summarized investigations showing negative relations between acquiescence and verbal intelligence, analytic attitude, and criticalness. This also may correspond to the type of acquiescence that Jackson and Messick (1958) called overgeneralization, although its basis appears to lie not so much in a tendency to overgeneralize as in an inability to differentiate or particularize (Messick, 1967).

The second type of noncontent response is that of acceptance acquiescence. This response style is defined as individual differences in the tendency to consider characteristics as descriptive. In the personality domain, this definition would include accepting characteristics as self-descriptive. A person high in acceptance acquiescence agrees with statements phrased in a positive way, and disagrees with statements that are negatively phrased. For example, such an individual would agree with the first two items in Table 1.1 and disagree with the second two. Damarin and Messick summarized evidence that acquiescence is associated with objective tests of speed, tempo, and fluency. This pattern appears to correspond to Couch and Keniston's (1960) clinical assessment of yeasaying as impulsive stimulus acceptance, a temperamental trait that is intrinsically associated with the tendency to say yes.

A problem with the item-reversal studies was that a large proportion of the reversals were negation reversals. Thus, the high positive correlations between original items and reversed items could be explained by an acceptance acquiescence hypothesis (Bentler et al., 1971). That is, acceptance acquiescence and content were confounded, since the factor loadings of the original and reversal had the same signs for the hypothesized acceptance acquiescence and content factors. Thus, either acceptance acquiescence, content, or some combination of the two could be causing the

high pcsitive correlations.[2]

Factor Analytic Research

Early factor analytic studies of the MMPI (Jackson and Messick, 1961, 1962a, 1962b) which did not distinguish acceptance and agreement showed that acquiescence accounts for a large proportion of the common variance on MMPI scales. Content is of relatively minor importance, even for several subscales keyed agree and disagree supposedly measuring the same content. Recently Bentler et al. (1971) have suggested that acceptance acquiescence is the major influence, and that agreement acquiescence is less important than acceptance acquiescence.

Messick (1967, pp. 141-144) summarized a factor analysis of true and false parts of both original and reversed MMPI scales in the same analysis. A large factor provided a clear separation between original and reversed true scales and original and reversed false scales, with corresponding original and reversed scales receiving very similar loadings on the factor. Subjects scoring high on the dimension agreed with original positively phrased MMPI items and disagreed with negatively phrased reversals of the

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[2] The factcr loadings of original and reversal on agreement acquiescence would have the same sign. Presumably, this should operate in an opposite direction to acceptance acquiescence and content in affecting the ccrrelation. Since the negative correlations between original and reversals were substantial, these studies do seem to indicate that agreement acquiescence is a relatively minor component of variance.

originals. They disagreed with original negatively phrased items, and agreed with their positively phrased reversals. The dimension was interpreted stystically as the tendency to accept many heterogeneous characteristics as descriptive of the self. It was also suggested that it might involve impulsivity, i.e., impulsive stimulus acceptance.

In this same study, a smaller factor tended to separate true-keyed scales, both original and reversed, from false-keyed scales. Subjects scoring high on this dimension consistently agreed or responded true to MMPI items, regardless of whether the items were positively or negatively phrased. It was considered a consistent tendency to agree or respond true to personality items regardless of the form of phrasing. It was suggested that it might be related to inadequacies in verbal comprehension--possibly an intellectually based dimension of acquiescence.

A study by Morf (1969; Morf and Jackson, 1972) on a sample of 87 males and 109 females showed the operation of each of the acquiescence processes. Morf and Jackson used a facet design, with items selected to elicit hypothesized content and stylistic processes, and specially constructed response style marker scales. Items were selected to provide measures of eight processes: agreement acquiescence, acceptance acquiescence, desirability, adjective acquiescence, and four content dimensions. The contents were exhibition, play, succorance, and

understanding. In the factor analysis of scales composed of these items eight factors were hypothesized and extracted, and the factors were rotated objectively to a position corresponding to the hypothesis. Distinct factors of Agreement Acquiescence and Acceptance Acquiescence were found, accounting for 18.2% and 12.1% of the common variance, respectively. A high degree of correspondence with the hypotheses was obtained for these factors. All true-keyed scales loaded positively and all false-keyed scales loaded negatively on the Agreement Acquiescence factor. All but one of the 44 personality and attitude scales in which direction of wording and direction of keying were systematically varied loaded in the appropriate direction on the Acceptance Acquiescence factor. Also, a factor identified as Adjective Acquiescence was found--restricted to adjective check-list items--which involved either agreement or acceptance acquiescence, or some blend of the two. A clear-cut Desirability factor was obtained. Finally, four factors representing each of four hypothesized content dimensions were obtained.

Jordan (1977) discussed the possibility that Morf's use of Procrustes rotation methods might have capitalized on chance in achieving a fit with the hypotheses. Jordan noted that the elaborate faceting of the data reduces to inconsequential the probability of this occurring.

Jordan criticized the adequacy of reversal and counterbalancing in Morf's study. The content stems used to define the response style facets were distributed nonrandomly across the facets of the design: item stems were not counterbalanced with respect to the facets of agreement and endorsement. Thus, the lack of counterbalancing maximized the chance that content-based differences in the exemplars of a trait were confounded with the estimation of response styles. Jordan showed that when each content area used by Morf was studied separately, a varimax rotated factor structure was equally or more consistent with a stem overlap hypothesis as it was with a response style hypothesis.

However, the hypothesis of separate acceptance and agreement acquiescence was tested by Morf in a factor analysis that included all the contents in one analysis. There was no stem overlap on items from different content areas. The rotated signs of the factor loadings fit the response style hypothesis for all content areas. Thus, the factors defined as Acceptance and Agreement Acquiescence were not easily interpreted in terms of content, since they implicated diverse content scales in both positive and negative phrased subscales keyed agree and disagree. Jordan's demonstration of stem overlap within content areas was not inconsistent with a finding of response styles across content areas.

Jordan applied three tests for the number of common factors to Morf's data: Bartlett's test; the Kaiser-Guttman roots greater-than-one rule; and Jöreskog's goodness-of-fit measure, i.e., a likelihood ratio chi-square test for the number of factors in the method of maximum likelihood exploratory factor analysis. Morf extracted eight factors, because that was the number hypothesized. Jordan estimated the number to be about 13, concluding that Morf underfactored the data.

Methods of determining the number of factors have been evaluated by applying them to simulated correlation matrices in which the number of factors and other parameters are predetermined. Cattell and Vogelman (1977) compared the scree and Kaiser-Guttman methods on 15 correlation matrices which varied in number of factors, number of variables, orthogonal versus oblique factors, presence of simple structure, presence of error, and size of communalities. Taking the mean of judges' scree test decisions, the number of factors determined was correct in six cases and missed by plus or minus one in eight instances. The Kaiser-Guttman test consistently underestimated the number of factors.

Bartlett's test, the Kaiser-Guttman roots greater-than-one rule, and the scree test all involve separating a set of large eigenvalues from a set of small eigenvalues. The eigenvalues are extracted from an unreduced correlation matrix, i.e., a correlation matrix with unities on the main

diagonal. Thus, the eigenvalues are the amounts of variance explained by the components from a principal component analysis. Horn and Engstrom (1979) noted, "It has become customary to assume that the factors of largest variance represent common factors and the factors of small variance represent sampling error and/or measurement error" (p. 284).

Hakstian, Rogers, and Cattell (1982) generated correlation matrices using the usual common factor model and also a model (the Middle Model) which supplements the common factor model with a matrix of minor common factors representing measurement error or sampling error. Parameters of both models included number of variables, factor to variable ratio, factorial complexity, variable communalities, and sample size. In a set of analyses evaluating the scree test and the Kaiser-Guttman test, the correlation matrices were treated as population correlation matrices. In a second set of analyses, which also evaluated Jöreskog's likelihood ratio test, random sampling error was included so as to simulate correlation matrices from random samples. In the analyses of population correlation matrices with the common factor model the scree test indicated the correct number of factors for all parameter values. The Kaiser-Guttman test tended to slightly underestimate the number of factors for data sets involving a large number of variables, high factor to variable ratio, and low communality. With the Middle Model, the Kaiser-Guttman test

tended to underestimate, and the scree test tended to overestimate. In the analyses of sample correlation matrices with the common factor model all three methods consistently indicated the correct number of factors when matrices of variables with high communalities were used. With low communality variables each performed less accurately, with results depending on the variable to factor ratio. Increasing sample size increased the accuracy of all three methods. With the Middle Model, the Kaiser-Guttman test tended to not register the presence of the minor factors. On the other hand, the scree and likelihood ratio methods determined too many factors, except for data sets with small sample size and low communality.

In conclusion, each of the methods for determining the number of factors has limitations under certain circumstances. However, used judiciously they seem to have value in determining an interval or range for the plausible number of factors. There is no question that it is better to use at least one of these methods than to extract the number of factors determined by one's hypotheses without determining whether this is warranted.

Thus, Jordan's criticism of Morf was well taken. What implications might this have for the validity of Morf's analysis? The number of factors extracted is a determinant of variables' communalities (Kaiser, 1976). Also, extraction of too few factors can result in small factors

merging into broader factors (Jordan, 1977). It does not seem that distortion in the communalities or merging of factors due to underfactoring could entirely account for Morf's finding of Acceptance and Agreement Acquiescence factors. There was a strong correspondence between the predicted and obtained signs of factor loadings for these factors. However, it is possible that distortions in the magnitude of some of the factor loadings might have occurred. The amount of variance accounted for by factors might have been distorted also.

Estimation of Variance Components

Another approach may be used to study acceptance, agreement, and content. Subscales are devised which define levels of a factorial (i.e., crossed) design with two levels for each factor. The relative magnitude of the contributions of acceptance, agreement, and content to individual differences are estimated by the size of their variance components. Covariances between the effects can also be assessed.

Methodological advances. Chapman and Bock (1958) developed a method for determining the magnitude of acquiescence and content variance components in the F-scale measure of authoritarianism. This involved estimation of variance components in a mixed model analysis of variance. Bock (1960) and Wiley, Schmidt, and Bramble (1973) have

considered covariance structure analysis as an approach to study differences in test performances when the tests have been constructed by assigning subtests according to item characteristics in a factorial design.

Jöreskog (Jöreskog & Sörbom, 1979) summarized a paper of Bock:

> Bock (1960) suggested that the scores of subjects on a set of tests classified in 2^n factorial design may be viewed as data from an N X 2^n experimental design, where the subjects represent a random mode of classification and the tests represent fixed modes of classification. Bock pointed out that conventional mixed-model analysis of variance gives useful information about the psychometric properties of the tests. In particular, the presence of nonzero variance components for the random mode of classification and for the interaction of the random and fixed modes of classification provides information about the number of dimensions in which the tests are able to discriminate among subjects. The relative size of these components measures the power of the tests to discriminate among subjects along the respective dimensions. (pp. 69-70)

The classical formulation of the mixed model involved assumptions of homogeneous error variances and uncorrelated factors. These assumptions may not always be tenable for analyzing faceted test data. Bock, Dicken, and Van Pelt (1969) employed a mixed model approach which did not restrict the latent variables to be uncorrelated. Wiley et al. (1973) suggested the study of a general class of components of covariance models. Their plan included as parameters: (a) correlated or uncorrelated latent variables, (b) homogeneous or heterogeneous error variances, and (c) scaling factors which allow for the possibility that

the observed variables are measured in different metrics. Bramble and Wiley (1974) employed it to estimate agreement acquiescence, content, and content-acquiescence components in the data of Bock et al. (1969). Jöreskog (Jöreskog & Sörbom, 1979) considered the model of Wiley et al. as a special case of Jöreskog's general model for covariance structures.

Wiley et al. (1973) fit to the observed variance-covariance matrix a model in which the number of factors is set to correspond to the number of facets in the factorial design of subtests. This is not predetermined in Jöreskog's approach. Jöreskog's approach allows the researcher to empirically determine the number of factors by tests for the number of factors on the observed variance-covariance matrix. Then a model which has an appropriate number of factors is fit to the observed variance-covariance matrix.

In the approach of Wiley et al. the design matrix, i.e., the fixed factor pattern matrix of ones and minus ones, is also set in advance. In Jöreskog's approach multiple design matrices can be constructed which reflect information about which factors there are (and possible interactions between them). Thus, Jordan (1977) performed a preliminary analysis using the observed variance-covariance matrix to determine which factors are large, and used its result to determine how to structure the design matrix.

Findings from studies which estimated variance components. Bock et al. (1969) reversed the items of the MMPI Pt and Hy scales. Subjects responded to both the original and reversed versions on two separate occasions. Thus, it was a 2 X 2 design, with facets for acquiescence (original and reversal) and administrations (first and second). A model was constructed treating a score as a linear combination of content, acquiescence, and trait instability components, as well as a constant and an error component. The model allowed for correlation between content and acquiescence, but assumed that all other correlations between components are zero.

Estimates of the variance components and content-acquiescence covariance were obtained for Hy and Pt scales separately. A small but significant acquiescence variance component was found on both scales. On neither scale did acquiescence amount to more than 10% of the positive scale variance. There was evidence, however, that the acquiescence factor was substantially correlated with the content factor. The investigators suggested that results which many researchers have attributed to acquiescence in the MMPI may be due to the presence of content-acquiescence correlation.

However, it may be noted that Hy and Pt have high negative loadings on desirability (Jackson & Messick, 1962a). Messick (1967) noted that "acquiescence appears to operate mainly on scales that are relatively neutral in

desirability and to decrease steadily in influence as scales become either more and more desirable or more and more undesirable" (p. 120). Thus, the minor involvement of acquiescence in the Hy and Pt scales may be accounted for by the strcng involvement of desirability in these scales.

Another problem with the study of Bock et al. (1969) was that acquiescence was equated with agreement acquiescence, and the concept of acceptance acquiescence was ignored. The reversals employed by Bock et al. were obtained from an item pool described as one in which "substantive changes rather than simple grammatical reversals were used in about 25 percent of the items" (Dicken & Van Pelt, 1967, p. 936). Thus, about 75% were negation reversals. Since acceptance acquiescence was not measured, the estimate of the content component was confounded with any effects of acceptance acquiescence. The use of approximately 75% negation reversals would allow the effect of acceptance acquiescence to be marked.

Jordan (1977) modified Morf's design by constructing subscales with a balanced incomplete block plan which counterbalanced item stems, thereby controlling for the possibility that item stems are confounded with response styles. Jordan's sample consisted of 173 undergraduates from a technical college and 106 undergraduates from an academic college. Eighty-four percent of the technical college group were males, and 79% of the academic group were

females. An analysis of covariance structure was done on each set of Play, Understanding, and F scales separately. Tests of dimensionality indicated there were two factors in each content area. Preliminary tests indicated that the variance component for endorsement (acceptance) acquiescence was not significantly different from zero. Variance component models were then fit with content and agreement acquiescence components estimated. The obtained estimates differed for the technical and academic groups. An agreement acquiescence component was significant for both groups, but was approximately twice as large in the academic group. Estimates of correlation between content and agreement acquiescence were close to zero. In another part of the study Jordan constructed three agreement acquiescence measures from Play, Understanding, and F-scale items, and two endorsement (acceptance) acquiescence measures from Play and Understanding items. Two-factor models were fit to the data, with acceptance and endorsement factors hypothesized. Solutions with the factors constrained to be uncorrelated and free to correlate were tried. Both solutions were found to be acceptable by a chi-square goodness of fit test with maximum likelihood factor analysis.

Jordan's failure to find acceptance acquiescence in the variance component analysis is puzzling in view of the results of the factor analysis. The apparent discrepancy might be explainable by arguing that the subscales used in

the variance component analysis were weak measures of acceptance acquiescence. The acceptance and agreement acquiescence measures employed in Jordan's factor analysis used large numbers of items. Presumably, this increased their reliability and validity as measures of acceptance and agreement acquiescence. In contrast, the subscales used in the variance component analysis had few items. If the items were poorly written for indexing acceptance acquiescence, the subscales would have been very weak measures of acceptance acquiescence.

The way in which items are reversed can substantially affect estimates of the magnitude of response styles and content. In a reanalysis of Chapman and Bock's (1958) data Jordan (1977) found that the variance component for content tended to be larger than the variance component for agreement acquiescence. Agreement acquiescence ranged from 13% to 21% of true scale variance, and content ranged from 25% to 32%. However, in a study by Jackson, Messick, and Solley (1957), in which the F-scale content was reversed while retaining the item style of the original items, an acquiescence variance component was obtained which was more than twice as large as the content variance component.

In Jordan's analysis of Play, Understanding, and F-scale items some of the negation reversals were two-clause compound sentences on which the wording of one clause was positive and the other negative. On the Play scale 12 of 28

negation reversals involve this kind of sentence, and on the Understanding scale, five of 28. Such sentences appear to be ambiguous from the standpoint of evaluating the acceptance acquiescence hypothesis. A better test would use only single-clause negative sentences, or, if two clause sentences must be employed, sentences with both clauses negatively phrased.

Secondly, the appropriateness of the words used as negations was sometimes questionable. The clearest example of a good negation reversal would involve insertion of a not, don't, or aren't in a simple sentence. On Jordan's Play scale eight of 28 negation reversals involve the words never, rarely, and seldom, and on the Understanding scale 5 of 28. Moreover, sometimes these terms occur in the type of two-clause sentence noted above. It seems to be doubtful whether such sentences are consistently processed by all subjects as negations. Furthermore, there may be individual differences in the ways the negative connotations of such sentences are construed.

Summary. Early factor analytic studies of the MMPI obtained a broad factor completely separating true- and false-keyed subscales which was interpreted as acquiescence. Criticisms of this interpretation by Block (1965) were discussed, and it was concluded that the acquiescence interpretation was still tenable. Early item-reversal studies of MMPI items did not show evidence of acquiescence,

however. The hypothesis of two kinds of acquiescence, acceptance acquiescence and agreement acquiescence, may provide a way to resolve the apparent contradiction.

A factor analytic study of Morf was reviewed. The study provided evidence for the existence of both acceptance and agreement acquiescence. Although the problem of underfactoring puts into doubt its estimates of the size of factor loadings and the amount of variance explained by factors, the consistency between the signs of factor loadings and the hypotheses could not be discounted. The interpretation of the large factors as acceptance and agreement acquiescence rather than content was also considered to be warranted.

Estimation of variance and covariance components was done in studies of Bock et al. (1969) and Jordan (1977). Small but significant agreement acquiescence variance components were obtained in both studies. Thus, the hypothesis of the existence of agreement acquiescence was supported by both factor analyses and estimates of variance components. Estimates of the magnitude of agreement acquiescence vary, however. Item writing procedures were considered as a possible cause of this variability. The hypothesis of acceptance acquiescence was not supported in Jordan's variance component analysis. An attempt was made to resolve the apparent contradiction between this finding and Jordan's factor analysis which supported the hypothesis of acceptance acquiescence.

Desirability Response Styles

Research on desirability response styles is associated with a longstanding problem in measurement of personality by questionnaires, the problem of deception. In various settings in which personality questionnaires are administered some individuals may present an invalid impression of their attributes so as to get rewards or approval, or to avoid negative outcomes contingent on the assessment. Various scales have been used to detect biases and distortion in self-reports, such as the lie scales discussed below.

Although lie scales typically have low correlations with measures of content, Edwards' (1957) SD scale correlates with a wide range of personality scales. If the SD scale is interpreted as a measure of deception, an implication that may be drawn is that a wide range of measures of content are affected by biases in self-report or self-evaluation. Thus, there is a need to control desirability for the optimal measurement of content, and to understand the psychological processes involved in desirability.

Desirability

Two factors involving consistent responses to connotations of desirability have been found in factor analyses of self-report personality and psychopathology

questionnaires. One of these Edwards (1970) called social desirability and the other, lying or impression management.

Edwards (1970) described a psychological scaling method for obtaining social desirability scale values (SDSVs) for each of a set of personality statements:

> To obtain the SDSVs, personality statements are presented, one at a time, to a group of judges who are asked to rate each statement on a 9-point rating scale ranging from extremely desirable, through neutral, to extremely undesirable . . . . For each statement a distribution of ratings is obtained and it is then possible to find the mean rating assigned to a statement. This mean rating is called the SDSV of the statement. If a large and representative set of personality statements is rated for social desirability, it will be found that on the average, some statements are judged as being extremely desirable, others as extremely undesirable, and still others as falling somewhere between these two extremes. (p. 88)

Edwards noted that the same set of items for which SDSVs are known may be given to an independent group of individuals who are asked to describe themselves by responding <u>true</u> or <u>false</u> to each statement. It is then possible to find for each individual the number of socially desirable responses, a socially desirable response being a response of <u>true</u> to an item with SDSV above 5.5, or <u>false</u> to an item with SDSV below 4.5. Edwards' (1957) 39-item Social Desirability (SD) scale consists of items from the MMPI that were scaled for social desirability and were found to have SDSVs above 5.5 or below 4.5. There are nine items with SDSVs above 5.5 keyed for <u>true</u> responses and 30 with SDSVs below 4.5 keyed for <u>false</u> responses. Edwards (1970) called

the scale "a very early attempt to measure individual differences in the tendency to give socially desirable responses in self-description" (p. 111).

The procedure of selecting items in terms of their desirability scale values has been applied to other item pools in constructing other desirability[3] scales. Jackson and Messick (1962a) devised five desirability scales which differed in mean judged desirability of the items. Items on all five scales were all keyed true so that the influence of acquiescence on each could also be determined. Jackson's (1974) PRF Desirability scales were constructed by a procedure which included selection of items from each extreme of a distribution of desirability scale values. The scale composed of items keyed agree has items with high desirability scale values, and the scale composed of items keyed disagree has items with low desirability scale values. Items of both scales were also selected so as to avoid psychopathological content and content consistencies.

In factor analyses of response style and personality scales (Edwards, 1963; Edwards, Diers, & Walker, 1962; Edwards & Walsh, 1964; Jackson & Messick, 1962a) a factor was found with high factor loadings on desirability scales and loadings above .30 on a broad range of personality

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[3] The term desirability appears preferable. There are "individual viewpoints about the desirability of certain personality characteristics" (Messick & Jackson, 1972). The term social desirability appears to imply a uniformity in judgments of desirability.

scales. It accounted for a substantial fraction of the total variance in several questionnaires, more than any other response style and probably more than any factor of item content (Damarin & Messick, 1965; Edwards, 1970). It was marked by Edwards' (1957) SD scale and, in the negative direction by anxiety scales such as the Manifest Anxiety scale. Edwards (1970) interpreted the Social Desirability factor in terms of the influence of individuals' judgments of the social desirability of attributes on their endorsements of the attributes as self-descriptive.

Psychological processes involved in desirability. Damarin and Messick (1965) proposed that answers to personality items reflect as many as four different sources of variance, including:

1. Variance in assessed or "true" desirability.

2. Variance in accuracy of self-report.

3. Variance in response bias caused by the subject's positive or negative self-referent attitudes.

4. Variance in response bias caused by attitudes toward the questioner.

Evidence was reviewed indicating that SD scores are nonlinear functions of the basic trait variables. Damarin and Messick analyzed proposals that Edward's SD scale measures some sort of true desirability, i.e., subjects are accurately indicating their true desirability or adjustment, an interpretation consistent with content oriented

interpretations of the Desirability factor. Damarin and Messick (1965) noted, "Other reinterpretations . . . require us tc have faith in the accuracy of the subject's responses . . . . Nevertheless, everything points to the conclusion that subjects may differ considerably in their ability to provide accurate reports on their own behaviors" (p. 17).

Damarin and Messick noted that inaccurate subjects or subjects who find items ambiguous are expected to respond desirably. Questionnaire items can be ambiguous in two different ways. As in any test, the true answers to the items may be hard to find. That is, some subjects may have difficulty knowing whether they have the attribute described by the item. Secondly, the socially desirable answers may not be obvious either. Thus, subjects may vary in their ability to assess the social desirability connotations of items. The abilities required to resolve the two kinds of ambiguity may be different.

Damarin and Messick also observed that attitudes towards self may play some part in determining responses to personality questionnaires, at least on those items where the correct answer is maximally ambiguous. Such attitudes also may be applied to the response style of social desirability, considering that attitudes towards self and biases in self-regard are determinants of desirable responding. Secondly, answers to a personality

questionnaire may be considered as a self-presentation used to facilitate the attainment of the subject's goals. Particularly when benefits to the subject are contingent on the subject's answers, the answers may reflect attitudes to the tester. By attitude is meant more than only a positive or negative feeling tone--the subject probably wishes to elicit a fairly definite response from the tester, a response that may be favorable in some instances (faking good) and unfavorable in others (faking bad).

Need for social approval (Crowne & Marlowe, 1964) also may cause self-report biases. The approval motive supposedly causes the subject to be sensitive to and conform to the wishes of others. Evidence adduced by Crowne and Marlowe support this interpretation.

A recent study by Sackeim and Gur (1979) provided some evidence which may be viewed as indicating that self-deception is involved in desirable responding. Sackeim and Gur administered inventories designed to assess self-deception, other-deception, and self-reported psychopathology (N = 250). In a previous study the self-deception inventory had a significant correlation with errors in identification of voices of self and others, which was interpreted as a validation. Sackeim and Gur found substantial negative correlations between the self-deception inventory and psychopathology scores on three questionnaires. Correlations of other-deception with the

psychopathology scales were also negative, but lower than those involving self-deception. The investigators interpreted the findings as showing that the more likely individuals are to engage in self-deception, the less likely they are tc report psychopathology. They alsc suggested that self-deception is more of an invalidating influence on measures of psychopathology than other-deception.

As noted above, diverse psychcpathclogy scales are highly correlated with Edwards' SD scale and load highly on a Desirability factor (Jackson & Messick, 1962a). Thus, Sackeim and Gur's evidence that self-deception is involved in psychopathology scales may be taken as showing that self-deception is involved in desirable responding.

Jackson and Paunonen (1980) reviewed recent attempts to explain self-referent responses involved in responses to personality questionnaires. Models of desirable responding and acquiescence based on latent trait theory, Thurstonian attitude scaling, and the Rasch model have furnished well fitting predictions for item reversal studies previously thought to represent consistencies in responses to ccntent, and structuring of MMPI scales very similar to that obtained empirically for the first two MMPI factors. Another approach is the explication of the cognitive representation of the concept of self and its implications fcr encoding and responding to personal information.

