ABSTRACT

A PILOT FACTOR ANALYTIC STUDY OF ACADEMIC MOTIVATION AND ACHIEVEMENT LEVELS IN ELEVENTH GRADE MALE STUDENTS

by Virgil B. Sterling

The basic problem of the study was concerned with academic motivation. An objective measure of motivation was developed for the Farquhar research project[1] based on a three dimensional bi-polar extension and modification of McClelland's[2] theory of motivation. The measure (Generalized Situational Choice Inventory) was administered to and tested on eleventh grade students. The relationship between each of the 200 items and academic achievement (Grade Point Averages) was studied through the major hypothesis that high achieving students would reveal high motivation and low achieving students would reveal low motivation. The motivation of students was defined and examined as independent of academic aptitude (Differential Aptitude Test - Verbal Reasoning).

Each item was examined as a unit measure of motivation or as predictive of GPA independent of DAT-VR on 192 male students who varied on GPA but who were equal on DAT-VR. Forty-five of the original 200 items were accepted through the validation procedure and cross-validated on 100 male students who varied on GPA with DAT-VR disregarded. Twenty-eight items were accepted through the cross-validation procedure and added together to form an inventory.

The inventory was examined on 180 male students from one school with GPA and DAT-VR through correlation methods.

The motivation inventory was a predictor of achievement independent of DAT-VR in a normal group of male eleventh grade students with a GSCI intercorrelation with GPA of .39. An estimate of inventory internal

consistency indicated acceptable reliability (.76).

The 28 valid and reliable items were intercorrelated and the 378 product moment item coefficients of intercorrelations were factor analyzed by the principle axis method and rotated by the varimax method. The interpretation was made that the inventory was functioning on the basis of eight dimensions named as follows:

1. Long term academic involvement versus short term academic involvement.
2. Chance-taking versus no chance-taking.
3. Active experiencing versus passive experiencing.
4. Long term work challenge versus short term work challenge.
5. Abiding rewards interests versus terminal rewards interests.
6. Long term mental activity versus short term mental activity.
7. Maximum confidence versus minimum confidence.
8. Individuality versus anonymity.

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1. Farquhar, William W. and associates, A Comprehensive Study of Motivational Factors Underlying Achievement of Eleventh Grade High School Students (Research Project No. 846 (8458); Supported by the U.S. Office of Education, in cooperation with Michigan State University, 1959).

2. McClelland, David and J. Atkinson et. al. The Achievement Motive Appleton-Century-Crofts, N. Y. New York. 1953.

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CHAPTER I

SETTING OF THE PROBLEM

Need for the Study

Writing in 1944, Wechsler argued for the development of more aggregate or global measures of behavior.[1] In the discussion, he contrasted "intellective" to "non-intellective" factors and concluded: "What are needed are not tests from which the non-intellective factors have been eliminated (even if that were possible), but, on the contrary, tests in which these factors are clearly present and objectively appraisable."[2] Wechsler tried to keep motivation out of measures of intelligence but not out of psychology. He expressed the need for measures of motivation as "non-intellective" factors.

Later, (1953) Wechsler's "non-intellective" factors were discussed in a limited context by McClelland[3] as he attempted to develop a measure of motivation via fantasy. McClelland's research led to a measure of need for achievement based on a projective technique and a theory. The measure was developed in relation to experimentally varied "arousal conditions," indicating McClelland was interested in motivation as it changes over short periods of time.

By extending the McClelland theory, Farquhar and associates[4] were

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1. Wechsler, David. The Measurement of Adult Intelligence, Baltimore, 1944.

2. Ibid, p - 11.

3. McClelland, David and J. Atkinson et. al. The Achievement Motive, Appleton-Century-Crofts, N.Y., New York, 1953.

4. William W. Farquhar, A Comprehensive Study of the Motivational Factors Underlying the Achievement of Eleventh Grade High School Students, Research Project No. 846 (8458); Supported by the U.S. Office of Education, in cooperation with Michigan State University, 1959.

able to develop an objective measure of motivation as an academic predictor variable which pointed to motivation which endured over an academic year. Thus, Farquhar added Wechsler's admonitions to McClelland's theoretical conceptions to fill the need for an objective measure of academic motivation with a theoretical base. This measure should enhance the understanding of the motivation of students in the educational process and, most particularly, be an interpretive aid to the teacher and counselor.