Defensiveness

In the factor analytic studies in which the Desirability factor was found another response style factor was obtained which was orthogonal to the Desirabilty, Acquiescence, and content factors (Edwards, 1963; Edwards, Diers, & Walker, 1962; Edwards & Walsh, 1964; Jackson & Messick, 1962a). The scales which have defined this Defensiveness or Lying factor were the MMPI Lie scale, Wiggins' (1959) Social Desirability (Sd), Cofer, Chance and Judson's (1949) Positive Malingering (Mp), Hanley's (1957) scale of test-taking defensiveness (Tt), and Crowne and Marlowe's (1960) Social Desirability (CM-SD). The pattern of loadings of lie scales and Edwards' SD scale on the Defensiveness and Desirability factors differs. In all these studies the MMPI Lie scale had high loadings (ranging from .54 to .99) on the Defensiveness factor, and a low loading (ranging from .03 to .32) on the Desirability factor. Edwards' SD scale consistently had a loading close to zero on the Defensiveness factor, and a high loading on the Desirability factor. In two studies (Edwards, 1963; Edwards et al., 1962) Sd and Mp had relatively high loadings on the Defensiveness factor (ranging from .78 to .97) and relatively low loadings on the Desirability factor (ranging from .15 to .44), but in one study (Jackson & Messick, 1962a) the loadings of Mp (split into subscales keyed <u>true</u> and <u>false</u>) on the two factors were fairly similar. In two

studies (Edwards et al., 1962; Edwards & Walsh, 1964) CM-SD had relatively high loadings (-.61 and -.83, respectively) on the Defensiveness factor, and relatively low loadings (.28 and -.43, respectively) on the Desirability factor. In one study (Jackson & Messick, 1962a) a subscale of Tt consisting of the items keyed false had loadings close to zero on the Defensiveness factor and moderate loadings on Desirability; a subscale of It consisting of the items keyed true had loadings of about equal magnitude on the two factors.

Jackson and Messick (1962a) interpreted a factor defined by lie scales as reflecting "a type of naive test-taking defensiveness" (p. 553). They noted that because responses to lie scales may be interpretable in terms of both a tendency to respond consistently to certain formal properties of items and a mode of defense invclving biased self-appraisal, these scales might be considered to reflect stylistic aspects of responding.

Lie scales typically have items that describe various characteristics that are worthy but few people actually possess, or that are unworthy but common. Examples of the first kind of item are, "I'm always willing to admit it when I make a mistake" (from CM-SD) and "I go to church almost every week" (from Mp). Examples of the second kind are "I get angry sometimes" (from MMPI Lie scale) and "I do not always tell the truth" (from Mp). Consistent responses of

agree to the first kind of item and disagree to the second kind are taken as an indication that an individual may be lying. It appears to be unlikely that anyone would actually possess all the good qualities and not have any of the faults. It is possible that some individuals may actually have some very good qualities described by some items, and may be describing them accurately. However, it is implausible that an individual would have most of such exceptionally good qualities and hardly any of the common faults. Impression management appears to be occurring.

Desirability and Intellective Self-evaluation

The proposal that affective attitudes toward self are basic processes involved in desirable responding suggests that responses to scales which involve self-evaluations may load on a Desirability factor. Likewise, another basic process involved in desirable responding, biases in self-report due to attitudes toward the experimenter, may also be involved in self-evaluation scales. Wylie (1974) summarized evidence that there are significant relations between many measures of self-esteem and social desirability. Wylie interpreted such relationships as potentially invalidating the self-esteem measures as measures of subjects' phenomenal self-regard.

Let us also consider the possible relation between social desirability and self-evaluations referring to a

specific life area, in particular, intellective self-evaluation. If self-concept is hierarchically organized as suggested by Shavelson, Hubner, and Stanton (1976), self-evaluations referring to a particular area would be expected to also reflect overall afffective self-referent attitudes to some degree. On the other hand, to the extent that the items have specific reference to particular goals and performances it is likely that responses will tend to refer only to them, and not be colored by broader self-referent attitudes.

Finally, there is the problem of biases in self-report due to attitudes toward the experimenter. To some degree such biases may be reflected in scores on lie scales. These scales have items with heterogeneous content, so they appear to involve psychological processes that are operative across a range of situations. Positive correlations between these scales and a self-evaluation referring to a particular life area like intellective self-evaluation might indicate that lying is involved. However, caution is necessary before drawing such a conclusion in view of the complexity of the psychological processes which may be involved in lie scales.

ACHIEVEMENT-RELATED DISPOSITIONS AND INTELLECTIVE SELF-EVALUATION

Achievement

Factor analytic studies which include achievement-related variables are worth examining because they raise questions as to whether achievement is a unitary disposition. Secondly, they help to place achievement in a context of other attitudes and dispositions.

Guilfcrd (1959) summarized evidence that there are at least three factors in the area of achievement, "General ambition: Desire to 'succeed,' to achieve fame and fortune . . . . Persistent effort: Self-imposed urge to keep working at a task. . . . Endurance: Willingness to withstand discomfort or pain in order to achieve a goal" (pp. 438-439).

Jackson, Ahmed and Heapy (1976) hypothesized that there are six facets to achievement: competitiveness, acquisitiveness, status with peers, status with experts, concern for excellence, and achievement via independence. They employed five methods to appraise each of the six facets, confirming the six-dimensicnal structure both at the correlational and factor analytic level. Even at the second-order level, there was evidence for more than one factor of achievement.

Messick (1962) administered ten content scales of the Personality Research Inventory. Two of the content scales were Achievement Striving-true and Achievement Striving-false. Two scales of acquiescence and two of desirability were included as markers of these response styles. Each content scale was split into a scale composed of items keyed agree and disagree. The matrix of correlations of the content scales was factor analyzed, and the four response style markers were projected into the factor space. Rotation was to oblique simple structure, but the resulting vectors were close to orthogonal. The Achievement Striving-true scale was found to have a positive loading (.43) on a second-order factor interpreted as a content complex of controlled conventionality versus impulsive unconventionality. Other scales with positive loadings on this factor were Conformity in Controlling Aggression (false), Defensiveness (false), and Desirability. Scales with negative loadings were both true-keyed and false-keyed subscales of Unconventionality, Affective-Effective, Impulsiveness, Self-Sufficiency, and Tolerance of Ambiguity.

Factor analytic research summarized by Cattell and Child (1975) indicated the presence of a self-assertiveness erg or drive. Evidence was summarized showing that it involves attitudes of achievement, competititiveness, pride, and independence.

There appear to be some conceptual links between the constellation of attitudes defined by Cattell and Child and the second-order factor obtained by Messick (1962). One may also note here a similarity to a cluster of traits called the entrepreneurial character (Brown, 1965) which involves achievement motivation, a tendency to plan ahead, and a liking for personal responsibility.

In summary, factor analytic research has defined a set of distinct dimensions of achievement. These are interrelated, and higher-order analyses show that there are one or more broad constellations of achievement-oriented dispositions.

Analyses of Achievement Scales

Questionnaire Measures of Achieving Tendency. Mehrabian (1968) developed male and female Tendency to Achieve scales by writing items referring to behaviors which research had shown to discriminate subjects high in motive to achieve and low in motive to avoid failure from subjects low in motive to achieve and high in motive to avoid failure. Atkinson and coworkers (e.g., Atkinson & Birch, 1978) had found a number of such behaviors involving risk-preference, persistence, performance level, and other achievement-related behaviors.

Each of the items compares an achievement-oriented behavior with a behavior that is failure-avoiding or

involves motives other than achievement. For instance, an item that compares an achievement-criented behavior with a behavior that characterizes people high in motive to avoid failure is "I more often attempt difficult tasks that I am not sure I can do than easier tasks I believe I can do." Mehrabian (1969) reported correlations of .24 and .34 for revised Achieving Tendency scales with the Crowne-Marlowe (1960) Social Desirability scale. The Achieving Tendency scales had low correlations with the standard thematic apperceptive measure of achievement and the Test Anxiety Questionnaire (Mehrabian, 1968; Mehrabian, 1969). The male and female scales correlated .62 and .37 with Jackson's (1967) PRF Achievement scale (Mehrabian, 1969). Mehrabian (1968) summarized a few studies relating the scale to performance and persistence in achievement situations.

Mehrabian (1968) performed separate principal component factor analyses of the items of the male and female scales. Eleven and 13 factors with eigenvalues greater than unity were extracted. For both scales the first factor accounted for no more than 15% of the total variance. Mehrabian interpreted these findings as consistent with the nature of the items which refer to a number of different kinds of achievement-related behaviors.

However, these factor analyses show that multiple processes are involved in responses, which seems inconsistent with the claim that the scales measure a single

disposition, tendency to achieve. A problem in defining the content measured is that the items are not measures of only the achievement motive. The items were written and selected to represent behaviors which differentiate subjects high and low in both motive to achieve and motive to avoid failure. These are distinct, independent motives (Smith, 1964). Combining items representing both in the same scale would be expected to increase its factorial complexity.

McClelland (1980) argued that structured personality questionnaire scales of achievement--including the Jackson (1974) Personality Research Form Achievement scale and the Mehrabian (1969) measure of achieving tendency--have insignificant correlations with the thematic apperceptive measure of achievement motivation because the thematic apperceptive measure and the structured scales get at different aspects of personality. The thematic apperceptive measure indexes motives or operant trends, while the questionnaires measure value for achievement

Let us reconsider the question of why Mehrabian's (1968, 1969) Tendency to Achieve scales had low correlations with the thematic apperceptive measure of achievement motivation. I will take a factor analytic approach. McClelland's idea that achievement questionnaires such as the Tendency to Achieve scale measure a different kind of variable from the thematic apperceptive measure is not mutually exclusive with this analysis, which may be considered supplementary.

The correlation between two tests equals the sum of the cross-products of their factor loadings (Harman, 1976; Thurstone, 1947). The multidimensional structure of the Tendency to Achieve scales was noted above. If achievement motivation is not the major or only factor on these scales, it would contribute in a relatively minor way to the scales' correlations with the thematic apperceptive measure of achievement motivation. Further, the questionnaire measures of achievement and the thematic apperceptive measure of achievement motivation have different measurement methods, so response styles can not contribute to their correlation.

Entwisle (1972) has taken a different position, that the low correlations of the thematic apperceptive measure with the Tendency to Achieve scales and other structured achievement scales are explained by the low reliability of the thematic apperceptive measure. However, Brody and Smith (1972) found that with a sufficient number of items and proper experimental controls the measure attains a higher reliability than was found in the studies summarized by Entwisle.

Mehrabian and Bank (1978) reported work on a new measure of individual differences in achieving tendency which is based on Mehrabian's (1969) Tendency to Achieve scales. Items were selected from an item pool which had high item-achievement scale correlations and low correlations with Crowne and Marlowe's (1960) Social

Desirability scale. Total scores cn the new achievement scale ccrrelated .03 with Crowne and Marlowe's scale. A factor analysis of the items showed that multiple factors are involved. Correlations of the achievement scale with Jackson's Personality Research Form Achievement and Mehrabian's (1968) Tendency to Achieve scales were high. The new measure is applicable to both sexes, and is more reliable than the earlier Tendency to Achieve scales.

Since Mehrabian and Bank's achievement scale correlates close to zero with Crowne and Marlcwe's Social Desirability scale, this might be regarded as an indication that desirability response style is not a problem on this scale. However, the Crowne-Marlowe Social Desirability scale is not a univocal measure of the Desirability factor--it alsc loads on a factor defined by lie scales. Thus, even though the achievement scale correlates close to zerc with the Crowne-Marlowe Social Desirability scale, it might load on the Desirability factor.

In conclusion, research on Mehrabian's (1968, 1969) Tendency Tc Achieve scales and Mehrabian and Bank's (1978) measure of individual differences in achieving tendency was reviewed. Item analyses indicate that these scales have a multidimensional structure. It was noted that a dimension of value for achievement might be involved.

The Personality Research Form Achievement Scale. The development of Jackson's (1974) Personality Research Form

Achievement scale exemplified the psychometric approach to scale construction. Theoretical, empirical, and statistical approaches were employed. The trait was initially conceptualized in terms of a description of the high scorer as follows: "aspires to accomplish difficult tasks; maintains high standards and is willing to work toward distant goals; responds positively to competition; willing to put forth effort to attain excellence" (Jackson, 1974, p. 6). Trait adjectives were also used to define the person high in achievement.

Evidence of the convergent validity of the achievement scale has been obtained by finding significant relations between it and behavior ratings of achievement need. Evidence for convergent and discriminant validity of the achievement scale and other PRF scales was obtained in a multimethod factor analysis of self-ratings, peer-ratings and PRF scales (Jackson, 1974). A factor was found which was defined by all three methods of measuring achievement and no scales representing other content.

In the construction of PRF scales a series of methods was employed for reducing the role of response styles. Acquiescence was suppressed by employing equal numbers of true-keyed and false-keyed items. Further, Jackson (1974) noted that the procedures employed in PRF-scale development to maximize content saturation also minimized the role of acquiescence. Desirability variance was suppressed at the

item level by selecting from the total pool of items only those which had a high correlation with total scale score, and a relatively low correlation with a desirability scale.

There is some evidence that despite the procedures employed to reduce variance due to desirability, responses to the PRF Achievement scale still involve desirability to a significant extent. Jackson's (1967) PRF Achievement scale correlated .55 with the Crowne-Marlowe Social Desirability scale in a sample of 98 female undergraduates and .44 in a sample of 114 male undergraduates (Mehrabian, 1969). Another measure of the likely presence of desirability variance on a scale is the mean social desirability scale value of its items (Edwards, 1970). Jackson (1974) reported that the majority of the PRF scales fall in a fairly neutral range of from four to six on a scale of desirability values from one to nine. However, the achievement scale-false has the highest mean desirability scale value of all the 21 content scales rated, and the achievement scale-true has the fifth highest desirability scale value.

Are the Mehrabian Tendency to Achieve Scale and the PRF Achievement scale measures of the same construct? Mehrabian and Bank (1978) reported a statistically significant and high correlation between them. However, this does not necessarily mean that they have in common an achievement factor. Other factors, such as Desirability, might also underlie the high correlation. McClelland's (1980) proposal

that structured self-report achievement scales measure value for achievement was noted above. One aspect of this idea is that scales like the Mehrabian and PRF achievement scales do have something in common. McClelland identifies it as value for achievement, and distinguishes it from need for achievement. In the present research only a specific hypothesis will be tested, that these scales measure a common factor having to do with achievement.

The Achievement Motive, Self-evaluation, and Expectancies

A large body of research shows that individual differences in achievement motivation are related to theoretically relevant behaviors such as academic performance, persistence, and level of aspiration (Atkinson & Feather, 1966); and parental childrearing antecedents (Smith, 1969). Recent developments in motivation theory and research explain temporal changes in achievement motivation (Atkinson & Birch, 1978), implications for behavior of contingent versus noncontingent paths toward goals, and consequences for the individual such as long term career accomplishments (Atkinson & Raynor, 1974). In a recent study Cooper (1983) related resultant achievement motivation, measured by thematic apperceptive achievement motivation minus test anxiety scores and also scores on the Mehrabian (1969) Achieving Tendency questionnaire, to seven variables including initial task choice, performance,

persistence, valence of success, valence of failure, task difficulty estimates, and the Zeigarnick effect. Both measures of resultant achievement motivation were related as predicted to five of the seven behaviors, but results for initial task choice were contrary to predictions and the Zeigarnick effect was not found. The results were discussed in terms of theory of achievement motivation as a nomological network.

Evidence suggesting a link between achievement-related motives and subjective probability of success was obtained in early studies testing Atkinson's (1957) risk-taking model. These studies tested the hypothesis that subjects with high motive to achieve and low motive to avoid failure would most frequently choose tasks with a subjective probability of .50, and that subjects with low motive to achieve and high motive to avoid failure would more frequently select tasks with extreme subjective probabilities. Results from early studies supported the hypothesis (Atkinson, Bastian, Earl, & Litwin, 1960). However, the probabilities most often chosen by achievement-oriented subjects were appreciably lower than .50, a finding not predicted by the model.

This led Atkinson (1957) to propose that the perceived probability of success of achievement-oriented individuals is higher than the objective probability, and that the perceived probability of failure avoiding individuals is

lower than the objective probability. Research directly relating achievement motivation to expectancies indicated that there is a significant but weak relationship at the start of a task when subjects have little information about their performance; during the task, as subjects acquire more information, differences in motive-linked expectancy biases decrease (Feather, 1966).

Several explanations have been advanced for the link between achievement-related motives and expectancies. In certain evaluative situations motive to achieve and motive to avoid failure influence level of performance (Smith, 1964). Thus, achievement-oriented individuals have personal histories of success in achievement situations. Atkinson and Feather (1966) noted:

> It is entirely consistent with all that has been said about the influence of the tendency to achieve success and the tendency to avoid failure on the level of performance to expect that Ss in whom Ms > Maf bring a greater history of success to most tasks. When there is sufficient ambiguity about the situational cues defining the individual's chances of success, the generalized effect of past history is to be expected. (pp. 359-360)

There may be developmental bases for a connection between achievement-related motives and self-evaluation. Veroff (1969) observed that in the course of trying out skills, the young child experiences positive affect associated with competent performances. Veroff suggested that the child's evaluation of his or her competence makes an experience an achievement. Such evaluations supposedly occur independently of social reinforcements.

Weiner (1972) summarized evidence that individuals who are high and low in achievement orientation have different perceptions of causality for success and failure. Persons high in achievement orientation ascribe success to high ability and high effort, and failure to a lack of effort. Persons low in achievement orientation display no clear attributional preferences for success and ascribe failure to low ability. Failure ascribed to low ability tends to result in hopelessness and anticipation of the negative consequences of failure. Also, subjects high in achievement orientation perceive that the degree of effort expenditure influences achievement outcomes. An effort-outcome covariation principle is not expressed by individuals low in achievement orientation. These attributional patterns presumably underlie differences in the motive groups' perception of their ability and affects, and are the source of individual differences in achievement motivation (Weiner, 1980).[4]

Shrable and Moulton (1968) investigated relationships between the nature of achievement fantasy and self-rated competencies with respect to the type of tasks portrayed in the picture cues used to elicit the fantasies. Subjects

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[4] Weiner and colleagues have used the Mehraban (1968) tendency to achieve scale to indicate achievement orientation. McClelland (1980) has called this scale a measure of value for achievement, which is different from the achievement motive that is measured by the thematic apperceptive measure. Value for achievement pertains to cognitive elements in achievement schemata.

were high school senior men. Achievement fantasy concerned with long-term career achievement and unique accomplishments occurred more often in stories written in response to pictures of tasks in which the individual perceives himself as highly competent. The achievement fantasies appearing in response to pictures accompanied by ratings of low competence tended to focus on concern about good performance with respect to the immediate routine aspects of the task portrayed. Shrable and Moulton suggested that a low need for achievement score could be interpreted to reflect either a low level of motive strength (Ms) or the failure of the picture stimuli to arouse subjective probabilities within an optimal range.

Atkinson and Birch's (1978) theory of the dynamics of action explains high achievement and low test anxiety subjects' preference for objective probabilities less than .50 as a result of changes in competing tendencies over time (pp. 44-47), i.e., the effects of success and failure on practice trials on inertial tendencies to succeed and to avoid failure. Kuhl (1978) has recently proposed revisions of the Atkinson risk-taking model which also explain the discrepancies from .50. Kuhl's model includes personal standards for self-evaluation as determinants of risk preferences.

Summarizing, research testing Atkinson's risk-taking model indicated that there is a weak relationship between

the achievement motive and performance expectancies at the start of a task when subjects have little information about their performance. Possible reasons for this were discussed, focusing on individuals' history of performances and self-evaluations in achievement situations, and attributions for success or failure. The measurement of achievement motivation with the thematic apperceptive measure and recent developments in motivation theory were also discussed.

Test Anxiety

Analyses of Measures

The Test Anxiety Questionnaire. The Test Anxiety Questionnaire (TAQ) of Sarason and Mandler (1952) is a measure of a disposition to be anxious in situations in which one's performance is evaluated. The scale has been used as a measure of motive to avoid failure in research relating achievement-related motives to risk preference, level of performance, and persistence in achievement-oriented activity (Atkinson & Feather, 1966).

The intercorrelations among the TAQ items have a generally positive manifold. However, factor analysis of the TAQ's items discloses that there are complex determinants of responses. Sassenrath (1964) performed a principal component analysis with a varimax rotation on 34 of the 36 items of the complete TAQ (N = 202). Seven

factors were retained and rotated. Three of the factcrs each corresponded to one of the subgroupings of items pertaining to type of test, individual intelligence test, group intelligence test, and course examination. Two factors involved physiclogical reactions, heartbeat and perspiring. Factors involving expressicns of worry or confidence did not emerge. Thus, the hypothesis that cognitive expectations and physiolcgical symptoms differ received only weak and questionable support. A factor emerged with loadings on four items pertaining to anxiety responses before course examinations. However, on other factors items pertaining to anxiety responses before and during a test loaded together.

Gorsuch (1966) reanalyzed Sassenrath's data, extracting seven oblique first-order factors which were similar to Sassenrath's factors. When the correlation between two second-order factors were factor analyzed a single factor appeared at the third order. Thus, there is no clear indication from these studies whether or not a notion of a unitary test anxious disposition is justified.

Sarason's Test Anxiety Scale. I. G. Sarascn (1978) conceptualized test anxiety as a response to a cognitive appraisal of a stressful evaluative academic situation. A student whc is not test anxious adcpts a problem-solving approach. In contrast, the test anxious individual engages in self-derogation, focuses on the undesirable consequences

of personal inadequacy, and expects failure and loss of regard by others.

Sarason distinguished two aspects of test anxiety. Worry is a cognitive activity marked by self-preoccupation, self-depreciation, and concern over the consequences of poor performance. Such personalized feedback interferes with the individual's processing of task-relevant information. It is expected to interfere with performance on complex tasks when evaluation is emphasized. Under neutral conditions, this interference should be either less potent or absent. Secondly, the test anxious person shows physiological reaction patterns that go along with worry.

Sarason (1980) found that the performance on complex tasks of high scorers on the Test Anxiety Scale is deleteriously affected by achievement-orienting instructions. When persons are assured that a negative evaluation of their performance will not be made there are no adverse effects of test anxiety on performance. Also, the less complex, less demanding the task, the weaker the effect.

Scales that distinguish cognitive and affective components. Liebert and Morris (1967) suggested that two components of test anxiety, one cognitive and the other emotional, are represented on Sarason and Mandler's (1952) Test Anxiety Questionnaire. Worry involves expressions of cognitive concern about one's performance (e.g., thinking

about the consequences of failure, expressing doubts about one's ability to perform adequately). Emctionality refers to physiological and affective reactions to the stress of the test situation. The distinction was initially based on Liebert and Morris' finding that worry is negatively related to perfcrmance expectancy, whereas emotionality is unrelated to expectancy.

Liebert and Morris developed a 10-item Worry-Emotionality Inventory. The items were derived from items on the Test Anxiety Questionnaire (Sarason & Mandler, 1952). They were selected from an item pool on the basis of 100% interjudge agreement regarding the dimension involved. Items are rated on a scale ranging from one to five indicating how much the thought or feeling is experienced. Osterhouse (1976) added three worry items and three emotionality items to the Liebert-Morris Worry-Emotionality Inventory. The additional items were selected from an item pool by the interjudge-agreement method. Osterhouse called the resultant 16-item scale the Inventory of Test Anxiety.

Deffenbacher (1980) summarized evidence that "worry and emotionality are positively correlated and that the correlations range from .55 to .76 when the situation invclves evaluative stress" (p. 113). Because of the relatively high correlation between worry and emotionality, this distinction will not be pursued in the main study.

Worry consistently correlates negatively with performance expectations and test performance; the relations of emotionality to performance expectations and test performance are inconsistent (Deffenbacher, 1980, pp. 113-118). A recent factor analytic study of test anxiety items obtained support for the worry-emotionality distinction in elementary school children (Hagtvet, 1976). Thus, despite their significant correlation, worry and emotionality do not appear to involve identical processes.

The studies reviewed have investigated the properties of a single test anxiety scale at a time, either by internal item analyses or by relating a scale to theoretically relevant behaviors. None of the studies included two or more different measures of test anxiety in the same analysis. Thus, it is difficult to determine to what extent findings obtained using one measure of test anxiety can be generalized to other such measures. To help determine this it would appear to be useful to do a factor analytic study which includes multiple measures of test anxiety.

Two major concepts of test anxiety, cognitive and emotional/physiological, have been used to describe items on test anxiety scales. Researchers studying each of the scales considered here have analyzed them in terms of these processes. If all of these scales are included in a factor analysis, they might all load on a factor that involves some combination of worry and emotionality about evaluation.

However, if other features of test anxiety scale items, such as type of test situation, are differently represented on these scales such features might weaken their loadings on a common test anxiety factor factor, or the scales might load on different factors.

Response Styles and Test Anxiety Scales

Acquiescence. The Test Anxiety Questionnaire employs a rating-scale response format with opposite self-descriptive phrases at the ends of the scale. Nine of the twelve items include the word not in the phrase indicating low test anxiety. Thus, acceptance acquiescence might contribute to a high test anxiety score.

In research to be reported in Chapter 3, the Test Anxiety Questionnaire had a loading of zero on an Acquiescence factor that did not differentiate agreement from acceptance. This might indicate that the response format was effective in controlling acquiescence. However, an alternative interpretation is suggested by findings that general anxiety scales have high negative loadings on the Desirability factor (Jackson & Messick, 1962a). A reciprocal relationship between Desirability and Acquiescence has been noted by Edwards (1970, p. 148) and Jackson and Messick (1962a). That is, scales that have high positive or negative loadings on Desirability tend to have loadings close to zero on Acquiescence, and scales that have

high positive or negative loadings on Acquiescence tend to have loadings close to zero on Desirability. Thus, if the Test Anxiety Questionnaire has a substantial loading on Desirability, it would have a predicted loading close to zero on Acquiescence.

Thirty-one of the 37 items of Sarason's (1978) Test Anxiety Scale are keyed true and six are keyed false. This imbalance in item keying suggests that acquiescence might be involved (Messick & Jackson, 1961), although the item analytic procedures employed in developing the Test Anxiety Scale should increase content saturation and reduce the influence of acquiescence (cf., Jackson, 1974, p. 15).

Desirable responding and test anxiety scales. Desirable responding is a response style which has effects on many personality scales, so its possible influence on test anxiety scales will be considered. There are weak relationships between test anxiety scales and scales supposedly indicative of general anxiety (Alpert & Haber, 1960; Spielberger & Sarason, 1978). For example, in a study of Alpert and Haber (1960) correlations among questionnaires pertaining to test anxiety, including their Debilitating Anxiety and Facilitating Anxiety scales, were higher than correlations between them and general anxiety scales. Alpert and Haber interpreted this as indicating that test anxiety is distinct from general anxiety.

However, an alternative interpretation makes use of findings that the Manifest Anxiety Scale has a high factor loading on Desirability (Jackson & Messick, 1962a). One of the patterns of desirable responding associates this response style with low anxiety (Damarin & Messick, 1965). Thus, Alpert and Haber's finding may be regarded as indicating that test anxiety is separable from desirability.

Levy (1980) found that the Test Anxiety Questionnaire had a loading close to zero on a factor marked by Cofer, Chance, and Judson's (1949) Positive Malingering scale. Positive Malingering has loaded on a Defensiveness factor in previous research (Edwards, 1963; Edwards et al., 1962; Jackson & Messick, 1962a). Thus, Levy's finding appears to indicate that Defensiveness is not an important influence on responses to the Test Anxiety Questionnaire.

Relations of Test Anxiety With Other Personality Constructs

Achievement motivation. Research has shown that the achievement motive and test anxiety are independent. The correlation between scores on the thematic apperceptive measure of Need for Achievement obtained under neutral conditions and test anxiety scores ranges from low positive to low negative (Smith, 1964).

Intellective self-evaluation and performance. There is general agreement that test anxiety is associated with low

self-evaluations and expectancies. Atkinson (1957) noted that subjective probability of success for avcidance-oriented individuals tends to be an underestimate of objective probability of success. Feather (1963) obtained experimental evidence supporting this. Smith (1969) found that children scoring high on the Test Anxiety Scale For Children rated themselves as more nervous and lazy, and less intelligent and competent than low scorers. Sarason (1980) suggested that high test anxiety is associated with low self-efficacy, i.e., test anxious subjects see themselves as ineffective and incapable.

Atkinson and Litwin (1960) conceived test anxiety as a motive to avoid failure, and found that high test anxiety was associated with low achievement-oriented test performance on a final examination in a college course. Evidence relating achievement-related motives to ability and achievement test performance is given by Smith (1964). A history of poor performance in achievement-oriented scholastic situations may be a source of low performance expectancies and intellective self-evaluations in test anxious individuals.

Sarason, Davidson, Lighthall, Waite and Ruebush (1960) proposed that test anxiety is associated with low self-esteem, negative view of one's competence, and anticipations of failure in test situations due to psychological conflicts associated with parental criticism of the child's mastery

attempts. This points to the child's relationships with the parents as important determinants. Smith (1969) found that mothers of boys with high test anxiety reported a low opinion of their sons' competence. They also reported more attempts tc motivate the child to achieve.

In summary, there are differing views as to the causal processes involved in the relationships of test anxiety with expectancies and self-evaluation. These views do not appear to be inconsistent necessarily; they focus on different aspects of a complex problem.

Subgroup Differences

Sex Differences

There are sex differences in the relationships of scores on the thematic apperceptive measure of achievement motivation to experimental situations which arouse achievement motivation (Atkinson & Birch, 1978). Certain motivational processes involving fear of success may occur more frequently in women than men (Horner, 1974). However, this result has not been consistently replicated (Smith, 1976).

Meece, Parsons, Kaczala, Goff, and Futterman (1982) summarized evidence that women score higher than men on measures of mathematics anxiety, and lower in self-concept of mathematics ability. Fewer women than men elect to take advanced level mathematics courses and to enter

mathematically oriented careers. Sex differences are also found in expectancies for performance on various academic-intellectual tasks, with women saying they expect to do less well. The magnitude of differences varies depending on the age of subjects and various task characteristics. In explaining the sex differences Meece et al. suggested that they are not entirely explained by differences in the underlying abilities. Several bases for the differences in mathematics anxiety were examined, such as the possibility that men might be less willing to admit to anxiety about mathematics than women, differences in socializers' beliefs about the competencies of boys and girls, attributions for failures, and modeling effects.

In a recent study, Plake and Parker (1982) reported item analyses and factor analyses of a revised Mathematics Anxiety Rating Scale. The scale is answered on a one to five rating scale, where one means low anxiety and five corresponds to high anxiety. Since this does not involve a response of agree versus disagree (or true versus false), acquiescence is apparently controlled. In a principal axis factor analysis of the items two factors were interpreted as Learning Mathematics Anxiety, pertaining to "the process of studying statistics or mathematics" (Plake & Parker, 1982, p. 556), and Mathematics Evaluation Anxiety.

An important question is whether the sex differences are specific to mathematical content, or whether there are

sex differences in relationships involving other abilities. For instance, are there sex differences in relationships involving verbal ability, self-evaluation of verbal ability, expectancies for verbal performances, and evaluation anxiety? If the sex differences are specific to the mathematical area, this would appear to implicate sex differences in the level of this ability. In a recent study by Payne, Smith, and Payne (1983) the correlation between scores on a test anxiety measure (the Survey of Feelings About Tests) and performance in science examinations was about the same for male and female fourth-grade and eighth-grade students.

Jensen (1980) summarized evidence on sex differences in intelligence and abilities. Significant sex differences are not consistently found in different studies, and when they are found the differences are small. There is no evidence of a mean sex difference in the general intelligence factor. There is a consistent significant sex difference in favor of males in spatial analytical ability and mathematical reasoning ability, with the differences appearing after puberty. In verbal ability females tend to score higher than males from age 10 or 11 years through adulthood.

Spatial analytical ability has also been considered a feature of the cognitive style field independence-field dependence (Witkin, Goodenough, & Oltman, 1979). This seems to suggest that possible effects of field independence-

dependence on the structure of self-evaluations (discussed below) may be seen in corresponding male-female differences in the structure of self-evaluations.

Jensen also reviewed studies comparing the predictive validity of Scholastic Aptitude Test scores for college grades in men and women. Two studies reported significantly higher validity coefficients in females, but a third study reported no significant difference. Jensen noted that the two studies which reported a significant difference might have involved a confound with sex differences in course selection. In a recent study, Ignatz (1982) correlated measures of Guilford's (1967) structure-of-intellect factors with a high school physics achievement examination. Achievement examination scores were most strongly correlated with divergent production measures in boys, and with convergent production measures in girls.

In conclusion, the studies discussed indicate that there are complex sex differences involving certain intellectual abilities, expectancies, and self-evaluation of abilities. Although they provide no definite guidelines concerning sex differences in the structure of interrelationships among these processes, they suggest that such differences exist.

Field Independence-Field Dependence

Several measures of field independence-field dependence have been employed in research on this cognitive style. Several versions of embedded figures tests have been employed. Messick and French (1975) found that a concealed figures test loaded on a first-order factor combining spatial and disembedding skills called Spatial Flexibility, a broad second-order factor interpreted as general analytical functioning or general reasoning, and a second-order factor combining spatial tests of flexibility and speed of closure. In the present research, the Hidden Figures Test (Ekstrom, French, Harman, & Dermen, 1976) was used. This test is a measure of the factor Flexibility of Closure, and related to the cognitive style field independence-field dependence.

A question that may be asked is whether the associations of intellective self-evaluation with anxiety about evaluation and self-referent attitudes are affected by the cognitive organization of the individual. This section will consider the cognitive style field independence-dependence as a possible moderator of some of the interrelations delineated in preceeding sections. Before continuing I will briefly discuss the cognitive style conception which underlies this treatment of field independence-dependence, focusing on research linking cognitive variables to self-evaluation.

Klein (1948) hypothesized that accuracy of self-appraisal reflects an aspect of ego functioning and defenses. Accuracy of self-evaluation was measured by the level of aspiration method developed by Kurt Lewin. Self estimates of performance were obtained before, during, and after each of six psychomotor tests, and discrepancy scores were computed between the estimates and actual performance. It was found that the difference scores significantly predicted cadets' success in primary-school flying training; cadets who overestimated their perfcrmance were more likely to fail than those who underestimated.

The study of Klein suggests a consideration of self-evaluation in the context of a cognitive style conception, in that self-evaluation was regarded as an aspect of ego functioning and organization. However, the methods employed were those of an ability model. Klein studied accuracy of self-evaluation, implicitly considering self-evaluation in terms of the level of skill displayed in the cognitive performance, and employed self-evaluations to predict a criterion cf successful performance.

Guilfcrd's (1967) structure-of-intellect includes a facet of behavioral information. One kind of behavioral information is information of self, "information concerned with the awareness and management cf ourselves" (Guilford, 1967, p. 238). The placement of self-knowledge in an ability framework suggests that there are individual

differences in the abilities involved in accurate self-awareness and self-evaluation. Their structure and correlates could be investigated by the same methods used in investigating other abilities.

Wylie (1968) noted that inaccuracies of self-concept may have a cognitive basis. Development of a realistic self-concept is a complex cognitive representation that may be beyond the cognitive capacities of some individuals.

The research reviewed thus far has regarded accuracy of self-evaluation in terms of cognitive functioning in an ability framework. The present study, by contrast, will consider self-evaluation within the context of a cognitive styles conceptualization, focusing on field independence-dependence. An explanation of differences between abilities and cognitive styles is given by Messick (1976). Abilities pertain to the level of performance, while cognitive styles refer to the manner or form of cognition. Cognitive styles implicate broader areas of personality than abilities.

Witkin, Dyk, Faterson, Goodenough, and Karp (1974) considered field independence-dependence within a theory of psychological differentiation, hypothesizing that field independence is associated with a more differentiated and developmentally advanced mode of cognitive organization than field dependence. Evidence for this view came partly from developmental research showing a progressive mean increase in field independence until about the mid-teen years, with little further change during the years of maturity.

Witkin, Goodenough and Oltman (1979) summarized studies in which the defenses of subjects are assessed by clinical observations, ratings, or clinical tests. These studies generally tend to show that field independents are more likely to use isolation, intellectualization and projection; field dependents use more primitive defenses of repression and denial.

To the extent that such differences in characteristic defense mechanisms exist, there would be expected to be a less clear separation between motivational variables and self-evaluations in field dependents. This raises a question of whether test anxiety is less distinct from intellective self-evaluation and broader self-referential attitudes in field dependents than in field independents. This hypothesis was supported by findings from previous research (Levy, 1980).

Secondly, field dependents may have more global self-concepts than field independents. Witkin et al. (1974) used the term "sense of separate identity" in describing "the outcome of a person's development of awareness of his own needs, feelings, and attributes . . . . It implies as well a self that is structured; internal frames of reference have been formed and are available as guides for definition of the self" (p. 134). They proposed that field independents have more of a sense of separate identity than field dependents.

Theories of cognitive developmental changes in self-concept have parallels with the theory of psychological differentiation. Shavelson et al. (1976) and Wylie, Miller, Cowles, and Wilson (1979) proposed that with increasing age and experience self-concept becomes increasingly differentiated. As the child matures and learns, a multifaceted, structured self-concept emerges. Differentiation of the self-concept presumably occurs with respect to the concept of self as contrasted with the social and physical environment, and among subareas of the self-concept.

If self-concept is more global or undifferentiated in field dependents, it is to be expected that self-evaluations referring to a particular life area or performance will tend to be less distinguishable from other self-referent attitudes and self-evaluations. This suggests that intellective self-evaluation will be more closely connected to broader self-referential attitudes in field dependents than field independents.

One of the basic processes hypothesized to be involved in desirability response style is affective attitudes toward self (Damarin & Messick, 1965). This suggests that intellective self-evaluation will be less distinguishable from desirable responding in field dependents than field independents. This hypothesis was only weakly sustained in previous research (Levy, 1980), however.

A self-evaluation refers to a broader class of situations than an expectancy, the latter referring to a specific performance or goal. Intellective self-evaluation may be hierarchically related to expectancies for performance on a particular ability test (cf., Shavelson et al., 1976). This suggests that intellective self-evaluation will be less distinguishable from performance expectancies in field dependents than field independents.

PRELIMINARY RESEARCH

This chapter describes the development of measures of intellective self-evaluation. Separate agree-keyed and disagree-keyed subscales are formed, and the influence of acquiescence in the subscales is empirically evaluated. Exploratory and confirmatory factor analyses of the intellective self-evaluation subscales and measures of test anxiety, acquiescence, self-esteem, and defensiveness are reported. Differences between field independents and field dependents in correlations and factor structure are tested. The chapter concludes with item analyses of the intellective self-evaluation items, the development of subscales which permit differentiation of both acceptance acquiescence and agreement acquiescence, and the development of separate mathematical and verbal self-evaluation subscales.

Scale Development Procedures

Conceptual Background

Wylie (1974) concluded a review of measures of overall self-esteem or self-regard by saying that the construct is poorly defined conceptually, and that there is little evidence for the validity of scales purporting to measure it. One of the suggestions Wylie made was that if research

would focus on specific areas of self-concept the yield in meaningful findings would be greater. This was part of the background for my decision to develop a scale of intellective self-evaluation.

The scales which are being developed will be referred to as potential measures of intellective self-evaluation. The term "intellective self-rating" was used by Sciortino (1969, p. 261) who obtained factors interpreted as ingenuity, meditativity, curiosity, alertness, and flexibility in a factor analysis of self-ratings.

Shavelson et al. (1976) formulated a hierarchical model of self-concept. General self-concept was presumed to have wide application. Below general self-concept in the hierarchy self-concepts referring to life areas varying in breadth were defined. Academic self-concept was distinguished from self-concepts referring to other areas, and within the academic area, verbal and mathematical self-concepts were differentiated. It may be noted that a notion of a hierarchical structure of academic self-concept is broadly consistent with factor analytic research (Messick & French, 1975) defining a hierarchical structure in the ability domain.

Shavelson et al. (1976) summarized factor analytic and correlational studies attempting to establish construct validity for subscales on four measures of self-concept which contain subscales referring to school or academic

ability or achievement. Some evidence suggested that self-concept referring to the scholastic area might be discriminable from other self-concept areas. Brookover, LePere, Hamachek, Thomas, and Erickson (1965) developed the Michigan State Self-Concept of Ability-General Scale, a measure of self-concept of academic ability. The scale has been related to high school students' intelligence, school achievement, and perceptions of the evaluations of significant others. Shavelson et al. (1976) review research on the scale's psychometric properties. Some of the items from this scale were rewritten and used in the present study.

None of these measures is appropriate for college students. The scales which I am developing are intended for college students.

Initial Item Pool

The theoretical conception guiding the writing of items was Diggory's (1966) view of self-evaluation as the individual's evaluation of his or her powers to accomplish goals. Items were written to indicate college students' evaluations of their cognitive and intellective powers to do well in various aspects of scholastic work. They covered some of the facets of intellectual ability defined by Guilford (1967), including memory, cognition, divergent production, and cognition of transformations. Two item

pairs were intended to describe analytic processes involved in field independence-dependence. Four items described expectancies about future performances.

Fifteen positively worded items were written on which a response of agree was keyed as an expression of a favorable intellective self-evaluation. A second set of 15 were written which were reversals of the 15 items keyed agree. They were reversed in meaning, i.e., polar opposite reversals. On these positively worded items a response of disagree was keyed as an expression of a favorable intellective self-evaluation.

Thus, there were 30 items, all positively worded. On 15 items a response of agree was keyed as an indicant of a favorable intellective self-evaluation. Paired with each was an item on which a response of disagree was keyed as an indicant of a favorable intellective self-evaluation. The items were answered by 156 female Brooklyn College students who participated in the study to satisfy a course requirement.

Analyses of Item Means

Six response categories were provided for all items: strongly agree, agree, slightly agree, slightly disagree, disagree, and strongly disagree. For the analyses of item means responses were dichotomized. A response of either strongly agree, agree, or slightly agree was considered a

response of agree, and was scored one for items keyed agree and zero for items keyed disagree. A response of either strongly disagree, disagree, or slightly disagree was considered a response of disagree, and was scored one for items keyed disagree and zero for items keyed agree.

Nine of the items keyed agree and 12 of the items keyed disagree had proportions greater than 0.5. Thus, on the majority of the items the majority of subjects responded in ways indicating favorable intellective self-evaluation.

The following psychological processes were considered as explanations: (a) bias in self-assessment due to affective attitudes toward self, basic processes in desirable responding (Damarin & Messick, 1965); (b) impression management or lying; and (c) veridical self-evaluation of truly desirable attributes.

Items keyed agree with proportions less than 0.5 described highly valuable but infrequently occurring attributes. In this regard the items are similar to some of the lie scale items on the Positive Malingering scale which was also included in the study. It seems that in disagreeing with these items most subjects are admitting that they do not have such intellectual attributes.

Items keyed disagree with proportions less than 0.5 involved attitudes of hopelessness or extreme pessimism regarding one's intellectual abilities. On such items most subjects may be veridically reporting that their

intellectual abilities are not so poor, and that they do not have such attitudes.

Analyses of Reliabilities and Correlation Between Subscales

The 15 items keyed agree will be referred to as Intellective Self-evaluation (A) or SEAIP-agree, and the 15 items keyed disagree will be referred to as Intellective Self-evaluation (D) or SEAIP-disagree. The KR-20 reliabilities of the SEAIP-agree and the SEAIP-disagree are .68 and .71, respectively. The correlation between the SEAIP-agree and the SEAIP-disagree is .48. The KR-20 reliability of the scale composed of all 30 items is .79.

Factor Analyses of Scales

Research Design

A factor analysis was performed on measures referring to the contents intellective self-evaluation, self-esteem, and test anxiety. Markers for the response styles acquiescence and lying were included. The following 12 scales were included:

1. Positive malingering (A), the items of Cofer et al.'s (1949) Positive Malingering scale keyed agree.

2. Positive Malingering (D), the items of Positive Malingering keyed disagree.

3. Acquiescence 1, Messick's (1962) Acquiescence Scale 1.

4. Acquiescence 2, Messick's (1962) Acquiescence

Scale 2.

5. Intellective Self-evaluation (A).

6. Intellective Self-Evaluation (D).

7. Rosenberg Self-esteem (A), a five item subset of Rosenberg's (1965) Self-Esteem Questionnaire composed of the items keyed Like Me, and which I keyed agree.

8. Rosenberg Self-esteem (D), a five item subset of Rosenberg's Self-Esteem Questionnaire composed of the items keyed Unlike Me, and which I keyed disagree.

9. Facilitating Anxiety Scale (Alpert & Haber, 1960).

10. Debilitating Anxiety Scale (Alpert & Haber, 1960).

11. Test Anxiety Questionnaire, the first section of the Test Anxiety Questionnaire (Mandler & Sarason, 1952) which concerns reactions to group intelligence tests.

12. Diggory's (1966) Self-Evaluation Questionnaire.

The content factors hypothesized were intellective self-evaluation, test anxiety, and self-esteem; the stylistic factors considered were lying and acquiescence.

A focus of the study was to examine interrelationships among variables connected with self-evaluation and self-esteem. To the extent that lying or defensiveness is a determinant of responses to a scale, the scale score does not directly correspond to a subject's phenomenal self-concept or self-evaluation (Wylie, 1974). Two or more scales might elicit common processes of defensiveness, which would spuriously contribute to their correlation. If a

distinct Defensiveness factor could be extracted, orthogonal to other factors, this would be an approach to partial out variance due to it. Positive Malingering subscales keyed agree and disagree were used to indicate defensiveness. It was noted that Positive Malingering might have factor loadings on two factors, the Defensiveness factor and the Desirability factor.

Ten of the 12 scales employed an agree-disagree response format. Messick's (1962) Acquiescence 1 and Acquiescence 2 were used as markers for acquiescence. All scales with an agree-disagree response format were split into separate scales composed of all items keyed agree and all items keyed disagree, following a procedure Jackson and Messick (1962a) employed in analyses of MMPI scales.

An Acquiescence factor was predicted with positive loadings on subscales keyed agree and negative loadings on subscales keyed disagree. The Test Anxiety Questionnaire and Diggory's Self-Evaluation Questionnaire were expected to have loadings close to zero because they emplcy a rating-scale response format which does not involve a response of agree versus disagree (or true versus false). On Diggory's Self-Evaluation Questionnaire a point is marked on a scale ranging from zero to 100, indicating the percentage of the time that the subject behaves in the way that is described by the item. On the Test Anxiety Questionnaire the subject circles a number from one to five indicating the magnitude of the subject's feelings or reactions.

Initial Findings

The 12 by 12 matrix of intercorrelations was factor analyzed by the method of principal factor analysis, with communalities iterated to stability. Five factors were extracted. The factors were rotated analytically to a varimax criterion of orthogonal simple structure. Minor graphic rotations were performed to balance the loadings of scales keyed agree and disagree on a factor defined by Acquiescence 1 and Acquiescence 2 scales. The graphic rotations maintained an orthogonal factor structure. The rotated factor loadings are displayed in Table 3.1.

Factor I and factor II are not readily interpreted. Factor I has loadings above .30 on the Intellective Self-evaluation subscales, Positive Malingering (A), and Diggory Self-evaluation. Factor II has loadings above .30 on the Intellective Self-evaluation subscales and Positive Malingering (D). Neither factor can be interpreted as measuring the content intellective self-evaluation, because of the loadings of the Positive Malingering subscales. The loadings above .30 of one of the Positive Malingering subscales on each factor might suggest interpretations in terms of desirability response style. However, neither factor is broad enough for this to be tenable. A desirability response style factor presumably would have involved loadings above .30 on a wider range of scales than had loadings above .30 on either factor. Neither factor can

Table 3.1

Rotated Factor Loadings

Scale	Factor I	II	III	IV	V	h^2
Acquiescence 1	01	-21	02	-14	50	31
Acquiescence 2	04	17	-06	05	38	18
Intellective Self-evaluation (A)	61	-38	24	-14	00	59
Intellective Self-evaluation (D)	41	-35	30	-02	-57	71
Positive Malingering (A)	67	06	02	-13	32	57
Positive Malingering (D)	18	54	04	-11	-30	42
Rosenberg Self-Esteem (A)	-23	-13	-02	51	33	44
Rosenberg Self-Esteem (D)	-23	03	-02	81	-17	76
Facilitating Anxiety	33	-10	74	00	08	68
Debilitating Anxiety	-06	02	-63	06	53	69
Test Anxiety Questionnaire	-01	14	-39	28	23	30
Diggory Self-Evaluation	56	-07	11	-32	-16	46
% Total Variance	12.9	5.7	10.5	9.7	11.8	50.7
% Common Variance	25.5	11.2	20.7	19.1	23.2	

be interpreted as a Defensiveness factor, because such a factor would have involved both Positive Malingering subscales.

The Facilitating Anxiety and Debilitating Anxiety scales have high loadings on factor III. Other scales with loadings above .30 are the Test Anxiety Questionnaire and Intellective Self-evaluation (D). Thus, all three scales having to do with anxiety about evaluation and one of the two intellective self-evaluation subscales loaded on this factor. A high scorer on this factor reports that her performance is hindered by anxiety about evaluation, and reports high test anxiety and that she does not have a good intellective self-concept. This factor might represent desirability response style, the content test anxiety, or a response style-content blend. A distinct Desirability factor was not extracted in this factor analysis. It would be important to control desirability by extracting a Desirability factor to determine whether the test anxiety scales were measuring a content distinct from desirability.

Rosenberg's self-esteem subscales have positive loadings on factor IV and Diggory's Self-evaluation questionnaire has a negative loading. Rosenberg's self-esteem subscales were keyed so that high scores indicate low self-esteem, and Diggory's Self-evaluation questionnaire is scored so that high scores indicate high self-evaluation. This factor might be interpreted as a Self-esteem factor.

However, previous research has shown that self-esteem scales are highly correlated with social desirability scales. Thus, a content interpretation in terms of self-esteem is problematic because a Desirability factor was not separately extracted.

Factor V is interpretable as Acquiescence. Consistent with expectations, all of the scales keyed disagree have negative loadings, and all of the scales keyed agree have positive loadings except for Intellective Self-evaluation (A) which has a loading close to zero. The Test Anxiety Questionnaire and Diggory Self-Evaluation both have loadings below .30. The Acquiescence factor accounts for 23.2% of the common variance.

Field Independence-dependence As A Moderator

Hypotheses were formulated that field independence-dependence is a moderator of interrelations among intellective self-evaluation, test anxiety, and self-esteem. The following hypotheses were tested:

1. Test anxiety is more strongly associated with intellective self-evaluation in field dependents than field independents.

2. Test anxiety is more strongly associated with self-esteem in field dependents than in field independents.

3. Intellective self-evaluation is more strongly associated with self-esteem in field dependents than field independents.

4. The foregoing hypotheses suggest that fewer factors will account for intercorrelations among measures of these constructs in field dependents than field independents.

The total sample was split at the median of scores on the Hidden Figures Test (Ekstrom et al., 1976), a measure of field independence-dependence. Intercorrelations among the 12 scales were computed separately for the two groups.

The first hypothesis was consistently supported. There were six correlations of intellective self-evaluation scales with test anxiety scales. Three were significantly higher in field dependents than field independents, and one was marginally significantly higher. Both of the remaining correlations were higher in field dependents than field independents, but the differences were not significant.

The second hypothesis was partially supported. Of the nine correlations involving test anxiety and self-esteem scales, one was significantly higher in field dependents than field independents, and one was marginally significantly higher. Six of the seven remaining correlations were higher in field dependents than field independents, but the differences were not significant.

The third hypothesis was weakly sustained. Of the six relevant correlations, two were marginally significantly higher in field dependents than field independents. The differences between the other relevant correlations were not consistently in the predicted direction.

A hypothesis pertinent to the fourth hypothesis was tested in an analysis reported below.

Factor Analysis With EFAP and LISREL

In the initial factor analysis reported above an interpretable acquiescence dimension and a dimension involving scales having to do with anxiety about evaluation and intellective self-evaluation were found. The other three factors presented unresolved problems of interpretation. It is possible that the rotations might have been off to some extent. The methods of rotation employed--varimax and additional graphic rotations--were not the best available. A second problem with the analysis, which exacerbated the rotation problem, was the presence in the analysis of Diggory's Self-evaluation scale and the two subscales of Rosenberg's Self-Esteem scale. Overall self-esteem scales are poorly defined in terms of the meaning of what they measure (Wylie, 1974). This indeterminacy made it difficult to define where to aim the graphic rotations of factors involving these scales.

Procedure. The following analysis is based on the 9 X 9 submatrix of the 12 X 12 correlation matrix used in the initial factor analysis obtained by dropping Rosenberg Self-esteem (A), Rosenberg Self-esteem (D), and Diggory Self-evaluation scales.

Table 3.2 displays the plausible factors, defined in advance of the data analysis. The prediction for acquiescence corresponds to the finding of an Acquiescence factor in the initial analysis. Scales which have all items keyed agree are predicted to have positive factor loadings, and scales which have all items keyed disagree are predicted to have negative loadings. The Test Anxiety Questionnaire does not employ an agree-disagree response format, and no prediction is made regarding its loading on acquiescence.

Table 3.2

Plausible Factors

	I	IIa	IIb	III	IV
Intellective Self-eval. (A)	+	+	0	-	++
Intellective Self-eval. (D)	-	+	0	-	++
Facilitating Anxiety	+	+	0	--	+
Debilitating Anxiety	+	-	0	++	-
Test Anxiety Questionnaire	.	0	0	++	-
Acquiescence 1	+	0	0	0	0
Acquiescence 2	+	0	0	0	0
Positive Malingering (A)	+	+	+	0	0
Positive Malingering (D)	-	+	+	0	0

Factors: I Acquiescence

IIa Desirability

IIb Defensiveness

III Test Anxiety

IV Intellective self-evaluation

Loadings: + Positive

++ High positive

- Negative

-- High negative

0 Zero

. No prediction

The factors labeled IIa and IIb are desirability and defensiveness. They represent a question of whether the Positive Malingering scales load on a single Desirability factor, a single Defensiveness factor, or on both factors. Thus, three different models are shown in Table 3.2: (a) a four factor model including desirability, (b) a four factor model including defensiveness, and (c) a five factor model including both desirability and defensiveness.