The measure of Farquhar and associates was validated on over- and underachievers; the students who had not achieved as predicted from aptitude scores. Motivation was invoked to account for the discrepancy between predicted and obtained achievement. Students were used with the greatest aptitude-achievement discrepancies (over and underachievers) but this did not eliminate the aptitude with achievement correlation. The correlation between the aptitude scores and the achievement criterion of either or both over- and underachievers may still be significant and thus contaminate the motivation measure.

Purpose of the Study

The purpose of this study was to develop a valid measure of motivation which was capable of predicting academic achievement over a period of a year or more. In other studies within the Farquhar project, motivation was invoked to account for the discrepancies between the grades predicted from aptitude and the achieved grades. Students with little or no discrepancies between the predicted and achieved grades were eliminated in developing the motivation measure. Students with the largest discrepancies between the aptitude predictor and achievement, over- and underachievers, were used as they had contributed most to the

error variance of the aptitude predictor. It is not clear whether the motivation instrument, as developed, measured motivation independent of or in combination with aptitude.

The methodology for this study was selected with the purpose of testing the significance of motivation items as predictors of achievement, and at the same time insure the independence of motivation and aptitude. Both the concept of motivation and the instrument to measure it are to be independent of rather than be intercorrelated with aptitude.

The achievement criteria of grades has the purpose of demanding a more enduring motivation than that captured by McClelland's "arousal conditions". To have achieved highly, a student's grades must have been high for more than a year. The factors basic to the enduring, aptitude-free motivation were sought.

The data from the Farquhar research project will be examined in search of items which identify the aptitude-free motivation. The search will be continued to find the identity and structure of the factors within the motivation.

Specific Problems

The first problem of this investigation was to establish the validity of objective items from 200 items developed for the larger Farquhar project in relation to academic achievement with the contribution of academic aptitude partialled out. A second problem was to appraise the concurrent validity and reliability of the valid items when combined into an inventory. The concluding problem was to interpret the inventory. To accomplish the latter, the item responses were factor analyzed and rotated to ascertain (1) the functional item groupings or sub-scales of the total inventory, (2) the relatively independent factors

contributing to the groupings, and (3) the relationship of the independent factors to the hypothesized dimensions of the theory.

Hypothesis

The basic assumption was made that if aptitude could be partialled out, the students who achieve high grades were endowed with high motivation and that low grades were related to low motivation. It was also assumed that the basic dimensions of academic achievement were to be found by studying the teacher's evaluation and not the student's performance.

Items which had been developed by Farquhar and associates to empirically test the hypothesized dimensions of the theory on over- and underachievers were used. The same items were used but with a differing methodology. The differing methodology was used to empirically test the same hypothesized dimensions on students with differing levels of achievement but the same aptitude. It was hypothesized that:

1. Students with high achievement would choose the alternative related to high motivation more often than students with low achievement.

2. The items reflecting differing motivation by differing achievers may be added together to constitute a reliable measure of motivation which correlates with grade point averages.

3. The items may be factored into interpretable sub-groups.

Organization of the Study

The review of the literature on factorial studies of non-intellectual variables as academic predictors is presented in Chapter II. The theory and instrumentation used as an attack on these problems are discussed in Chapter III. The analysis of the data (Chapter IV) contains three sections: A) Item validation; B) Inventory validation; and C) Factor

analysis of the inventory. The summary, conclusions and implications are presented in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

Factor Analytic Studies of Motivation and Achievement

Motivation, when viewed as psychological variables which initiate and sustain activity, has been assessed by a variety of methods. One way of conveying the meaning of the motivational concept is to isolate the operational definition used in the research. Stern, Stein and Bloom[1] have discussed the problem of assessment methodologies; their methods of classifying the various methodologies are listed to facilitate the discussion of motivation research related to this study.