The predicted factor loadings for the test anxiety factor are intended to describe a factor primarily defined by test anxiety scales and secondarily by scales pertaining to intellective self-evaluation. The predicted loadings for the intellective self-evaluation factor describe a factor defined primarily by intellective self-evaluation scales and secondarily by test anxiety scales.

Tests for the number of factors were made using EFAP (Jöreskog & Sörbom, 1978a), and are presented in Table 3.3. The columns headed Goodness of fit show that one and two factor solutions do not provide acceptable fits. Three, four, and five factor solutions provide acceptable fits. The probability is highest for the four factor solution. The columns headed Improvement in fit show that a three factor solution is a significant improvement over a two factor solution, and a four factor solution is a marginally significant improvement over a three factor solution. The five factor solution is not a significant improvement over

the four factor solution. In summary, three or four factors appear to be indicated.

Table 3.3

Tests for Number of Factors

	Goodness of fit			Improvement in fit		
Factors	Chi-square	df	p	Chi-square	df	p
1	124.45	27	.000			
2	43.16	19	.001	81.29	8	.000
3	19.14	12	.085	24.02	7	.001
4	6.96	6	.324	12.18	6	.058
5	2.37	1	.123	4.59	5	.467

Following the scheme for a general triangular solution described by Jöreskog (Jöreskog & Sörbom, 1979, pp. 31-38), the parameters of an unrestricted solution were estimated using LISREL (Jöreskog & Sörbom, 1978b). This was a four factor orthogonal solution with six factor loadings fixed at zero. Using the unrestricted solution as a point of departure, additional restrictions were imposed on Λ (the matrix of factor loadings), maintaining an orthogonal factor structure. Loadings which were hypothesized to be zero were fixed at zero when the resulting solution was identified and was not a Heywood case. Fixed loadings with large first derivatives were freed individually when the difference in

chi-squares for one degree of freedom was significant. The last solution is displayed in Table 3.4 (a). This solution has an acceptable fit, $\chi^2(14) = 11.78$, $p = .62$. Table 3.4 (b) shows the standard errors of the factor loadings.

Results and discussion. Where possible, the results presented in Table 3.4 will be interpreted in terms of the hypothesis matrices in Table 3.2. Factor I is interpreted as acquiescence. All signs of factor loadings for factor I agree with predictions concerning acquiescence. Moreover, Acquiescence 1 has the highest loading. The Test Anxiety Questionnaire has a fixed zero loading.

Factor II seems more consistent with the prediction for defensiveness than the prediction for desirability, but an interpretation in terms of desirability can not be excluded. Both positive malingering scales have loadings above .30, which is consistent with predictions for either defensiveness or desirability. The Test Anxiety Questionnaire and the acquiescence subscales have fixed zero loadings, which is consistent with either desirability or defensiveness. The loadings of the Intellective Self-evaluation subscales and Debilitating Anxiety scales are all either fixed at zero or less than twice their standard errors, which is consistent with the predictions for defensiveness, and inconsistent with the prediction for desirability. However, the loading of Facilitating Anxiety

Table 3.4

Restricted Orthogonal Maximum Likelihood Solution

(a) Factor loadings

Variable	Factors I	II	III	IV	h^2
Intellective Self-eval. (A)	28	00*	-43	84	96
Intellective Self-eval. (D)	-25	-11	-60	35	56
Facilitating Anxiety	31	33	-75	00*	76
Debilitating Anxiety	38	00*	73	00*	69
Test Anxiety Questionnaire	00*	00*	46	00*	21
Acquiescence 1	56	00*	00*	00*	31
Acquiescence 2	25	23	23	00*	17
Positive Malingering (A)	30	38	00*	38	39
Positive Malingering (D)	-42	45	00*	00*	38
% Total Variance	11.3	5.7	21.1	10.8	48.9
% Common Variance	23.1	11.7	42.9	21.9	

$\chi^2 = 11.78$ with 14 degrees of freedom

$p = .62$

(b) Standard errors of the factor loadings

	I	II	III	IV
Intellective Self-eval. (A)	11	-	08	22
Intellective Self-eval. (D)	11	11	09	11
Facilitating Anxiety	12	14	09	-
Debilitating Anxiety	10	-	08	-
Test Anxiety Questionnaire	-	-	09	-
Acquiescence 1	10	-	-	-
Acquiescence 2	10	12	09	-
Positive Malingering (A)	12	14	-	13
Positive Malingering (D)	12	21	-	-

Note. An asterisk indicates that the parameter was fixed at zero. Decimal points are omitted.

is above .30, which is consistent with the prediction for desirability and inconsistent with the prediction for defensiveness. The uncertainty about the definition of this factor puts into doubt interpretations of factor III and factor IV (discussed next) in terms of content. Since a Desirability factor was not unequivocally defined, variance due to desirability might be implicated in these factors.[5]

Factor III might represent desirability response style, a combination of the contents test anxiety and intellective self-evaluation, or a blend of desirability and these contents. An individual scoring high on factor III reports high anxiety about evaluation, that evaluation anxiety debilitates her performance, and low intellective self-evaluation. There is also a suggestion that she tends to be a yea-sayer, since Acquiescence 2 has a low loading on the factor.

Factor IV has a high factor loading for Intellective Self-evaluation (A). Intellective Self-evaluation (D) and Positive Malingering (D) also load on the factor. The fact that both intellective self-evaluation subscales load on this factor suggests an interpretation of it in terms of the content intellective self-evaluation. However, the loading of Positive Malingering (A) indicates that desirability or

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[5] The solution was a Heywood case when the loadings of Intellective Self-evaluation (D) and Acquiescence 2 on factor II were fixed at zero. Thus, although they were less than twice their standard errors they could not be fixed.

defensiveness is involved.

The prediction of a relation between test anxiety and intellective self-evaluation in terms of a pattern of larger and smaller loadings on two factors (see Table 3.2) was not supported. However, this kind of relationship did emerge in that scales having to do with anxiety about evaluation and intellective self-evaluation loaded together on factor III.

A comparison of the results of this analysis with those of the original analysis may be useful at this point. Factor I in Table 3.4 and factor V in Table 3.1 were both interpreted as acquiescence. Factor III in Table 3.4 and factor III in Table 3.1 were both interpreted as involving desirability response style or the contents test anxiety and intellective self-evaluation. Factor II in Table 3.4 was interpreted as defensiveness, or alternatively desirability. No single factor representing defensiveness or desirability was obtained in the initial analysis. Factor IV in Table 3.4 and factor I in Table 3.1 were similar in their loadings above .30, and presented similar problems of interpretation.

In research building on the present analysis certain of the difficulties of interpretation may be clarified by including more subscales representing certain constructs. In particular, if more scales representing desirability and defensiveness are included an interpretation of factors involving them might be clarified, and they might be distinguished as separate factors. A distinct factor

representing test anxiety did not emerge in this analysis. However, it might be that there was an insufficient number or selection of scales representing the construct to define such a factor. Although the Test Anxiety Questionnaire might be regarded as a potential marker for such a factor, the Debilitating Anxiety and Facilitating Anxiety scales might have been poor measures of it. Although a factor involving intellective self-evaluation subscales was found, its interpretation was made difficult by the loading of a defensiveness (or desirability) scale. Presumably, the interpretation of the intellective self-evaluation construct would also be aided by inclusion of more scales representing intellective self-evaluation, desirability, and defensiveness.

Comparison of field independents and field dependents. The 12 X 12 variance-covariance matrix was computed separately for the subgroup above the median on the Hidden Figures Test (field independents, $n = 76$) and the group below the median (field dependents, $n = 74$). The hypothesis of equality of variance-covariance matrices was tested using LISREL. The hypothesis of equal variance-covariance matrices could not be rejected, $\chi^2(78) = 81.12$, $p = .38$.

A hypothesis that there is an invariant restricted four factor pattern for field dependents and field independents was tested with LISREL. This was a simultaneous factor analysis for two groups and the nine variables which were

used in the factor analysis described immediately above. The same restrictions which were placed on Λ (the matrix of factor loadings) shown in Table 3.4--i.e., the fixed zeros--were placed on it for this analysis. All free loadings were constrained to be equal for the two groups. The hypothesis that there is the same restricted four factor structure for the two groups could not be rejected, $\chi^2(59) = 58.26$, $p = .50$. Thus, there is no evidence that there is a difference in the number of factors or factor loadings for field dependents and field independents.

Further Analyses of Intellective Self-evaluation Items

Item Analyses

Point-biserial correlations were computed between each SEAIP item and the total scale. Items with an item-scale correlation below .25 were considered for being rewritten or dropped. I decided that if both items of an agree-disagree item pair correlated with the total scale below .25 the pair would be dropped. This decision resulted in dropping one item pair, "I doubt that I have enough mental ability to do graduate work in my major field" and "I think that I have enough mental ability to do graduate work in my major field." It appears that the low item-scale correlations of this item pair may reflect the fact that it describes an expectancy of a future goal, which is different from the self-evaluative tone of the other item pairs.

When one of an item pair correlated below .25 with the scale and the other correlated above .25, the item correlating below .25 was rewritten. Examination of the items correlating below .25 with the total scale suggested three possible reasons for the low item-scale correlations:

1. The item had a highly skewed distribution. In such cases the item was rewritten so as to have a less extreme apparent valuational connotation. Thus, item 1A "I can keep at studying for hours on end" was rewritten as, "I can keep at studying for a long time without taking a break."

2. The item was unclear because of its wording. Item 13D "In writing papers the ideas I think of are pretty much like everyone else's" was changed to "In writing papers the ideas I come up with are commonplace and unoriginal." Item 14A "It is easy for me to change my way of thinking so as to adjust to new, unfamiliar ideas taught by a professor" was changed to "When a professor presents new, unfamiliar ideas it is easy for me to change my usual way of thinking about things."

3. The item was more general in reference than the academic-intellectual area. Thus, the item "Overall, I am a bright person" was rewritten as "Overall, I am above average in intelligence."

Desirability

In the initial factor analysis reported above the Intellective Self-evaluation subscales loaded on two factors on which the Positive Malingering subscales also loaded. This indicates that desirable responding might be involved in the Intellective Self-evaluation subscales. The possible involvement of desirable responding indicated a need to devise and select items which minimize the variance due to this response style in order to more satisfactorily measure the content intellective self-evaluation.

I wrote a set of 34 additional items with similar content as those used in the earlier study (Levy, 1980), but the new items were written so as to have more qualified or moderated evaluative connotations. The intention is to develop a set of items with relatively moderate social desirability scale values. There is a strong relationship between the SDSV of an item (or scale) and its loading on the Desirability factor. Items with relatively neutral SDSVs are not as sensitive to individual differences in SD tendencies as items outside the neutral area (Edwards, 1970). Thus, if items with moderate SDSVs can be written and selected, the contribution of desirability to variance is expected to be reduced.

The 30 original items and 34 additional items were rated for Social Desirability Scale Values by the method described by Edwards (1970). The raters were 25 female

students (12 Brooklyn College undergraduates, and 13 other women with graduate or undergraduate education). SDSVs for all the items were computed. Items with SDSVs between 3.5 and 6.5 (on a scale from one to nine) were selected for further use. There were 10 such items. Since the Balanced Incomplete Block Design (described below) requires 12 items, two additional items were selected which were slightly outside this range.

Acquiescence

In the initial factor analysis reported above a factor was found which was consistent with predictions for an Acquiescence factor, except for the loading of zero of Intellective Self-evaluation (A). The design of the study did not permit a determination of whether this factor involved agreement acquiescence, acceptance acquiescence, or some combination of them. In order to further study acceptance and agreement acquiescence, a Balanced Incomplete Block Design (see Jordan, 1977) was used to guide the writing and selection of items representing item keying (agree versus disagree) and wording (positive versus negative) for each of two scales, Intellective Self-evaluation and Achievement. Each of the cells of this factorial design is a six item scale. The item stems for the intellective self-evaluation area were the 12 items selected by the procedure described above. Item stems for

the achievement scale were derived from the Personality Research Form (Jackson, 1974) Achievement scale. The Balanced Incomplete Block Design requires six stems, and it pairs items of every type (Positive, Agree; Positive, Disagree; Negative, Agree; Negative, Disagree) with every other type. The basic design was repeated twice to yield 24 items based on 12 stems for each of the intellective self-evaluation and achievement categories. The items are shown in Appendix A. A Balanced Incomplete Block Design was also used to guide the writing of items for Verbal Self-evaluation and Mathematical Self-evaluation subscales (shown in Appendix A).

Summarizing, analyses of the item means of intellective self-evaluation items suggested that psychological processes involved in desirable responding or defensiveness are implicated. Although the reliabilities of the agree-keyed and disagree-keyed subscales are acceptable, they might have been spuriously increased by variance due to response styles. An exploratory factor analysis produced evidence of acquiescence in the domain of self-report measures of intellective self-evaluation, test anxiety, and self-esteem. The content test anxiety was defined as a factor. A confirmatory factor analysis also resulted in an Acquiescence factor, and a factor representing desirability or defensiveness. Two other factors were considered to involve combinations of content and response styles.

Problems in factor analytically defining some of the hypothesized factors were attributed to an insufficient number of measures and the presence in the exploratory analysis of overall self-esteem measures.

Item analyses led to the dropping or rewriting of some intellective self-evaluation items, and the retention of 12 items. These 12 items were the stems of items in four subscales defined by a factorial design with facets of keying (agree and disagree) and wording (positive and negative). This design would permit an evaluation of the influences of both agreement acquiescence and acceptance acquiescence. Separate agree-keyed and disagree-keyed verbal self-evaluation and mathematical self-evaluation scales were also written.

The following chapter describes the design and data collection for another factor analysis which builds on what was learned in the analyses described in this chapter. The design includes more variables for each of the hypothesized factors of test anxiety, intellective self-evaluation, desirability, and defensiveness so as to attain better factor analytic definition of them. It includes a set of scales with faceted designs for wording and keying that may permit definition of agreement acquiescence and acceptance acquiescence factors. It also has self-report measures of achievement orientation, verbal self-evaluation, mathematical self-evaluation, and performance expectancies.

Inclusion of these sets of measures will allow factor analytic determination of their structure and interrelationships, and their relationships with both test anxiety and achievement orientation. The separate extraction of response style factors will insure that the definition of these factors and their interrelationships is not obscured by stylistic variance.

PROCEDURE AND HYPOTHESES

Procedure

Administration and Subjects

Data were collected during Fall Semester, 1982 from a total of 386 undergraduate students. One hundred and seventy-one students from Brooklyn College participated in the study to satisfy a course requirement for Psychology 1. They completed all personality and cognitive measures in a classroom at the college in a session lasting approximately 1 hr 30 min. Two hundred and fifteen students from other colleges in the New York City area participated in the study voluntarily or for extra course credit given by their teachers. They completed cognitive measures and expectancy questions in class in a session lasting 30 min, and did the personality questionnaires at home.

A total of 45 individuals were deleted from the sample. Thirty-eight students from colleges other than Brooklyn College did not turn in the second part of the research instrument, which contains all the self-report variables, or turned it in mostly incomplete. Six additional research protocols were found which were less than half completed. In screening the data for multivariate outliers, one individual was found whose scale scores were distant from

the vector of scale means, and who had improperly followed directions on parts of the research instrument.

After eliminating the individuals described above, the sample consisted of 341 individuals, 231 females, 106 males, and four individuals who did not report their sex. At the time of testing, the females had a mean age of 21.3 years and the males a mean age of 20.1 years (t = 1.63, n.s.).

Measures

The measures are listed in Table 4.1. The following response style scales were split into subscales of items keyed agree and disagree: Edwards' (1957) Social Desirability Scale, Personality Research Form Desirability (Jackson, 1974), Crowne-Marlowe (1960) Social Desirability, and Positive Malingering (Cofer et al., 1949). The Test Anxiety Questionnaire is the first part of S. B. Sarason and Mandler's (1952) Test Anxiety Questionnaire, and the Test Anxiety Scale is by I. G. Sarason (1978). The Achieving Tendency scale is by Mehrabian and Bank (1978). The Inventory of Test Anxiety is an adaptation of Osterhouse's (1976) Inventory of Test Anxiety. Means, standard deviations, number of items, and coefficient alpha reliabilities of the personality measures are listed in Table 4.2.

Table 4.1

List of Measures

Label	Variable
	Response style measures
ACQ1A	Acquiescence 1
ACQ2A	Acquiescence 2
SDA	Edwards' Social Desirability - Agree
SDD	Edwards' Social Desirability - Disagree
PRFDYA	PRF Desirability - Agree
PRFDYD	PRF Desirability - Disagree
CMSDA	Crowne-Marlowe Social Desirability - Agree
CMSDD	Crowne-Marlowe Social Desirability - Disagree
MPA	Positive Malingering - Agree
MPD	Positive Malingering - Disagree
LIED	MMPI Lie scale
	Content measures
	Subscales based on PRF Achievement*:
ACHPA	Positive, Agree
ACHPD	Positive, Disagree
ACHNA	Negative, Agree
ACHND	Negative, Disagree
ACHIEVE	Achieving Tendency
TAQ	Test Anxiety Questionnaire*
TAS	Test Anxiety Scale
ITANX	Inventory of Test Anxiety*

Table 4.1--Continued

DEBANXA	Debilitating Anxiety
FACANXA	Facilitating Anxiety
	Intellective Self-evaluation subscales*:
INTELPA	Positive, Agree
INTELPD	Positive, Disagree
INTELNA	Negative, Agree
INTELND	Negative, Disagree
SELFABIL	Self-Concept of Ability*
VERBALA	Verbal Self-evaluation - Agree*
VERBALD	Verbal Self-evaluation - Disagree*
EXPVOCAB	Performance Expectancies, Vocabulary*
MATHA	Mathematical Self-evaluation - Agree*
MATHD	Mathematical Self-evaluation - Disagree*
EXPMATH	Performance Expectancies, Mathematics*
EXPHFT	Performance Expectancies, Hidden Figures Test*
	Cognitive measures
VOCAB	Items from Advanced Vocabulary Test V-4
MATH	Items from Mathematics Aptitude Test RG-2
HFT	Items from Hidden Figures Test CF-1
	Other variables
SEX	Sex
AGE	Age

Note. Starred measures are given in Appendix A.

Table 4.2

Means, Standard Deviations, Number of Items, and Reliabilities of Personality Variables

(N = 341)

Variable	Mean	SD	Items	Alpha
ACQ1A	6.17	1.93	12	.29
ACQ2A	6.83	1.97	12	.31
SDA	6.37	1.62	9	.40
SDD	19.41	5.41	30	.82
PRFDYA	7.37	1.78	10	.48
PRFDYD	7.13	1.90	10	.58
CMSDA	10.53	3.37	18	.70
CMSDD	5.65	3.17	15	.73
MPA	6.39	2.29	16	.48
MPD	5.34	2.53	17	.56
LIED	4.24	2.07	15	.49
ACHPA	4.26	1.45	6	.52
ACHPD	3.96	1.52	6	.54
ACHNA	3.49	1.19	6	.14
ACHND	3.22	1.34	6	.34
ACHIEVE	25.05	6.82	38	.86
TAQ	32.71	8.51	12	.84
TAS	19.76	7.59	37	.88
ITANX	25.64	6.69	8	.84

Table 4.2--Continued

DEBANXA	5.20	2.89	10	.81
FACANXA	3.30	1.86	9	.60
INTELPA	4.14	1.09	6	.14
INTELPD	3.79	1.37	6	.41
INTELNA	3.95	1.16	6	.18
INTELND	3.23	1.47	6	.50
SELFABII	34.08	4.54	9	.86
VERBALA	4.32	1.49	6	.55
VERBALD	3.71	1.61	6	.59
EXPVOCAB	.01	2.55	3	--
MATHA	3.89	1.61	6	.65
MATHD	3.57	2.01	6	.79
EXPMATH	.04	2.69	3	--
EXPHFT	.00	2.63	3	--

The timed cognitive measures consist of items from tests in the Kit of Factor-Referenced Cognitive Tests (Ekstrom et al., 1976): Advanced Vocabulary Test I (V-4), Mathematics Aptitude Test (RG-2), and Hidden Figures Test (CF-1). Advanced Vocabulary Test I is a measure of the factor of verbal comprehension (Ekstrom et al., 1976). In each item the subject must select the correct synonym for a given word from a list of five alternative choices. Mathematics Aptitude Test (RG-2) is a measure of

quantitative and general reasoning. Messick and French (1975) found that a mathematics aptitude test loaded on a first-order quantitative reasoning factor and a second-order factor of general analytical functioning or general reasoning. In each word problem on Mathematics Aptitude Test (RG-2) the subject must select the correct answer from among five choices. The Hidden Figures Test, a measure of flexibility of closure, was discussed above in Chapter 3. In each item the subject must select which one of five simple geometrical forms is embedded in a given complex pattern.

The reliabilities of the cognitive measures were not computed because only one 16-item form was administered and the likelihood of moderate speededness would have spuriously increased split-half estimates of reliability. An indication of the reliability level of these tests is available from other studies. Ekstrom et al. (1976) report reliabilities of the 1963 version of Hidden Figures Test of .83 in a sample of college males, and .82 and .80 in samples of 11th and 12th grade males and females, respectively. They report a reliability of Advanced Vocabulary I of .79 in a sample of college students, and a reliability of the 1963 version of Mathematics Aptitude (RG-2) of .81 in a sample of Army enlistees.

A performance expectancy score for vocabulary, a performance expectancy score for mathematics, and a

performance expectancy score for hidden figures were each computed as the sum of the standardized scores on three expectancy questions preceeding each cognitive measure (see Appendix A). Intercorrelations of each set of expectancy questions are listed in Table 4.3. These correlations are all significant at the .001 level, and are considered sufficiently high to justify computing total scores in this manner.

The research instrument consisted of the following in this order: (a) Performance Expectancies, Vocabulary, (b) Vocabulary Test, (c) Performance Expectancies, Mathematics, (d) Mathematics Test, (e) Performance Expectancies, Hidden Figures Test, (f) Hidden Figures Test, (g) a 322 item questionnaire with an agree-disagree response format, (h) Test Anxiety Questionnaire, (i) Inventory of Test Anxiety, and (j) Self-Concept of Ability. The items in the 322-item questionnaire were ordered with items from response style and content scales alternating. Within the alternating pattern items from the content scales were sequentially selected one at a time in a rotating scheme, and items from response style scales were likewise sequentially selected. This ordering was employed to intersperse items from response style and content scales, and to avoid having sets of items from the same hypothesized factor grouped together.

Table 4.3

Correlations of Performance Expectancy Questions

	1.	2.	3.
Vocabulary			
1. How many problems will ycu know	--		
2. Expected standing in the grcup	.52	--	
3. Rate ycurself on the ability	.61	.65	--
Mathematics			
1. How many problems will you know	--		
2. Expected standing in the grcup	.75	--	
3. Rate ycurself on the ability	.78	.71	--
Hidden Figures			
1. How many problems will ycu know	--		
2. Expected standing in the grcup	.68	--	
3. Rate ycurself on the ability	.71	.69	--

Factor Analysis Design and Hypotheses

The thirty-three measures to be included in the factor analysis are all the response style and content variables listed in Table 4.1. Response style measures were selected because they have appeared in previous factor analytic studies, and are associated with the response styles agreement acquiescence, acceptance acquiescence, desirability, and defensiveness. Certain response style and content scales have been split into subscales keyed agree and disagree, so as to determine their loadings on a hypothesized agreement acquiescence factor. Four subscales each of achievement and intellective self-evaluation contents were constructed by a faceted design, with subscales having positive versus negative wording and keyed agree versus disagree, and have a predicted pattern of signs of factor loadings (described below) on acceptance acquiescence and agreement acquiescence.

The following measures were selected because they are representative of frequently used measures pertinent to test anxiety, and are expected to load on a common factor: Facilitating Anxiety and Debilitating Anxiety scales (Alpert & Haber, 1960), Test Anxiety Questionnaire (Sarason & Mandler, 1952), Test Anxiety Scale (Sarason, 1978), and an adaptation of Osterhouse's (1976) Inventory of Test Anxiety by Charles P. Smith. Mehrabian and Bank's (1978) Achieving Tendency Scale and subscales based on the PRF Achievement

scale (Jackson, 1974) are expected to load on a common factor invclving achievement. Measures of intellective self-evaluation and performance expectancies include overall intellective self-evaluation subscales, separate subscales for verbal and mathematical self-evaluation, and performance expectancies preceeding vocabulary, mathematics, and hidden figures cognitive measures.

The hypothesized orthogonal factor structure is displayed in Table 4.4. The predicted loadings for the agreement acquiescence factor are based on the proportions of items in each scale keyed agree. Subscales labeled with a last letter of A have all items keyed agree, and are expected tc have positive factor lcadings on agreement acquiescence. Subscales labeled with a last letter of D have all items keyed disagree, and are expected to have negative lcadings. Twc scales consist of both items keyed agree and disagree, Achieving Tendency and Test Anxiety Scale. Thirty-two of the 37 items or 86% of the Test Anxiety Scale items are keyed agree, so a positive factor loading on agreement acquiescence is expected for it. No prediction is made for the factor loading of the Achieving Tendency Scale, which has 18 of 37 items or 47% keyed agree, and for measures which employ rating-scale formats that do not involve a response of agree or disagree.

Table 4.4

Hypothesized Orthogonal Factor Structure

	1	2	3	4	5	6	7	8	9	10
ACQ1A	+	+	0	0	0	0	0	0	0	0
ACQ2A	+	+	0	0	0	0	0	0	.	0
SCA	+	.	++	0	0	0	0	0	0	0
SCD	-	-	++	0	0	0	0	0	0	0
PREDYA	+	+	+	+	0	0	0	0	0	0
PREDYD	-	-	+	+	0	0	0	0	0	0
CMSDA	+	.	+	+	0	0	0	0	0	0
CMSDD	-	-	+	+	0	0	0	0	0	0
MPA	+	+	+	+	0	0	0	0	0	0
MPD	-	-	+	+	0	0	0	0	0	0
LIED	-	.	.	+	0	0	0	0	0	0
ACHPA	+	+	+	0	+	0	0	0	0	0
ACHPD	-	-	+	0	+	0	0	0	0	0
ACHNA	+	-	+	0	+	0	0	0	0	0
ACHND	-	+	+	0	+	0	0	0	0	0
ACHIEVE	.	.	+	0	+	0	0	0	0	0
TAC	.	+	-	0	0	+	0	0	+	0
TAS	+	.	-	0	0	+	0	0	+	0
ITANX	.	.	-	0	0	+	0	0	+	0
DEBANXA	+	+	-	0	0	+	0	0	+	0
FACANXA	+	+	+	0	0	-	0	0	-	0
INTELPA	+	+	.	0	0	0	0	0	-	+
INTELPD	-	-	.	0	0	0	0	0	-	+
INTELNA	+	-	.	0	0	0	0	0	-	+
INTELND	-	+	.	0	0	0	0	0	-	+
SELFABIL	.	.	+	0	0	0	0	0	.	+
VERBALA	+	.	.	0	0	0	+	0	.	+
VERBALD	-	.	.	0	0	0	+	0	.	+
EXPVOCAB	.	.	.	0	0	0	+	0	.	+
MATHA	+	.	.	0	0	0	0	+	.	+
MATHD	-	.	.	0	0	0	0	+	.	+
EXPMATH	.	.	.	0	0	0	0	+	.	+
EXPHFT	.	.	.	0	0	0	0	0	.	+

Table 4.4--continued

Response styles

1 Agreement Acquiescence

2 Acceptance Acquiescence

3 Desirability

4 Defensiveness

Content

5 Achievement

6 Test Anxiety

7 Verbal Self-evaluation

8 Mathematical Self-evaluation

9 Test Anxiety and Intellective Self-evaluation

10 Intellective Self-evaluation and Expectancies

Factor loadings

++ means high positive loading.

\+ means positive loading.

\- means negative loading.

0 means zero loading.

. means no prediction.

The predictions for the acceptance acquiescence factor are based on the percentages of items in a scale which are positively phrased shown in Appendix B and the keying of the items. A scale which has 75% or more (an arbitrarily chosen criterion) of the items positively phrased is predicted to have a positive loading on acceptance acquiescence if all the items are keyed agree, and a negative loading if all the items are keyed disagree. Scales which have all of the items negatively phrased are expected to have a negative loading on acceptance acquiescence if all the items are keyed agree, and a positive loading if all the items are keyed disagree. No predictions are made for scales which employ a response format that does not involve a response of agree or disagree.

It may be noted that the only predicted loadings which differ for agreement acceptance and acceptance acquiescence, are those of ACHNA, ACHND, INTELNA, and INTELND.

The subscales of Edwards' SD scale are predicted to have high positive loadings on a desirability factor, and several content scales are expected to load on this factor. A factor interpretable as defensiveness is expected with positive loadings on lie scales and the PRF Desirability subscales, and zero loadings on acquiescence and content scales.

Distinct factors of achievement and test anxiety are predicted. Distinct factors of verbal self-evaluation and mathematical self-evaluation are also predicted.

The last two predicted factors represent combinations of contents. A factor with loadings on test anxiety and intellective self-evaluation scales is predicted. Finally, a broad factor representing intellective self-evaluations and expectancies across verbal, mathematical, and spatial-analytic domains is hypothesized.

RESULTS: EXPLORATORY FACTOR ANALYSIS

The 33 x 33 matrix of correlations was factored by the principal factor method, with communalities estimated by each variable's squared multiple correlation with all other variables. A parallel analysis was performed by the method described by Montanelli and Humphreys (1976). The parallel analysis technique for deciding on the number of factors in factor analysis involves the construction of a second correlation matrix from normally distributed random numbers (a "random matrix"), using the same numbers of variables and observations as there are in the obtained correlation matrix. Squared multiple correlations are inserted in the diagonals of both the random matrix and the obtained correlation matrix, and both matrices are factored using the principal axes method. The number of factors is determined to be the ordinal number of the last latent root of the obtained correlation matrix which exceeds the corresponding latent root of the random matrix. Montanelli and Humphreys present a method of predicting the size of the logarithms of the latent roots of a random matrix, with squared multiple correlations on the diagonal, based on the number of variables and the number of observations. The parallel analysis proceeds by comparing the logarithms of the latent

roots of the obtained correlation matrix, with squared multiple correlations on the diagonal, with the predicted logarithms of the latent roots of the random matrix.

The results of the parallel analysis are shown in columns 3 and 4 of Table 5.1. Column 1 contains the latent roots of the obtained 33 x 33 correlation matrix (N = 341), with squared multiple correlations on the diagonal. Column 3 contains the logarithms of the figures in column 1. Column 4 has estimates of the logarithms of the latent roots of a random matrix, with squared multiple correlations on the diagonal, for a sample size of 341 and 33 variables. The first nine rows of column 3 are larger than the corresponding rows in column 4, and all subsequent rows of column 3 are smaller than the corresponding rows of column 4. Thus, the parallel analysis indicates nine factors. Examination of the differences in magnitudes of the latent roots (column 2) is also consistent with nine factors. The difference between the ninth and tenth latent root (.09) is appreciably larger than any subsequent difference. All the factors of a nine factor structure (described below) are interpretable, thus indicating that no less than nine factors should be retained. Examination of a ten factor structure indicated that it did not have a good structure. Thus, nine factors were retained.

Table 5.1

Latent Roots, Differences between Latent Roots, Logarithms of Latent Roots, and Logarithms of Latent Roots of Random Data

(N = 341)

	Latent root	Differences	Log of root	Random data
1	7.59	4.86	0.88	-0.09
2	2.72	0.68	0.43	-0.18
3	2.04	0.25	0.31	-0.23
4	1.78	0.59	0.25	-0.27
5	1.19	0.13	0.07	-0.32
6	1.05	0.08	0.02	-0.36
7	0.96	0.36	-0.01	-0.40
8	0.59	0.24	-0.22	-0.45
9	0.35	0.09	-0.46	-0.49
10	0.25	0.02	-0.59	-0.53
11	0.22	0.02	-0.64	-0.57
12	0.20	0.03	-0.69	-0.65
13	0.17	0.03	-0.76	-0.73
14	0.13	0.04	-0.87	-0.81
15	0.08	0.02	-1.06	-0.91
16	0.06	0.05	-1.20	-1.07
17	0.00	0.02	--	--
18	-0.01	0.01	--	--
19	-0.03	0.02	--	--
20	-0.05	0.02	--	--
21	-0.08	0.00	--	--
22	-0.09	0.00	--	--
23	-0.09	0.00	--	--
24	-0.10	0.02	--	--
25	-0.12	0.01	--	--
26	-0.13	0.02	--	--
27	-0.15	0.01	--	--
28	-0.17	0.00	--	--
29	-0.17	0.02	--	--
30	-0.19	0.00	--	--
31	-0.20	0.01	--	--
32	-0.22	0.04	--	--
33	-0.26	--	--	--

Note. Logarithms of the obtained latent roots and logarithms of latent roots of random data are not computed for roots 17-33 because Montanelli and Humphrey's (1976) formula for logarithms of the latent roots of a random data correlation matrix determines only the first (N - 1)/2, where N is the number of variables.

The nine factors were first rotated analytically to the varimax criterion (see Appendix B, Table B). Graphic rotations were then performed. The graphic rotations kept response style factors orthogonal with other response style factors, and response style factors orthogonal to content factors. The graphic rotations of response style factors were oriented by the hypotheses concerning response styles (see Table 4.4). Content factors were allowed to be mutually correlated. No substantial changes were made in the orientation of content factors from their locations in the varimax solution. Oblique axes were placed through the approximate centroid of each group of content variables. The graphically rotated factors were then rescaled into corresponding reference vectors by the method given by Harman (1976, pp. 270-274). The obliquely-rotated first-order reference-vectors factor structure appears in Table 5.2, along with the communalities based on the first 9 orthogonal principal axis factors. The correlations among the first-order graphically rotated factors appear in Table 5.3. A factor analysis of the intercorrelations among the first-order factors produced three second-order dimensions which were rotated analytically to the equamax criterion. Loadings of the 9 first-order factors on the second-order equamax reference vectors appear in Table 5.4.

Table 5.2

Rotated Reference Vectors Factor Structure
(N = 341)

	1	2	3	4	5	6	7	8	9	h_a^2
ACQ1A	-05	28	04	-05	11	08	35	-04	-09	25
ACQ2A	-18	39	11	-03	-10	12	31	06	-04	33
SDA	59	03	12	05	-16	15	07	20	11	43
SDD	73	-35	11	-01	08	-01	-25	14	-02	78
PRFDYA	53	21	13	16	-05	12	17	23	08	47
PRFDYD	63	-38	-01	03	13	01	-18	15	01	66
CMSDA	09	02	62	09	06	18	16	00	-09	49
CMSDD	21	-54	52	04	13	-03	-17	-09	-03	65
MPA	12	36	44	-01	15	02	20	-07	10	42
MPD	17	-42	54	-02	00	-15	-37	-05	04	65
LIED	-03	-46	58	-09	09	-13	-25	-06	-02	63
ACHPA	22	19	16	-02	54	02	29	-01	-07	57
ACHPD	28	-10	08	-03	63	-07	-16	01	-11	68
ACHNA	19	-09	03	11	25	00	32	00	-03	26
ACHND	14	-13	12	-07	63	-01	04	-11	-03	51
ACHIEVE	47	06	11	03	59	-09	04	01	-03	79
TAQ	-41	-05	-02	03	07	40	27	-02	-12	52
TAS	-44	22	-04	00	00	64	03	03	00	83
ITANX	-35	11	-09	05	-10	47	13	-06	02	54
DEBANXA	-36	32	05	-03	-05	57	-01	-01	06	74
FACANXA	16	02	13	-07	08	-38	39	03	01	44
INTELPA	15	28	04	14	-05	12	15	37	05	33
INTELPD	19	-19	-01	01	14	-09	-12	34	12	48
INTELNA	14	-08	07	13	-01	06	26	35	07	31
INTELND	19	-21	05	04	20	-09	-12	34	19	62
SELFABIL	21	03	-02	14	13	-14	02	30	23	59
VERBALA	32	06	-13	-10	-18	06	04	57	08	50
VERBALD	35	-15	-10	-18	02	09	-12	55	03	59
EXPVOCAB	16	04	-11	-02	-05	03	-04	28	57	54
MATHA	17	04	-01	80	-08	10	10	07	08	74
MATHD	06	-10	-03	77	06	00	-06	-09	12	72
EXPMATH	05	-05	04	52	-03	11	06	-05	62	72
EXPHFT	07	-02	08	09	-05	13	01	07	64	47
p^b	1.00	1.00	1.00	.938	.845	.827	1.00	.791	.914	

a-h^2 gives the communality of each test over the first 9 orthogonal factors in either the unrotated principal axis solution or the varimax rotation.

b-p is a multiplying factor that scales each graphically rotated dimension into the corresponding reference vector.

Table 5.3

Correlations Among the Primary Factors

(N = 341)

Factors	1	2	3	4	5	6	7	8	9
1	--	00	00	00	00	00	00	00	00
2	00	--	00	00	00	00	00	00	00
3	00	00	--	00	00	00	00	00	00
4	00	00	00	--	24	-29	00	26	06
5	00	00	00	24	--	-19	00	46	29
6	00	00	00	-29	-19	--	00	-47	-29
7	00	00	00	00	00	00	--	00	00
8	00	00	00	26	46	-47	00	--	12
9	00	00	00	06	29	-29	00	12	--

Table 5.4

Loadings of the 9 First-Order Factors on the Orthogonal Second-Order (Equamax) Reference Vectors

Factor	I	II	III
1	00	00	00
2	00	00	00
3	00	00	00
4	28	-31	08
5	52	-11	32
6	-23	52	-29
7	00	00	00
8	52	-41	19
9	12	-11	46

A hierarchical transformation was performed as described by Schmid and Leiman (1957) to obtain a single orthogonal framework in which the contributions of both the first- and second-order factors to the communalities would be additive.[6] This transformation was accomplished using the orthogonal equamax rotation of the second-order factors. The loadings of the tests on the first- and second-order factors are presented in Table 5.5. The coefficients for the first-order factors are primary factor loadings scaled by the square root of the uniqueness of the factor at the second order, as outlined in the Schmid-Leiman procedure. Thus, the factor loadings of first-order content factors in Table 5.5 are proportional to those of the content factors in Table 5.2. The factor loadings of each response style factor are identical to those of a response style factor in Table 5.2, since each response style factor is uncorrelated with all other factors, and thus has a uniqueness of unity at the second order. The test communalities across both the first- and the second-order hierarchically transformed factors are equivalent to the original communalities based upon 9 orthogonal factors, as may be seen by comparing the communalities in Table 5.5 with those in Table 5.2.

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[6] The computations were done by programming the MATRIX procedure in SAS (1982).

Table 5.5

Loadings on First- and Second-Order Factors,

After Hierarchical Transformation

(N = 341)

	First-Order Factors									Second-Order Factors			
Variable	1	2	3	4	5	6	7	8	9	I	II	III	h^2
ACQ1A	-05	28					35						24
ACQ2A	-18	39					31						34
SDA	59	03					07						46
SDD	73	-35					-25						78
PRFDYA	53	21					17	21					50
PRFDYD	63	-38					-18						66
CMSDA	09	02	62				16						48
CMSDD	21	-54	52				-17						66
MPA	12	36	44				20						42
MPD	17	-42	54				-37						66
LIED	-03	-46	58				-25						64
ACHPA	22	19			50		29			31			57
ACHPD	28	-10			59		-16			39		21	69
ACHNA	19	-09			23		32						26
ACHND	14	-13			58		04			29			53
ACHIEVE	47	06			55		04			40		25	79
TAQ	-41	-05				37	27				26		50
TAS	-44	22				59	03				39	-22	83
ITANX	-35	11				43	13			-21	32	-20	55
DEBANXA	-36	32				53	-01			-20	38	-20	74
FACANXA	16	02				-36	39				-25		45
INTELPA	15	28					15	34		23			35
INTELPD	19	-19					-12	31		35	-27	23	47
INTELNA	14	-08					26	32		25			33
INTELND	19	-21					-12	32		41	-29	28	60
SELFABIL	21	03					02	28	22	39	-34	30	58
VERBALA	32	06					04	52		23	-21		54
VERBALD	35	-15					-12	50		30			59
EXPVOCAB	16	04					-04	26	54	21		32	58
MATHA	17	04		77			10			22	-24		76
MATHD	06	-10		75			-06			22	-23		72
EXPMATH	05	-05		50			06		60			29	76
EXPHFT	07	-02					01		61			28	51
Σa^2	3.17	1.79	1.68	1.57	1.53	1.29	1.26	1.24	1.24	1.63	1.20	.95	

Table 5.5--Continued

Factor Labels

First-Order Factors

1. Desirability
2. Acquiescence/Defensiveness
3. Defensiveness
4. Mathematical Self-evaluation
5. Achievement
6. Test Anxiety
7. Acquiescence
8. Verbal/Intellective Self-evaluation
9. Performance Expectancies

Second-Order Factors

I. Achievement/Intellective Self-evaluation

II. Test Anxiety/Intellective Self-evaluation

III. Residual associations among contents

Note. Loadings below .20 are omitted for all factors except for factors 1, 2, and 7.

Factor 1 at the first order is interpreted as Desirability response style. Both agree- and disagree-keyed subscales of Edwards' Social Desirability scale and the PRF Desirability scale have high loadings. Mehrabian's Tendency to Achieve scale and both Verbal Self-evaluation subscales have moderate positive loadings, and all test anxiety scales have moderate negative loadings. The signs of all the remaining scales are positive (except for Acquiescence 1 and Acquiescence 2), which is consistent with predictions.

Factor 2 is interpreted as an Acquiescence factor. It has positive signed loadings above .30 for an acquiescence measure (ACQ2A) and an agree-keyed test anxiety measure (DEBANXA). Five disagree-keyed measures of desirability or defensiveness have negative signed loadings exceeding -.30. With regard to the factor loadings of all measures, the signs of the factor loadings are consistent with predictions for acceptance acquiescence or agreement acquiescence. The signs of loadings of ACHNA and INTELNA are consistent with predictions for acceptance acquiescence, and inconsistent with predictions for agreement acquiescence. The signs for ACHND, TAQ, and INTELND are consistent with predictions for agreement acquiescence, and are inconsistent with predictions for acceptance acquiescence.

Factor 3 is interpreted as Defensiveness response style. The factor is defined by the MMPI Lie scale and both agree- and disagree-keyed subscales of Positive Malingering and Crowne-Marlowe Social Desirability scales.

Factor 4 is defined by both agree- and disagree-keyed mathematical self-evaluation subscales and performance expectancies for mathematics. It is consistent with a prediction of a Mathematics Self-evaluation factor.

Factor 5 is defined by the four achievement measures constructed from items of the PRF Achievement scale and Mehrabian's Achieving Tendency scale. It conforms to the hypothesis of an Achievement factor.

Factor 6 is consistent with the hypothesis of a Test Anxiety factor. All four test anxiety scales have positive loadings, and the Facilitating Anxiety scale has a negative loading.

Factor 7 is interpreted as an Acquiescence factor. It has positive signed loadings above .30 for the two acquiescence measures (ACQ1A, ACQ2A) and two agree-keyed measures of different contents (ACHNA, FACANXA). It has negative signed loadings exceeding -.30 for a disagree-keyed measure of defensiveness (MPD). With regard to the factor loadings of all measures, the signs of the factor loadings are consistent with predictions for acceptance acquiescence or agreement acquiescence. The sign of ACHND is consistent with the predicted sign for acceptance acquiescence, and inconsistent with the prediction for agreement acquiescence. The signs for ACHNA, INTELNA, and INTELND are consistent with predictions for agreement acquiescence, and inconsistent with predictions for acceptance acquiescence.

Factor 8 is a content factor of verbal self-evaluation, intellective self-evaluation, and expectancy for vocabulary test performance. Thus, self-evaluations and expectancies regarding verbal ability were combined with intellective self-evaluation.

Factor 9 is defined by expectancies for vocabulary, mathematics, and hidden figures performances. This factor appears to reflect consistencies in expectancies across these cognitive domains, although it also might involve method variance shared by the performance expectancy scores.

At the second-order level, the first factor combines achievement and intellective self-evaluation. An individual scoring high on this factor is high in self-reported value for achievement, and high in intellective self-evaluation including self-evaluations pertaining to both verbal and mathematical skills.

The second second-order factor reflects negative relationships of test anxiety with intellective self-evaluation and self-evaluations pertaining to mathematics. An individual scoring high on this factor is high in test anxiety, and low in intellective self-evaluation and mathematical self-evaluation.

The third second-order factor is an uninterpreted combination of low loadings on diverse content variables.

Cognitive measures and sex

The correlations of vocabulary, mathematics, and hidden figures cognitive measures and sex of subject (scored 1=male, 0=female) with the 33 personality measures were placed in an extension matrix (Mosier, 1939). The factor loadings of vocabulary, mathematics, hidden figures, and sex in the principal factor structure were solved for, and then were brought into the space defined by the graphic rotation of Table 5.2 by postmultiplying their principal factor loadings by the transformation matrices that carried the principal factor structure into the graphically rotated factor structure.[7] The projections of the cognitive measures and sex in the space defined in Table 5.2 are displayed in Table 5.6 along with the labels of the factors. The matrix displayed in Table 5.6 is the transpose of a 4 x 9 matrix that could be appended to the bottom of the matrix of loadings shown in Table 5.2.

The coefficients displayed in Table 5.6 are interpretable as correlations of the cognitive measures with the factors and the point-biserial correlation of sex with the factors. A point-biserial correlation with a positive sign means that the mean factor score of males is higher than the mean factor score of females. For a sample size of 341, a correlation of .11 is significant at the .05 level and a correlation of .14 is significant at the .01 level.

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[7] See footnote 6, p. 127.

Table 5.6

Correlations of Cognitive Measures and Sex with the Rotated Reference Vectors Factors

Factor	Vocabulary	Mathematics	Hidden Figures	Sex
1	12	09	09	17
2	-07	13	03	16
3	-43	-16	-12	02
4	-01	37	19	29
5	-01	-14	-16	-14
6	-13	-10	-02	-11
7	09	-06	-06	-08
8	26	07	12	-04
9	05	15	16	19

Factor Labels

1. Desirability
2. Acquiescence/Defensiveness
3. Defensiveness
4. Mathematical Self-evaluation
5. Achievement
6. Test Anxiety
7. Acquiescence
8. Verbal/Intellective Self-evaluation
9. Performance Expectancies

The correlation of -.43 of vocabulary with factor 3, which was interpreted as Defensiveness, indicates that low scores on vocabulary are associated with high scores on self-report measures of Defensiveness. The correlation of .26 of vocabulary with factor 8, interpreted as Verbal/intellective self-evaluation, shows that individuals scoring high on vocabulary have high self-reported verbal and intellective self-evaluation. Vocabulary also tends to be associated positively with Desirability and negatively with Test Anxiety. The correlation of .37 of mathematics with factor 4, interpreted as Mathematical Self-evaluation, indicates that individuals scoring high on the mathematics test tend to have high Mathematical Self-evaluation. Mathematics also has low positive associations with Acquiescence/Defensiveness and Performance Expectancies, and low negative associations with Defensiveness and Achievement.

Hidden Figures Test performance has low positive relationships with Mathematical Self-evaluation, Verbal/intellective Self-evaluation, and Performance Expectancies. It has low negative relationships with Defensiveness and Achievement.

The point-biserial correlation of .37 of sex with factor 4, interpreted as Mathematical Self-evaluation, indicates that males have higher self-reported Mathematical self-evaluation than females. Males also have higher

Performance Expectancies than females, but lower Achievement and Test Anxiety. With regard to response styles, males respond more desirably and are more acquiescent.

RESULTS: SEX DIFFERENCES

Mean Differences

Scale means on cognitive measures for females and males are compared in Table 6.1 below. The difference in Mathematics and Hidden Figures Test scores are both significant at the .01 level, with males scoring higher on both.

Table 6.1

Means and Standard Deviations of Cognitive Measures for Females and Males, along with *t*-values from Significance Tests of Mean Differences

	Females (*n* = 231)		Males (*n* = 106)		
Variable	Mean	SD	Mean	SD	*t*
Vocabulary	6.18	2.77	6.67	2.61	1.55
Mathematics	3.84	2.12	5.51	3.16	4.94**
Hidden Figures	4.07	2.57	5.50	3.61	3.67**

** $p < .01$

Table 6.2 displays separately for females and males the coefficient alpha reliabilities of the personality measures and tests for significance of the differences in means. For the response style scales, there are significant mean differences on Edwards' Social Desirability-agree (SDA), Crowne-Marlowe Social Desirability-agree (CMSDA), and Positive Malingering-agree (MPA), with males obtaining higher scores (i.e., more desirable) on Edwards' Social Desirability-agree and Positive Malingering-agree, and females having higher scores on Crowne-Marlowe Social Desirability-agree. With respect to content scales, there are significant differences on three of the five measures of test anxiety (TAQ, TAS, and DEBANXA), females scoring higher on all three. There are significant differences on three of the five measures of intellective self-evaluation (INTELPD, INTELND, and SELFABIL). On all these measures males score higher, indicating higher intellective self-evaluation in males. There are significant differences on all three performance expectancies (EXPVOCAB, EXPMATH, and EXPHFT) with males stating higher expectancies than females for them all.

Table 6.2
Means, Standard Deviations, and Coefficient Alpha Reliabilities of Personality Measures for Females and Males, along with t-values from Significance Tests of Mean Differences

	Females (n = 231)			Males (n = 106)			
	Reliability	Mean	SD	Reliability	Mean	SD	t
ACQ1A	.32	6.25	1.98	.16	6.06	1.78	-.86
ACQ2A	.37	6.85	2.04	.18	6.81	1.86	-.16
SDA	.38	6.12	1.64	.35	6.91	1.48	4.24**
SDD	.83	19.09	5.46	.80	20.10	5.20	1.60
PRFDYA	.47	7.25	1.78	.50	7.63	1.81	1.79
PRFDYD	.59	7.02	1.91	.55	7.38	1.88	1.57
CMSDA	.67	10.83	3.17	.74	9.99	3.77	-1.99*
CMSDD	.73	5.83	3.19	.72	5.28	3.16	-1.48
MPA	.45	6.15	2.25	.53	6.94	2.63	2.85**
MPD	.58	5.20	2.56	.48	5.56	2.42	1.21
LIED	.55	4.26	2.17	.34	4.21	1.87	-.18
ACHPA	.53	4.30	1.45	.43	4.23	1.40	-.45
ACHPD	.58	3.90	1.59	.44	4.08	1.35	1.01
ACHNA	.18	3.48	1.24	.05	3.56	1.12	.54
ACHND	.31	3.31	1.33	.39	3.01	1.38	-1.85
ACHIEVE	.85	24.73	6.69	.86	25.87	7.04	1.42
TAQ	.84	33.97	8.50	.82	30.00	7.84	-4.03**
TAS	.89	20.93	7.52	.86	17.29	7.15	-4.19**
ITANX	.84	26.13	6.76	.83	24.70	6.35	-1.82
DEBANXA	.82	5.52	2.94	.76	4.50	2.70	-3.05**
FACANXA	.60	3.18	1.83	.59	3.59	1.94	1.86
INTELPA	.07	4.09	1.07	.22	4.33	1.11	1.88
INTELPD	.37	3.67	1.36	.47	4.08	1.39	2.57*
INTELNA	.24	3.91	1.23	.04	4.07	1.03	1.18
INTELND	.51	3.10	1.50	.47	3.49	1.41	2.24*
SELFABIL	.86	33.46	4.55	.83	35.44	4.19	3.73**
VERBALA	.55	4.30	1.49	.54	4.47	1.44	.95
VERBALD	.55	3.76	1.58	.66	3.61	1.69	-.81
EXPVOCAB[b]	--[a]	-0.18	2.52	--[a]	0.46	2.62	2.05*
MATHA	.65	3.62	1.63	.55	4.55	1.38	1.39
MATHD	.79	3.19	2.04	.74	4.42	1.71	5.72**
EXPMATH[c]	--[a]	-0.53	2.56	--[a]	1.23	2.61	5.65**
EXPHFT[d]	--[a]	-0.23	2.66	--[a]	0.51	2.54	2.30*

[a] Not estimated.
[b] Due to incomplete data on this scale, the sample size for these values was 218 for females and 98 for males.
[c] Due to incomplete data on this scale, the sample size for these values was 209 for females and 100 for males.
[d] Due to incomplete data on this scale, the sample size for these values was 213 for females and 94 for males.
* $p < .05$. ** $p < .01$.

Correlations between the following sets of personality measures were computed separately for females and males:

1. Test anxiety with intellective self-evaluation.

2. Test anxiety with verbal self-evaluation.

3. Test anxiety with mathematical self-evaluation.

4. Test anxiety with performance expectancies.

5. Verbal self-evaluation with mathematical self-evaluation.

6. Verbal self-evaluation with intellective self-evaluation.

7. Mathematical self-evaluation with intellective self-evaluation.

8. Acquiescence with all contents.

Correlations of the following personality and cognitive measures were computed separately for females and males:

1. Measures of test anxiety with vocabulary, mathematics and hidden figures test scores.

2. Verbal self-evaluation with vocabulary test score.

3. Expectancies for vocabulary test performance with vocabulary test score.

4. Mathematical self-evaluation with mathematics test score.

5. Expectancies for mathematics test performance with mathematics test score.

6. Intellective self-evaluation with vocabulary, mathematics and hidden figures test scores.

The differences between coefficients of correlation that are uncorrelated were tested by transformation to Fisher's z (Guilford & Fruchter, 1973, pp. 166-167). Pairs of correlations for which Fisher's z exceeded ± 1.96 are listed in Table 6.3. The correlation pairs numbered 1-5 in Table 6.3 are correlations between personality measures, and the correlations numbered 6-13 are correlations of personality measures with cognitive measures. The correlations numbered 1-3 are correlations of test anxiety measures with intellective self-evaluation measures. There is a higher negative correlation between two measures of test anxiety and intellective self-evaluation measures with negative wording in females than males, and a higher positive relationship between a facilitating anxiety measure and an intellective self-evaluation measure with negative wording keyed disagree. A disagree-keyed verbal self-evaluation measure and a negatively worded, disagree-keyed measure of intellective self-evaluation are more highly correlated in males than in females. An acquiescence measure (ACQ1A) is more highly related to the negatively worded, agree-keyed intellective self-evaluation measure in males than in females.

Table 6.3

Significant Differences between Product-moment Correlations for Females and Males

	Correlation		
	Males (n = 106)	Females (n = 231)	z
1. TAS-INTELND	-.27	-.51	2.41
2. ITANX-INTELNA	.03	-.23	2.16
3. FACANXA-INTELND	.06	.33	-2.44
4. VERBALD-INTELND	.62	.43	2.18
5. ACQ1A-INTELNA	-.20	.07	-2.22
6. TAQ-HFT	-.31	-.03	-2.46
7. TAS-HFT	-.29	.01	-2.61
8. DEBANXA-HFT	-.34	-.04	-2.68
9. INTELPA-VOCAB	.29	.06	1.99
10. INTELPD-MATH	.30	.04	2.27
11. INTELPD-HFT	.31	-.03	3.01
12. INTELNA-HFT	.25	-.05	2.53
13. INTELND-HFT	.37	-.04	3.55

Note. For a z of 1.96 p = .05. For a z of 2.58 p = .01.

The correlations numbered 6-8 are correlations between test anxiety measures and the Hidden Figures Test. There is a higher negative correlation between the three test anxiety measures and Hidden Figures Test in males than females. The correlations numbered 9-13 are correlations of intelective self-evaluation measures with vocabulary, mathematics, and hidden figures cognitive measures. These correlations of intellective self-evaluation measures with cognitive measures are all higher in males than females.

The correlations for field independents and field dependents were also examined. There were fewer significant differences in correlations between field independents and field dependents than there were between males and females, and measures of factors showing a significant difference between field independents and field dependents tended to be measures of factors showing a significant sex difference. Thus, the sex differences in correlations were more pervasive than the field independence-field dependence differences in correlations. It was thus decided to concentrate on the sex differences in the following factor analytic work.

Factor Analyses

In view of the differences in means and correlations, separate factor analyses were performed for females and males. The 33 x 33 matrices of correlations were computed separately for females and males, and were each factored by the principal factor method, with communalities estimated by each variable's squared multiple correlation with all other variables. A parallel analysis (Montanelli & Humphreys, 1976) was performed for each subsample. The parallel analysis for females, displayed in columns 3 and 4 of Table 6.4, indicates that there are nine factors. Examination of the differences in magnitudes of the latent roots (column 2) appears to also indicate nine factors. The difference between the ninth and tenth latent root (.15) is appreciably larger than any subsequent difference. However, it may also be noted that the difference between the seventh and eighth latent roots (.36) is appreciably larger than any subsequent difference. Thus, examination of the differences might indicate seven factors.

The parallel analysis for males, displayed in columns 3 and 4 of Table 6.5, indicates that there are seven factors. Examination of the differences in magnitudes of the latent roots, shown in column 2, also appears consistent with the parallel analysis finding of seven factors.

Table 6.4

Latent Roots, Differences between Latent Roots, Logarithms of the Latent Roots, and Logarithms of the Latent Roots of Random Data for Females (n = 231)

	Latent root	Differences	Log of root	Random data
1	7.68	4.69	0.88	0.00
2	2.99	0.76	0.47	-0.08
3	2.30	0.43	0.36	-0.12
4	1.79	0.46	0.25	-0.17
5	1.33	0.23	0.12	-0.21
6	1.09	0.09	0.03	-0.25
7	1.00	0.36	0.00	-0.29
8	0.64	0.16	-0.19	-0.34
9	0.47	0.15	-0.32	-0.38
10	0.31	0.03	-0.50	-0.42
11	0.28	0.06	-0.55	-0.46
12	0.21	0.03	-0.67	-0.54
13	0.18	0.05	-0.74	-0.62
14	0.13	0.03	-0.88	-0.69
15	0.09	0.01	-1.04	-0.79
16	0.08	0.05	-1.09	-0.96
17	0.02	0.03	--	--
18	-0.00	0.02	--	--
19	-0.02	0.00	--	--
20	-0.03	0.01	--	--
21	-0.04	0.01	--	--
22	-0.06	0.03	--	--
23	-0.09	0.01	--	--
24	-0.11	0.00	--	--
25	-0.11	0.01	--	--
26	-0.13	0.02	--	--
27	-0.16	0.00	--	--
28	-0.16	0.01	--	--
29	-0.17	0.01	--	--
30	-0.19	0.01	--	--
31	-0.20	0.00	--	--
32	-0.21	0.05	--	--
33	-0.26	--	--	--

Table 6.5

Latent Roots, Differences between Latent Roots, Logarithms of the Latent Roots, and Logarithms of the Latent Roots of Random Data for Males
(n = 106)

	Latent root	Differences	Log of root	Random data
1	7.30	3.96	0.86	0.21
2	3.33	1.13	0.52	0.12
3	2.20	0.42	0.34	0.08
4	1.77	0.47	0.24	0.04
5	1.29	0.28	0.11	0.00
6	1.01	0.07	0.00	-0.04
7	0.93	0.18	-0.03	-0.08
8	0.74	0.04	-0.13	-0.12
9	0.70	0.16	-0.15	-0.16
10	0.53	0.04	-0.27	-0.20
11	0.48	0.07	-0.31	-0.23
12	0.40	0.06	-0.39	-0.32
13	0.34	0.06	-0.46	-0.39
14	0.27	0.06	-0.56	-0.47
15	0.21	0.06	-0.67	-0.57
16	0.15	0.03	-0.82	-0.73
17	0.11	0.03	--	--
18	0.08	0.04	--	--
19	0.04	0.01	--	--
20	0.02	0.03	--	--
21	0.00	0.02	--	--
22	-0.03	0.01	--	--
23	-0.05	0.01	--	--
24	-0.06	0.01	--	--
25	-0.08	0.02	--	--
26	-0.11	0.02	--	--
27	-0.13	0.02	--	--
28	-0.15	0.01	--	--
29	-0.17	0.01	--	--
30	-0.18	0.01	--	--
31	-0.20	0.01	--	--
32	-0.22	0.03	--	--
33	-0.26	--	--	--

Chi-square tests for the number of factors were performed with EFAP separately for females and males, and are displayed in Table 6.6. For females fourteen factors is the best solution. Thirteen, fourteen, and fifteen factors have reasonable fits. The fourteen factor solution has an acceptable fit, $\chi^2(157) = 146.60$, $p = .713$, and is a significant improvement in fit over a thirteen factor solution, $\chi^2_{diff} = 180.78 - 146.60 = 34.18$, $df = 177 - 157 = 20$, $p = .024$. A fifteen factor solution is not a significant improvement in fit over a fourteen factor solution, $\chi^2_{diff} = 146.60 - 118.78 = 27.82$, $df = 157 - 138 = 19$, $p = .086$.

For males twelve or thirteen factors provide good fits, and eleven factors is also reasonable. A twelve factor solution has an acceptable fit, $\chi^2(198) = 185.35$, $p = .731$, and is a significant improvement in fit over eleven factors, $\chi^2_{diff} = 219.48 - 185.35 = 34.13$, $df = 220 - 198 = 22$, $p = .047$. A thirteen factor solution has an acceptable fit, $\chi^2(177) = 153.35$, $p = .900$, and is a marginally significant improvement in fit over twelve factors, $\chi^2_{diff} = 185.35 - 153.35 = 32.00$, $df = 198 - 177 = 21$, $p = .058$.

Summarizing, both parallel analyses and chi-square tests for the number of factors indicate a larger number of factors in females than in males. The parallel analyses indicate nine factors in females and seven factors in males. The chi-square tests indicate fourteen factors in females and twelve or thirteen factors in males.

Table 6.6

Chi-square Tests for the Number of Factors for Females and Males

	Females (n = 231)					
	Goodness of fit			Improvement in fit		
Factors	Chi-square	df	p	Chi-square	df	p
8	450.79	292	.000			
9	374.01	267	.000	76.78	25	.000
10	318.13	243	.001	55.88	24	.000
11	262.05	220	.027	56.08	23	.000
12	220.24	198	.133	41.81	22	.006
13	180.78	177	.407	39.46	21	.008
14	146.60	157	.713	34.18	20	.024
15	118.78	138	.880	27.82	19	.086
	Males (n = 106)					
8	347.87	292	.014			
9	291.27	267	.147	56.60	25	.000
10	255.88	243	.273	35.39	24	.062
11	219.48	220	.497	36.40	23	.037
12	185.35	198	.731	34.13	22	.047
13	153.35	177	.900	32.00	21	.058
14	129.97	157	.943	23.38	20	.270
15	109.19	138	.966	20.78	19	.349

For females, nine factors were retained and rotated to the promax criterion.[8] In another analysis seven factors were retained and rotated to the promax criterion. Examination of the latter solution indicated that it did not have a good structure, and it will not be discussed further. The promax rotated reference vectors for females are shown in Table 6.7 and the promax rotated factor pattern is shown in Table 6.8. Intercorrelations of the promax rotated factors are given in Table 6.9.

A second-order factor analysis was performed on the intercorrelations of the promax rotated first-order factors. In order to determine the number of factors to extract at the second order, parallel analysis and chi-square tests were first performed on the intercorrelations of the first-order factors. The results of the parallel analysis are shown in columns 3 and 4 of Table 6.10. The first three rows of column 3 are larger than the corresponding rows in column 4, and the fourth row of column 3 is smaller than the corresponding row of column 4. Thus, the parallel analysis indicates three factors. Chi-square tests for the number of factors are shown in Table 6.11. The three factor solution has an acceptable fit, $\chi^2(12) = 13.82$, $p = .312$, and is a significant improvement over two factors, $\chi^2_{diff} = 34.13 - 13.82 = 20.31$, $df = 19 - 12 = 7$, $p = .004$. A four factor solution also has an acceptable fit, $\chi^2(6) = 5.33$, $p = .503$,

[8] The PROMAX rotation option of the FACTOR procedure in SAS (1982) was used.

but is not a significant improvement over three factors, χ^2_{diff} = 13.82 - 5.33 = 8.49, df = 12 - 6 = 6, p = .204.

Three second-order factors were extracted and rotated to the equamax criterion. A hierarchical transformation (Schmid & Leiman, 1957) was then performed, using the orthogonal equamax rotation of the second-order factors. The loadings of the tests on the first- and second-order factors are presented in Table 6.12.

Table 6.7

Promax Rotated Reference Vectors for Females
(n = 231)

Variable	Factors								
	1	2	3	4	5	6	7	8	9
ACQ1A	14	10	-17	00	-07	-03	00	15	33
ACQ2A	16	-17	-17	-02	-02	-08	12	28	20
SDA	-01	-06	02	63	04	-04	00	14	08
SDD	-14	13	29	54	-01	-03	00	-09	-09
PRFDYA	-03	01	-12	50	03	15	09	26	05
PRFDYD	-08	22	19	45	03	03	03	-21	-06
CMSDA	18	06	30	12	-09	14	01	53	01
CMSDD	00	12	65	06	00	04	-01	09	-06
MPA	-05	14	03	00	12	-04	-07	62	06
MPD	-13	-11	73	04	03	-03	00	03	-03
LIED	-01	-01	76	-12	-01	-09	04	07	05
ACHPA	04	56	-11	04	04	-02	-01	22	29
ACHPD	-07	69	03	-07	-10	01	09	03	-10
ACHNA	00	33	-03	11	00	12	-11	-02	37
ACHND	06	61	08	-04	07	-02	03	-02	11
ACHIEVE	-15	66	-05	09	01	00	06	19	06
TAQ	62	06	01	-09	-04	05	01	-11	20
TAS	71	-02	-06	-04	03	-04	00	06	-09
ITANX	56	-03	-10	01	00	-01	-13	-01	01
DEBANXA	58	-05	-07	-04	07	-11	-02	21	-21
FACANXA	-33	06	-04	-01	05	-12	14	12	43
INTELPA	-02	-06	-17	18	-05	13	35	27	03
INTELPD	-14	18	16	-03	00	01	44	-04	-06
INTELNA	00	06	08	19	00	14	29	09	31
INTELND	-17	23	21	-01	13	06	36	-06	05
SELFABIL	-23	17	-05	-02	23	12	37	02	03
VERBALA	-07	-05	-15	44	-01	-03	41	-08	04
VERBALD	-01	20	01	35	00	-12	37	-17	00
EXPVOCAB	-17	08	-09	08	56	-08	14	-03	-07
MATHA	00	-05	-08	13	01	78	08	07	01
MATHD	-05	07	00	-12	04	78	00	-04	-05
EXPMATH	06	00	06	-05	66	34	-03	00	06
EXPHFT	01	-01	05	05	68	00	00	05	-01

Table 6.8

Nine Factor Promax Rotated Factor Pattern for Females
(n = 231)

	1	2	3	4	5	6	7	8	9	h^2_a
ACQ1A	17	12	-19	00	-04	00	16	-07	35	30
ACQ2A	20	-19	-19	13	-09	-03	31	-03	22	41
SDA	-02	-07	03	-01	-05	68	15	05	09	46
SDD	17	16	32	00	-03	58	-10	-02	-10	76
PRFDYA	-04	01	-13	11	16	54	28	04	06	46
PRFDYD	-11	25	21	04	04	49	-23	04	-07	67
CMSDA	21	07	33	02	15	14	57	-10	02	50
CMSDD	01	15	72	-01	05	07	10	00	-07	62
MPA	-07	16	04	-08	-05	00	67	13	07	53
MPD	-16	-13	80	-01	-03	05	04	04	-03	68
LIED	-02	-01	84	05	-10	-14	08	-01	06	66
ACHPA	06	64	-13	-01	-03	05	25	04	31	59
ACHPD	-09	79	04	11	01	-09	04	-11	-11	70
ACHNA	-01	37	-04	-13	13	13	-03	00	40	34
ACHND	07	69	09	04	-02	-04	-03	08	12	52
ACHIEVE	-18	75	-06	07	-01	10	20	01	07	78
TAQ	74	08	02	02	06	-10	-12	-05	22	57
TAS	85	-03	-07	00	-05	-04	07	04	-10	82
ITANX	66	-04	-11	-15	-02	02	-02	00	02	58
DEBANXA	69	-06	-08	-02	-12	-05	23	08	-23	75
FACANXA	-40	08	-04	16	-13	-02	14	06	46	50
INTELPA	-03	-07	-19	39	14	20	30	-05	04	35
INTELPD	-17	21	18	48	01	-04	-05	01	-07	51
INTELNA	-01	07	09	32	15	21	10	-01	33	37
INTELND	-20	27	24	41	07	-01	-07	15	06	63
SELFABIL	-27	20	-06	41	14	-03	03	25	04	60
VERBALA	-09	-06	-17	45	-03	47	-09	-02	05	57
VERBALD	-02	23	01	41	-13	38	-19	-01	01	59
EXPVOCAB	-21	09	-10	16	-09	09	-04	60	-08	56
MATHA	-01	-06	-09	10	81	14	08	01	02	72
MATHD	-06	08	01	00	82	-13	-05	05	-06	72
EXPMATH	07	-01	08	-04	36	-05	-01	71	06	74
EXPHFT	02	-02	06	-01	00	06	06	72	-02	53

a-h^2 gives the communality over the first 9 orthogonal factors in the principal axis solution.

Table 6.9

(n = 231)

Intercorrelations of Promax Rotated Factors for Females

	1	2	3	4	5	6	7	8	9
1	--	-31	-24	-33	-10	-29	21	-18	00
2	-31	--	26	26	16	25	00	18	-01
3	-24	26	--	-02	09	09	-12	07	-19
4	-33	26	-02	--	06	19	-08	14	06
5	-10	16	09	05	--	05	06	23	08
6	-29	25	09	19	05	--	-06	02	-06
7	21	00	-12	-08	06	-06	--	09	24
8	-18	18	07	14	23	02	09	--	05
9	00	-01	-19	06	08	-06	24	05	--

Table 6.10

Females: Latent Roots of Intercorrelations of Promax Rotated First-order Factors, Differences between Latent Roots, Logarithms of Latent Roots, and Logarithms of the Latent Roots of a Random Data Correlation Matrix

(n = 231)

	Latent root	Differences	Log of root	Random data
1	1.28	0.73	0.10	-0.41
2	0.54	0.27	-0.26	-0.60
3	0.26	0.20	-0.58	-0.74
4	0.06	0.12	-1.22	-0.90
5	-0.06	0.01	--	--
6	-0.07	0.05	--	--
7	-0.13	0.09	--	--
8	-0.23	0.06	--	--
9	-0.29	--	--	--

Table 6.11

Chi-square Tests for the Number of Second-order Factors for Females

(n = 231)

	Goodness of fit			Improvement in fit		
Factors	Chi-square	df	p	Chi-square	df	p
2	34.13	19	.016			
3	13.82	12	.312	20.31	7	.004
4	5.33	6	.503	8.49	6	.204
5	0.61	1	.436	4.72	5	.450

Table 6.12

Loadings on First- and Second-Order Factors, After Hierarchical Transformation, for Females

(N = 231)

	First-order Factors									Second-Order Factors			
Variable	1	2	3	4	5	6	7	8	9	I	II	III	h^2
ACQ1A									32			30	28
ACQ2A							28		20	-21		36	40
SDA						62				23		00	47
SDD			28			53				43		-34	73
PRFDYA						49	25			24		12	46
PRFDYD		21				45	-21			44		-31	66
CMSDA			29				51				20	10	48
CMSDD			63								27	-32	61
MPA							60				24	22	51
MPD			70								20	-35	69
LIED			73									-28	68
ACHPA		53					22		28		28	19	58
ACHPD		66								35	28	-17	71
ACHNA		31							36		21	10	35
ACHND		58								26	29	-07	52
ACHIEVE		63								42	36	-02	77
TAQ	58								20	-38		19	60
TAS	67									-51		17	79
ITANX	52									-45	-20	17	57
DEBANXA	54						21		-21	-48		17	70
FACANXA	-31								41	30		18	48
INTELPA				34			27					21	36
INTELPD				41						42		-15	49
INTELNA				28					30	28	20	13	37
INTELND		23	21	35						48	32	-14	62
SELFABIL	-21			35				23		45	31	03	57
VERBALA				39		43				43		02	56
VERBALD				35		35				48		-13	57
EXPVOCAB								54		34	26	-02	56
MATHA					75						31	11	72
MATHD					76						35	- 1	73
EXPMATH					33			64			41	08	72
EXPHFT								65			30	04	54
$\sum a^2$	1.71	1.87	1.86	1.00	1.43	1.60	1.15	1.28	0.78	3.23	1.74	1.18	

Table 6.12--Continued

Factor Labels

First-Order Factors

1. Test anxiety
2. Achievement
3. Defensiveness
4. Intellective/verbal self-evaluation
5. Mathematical self-evaluation
6. Desirability
7. Acquiescence/Defensiveness
8. Expectancies
9. Acquiescence

Second-Order Factors

I. Desirability

II. Achievement/Intellective and Mathematical Self-evaluation/ Mathematics and Hidden Figures Performance Expectancies

III. Agreement Acquiescence

Note. Loadings below .20 are omitted except for second-order factor III.

At the first order, factor 1 is interpreted as Test Anxiety. It is consistent with the hypcthesis for this factor defined in Table 4.4. Loadings above .30 occur for the measures hypothesized to define this factor, and the measures which have loadings below .30 were all predicted to have loadings of zero.

Factor 2 is interpreted as Achievement. It is consistent with the hypothesis for this factor defined in Table 4.4. Loadings above .30 occur for the appropriate measures, and for none of the measures predicted to have loadings of zero.

Factor 3 is interpreted as a Defensiveness factor. It has high loadings for three lie scales (CMSDD, MPD, and LIED), and loadings above .20 for CMSDA and SDD. PRFDYD was predicted to have a positive loading on a Defensiveness factor, but its loading is only .18. PRFDYA was also predicted to have a positive loading, but its loading is negative (-.11). A single content measure (INTELND) loads above .20.

Factor 4 is defined by intellective self-evaluation and verbal self-evaluation scales. An individual scoring high on this factcr evaluates herself highly in intellective and verbal areas.

Factor 5 is interpreted as Mathematical Self-evaluation. It is consistent with the hypothesis for this factor defined in Table 4.4.

Factor 6 has high loadings for Edwards' Social Desirability and PRF Desirability scales keyed agree and disagree. Verbal Self-evaluation-agree and Verbal Self-evaluation-disagree scales load abcve .30. The loadings of the Social Desirability scales mark this as a Desirability factor. It may be noted, however, that it is restricted to desirability scales and only two ccntent measures.

Factor 7 has high loadings for two positively worded, agree-keyed measures of defensiveness or desirability (MPA, CMSDA). It has loadings above .20 for an acquiescence measure (ACQ2A) and four agree-keyed measures (PRFDYA, ACHPA, DEBANXA, and INTELPA), and a negative loading for a disagree-keyed measure (PRFDYD). Cn the basis of these loadings, the factor is interpreted as Acquiescence, mixed with defensive or desirable responding to agree-keyed measures. With regard to all the measures, the signs of factor loadings are consistent with predictions for agreement acquiescence or acceptance acquiescence, except that the signs of CMSDD, MPD, and ACHPD are discrepant with predictions for both agreement and acceptance acquiescence. Of those measures which could discriminate agreement and acceptance acquiescence, the signs of LIED and ACHNA are consistent with predictions for acceptance acquiescence, and are inconsistent with predictions fcr agreement acquiescence. The signs of ACHND and TAQ are consistent with predictions for agreement acquiescence and are inconsistent with predictions for acceptance acquiescence.

Factor 8 is defined by expectancies for vocabulary, mathematics, and hidden figures performances. An individual scoring high on this factor reports expecting to do well on these cognitive measures.

Factor 9 has loadings above .20 for both acquiescence measures and four agree-keyed measures of three different contents (ACHPA, ACHNA, FACANXA, and INTELNA). On the basis of these loadings the factor is interpreted as Acquiescence to agree-keyed measures. With regard to the factor loadings of all measures, the signs are consistent with predictions for agreement acquiescence or acceptance acquiescence, except that the signs of TAS and DEBANXA are discrepant with predictions for both agreement and acceptance acquiescence. For measures that could discriminate agreement and acceptance acquiescence, the signs of ACHNA and INTELNA are consistent with predictions for agreement acquiescence, and inconsistent with predictions for acceptance acquiescence. The signs of loadings of ACHND and INTELND are consistent with predictions for acceptance acquiescence, and inconsistent with predictions for agreement acquiescence.

At the second-order level, the first factor is interpreted as Desirability response style. It has loadings above .40 for two desirability measures (SDD, PRFDYD). Many of the content measures which were predicted to load on desirability have substantial loadings, and the signs of the loadings are all as predicted.

The second second-order factor has loadings of at least .30 for a measure of achievement (ACHIEVE), two measures of intellective self-evaluation (INTEIND, SELFABIL), both mathematical self-evaluation measures (MATHA, MATHD), and performance expectancies for mathematics (EXPMATH) and hidden figures (EXPHFT). Thus, the factor associates achievement tendency with intellective and mathematical self-evaluation and performance expectancies for mathematics and hidden figures. Four measures of defensiveness load above .20, indicating a minor involvement of impression management. An individual scoring high on this factor reports that she is oriented to achievement, has good intellective and mathematical self-evaluations, and high expectancies for mathematics and hidden figures test performances.

The third second-order factor is interpreted as Agreement Acquiescence. Both acquiescence measures load above .30. As hypothesized, all agree-keyed measures have positive signed factor loadings, and all disagree-keyed measures have negative signed loadings.

For males, seven factors were retained and were rotated analytically to the promax criterion. The promax rotated reference vectors for males are shown in Table 6.13 and the promax rotated factor pattern is displayed in Table 6.14. Intercorrelations of the promax rotated factors are given in Table 6.15.

A second-order factor analysis was performed on the intercorrelations of the promax rotated first-order factors. In order tc determine the number cf factors tc extract at the second order, parallel analysis and chi-square tests were first performed on the interccrrelations of the first-order factors. The results of the parallel analysis are shown in columns 3 and 4 of Table 6.16. The first two rows cf column 3 are larger than the corresponding rows in column 4, and subsequent rows of column 3 are smaller than the corresponding rows of column 4. Thus, the parallel analysis indicates two factors. Chi-square tests for the number of factors are shown in Table 6.17. A one factor solution has an acceptable fit, $\chi^2(14) = 14.78$, $p = .393$. A two factor solution is not a significant imprcvement in fit over one factor, $\chi^2_{diff} = 14.78 - 4.67 = 10.11$, $df = 14 - 8 = 6$, $p = .120$.

In view of the tests for the number cf factors, both one factor and two factor second-order analyses were performed. A two factor second-order structure did not have a good structure, and will not be discussed further. A hierarchical transformation (Schmid & Leiman, 1957) employing one second-order factor was then performed. The loadings of the tests on the first-order factors and one second-crder factor are presented in Table 6.18.

Table 6.13

Promax Rotated Reference Vectors for Males
(n = 106)

	1	2	3	4	5	6	7
ACQ1A	-21	07	01	-14	05	-06	43
ACQ2A	-07	01	13	-09	-01	-07	38
SDA	08	-07	11	22	51	08	27
SDD	-05	14	-08	22	60	02	-08
PRFDYA	07	06	-20	-04	46	13	47
PRFDYD	-01	08	-05	17	56	08	-10
CMSDA	05	00	00	67	05	00	41
CMSDD	-06	-01	-09	73	15	09	-11
MPA	-02	22	-03	07	04	-21	56
MPD	-01	08	-01	64	15	-12	-09
LIED	-05	05	-11	63	02	-13	-13
ACHPA	09	67	-08	-02	-03	-05	25
ACHPD	14	60	06	10	19	03	-02
ACHNA	08	17	01	03	10	12	05
ACHND	-10	75	08	11	-12	07	03
ACHIEVE	07	56	-11	-02	23	16	11
TAQ	-16	05	29	-03	-13	-06	00
TAS	00	10	77	-09	-08	-03	07
ITANX	06	-14	51	04	-21	10	-03
DEBANXA	-02	-05	64	-05	00	00	29
FACANXA	06	01	-57	10	-24	09	15
INTELPA	34	20	00	-10	06	01	12
INTELPD	38	22	-07	-04	19	10	-15
INTELNA	42	-01	04	03	00	11	-13
INTELND	43	31	-04	-06	14	-04	-21
SELFABIL	39	26	-23	-19	07	05	00
VERBALA	52	-03	-11	-07	14	-19	03
VERBALD	43	04	-03	-05	38	-18	-17
EXPVOCAB	59	-04	-01	-12	01	11	00
MATHA	-04	06	-08	-10	08	75	-06
MATHD	-07	11	-02	-08	09	74	-20
EXPMATH	29	02	00	05	-02	67	-05
EXPHFT	58	04	01	20	-15	10	-10

Table 6.14

Seven Factor Promax Rotated Factor Pattern for Males ($\underline{n}$ = 106)

Variable	Factors 1	2	3	4	5	6	7	$\underline{h}^2_a$
ACQ1A	-23	08	02	-15	07	-06	45	25
ACQ2A	-08	02	15	-11	-01	-08	40	24
SDA	09	-08	12	23	60	09	28	37
SDD	-06	16	-10	24	71	03	-08	81
PRFDYA	08	07	-23	-05	54	14	49	61
PRFDYD	-02	09	-06	19	66	09	-11	64
CMSDA	06	01	00	71	06	-01	43	64
CMSDD	-07	-02	-11	78	18	10	-12	76
MPA	-03	25	-04	08	05	-22	58	43
MPD	-02	10	-02	68	19	-13	-10	59
LIED	-06	06	-12	67	03	-14	-14	57
ACHPA	10	74	-09	-03	-04	-06	27	63
ACHPD	16	66	07	11	23	04	-03	66
ACHNA	09	20	02	03	12	13	06	11
ACHND	-11	83	09	12	-15	08	04	64
ACHIEVE	08	62	-13	-02	28	16	12	75
TAQ	-18	06	33	-04	-15	-06	00	23
TAS	00	11	86	-11	-09	-04	08	83
ITANX	08	-16	58	05	-25	10	-03	55
DEBANXA	-03	-06	72	-06	-01	-01	30	73
FACANXA	07	01	-64	11	-29	10	16	43
INTELPA	38	23	00	-11	08	02	13	29
INTELPD	41	24	-08	-05	23	11	-16	53
INTELNA	46	-02	05	04	-01	12	-14	23
INTELND	47	34	-05	-06	18	-04	-22	61
SELFABIL	43	29	-26	-20	08	06	01	58
VERBALA	56	-03	-13	-08	17	-20	04	46
VERBALD	47	05	-03	-06	45	-19	-18	64
EXPVOCAB	65	-04	-02	-13	01	12	-01	51
MATHA	-05	07	-09	-11	10	77	-07	68
MATHD	-08	12	-03	-09	11	76	-21	73
EXPMATH	32	02	01	06	-03	69	-06	61
EXPHFT	63	05	02	22	-18	10	-11	38

a-$\underline{h}^2$ gives the communality of each test over the first 9 orthogonal factors in the unrotated principal axis solution.

Table 6.15

(n = 231)

Intercorrelations of Promax Rotated Factors for Males

	1	2	3	4	5	6	7
1	--	16	-19	-25	20	09	-01
2	16	--	-25	06	37	14	-05
3	-19	-25	--	-12	-37	-14	14
4	-25	06	-12	--	06	-04	-05
5	20	37	-37	06	--	06	-25
6	09	14	-14	-04	06	--	-05
7	-01	-05	14	-05	-25	-05	--

Table 6.16

Males: Latent Roots of Interccrrelations of Promax Rotated First-order Factors, Differences between Latent Roots, Lcgarithms of Latent Roots, and Logarithms of the Latent Roots of a Random Data Correlation Matrix

(n = 106)

	Latent root	Differ-ences	Loo of roct	Random data
1	1.10	0.73	0.04	-0.29
2	0.37	0.30	-0.43	-0.51
3	0.06	0.05	-1.15	-0.71
4	0.01	0.07	-2.00	--
5	-0.06	0.17	--	--
6	-0.23	0.02	--	--
7	-0.26	--	--	--

Table 6.17

Chi-square Tests for the Number of Second-order Factors for Males

(n = 106)

	Goodness of fit			Improvement in fit		
Factors	Chi-square	df	p	Chi-square	df	p
1	14.78	14	.393			
2	4.67	8	.792	10.11	6	.120
3	1.14	3	.767	3.53	5	.619

Table 6.18

Loadings on First-Order Factors and Second-Order Factor, After Hierarchical Transformation, for Males

(N = 106)

	First-order Factors							Second-Order Factor	
Variable	1	2	3	4	5	6	7	I	h^2
ACQ1A	-22						43		29
ACQ2A							39	-23	24
SDA				23	47		27	26	44
SDD				24	56			59	75
PRFDYA			-20		42		47	41	64
PRFDYD					52			53	62
CMSDA				71			42		68
CMSDD				78				23	72
MPA		22				-22	56		42
MPD				68				21	56
LIED				67					52
ACHPA		65					26	33	62
ACHPD		58						50	66
ACHNA								20	11
ACHND		73						24	64
ACHIEVE		54			22			57	72
TAQ			28					-31	22
TAS			73					-49	81
ITANX			49		-20			-48	55
DEBANXA			61				29	-51	72
FACANXA			-54		-23				43
INTELPA	36	20						25	26
INTELPD	39	21						49	51
INTELNA	44								25
INTELND	45	30					-21	50	61
SELFABIL	41	25	-22	-20				46	54
VERBALA	53					-20		28	44
VERBALD	45				35			47	62
EXPVOCAB	62							22	46
MATHA						75		30	69
MATHD						74	-20	32	73
EXPMATH	30					68		25	62
EXPHFT	60			22					47
$\sum a^2$	2.33	1.99	1.73	2.43	1.49	1.92	1.58	4.11	

Table 6.18--Continued

Factor Labels

First-Order Factors

1. Expectancies/Verbal and intellective self-evaluation
2. Achievement
3. Test anxiety
4. Defensiveness
5. Desirability
6. Mathematical self-evaluation
7. Acquiescence/Defensiveness

Second-Order Factor

I. Desirability

Note. Loadings below .20 are omitted.

At the first order, factor 1 is defined by expectancies for performances on cognitive measures, intellective self-evaluation scales, and verbal self-evaluation scales. An individual scoring high on factor 1 has high expectations for his performance on cognitive measures, and high verbal and intellective self-evaluation.

Factor 2 is consistent with the hypothesis of an Achievement factor defined in Table 4.4, except that an intellective self-evaluation subscale (INTELND) also loads the factor.

Factor 3 is interpreted as Test Anxiety, and is consistent with the hypothesis for this factor defined in Table 4.4.

Factor 4 has high loadings for agree-keyed and disagree-keyed subscales of Crowne-Marlowe Social Desirability (CMSDA, CMSDD), Positive Malingering-disagree (MPD), and the MMPI Lie Scale (LIED). Thus, four of the scales hypothesized to load on Defensiveness define this factor.

Factor 5 has high loadings for Edwards' Social Desirability and PRF Desirability subscales keyed agree and disagree, and a loading above .30 for Verbal Self-evaluation-disagree (VERBALD). The loadings of the social desirability scales mark this as a Desirability factor. However, it is restricted to the desirability measures and a single content measure.

Factor 6 is interpreted as Mathematical Self-evaluation, and is consistent with the hypothisis for this factor defined in Table 4.4.

Factor 7 has loadings of .30 or higher for the two measures of acquiescence (ACQ1A, ACQ2A) and three positively worded, agree-keyed measures of defensiveness or desirability (PRFDYA, CMSDA, MPA). An agree-keyed measure of test anxiety (DEBANXA) has a loading above .20. On the basis of these loadings, the factor is interpreted as Acquiescence to positively worded, agree-keyed response style measures, although the loading of DEBANXA indicates that acquiescence to content is also involved. With regard to all measures, signs of factor loadings are consistent with predictions for agreement acquiescence or acceptance acquiescence, except that the sign of MATHA is inconsistent with predictions for both agreement and acceptance acquiescence. For measures that could discriminate agreement and acceptance acquiescence, the signs of the loadings of ACHNA and INTELND are consistent with predictions for agreement acquiescence and inconsistent with predictions for acceptance acquiescence. The signs of the loadings of ACHND and INTELNA are consistent with predictions for acceptance acquiescence and inconsistent with predictions for agreement acquiescence.

At the second-order level, the single second-order factor is interpreted as Desirability response style. It

has loadings above .40 for three desirability measures (SDD, PRFDYA, PRFDYD). Many of the content measures which were predicted to load on desirability have substantial loadings, and the signs of the loadings are all as predicted.

For purposes of comparison with the factor structure of the female subsample, the nine retained factors for the total sample (N = 341) were rotated to the promax criterion (see Appendix B, Table C). The factors for females displayed in Table 6.8 were compared with the factors for the total sample by computing Tucker's coefficient of congruence (Harman, 1976, pp. 343-345), a measure of the degree of factorial similarity, for each pair of factors (see Table 6.19). The coefficients on the principal diagonal are high, the lowest being .89. However, some of the off-diagonal coefficients are appreciable, two exceeding .40, one of .30, and eight equal to or greater than .20. Thus, there is a correspondence between the nine factors in the female subsample and the nine factors in the total sample, although there is some unclarity in the correspondence.

Table 6.19

Coefficients of Congruence between Promax Rotated Factors for Females and the Total Sample

		Total Sample								
		1	2	3	4	5	6	7	8	9
Females	1	98	-14	-14	-27	-04	-14	09	-06	-20
	2	-13	99	07	23	04	08	16	07	27
	3	-11	07	99	02	00	05	14	01	-13
	4	-24	24	-01	96	08	49	00	14	21
	5	-06	04	-02	12	99	02	07	21	02
	6	-18	14	11	14	06	96	13	06	01
	7	15	08	-11	04	-02	07	95	02	48
	8	-11	07	05	16	11	06	03	99	-01
	9	03	30	-05	15	13	14	08	01	89

The nine factors for females shown in Table 6.8 were compared with the seven factors for males shown in Table 6.14 by computing Tucker's coefficient of congruence for each pair of factors (see Table 6.20). For the columns of Table 6.20, there is a coefficient of .80 or higher in columns 1, 2, 3, 5, 6, and 7. Thus, for six of the factors there is a factor with relatively high congruence in females and males. The factors for which such a correspondence occurred were labeled for both females and males as Test Anxiety, Achievement, Defensiveness, Mathematical Self-evaluation, Desirability, and Acquiescence/Defensiveness.

Table 6.20

Coefficients of Congruence between Promax Rotated Factors for Females and Males

		Females								
		1	2	3	4	5	6	7	8	9
	1	-24	22	-03	74	06	35	02	60	09
	2	-12	91	09	32	12	06	25	10	27
	3	90	-12	-14	-25	-10	-13	02	-02	-29
Males	4	-05	09	89	-12	-06	18	27	02	-02
	5	-27	30	28	34	13	81	02	-04	-11
	6	-06	11	-05	02	87	05	-02	39	04
	7	23	07	-29	-10	-15	21	82	-06	35

Factor 4 in females and factor 1 in males have a coefficient of congruence of .74. Both factors are defined by intellective and verbal self-evaluation measures, but factor 1 in males also includes expectancies for performance on cognitive measures.

Factor 8 in females, defined by expectancies for performances on cognitive measures, has no corresponding factor in males. The coefficient of congruence of .60 between factor 8 in females and factor 1 in males is due to the involvement of performance expectancies in a factor which also included verbal and intelletive self-evaluation measures in males. The coefficient of congruence of .39 between factor 8 in females and factor 6 in males is due to the loading of expectancy for mathematics on the Mathematical Self-evaluation factor in males.

Factor 9 in females which was interpreted as an Acquiescence factor does not correspond with any factor in males. The coefficient of congruence of .35 between factor 9 in females and factor 7 in males indicates a minor degree of congruence between the Acquiescence factor for females and the Acquiescence/Defensiveness factor for males.

Cognitive measures

The following analyses were performed separately for females and males. The correlations of vocabulary, mathematics, and hidden figures cognitive measures with the 33 personality measures were placed in extension matrices (Mosier, 1939). The factor loadings of vocabulary, mathematics, and hidden figures in the principal factor structures were solved for, and then were brought into the promax rotated factor patterns of Tables 6.8 and 6.14 by postmultiplying their principal factor loadings by the transformation matrices that carried the principal factor structures into the promax rotated factor patterns.

The pattern coefficients of the cognitive measures in the promax rotated factor patterns are displayed in Tables 6.21 and 6.22 along with the labels of the factors. The matrices displayed in Tables 6.21 and 6.22 are transposed 3 x 9 matrices that could be appended to the bottom of the matrices of coefficients shown in Tables 6.8 and 6.14. The coefficients displayed in Tables 6.21 and 6.22 are interpretable as standardized regression coefficients.

Table 6.21

Pattern Coefficients of Cognitive Measures in the Promax Rotated Factor Pattern for Females

Factor	Vocabulary	Mathematics	Hidden Figures
1	-19	-22	00
2	10	-15	-13
3	-23	-11	-04
4	23	05	03
5	-01	29	18
6	06	00	09
7	-33	-06	-03
8	-03	00	04
9	20	02	-15

Factcr Iabels

1. Test anxiety
2. Achieverent
3. Defensiveness
4. Intellective self-evaluation
5. Mathematical self-evaluation
6. Desirability
7. Acquiescence/Defensiveness
8. Expectancies
9. Acquiescence

Table 6.22

Pattern Coefficients of Cognitive Measures in the Promax Rotated Factor Pattern for Males

Factor	Vocabulary	Mathematics	Hidden Figures
1	32	24	27
2	-05	-07	00
3	-12	-06	-30
4	-39	-23	-10
5	02	04	-08
6	14	37	10
7	-31	-06	-16

Factor Labels

1. Expectancies/Verbal-intellective self-evaluation
2. Achievement
3. Test anxiety
4. Defensiveness
5. Desirability
6. Mathematical self-evaluation
7. Acquiescence

With regard to response style factors for females, vocabulary is negatively related tc Defensiveness (-.23) and Acquiescence/Defensiveness (-.33), and positively associated (.20) with Acquiescence. With regard to content factors, vocabulary is positively associated (.23) with Intellective Self-evaluation. Mathematics is negatively related (-.22) to Test Anxiety and positively related (.29) to Mathematical self-evaluation.

With regard to response style factors for males, vocabulary and mathematics are negatively related (-.39 and -.23, respectively) to Defensiveness, and vocabulary is negatively related (-.31) to Acquiescence. With regard to content factors, vocabulary, mathematics, and hidden figures are positively associated (.32, .24, and .27, respectively) with Expectancies/verbal-intellective Self-evaluation. Hidden figures is negatively associated (-.30) with Test Anxiety. Mathematics is positively related (.37) to Mathematical Self-evaluation.

RESULTS: CONFIRMATORY FACTOR ANALYSIS

A selected subset of the measures employed in the exploratory factor analysis was used to clarify issues of structure. A confirmatory factor analysis was performed on selected measures of the response styles acceptance acquiescence, agreement acquiescence, and desirability, and measures of the contents achievement and test anxiety. For practical reasons, it was not possible to include all of the variables that had been used in the exploratory factor analysis. Two measures of acquiescence (Acquiescence 1 and Acquiescence 2) which loaded on Acquiescence factors in the exploratory factor analysis were included as measures of hypothesized factors of acceptance acquiescence and agreement acquiescence. Edwards' Social Desirability-agree and Social Desirability-disagree, which had high loadings on a Desirability factor in the exploratory factor analysis, were included as markers for desirability. The sets of five measures of the Achievement and Test Anxiety factors in the exploratory factor analysis were employed as measures of these hypothesized factors. The set of measures and their hypothesized loadings on factors are shown in Table 7.1. The factors are assumed to be uncorrelated.

Table 7.1

Hypothesized Response Style and Content Factors

	I	II	III	IV	V
ACQ1A	0	+	+	0	0
ACQ2A	0	+	+	0	0
SDA	+	.	+	0	0
SDD	+	-	-	0	0
ACHPA	+	+	+	+	0
ACHPD	+	-	-	+	0
ACHNA	+	-	+	+	0
ACHND	+	+	-	+	0
ACHIEVE	+	.	.	+	0
TAQ	-	+	.	0	+
TAS	-	.	+	0	+
ITANX	-	.	.	0	+
DEBANXA	-	+	+	0	+
FACANXA	+	+	+	0	-

Factors: I Desirability

II Acceptance Acquiescence

III Agreement Acquiescence

IV Achievement

V Test Anxiety

Loadings: + Positive

0 Zero

. No prediction

In view of findings from the exploratory factor analysis indicating a difference in the number of factors in females and males, the sample was split into subsamples of females (n = 231) and males (n = 106). A LISREL model for two groups from a population with the same variance-covariance strucure was tested. The chi-square with 105 degrees of freedom was 119.68, p = .155. Thus, the hypothesis of equal variance-covariance matrices in females and males can not be rejected. It may be noted that this result is not incongrucus with the findings reported in Chapter 6 cf a sex difference in the number of factors. Those findings were based on the entire set of 33 variables, while the present analysis was based on a subset of 14 variables. The sex difference in the number cf factors thus involved variables that were omitted frcm the present analysis.

The subsamples of females, males, and four individuals with unknown sex were combined intc a single sample (N = 341) for the following analyses. Tests for the number of factors were made with EFAP, and are presented in Table 7.2. A five factor solution has an acceptable fit, $\chi^2(31)$ = 26.56, p = .694, and is a significant improvement in fit cver a four factor solution, χ^2_{diff} = 48.66 - 26.56 = 22.10, df = 41 - 31 = 10, p = .014. A six factor solution is not a significant improvement over five factors, χ^2_{diff} = 26.56 - 15.14 = 11.42, df = 31 - 22 = 9, p = .248. Thus, five factors are indicated.

Table 7.2

Chi-square Tests for the Number of Factors

(N = 341)

	Goodness of fit			Improvement in fit		
Factors	Chi-square	df	p	Chi-square	df	p
3	150.86	52	.000			
4	48.66	41	.192	102.20	11	.000
5	26.56	31	.694	22.10	10	.014
6	15.14	22	.856	11.42	9	.248

Following the scheme for a general triangular solution (Joreskog & Sorbom, 1979, pp. 31-38), a five factor unrestricted, orthogonal solution was estimated with LISREL. Additional restrictions were imposed on the matrix of factor loadings by fixing at zero factor loadings which were less than twice their standard errors. The solution is displayed in Table 7.3. It has an acceptable fit, χ^2 (49) = 48.32, p = .50.

Factor 1 is interpreted as a Test Anxiety factor. The five measures hypothesized to define the factor all have statistically significant loadings. All other measures which were predicted to have zero loadings have fixed zero loadings except for an achievement measure (ACHND) which has a significant loading of .13.

Factor 2 is interpreted as a Desirability factor. All measures which were hypothesized to have positive factor loadings on desirability have significant positively signed factor loadings. Three of the measures predicted to have negatively signed loadings have significant loadings with negative signs, but one measure predicted to have a negative loading (TAQ) is fixed at zero. The two acquiescence measures were predicted to have loadings of zero. ACQ1A does have a fixed zero loading, but ACA2A has a significant loading of -.19.

Table 7.3

Restricted Orthogonal Maximum Likelihood Solution

(N = 341)

	1	2	3	4	5	h^2
ACQ1A	00*	00*	00*	48	00*	23
ACQ2A	00*	-19	00*	50	00*	30
SDA	00*	21	70	00*	00*	55
SDD	00*	52	49	-48	00*	77
ACHPA	00*	54	00*	34	41	59
ACHPD	00*	62	00*	-18	46	65
ACHNA	00*	44	00*	19	00*	24
ACHND	13	54	-12	00*	36	52
ACHIEVE	00*	74	14	00	47	82
TAQ	53	00*	-36	37	-39	72
TAS	72	-42	-12	37	00*	89
ITANX	46	-38	-11	32	-11	51
DEBANXA	59	-46	00*	38	00*	74
FACANXA	-51	35	00*	22	00*	45

χ^2 = 48.32 with 49 degrees of freedom

p = .50

Note. An asterisk indicates that the parameter was fixed at zero. Decimal points are omitted.

Edwards' Social Desirability-agree and Social Desirability-disagree load .70 and .49 on factor 3. Three test anxiety measures (TAQ, TAS, and ITANX) have significant loadings with negative signs, and an achievement measure (ACHIEVE) has a significant loading with a positive sign. The loadings of the social desirability, test anxiety, and achievement measures suggest that this factor might be interpreted as a second Desirability factor. The fixed zero loadings of the acquiescence measures (ACQ1A, ACQ2A) are also consistent with this interpretation. However, a problem for this interpretation is the significant loading of ACHND (-.12) which has a sign which is not positive as would be expected.

Factor 4 is interpreted as an Acquiescence factor. The two acquiescence measures (ACQ1A, ACQ2A) load .48 and .50, respectively. The signs of estimated factor loadings of those measures which had the same predicted signs of factor loadings for acceptance acquiescence and agreement acquiescence are all consistent with predictions. There are different predictions for the signs of factor loadings on acceptance acquiescence and agreement acquiescence for two measures, ACHNA and ACHND. ACHNA has a significant positively signed factor loading, which is consistent with the prediction for agreement acquiescence and inconsistent with the prediction for acceptance acquiescence. ACHND has a fixed zero loading, so it can not be used to help make this distinction.

Factor 5 is interpreted as a content factor of Achievement combined subsidiarily with the content Test Anxiety. All measures of achievement have significant loadings except for ACHNA. Consistent with predictions for an Achievement factor, all response style measures and three of the test anxiety measures have fixed zero loadings. However, two test anxiety measures (TAQ, ITANX) have significant loadings with negative signs. It may be noted that Mehrabian and Bank's (1978) Achieving Tendency scale (ACHIEVE) has the highest loading (.47) of any scale on factor 5. As noted in Chapter 2, the achieving tendency scales (Mehrabian, 1968, 1969; Mehrabian & Bank, 1978) measure a combination of motive to approach success, weighted positively, and motive to avoid failure, weighted negatively. Thus, the apparent negative association of achievement and test anxiety implied by the negative loadings of test anxiety measures on factor 5 may occur because the Achieving Tendency scale is a weighted measure of both achievement and test anxiety.

SUMMARY AND CONCLUSIONS

Theoretical Contributions

Response Styles

This research shows that response styles are factors in the measurement of achievement-related dispositions and intellective self-evaluation. In an exploratory factor analysis of a combined sample of 341 females and males, first-order factors of Desirability, Defensiveness, an Acquiescence factor, and a factor blending Acquiescence and Defensiveness were found. In a confirmatory factor analysis, two Desirability factors and an Acquiescence factor were found. In separate exploratory factor analyses for female (n = 231) and male (n = 106) subsamples the first-order Desirability, Defensiveness and Acquiescence/Defensiveness factors found in the exploratory factor analysis of the total sample were found in both sexes, and a second-order Desirability factor was also found for both sexes. The first-order Acquiescence factor found in the total sample, and a second-order Agreement Acquiescence factor were found for females, but were not found for males.

Achievement-related Dispositions

In exploratory factor analyses, distinct first-order factors of Achievement and Test Anxiety were found in the total sample, as well as in female and male subsamples. In a confirmatory factor analysis, an Achievement factor and a Test Anxiety factor were also found. In the exploratory factor analysis of the total sample, second-order factors were found which showed an association of Achievement with high Intellective Self-evaluation, and an association of Test Anxiety with low Intellective Self-evaluation. In females, a second-order factor asscciated Achievement Tendency with high Intellective Self-evaluation, Mathematical Self-evaluation, and performance expectancies for mathematics and hidden figures tests.

Intellective Self-evaluation

A Mathematical Self-evaluation factor was found for the total sample and for both sexes. A Performance Expectancies factor and a factor blending Verbal and Intellective Self-evaluations was found for the total sample and for females. For males, a factor associating verbal and intellective self-evaluations also involved performance expectancies. Thus, self-reports concerning verbal and intellective abilities were associated with expectations for performances on ability tests only in males.

Sex Differences in Factor Structure

A sex difference in the number of first-order factors was found by both parallel analysis and chi-square methods of testing the number of factors, with both methods indicating more factors for females than males. A sex difference in the number of second-order factors was also found by both parallel analysis and chi-square methods, with both methods indicating more factors in females than males. In females, there were three second-order factors which were interpreted as Desirability; Agreement Acquiescence; and a content factor involving achievement, intellective and mathematical self-evaluation, and performance expectancies for mathematics and hidden figures. In males, one second-order factor was interpreted as Desirability.

Sex Differences In Means

There were significant sex differences in means on mathematics and hidden figures cognitive measures, males obtaining the higher means. On self-report content measures males had significantly lower means on three test anxiety measures, and higher means on three intellective self-evaluation measures and performance expectancies. There was a significant difference on an agree-keyed desirability measure (SDA). There were significant differences on two agree-keyed defensiveness measures, males having a higher mean on MPA and females having a higher mean on CMSDA.

The mean difference on a desirability measure suggests that some of the mean differences on content variables involved a confound with a sex difference in desirable responding. This possible confound can be separated factor analytically. As shown in Table 5.6, males had higher factor scores on a desirability factor and on one of two acquiescence factors. Males had higher mathematical self-evaluation and performance expectancies, and lower achievement tendency and test anxiety. These differences do not involve a confound with desirability, since the desirability factor was separately extracted. The sex difference in self-report intellective self-evaluation measures is not found when desirability is controlled factor analytically. A sex difference in achievement is found factor analytically, but was only reflected in a marginally significant mean difference on one measure.

Implications for Research

Response Styles

To my knowledge, this is the first study in which measures of desirability and acquiescence response styles are factor analyzed along with measures of achievement-related dispositions and intellective self-evaluation. Content measures selected for inclusion in the analysis were chosen because they are theoretically based measures with some evidence of construct validity. Thus, the

demonstration that response styles operate in this domain is an important extension of previous research on response styles.

Although Agreement Acquiescence was found as a second-order factor in females, Acceptance Acquiescence was not found as a clearly identifiable factor in either sex. In females, the first-order Acquiescence factor and the first-order factor blending Acquiescence and Defensiveness both involved either acceptance acquiescence or agreement acquiescence. In males, the first-order factor blending Acquiescence and Defensiveness also involved either acceptance acquiescence or agreement acquiescence. This problem of identification may have occurred partially because there were only four measures for which the predicted signs of the factor loadings were different for acceptance acquiescence and agreement acquiescence. Measures having high loadings on the acquiescence factors tended to be response style measures on which items' content is heterogeneous. The intellective self-evaluation and achievement measures which were intended to identify the two acquiescence factors had low loadings on the acquiescence factors. In a confirmatory factor analysis one acquiescence factor was found. However, the design only included two measures that could differentiate two acquiescence factors, so this can not be regarded as evidence against the existence of two acquiescence factors. In future research

on response styles and the types of contents studied here it would be advisable to include numerous markers for acceptance acquiescence and agreement acquiescence all of which are composed of items which are heterogeneous in content.

Content

Measures of content will be considered in terms of the degree to which they are univocal measures of the intended content, and the degree to which they are affected by response styles. Table 5.5 will be used as a summary of findings for the total sample.

Recommendations given here apply to correlational research. In such research correlations among content measures might be affected by response styles, and this can only be detected factor analytically if measures of response styles are included in a study. The recommendations also apply to research in which measures of content serve as independent variables in a regression analysis or analysis of variance in nonexperimental studies, or covariates in analysis of covariance. In such research omission of response style variables which are correlated with the dependent variable or the included content variables entails possible specification errors (Pedhazur, 1982). Preferably, multiple measures of contents and response styles would be used as indicators of latent variables in a structural equation model.

Subscales derived from the Personality Research Form Achievement scale and the Achieving Tendency measure of Mehrabian and Bank (1978) loaded on the same factor, thus providing evidence of their convergent validity as measures of achievement orientation. However, Achieving Tendency had an almost equally high loading on a Desirability factor as on the Achievement factor. Thus, it is suggested that in future research with this measure it be employed in conjunction with a desirability measure.

All of the test anxiety measures analyzed loaded highly on a factor defined only by test anxiety scales, thus providing evidence of their validity as measures of a common content. The Test Anxiety Scale (Sarason, 1978) and Debilitating Anxiety (Alpert & Haber, 1960) had the two highest loadings on this factor. All of the test anxiety measures had loadings between .35 and .45 on a Desirabilty factor, except for Alpert and Haber's (1960) Facilitating Anxiety scale which had a lower loading. However, Facilitating Anxiety also had a lower loading than the other measures on the Test Anxiety factor. All of them except for Inventory of Test Anxiety loaded above .30 on the Acquiescence or Acquiescence/Defensiveness factors. Thus, while there are minor differences among these scales in the degree to which they are affected by response styles, the more important difference among them is the degree to which they load on the Test Anxiety content factor (except for

Facilitating Anxiety). As measures of the Test Anxiety factor either the Test Anxiety Scale or Debilitating Anxiety are the best. It is advised that desirability and acquiescence measures be employed along with them.

Three measures defining a Mathematical Self-evaluation factor showed little influcence of response styles. Performance expectancy scores were also unaffected by response styles. These performance expectancies involved both factors pertaining to intellectual area--Mathematical Self-evaluation and Verbal/intellective Self-evaluation--and a factor of Performance Expectancies which cut across cognitive performances.

Sex Differences

The finding of a sex differences in factor structure indicates that it would be useful to separately analyze and compare results for females and males in future research on response styles and content. If this dissertation had not gone on from an analysis of the total sample to an analysis of females and males separately the factor analytic results would have been equivocal with regard to the factor structure of the sexes. The finding that two of the nine first-order factors in females did not correspond with any factors in males, taken together with the correspondence between the factors in females and the factors in the total sample, explains the fact that there were the same number of

factors in females and in the total sample. Two of the nine factors for the total sample involved variance due to factors which emerged in the female subsample only.

Appendix A

The following questionnaire contains the first part of Sarason and Mandler's (1952) Test Anxiety Questionnaire (questions 1-13) and an adaptation of Osterhouse's (1976) Inventory of Test Anxiety by Charles P. Smith (questions 14-21).

QUESTIONNAIRE ON ATTITUDES TOWARD TESTING SITUATIONS

The questions below deal with intelligence or aptitude tests (such as the SAT) that are administered to a group of persons at the same time. The questions ask how you feel about taking such group intelligence or apptitude tests.

Please try to remember how you usually reacted toward such tests and how you felt while taking them. The value of this questionnaire will in large part depend on how frank you are in stating your attitudes and feelings.

For each question there is a five-point scale. At the ends of each scale are statements of opposing feelings or attitudes; in the middle is the word "mid-point" or a phrase intended to reflect a feeling or attitude midway between the two extremes.

Please circle whatever number along the scale best indicates the strength of your feeling or attitude.

---

1. How valuable do you think group intelligence tests are in determining a person's ability?

1 2 3 4 5
very valuable valuable in some respects valueless

2. If you know that you are going to take a group intelligence test, how do you feel beforehand?

1	2	3	4	5
very unconfident		(midpoint)		very confident

3. After you have taken a group intelligence test, how confident do you feel that you have done your best?

1	2	3	4	5
very unconfident		(midpoint)		very confident

4. When you are taking a group intelligence test, to what extent do your emotional feelings interfere with or lower your performance?

1	2	3	4	5
do not interfere at all		(midpoint)		interfere a great deal

5. Before taking a group intelligence test, to what extent are you aware of an "uneasy feeling"?

1	2	3	4	5
am very much aware of it		(midpoint)		am not aware of it at all

6. While taking a group intelligence test to what extent do you experience an accelerated heartbeat?

1	2	3	4	5
heartbeat does not accelerate at all		(midpoint)		heartbeat noticeably accelerated

7. Before taking a group intelligence test to what extent do you experience an accelerated heartbeat?

1	2	3	4	5
heartbeat does not accelerate at all		(midpoint)		heartbeat noticeably accelerated

8. While taking a group intelligence test tc what extent do you worry?

1	2	3	4	5
worry a lot		(midpoint)		worry not at all

9. Before taking a group intelligence test to what extent do you worry?

1	2	3	4	5
worry a lot		(midpoint)		worry not at all

10. While taking a group intelligence test to what extent do you perspire?

1	2	3	4	5
perspire not at all		(midpoint)		perspire a lot

11. Before taking a group intelligence test to what extent do you perspire?

1	2	3	4	5
perspire not at all		(midpoint)		perspire a lot

12. In comparison with other students how often do you think of ways of avoiding a group intelligence test?

1	2	3	4	5
less often than other students		(midpoint)		more often than other students

13. To what extent do you feel that your performance on the SAT (or a similar test) was affected by your emotional feelings at the time?

1	2	3	4	5
affected a great deal		(midpoint)		not affected at all

The next questions deal with course examinations. Please try to remember how you usually react tc examinations and how you feel while taking them.

14. I feel that I will not be able to finish on time.

1	2	3	4	5
not at all		(midpoint)		very strongly

15. I feel that I may not be as well prepared as I could be.

1	2	3	4	5
not at all		(midpoint)		very strongly

16. I feel that I let myself and cther persons down by my performance.

1	2	3	4	5
not at all		(midpoint)		very strongly

17. I worry abcut getting a low grade.

1	2	3	4	5
not at all		(midpoint)		a great deal

18. I think about the consequences of failing.

1	2	3	4	5
not at all		(midpoint)		a great deal

19. I feel that I could have done better than I actually did.

1	2	3	4	5
not at all		(midpoint)		very strongly

20. I find myself thinking of how much brighter the other students are than I am.

1	2	3	4	5
not at all		(midpoint)		a great deal

21. I do not feel very confident about my performance.

1	2	3	4	5
feel very confident		(midpoint)		feel very unconfident

Intellective Self-evaluation Items

Positive, Agree

I easily remember unimportant details.

I understand most of the ideas in the textbooks I read, but there are some ideas I misunderstand.

Even when I am tired I think clearly.

I will probably always be adequate at intellectual work.

Possibly someday I may reach the high intellectual level my college professors have attained.

I am able to comprehend difficult ideas when I exert alot of mental effort.

Positive, Disagree

I easily fcrget unimportant details.

Even in my best subject my schoolwcrk is only about average.

In writing papers the ideas I think of are pretty much like everyone else's.

I have to drill myself on material I am learning in order to remember it later.

I often forget important concepts, but I usually remember insignificant details.

I will never reach the high intellectual level that my college professors have attained.

Negative, Agree

I do not have any intellectual shortcomings that prevent me from becoming a doctor, scientist, or lawyer.

I don't get confused by most of the ideas in the textbooks I read, but there are some ideas I don't get.

In writing papers the ideas I think of are not "run of the mill."

I don't have to take frequent breaks when I am studying for a long time.

I usually don't forget important concepts, but I often don't remember insignificant details.

I am not incapable of comprehending difficult ideas when I exert alot of mental effort.

Negative, Disagree

I probably do not have the intellectual potential to be a doctor, scientist, or lawyer.

Even in my best subject my schoolwork is not outstanding.

When I am tired I do not think clearly.

If I do not drill myself on material I am learning I do not remember it later.

I will probably never do anything better than passable intellectual work at best.

I can't study for a long time without taking frequent breaks.

The Mathematical Self-evaluation and Verbal Self-evaluation subscales keyed agree in Table 4.1 are formed by combining the 3 items labeled "Positive, Agree" and the 3 items labeled "Negative, Agree" in each of the Mathematical and Verbal item sets below. The subscales keyed disagree are formed by combining the 3 items labeled "Positive, Disagree" and the 3 items labeled "Negative, Disagree."

Self-evaluation of Mathematical Ability Items

Positive, Agree

I am able to understand difficult numerical concepts when I exert alot of mental effort.

I have a head for figures.

My quantitative aptitude is satisfactory.

Positive, Disagree

I get confused by formulas and equations.

I have difficulty understanding numerical concepts which are abstract and complicated.

I am incapable of doing better than passable work in courses requiring mathematical ability.

Negative, Agree

I do not have any intellectual shortcomings that prevent me from becoming a physicist, engineer, or accountant.

I don't get confused by formulas and equations.

My quantitative aptitude is not inadequate.

Negative, Disagree

I probably do not have the intellectual potential to be a physicist, engineer, or accountant.

I am not able to do better than passable work in courses requiring mathematical ability.

I don't have much of a head for figures.

Self-evaluation of Verbal Ability Items

Positive, Agree

I usually express myself clearly in writing.

I will probably always be adequate at work requiring verbal ability.

My vocabulary is satisfactory.

Positive, Disagree

I have difficulty expressing myself clearly in writing.

I can only read a book for a short time before I need to take a break.

I have a vague understanding of many of the words in the books I read.

Negative, Agree

I do not have any intellectual shortcomings that prevent me from becoming a journalist, writer, or English teacher.

I don't misunderstand most of the words in the books I read.

My vocabulary is not inadequate.

Negative, Disagree

I can't read a book for a long time without taking a break.

I do not have the intellectual potential to become a journalist, writer, or English teacher.

I will probably never be good at work requiring verbal ability.

Achievement Items based on the PRF Achievement Scale

Positive, Agree

I enjoy doing things which challenge me. (a)

I will keep working on a problem after others have given up. (a)

It really matters to me whether I become one of the best in my field.

I often set goals that are very difficult to reach. (a)

I am a hard worker. (b)

I have often done extra studying in connection with my work.

Positive, Disagree

I would rather do an easy job than one involving obstacles which must be overcome. (a)

I really dislike hard work.

It is unrealistic for me to insist on becoming the best in my field of work all of the time. (a)

I seldom set goals that are very difficult to reach.

I have very little drive.

I try to work just hard enough to get by. (a)

Negative, Agree

I don't mind working while others are having fun. (a)

I will not quit working on a problem after others have given up.

It is unrealistic for me to insist on becoming the best in my field of work all of the time.

I don't enjoy play more than work. (b)

I am not a lazy worker.

I don't work just hard enough to get by.

Negative, Disagree

I don't mind having fun while others are working.

I really don't enjoy hard work. (a)

It doesn't really matter to me whether I become one of the best in my field (a)

I don't enjoy work more than play.

I don't have a great deal of drive. (b)

I have rarely done extra studying in connection with my work. (a)

Note. (a) means the item is unchanged from a PRF Achievement scale item. (b) means the item is modified from a PRF Achievement scale item by insertion or deletion of a not or don't.

The following scale's items are rewordings for college students of the items of the Self-Concept of Ability - General scale (Brookover et al., 1965). The first eight items correspond to items on that scale. Greater or lesser changes were made on all these items except item seven. Item nine does not directly correspond to any original item. Research on the Self-Concept of Ability - General scale is summarized by Shavelson et al. (1976).

SELF-CONCEPT OF ABILITY - GENERAL FOR COLLEGE STUDENTS

Circle the letter in front of the statement which best answers each question.

1. How do you rate yourself in academic ability compared with your close friends?

    a. I am the best
    b. I am above average
    c. I am average
    d. I am below average
    e. I am the poorest

2. How do you rate yourself in academic ability compared with those in your classes at college?

    a. I am the best
    b. I am above average
    c. I am average
    d. I am below average
    e. I am among the poorest

3. Where do you think you would rank compared to all those at your level at college? (If you are a freshman compare yourself to all freshmen. If you are a sophomore compare yourself to all sophomores . . . and so on.)

    a. among the best
    b. above average
    c. average
    d. below average
    e. among the poorest

4. Do you think you have the ability to complete a master's degree program?

   a. yes, definitely
   b. yes, probably
   c. not sure either way
   d. probably not
   e. no

5. Where do you think you would rank compared to other students in a master's degree program?

   a. among the best
   b. above average
   c. average
   d. below average
   e. among the poorest

6. In order to enter some occupations (for example, doctor, lawyer, or university professor) work which is more advanced than the master's degree is necessary. How likely do you think it is that you could complete such advanced work?

   a. very likely
   b. somewhat likely
   c. not sure either way
   d. unlikely
   e. most unlikely

7. Forget for a moment how others grade your work. In your own opinion how good do you think your work is?

   a. my work is excellent
   b. my work is good
   c. my work is average
   d. my work is below average
   e. my work is much below average

8. What kind of grades do you think you are capable of getting?

   a. mostly A's
   b. mostly B's
   c. mostly C's
   d. mostly D's
   e. mostly F's

9. Do you think you have the ability to complete college?

a. yes, definitely
b. yes, probably
c. not sure either way
d. probably not
e. no

On the following pages will be a vocabulary test. Look at the examples below. In each example one of the five numbered words has the same meaning or nearly the same meaning as the word above the numbered words. The correct answers are circled.

contamination	duplicity
1-contradiction	1-extent
2-contempt	2-double-dealing
3-warning	3-agreement
4-pollution	4-cleverness
5-continuation	5-overlapping

The problems on the test will be the same kind of problems as the examples. They will be just as hard. There will be 16 problems on the test.

How many of the problems on the test do you think you will know the answer to? (circle one number):

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Suppose that the test you are about to take were given to all students at your level (e.g., all freshmen, all sophomores, etc). Do you think you would score (circle one number):

9 - better than 90% of the group
8 - better than 80% of the group
7 - better than 70% of the group
6 - better than 60% of the group
5 - better than 50% of the group
4 - better than 40% of the group
3 - better than 30% of the group
2 - better than 20% of the group
1 - better than 10% of the group
0 - in the lowest tenth of the group

How would you rate yourself on the ability tested by the test you are about to take? (circle one number):

1-poor 2-fair 3-good 4-very good 5-excellent

On the following pages will be a mathematics test. Look at the two examples below. The correct answers are circled.

If a nut on a bolt is advanced 3/4 inch when it is turned 6 times, how many inches will 28 turns advance it?

a - 2
b - 3
c - 3-1/2
d - 4-1/2
e - 4-2/3

A certain public library has 2 children's books to every 8 books for adults. If they want to keep the same ratio, how many children's books should be ordered when 1,000 books for adults are ordered?

a - 150
b - 200
c - 250
d - 300
e - 350

The problems on the test will be the same kind of problems as the examples. They will be just as hard. There will be 16 problems on the test.

How many of the problems on the test do you think you will know the answer to? (circle one number):

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Suppose that the test you are about to take were given to all students at your level (e.g., all freshmen, all sophomores, etc). Do you think you would score (circle one number):

9 - better than 90% of the group
8 - better than 80% of the group
7 - better than 70% of the group
6 - better than 60% of the group
5 - better than 50% of the group
4 - better than 40% of the group
3 - better than 30% of the group
2 - better than 20% of the group
1 - better than 10% of the group
0 - in the lowest tenth of the group

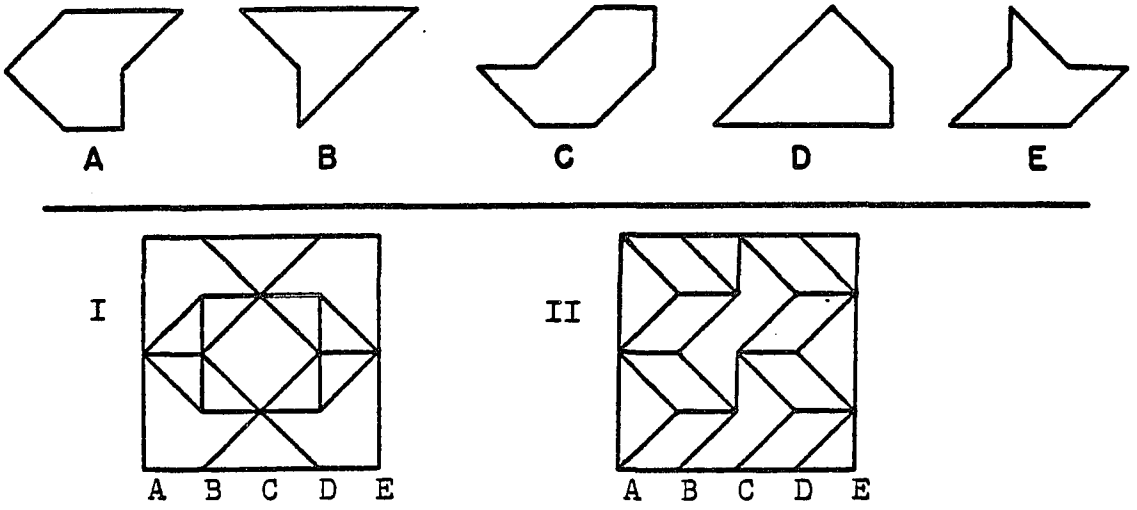
How would you rate yourself on the ability tested by the test you are about to take? (circle one number):

1-poor 2-fair 3-good 4-very good 5-excellent

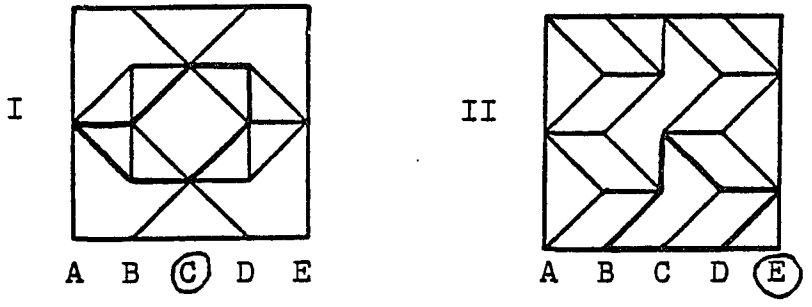
Next will be a hidden figures test. This is a test of your ability to tell which one of five simple figures can be found in a more complex pattern. At the top of each page are five simple figures lettered A, B, C, D, and E. Beneath each row of figures is a page of patterns. Each pattern has a row of letters beneath it. Indicate your answer by circling the letter of the figure which you find in the pattern.

NOTE: There is only one of these figures in each pattern, and this figure will always be right side up and exactly the same size as one of the five lettered figures.

Look at these 2 examples.



The figures below show how the figures are included in the problems. Figure C is in the first problem and figure E in the second.



The problems on the test will be the same kind of problems as the examples. They will be just as hard. There will be 16 problems on the test.

(2/1-4)

How many of the problems on the test do you think you will know the answer to? (circle one number):

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 (5-6)

Suppose that the test you are about to take were given to all students at your level (e.g., all freshmen, all sophomores, etc). Do you think you would score (circle one number):

9 - better than 90% of the group
8 - better than 80% of the group
7 - better than 70% of the group
6 - better than 60% of the group
5 - better than 50% of the group (7)
4 - better than 40% of the group
3 - better than 30% of the group
2 - better than 20% of the group
1 - better than 10% of the group
0 - in the lowest tenth of the group

How would you rate yourself on the ability tested by the test you are about to take? (circle one number):

1-poor 2-fair 3-good 4-very good 5-excellent (8)

Appendix B

Table A
Percentages of Items Positively Phrased

	% Positive
Acquiescence 1	92
Acquiescence 2	75
Edwards' Social Desirability (A)	55
Edwards' Social Desirability (D)	86
PRF Desirability (A)	80
PRF Desirability (D)	90
Crowne-Marlowe Social Desirability (A)	47
Crowne-Marlowe Social Desirability (D)	100
Positive Malingering (A)	100
Positive Malingering (D)	87
MMPI Lie	73
Achievement P,A	100
Achievement P,D	100
Achievement N,A	00
Achievement N,D	00
Achieving Tendency (A)	95
Achieving Tendency (D)	66
Test Anxiety Questionnaire	75
Test Anxiety Scale (A)	93
Test Anxiety Scale (D)	17
Inventory of Test Anxiety	--
Debilitating Anxiety	100
Facilitating Anxiety	100
Intellective Self-evaluation PA	100
Intellective Self-evaluation PD	100
Intellective Self-evaluation NA	00
Intellective Self-evaluation ND	00
Self-concept of Ability	--
Verbal Self-evaluation A	50
Verbal Self-evaluation D	50
Performance Expectancies, Vocabulary	--
Mathematical Self-evaluation A	50
Mathematical Self-evaluation D	50
Performance Expectancies, Mathematics	--
Performance Expectancies, Hidden Figures	--

Table A--continued

Note. The number of positively phrased items in each scale with an agree-disagree response format were counted. An item was considered positively phrased if it did not include the words not, don't, do not, never, or seldom. The percentages displayed were obtained by dividing the number of positively phrased items in a scale by the total number of items in the scale.

The Test Anxiety Questionnaire employs a rating-scale response format with opposite self-descriptive phrases at the ends. Nine of the 12 items include the word not in the phrase indicating low test anxiety. Thus, a person responding in terms of acceptance acquiescence would give the keyed (high test anxiety) response to these nine items. The Test Anxiety Scale and Achieving Tendency Scale are each included in the factor analysis as a single total scale combining items keyed agree and disagree. The subsets of items of these scales keyed agree and disagree are listed here separately.

Table B

Nine factor varimax rotated factor structure
(N=341)

	1	2	3	4	5	6	7	8	9	h^2
1. ACQ1A	14	08	-24	-05	-06	-02	35	-09	16	24
2. ACQ2A	19	-14	-24	00	-06	-10	45	-07	06	33
3. SDA	-10	01	05	16	03	60	13	07	04	42
4. SDD	-28	28	36	19	02	63	-25	00	-04	77
5. PRFDYA	-14	13	-08	25	17	50	29	07	03	47
6. PRFDYD	-24	31	27	22	07	53	-32	04	05	66
7. CMSDA	18	08	41	-03	07	14	49	-10	09	48
8. CMSDD	-08	17	76	-05	05	16	-07	00	11	65
9. MPA	-02	18	06	-05	00	08	60	13	-04	42
10. MPD	-20	03	76	-02	00	10	-06	05	-13	65
11. LIED	-11	07	78	-03	-07	-08	-01	01	-01	63
12. ACHPA	-04	63	-08	13	05	08	35	04	14	57
13. ACHPD	-16	74	17	20	07	08	-08	02	-09	67
14. ACHNA	-08	32	-02	08	15	11	10	02	32	26
15. ACHND	-03	69	15	04	01	-01	02	09	09	51
16. ACHIEVE	-27	75	04	21	13	25	13	10	00	78
17. TAQ	59	-03	-07	-11	-03	-23	07	-17	26	52
18. TAS	84	-09	-17	-14	-11	-17	12	-08	-08	82
19. ITANX	63	-19	-18	-22	-05	-12	07	-05	06	54
20. DEBANXA	74	-14	-15	-19	-14	-10	23	-02	-18	73
21. FACANXA	-48	12	-04	16	01	-02	26	08	31	44
22. INTELPA	-05	08	-18	41	17	12	26	04	-02	32
23. INTELPD	-28	30	14	47	10	04	-18	18	-01	48
24. INTELNA	-10	12	02	41	17	09	11	08	25	31
25. INTELND	-30	37	20	50	13	02	-14	26	00	62
26. SELFABIL	-38	31	-04	46	23	03	02	31	00	59
27. VERBALA	-19	01	-15	60	-06	27	-03	05	01	50
28. VERBALD	-15	22	05	62	-13	27	-21	04	-02	59
29. EXPVOCAB	-20	11	-10	32	01	08	-06	60	-05	54
30. MATHA	-09	05	-06	14	82	14	06	08	06	73
31. MATHD	-12	14	05	01	81	-01	-10	15	01	72
32. EXPMATH	-07	07	04	-01	53	01	02	65	08	72
33. EXPHFT	-04	06	07	07	08	05	04	67	01	46

Table C

Nine factor promax rotated factor pattern
(N = 341)

	1	2	3	4	5	6	7	8	9	h^2
1. ACQ1A	08	13	-20	-04	-07	01	30	-06	16	35
2. ACQ2A	09	-10	-12	06	-03	-05	40	-05	05	33
3. SDA	-02	-09	01	08	-01	63	14	07	03	43
4. SDD	-13	17	24	05	-02	59	-20	-03	-05	78
5. PRFDYA	-07	03	-09	17	13	49	31	03	02	47
6. PRFDYD	-07	22	15	09	02	49	-29	01	05	66
7. CMSDA	19	03	49	04	07	14	51	-09	08	49
8. CMSDD	01	08	74	-05	02	12	-02	00	10	65
9. MPA	-06	17	10	-07	-05	07	63	11	-05	42
10. MPD	-15	-08	76	-01	-01	04	03	03	-14	65
11. LIED	-07	-01	81	03	-08	-14	07	00	-01	61
12. ACHPA	00	66	-11	05	-02	03	33	-01	15	57
13. ACHPD	-03	76	07	08	03	-03	-04	-07	-08	69
14. ACHNA	-04	31	-06	02	09	10	05	01	33	28
15. ACHND	06	74	08	-05	-06	-07	00	06	11	51
16. ACHIEVE	-16	74	-07	04	05	15	15	01	01	76
17. TAQ	60	06	01	03	02	-16	-03	-08	27	43
18. TAS	87	03	-07	01	-02	-08	05	01	-08	81
19. ITANX	62	-10	-11	-10	00	-02	-01	05	06	62
20. DEBANXA	74	-04	-06	-06	-07	-02	19	06	-18	72
21. FACANXA	-54	06	-03	09	-08	-06	26	04	32	44
22. INTELPA	00	01	-13	42	17	08	28	-03	-01	41
23. INTELPD	-15	21	11	43	06	-05	-14	09	01	65
24. INTELNA	-02	03	06	43	14	05	09	04	27	42
25. INTELND	-16	27	18	45	08	-09	-10	16	02	68
26. SELFABIL	-28	21	-06	38	17	-07	05	19	01	73
27. VERBALA	-10	-11	-13	59	-08	24	00	00	03	58
28. VERBALD	01	13	03	59	-15	21	-17	-01	01	74
29. EXPVOCAB	-10	03	-11	25	-07	05	-05	58	-04	55
30. MATHA	00	-05	-06	10	84	10	04	-05	03	74
31. MATHD	-04	07	02	-04	82	-07	-12	03	-03	79
32. EXPMATH	02	00	03	-08	46	01	-01	62	06	72
33. EXPHFT	04	00	07	02	00	06	03	68	01	47

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