> "All four methodologies are based on the proposition that assessment can be conducted most adequately and accurately if attention is paid to both the individual and the environment in their transactional relationship.....(p-57)
>
> "The first of these four methodologies--the analytic--is based upon the most thorough elaboration of a transactional orientation, and is in fact the fundamental paradigm from which the other three methodological alternatives can be derived. The analytic design involves several stages. It begins with a thorough situational analysis based upon the observations of the assessment staff aided by the faculty or significant others, from which the functional roles are clarified. A criterion is derived from this material by translating the functional roles into descriptive personality models of hypothetically effective performers. This is followed by a selection of tests on the basis of which the personalities of the individuals to be assessed are diagnosed. Finally, assessment staff conferences are held in which data from the analysis of environment and individuals are integrated and predictions made..(pps, 57-58)
>
> "The three alternative approaches suggested here--empirical, synthetic, and configurational--each represent a modification of the analytic methodology intended to increase its applicability to concrete situations requiring improvement in the prediction of performance. (p-134).

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1. Stern, George G., Morris I Stein and Benjamin S. Bloom. Methods in Personality Assessment The Free Press, Glencoe Illinois. 1956.

> "The empirical approach takes as its starting point already differentiated groups of subjects and seeks to find further bases for discriminating between them. The configurational approach is more concerned with isolating discriminable clusters than it is with understanding the dimensions which distinguish them." (p-135)

The definitions of the three alternative approaches are circular and interdependent upon the purpose for which the methods are used. The empirical method as described above uses the technique of statistical inference in determining the acceptance or rejection of relationship between test and criteria. The statistical tests are legend in psychology. The configurational method uses statistical techniques like factor analysis for identifying clusters.

The purpose of any investigation, broadly conceived, tends to determine the structure of the methodology used. When the configurational method is used, it serves a dual purpose by also determining the method of factor analysis, the method of rotation and the values inserted in the diagonal of the matrix which provides the intercorrelations. There simply is not a method of factor analysis which yields all answers. For the purposes of this review, not only will the operational definitions employed in the relevant research be identified but the appropriateness of the statistic employed for either the empirical or configurational method will be assessed.

Both Thorpe[1] and Taylor[2] discussed factor analytic procedure in relation to motivation. To date, only a few factor analytic studies on motivation have been reported and in each, the factor analysis had

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1. Thorpe, Marion D. The Factored Dimensions of an Objective Academic Achievement Inventory in Eleventh Grade High School Males. Unpublished Doctoral Dissertation. Michigan State University. 1961.

2. Taylor, Ronald G., Personality Factors Associated With Scholastic Achievement. Unpublished Doctoral Dissertation. Michigan State University. 1962.

a different purpose. For example, McQuary's [1] investigation stated two hypotheses: 1) achievement in college is significantly related to certain non-intellectual variables, and 2) the non-intellectual variables can be grouped into several factors. The first hypothesis suggested that the empirical method was to be used. Achievement was an established criterion differentiated by grades, and measures (non-intellectual variables) were sought which would reproduce these criteria. The second hypothesis appeared to require the configurational method to arrange the non-intellectual variables into functional sub-groups. The methods used, however, were different from those suggested by the hypotheses.

McQuary's sample was one hundred seventy four male first semester University of Wisconsin students who had come to the counseling center for service. The students were selected for the sample only if complete data on 23 random variables were available; e.g., test scores, size of home community and educational level of mother.

The data were factor analysed by the multiple group method and rotated to an oblique solution. McQuary concluded that 1) a highly satisfactory solution was obtained which was interpretable and 2) two factors were given to account for the grade point averages.

McQuary may not have completely reported his investigation. However, from what was reported, it would appear that the first hypothesis remained untested because no empirical method was used to indicate that the non-intellectual variables were validly and reliably related to college achievement. The same non-intellectual variables provided the intercorrelations used to check the second hypothesis. The configurational

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1. McQuary, John P. "Some Relationships Between Non-Intellectual Characteristics and Academic Achievement," Journal of Educational Psychology, April, 1953, 40: 117-120.

method was used to discover the factors underlying the variables. The factoring could be done because mathematics are available which will factor analyze any matrix if the numbers are in appropriate form. That the factors were interpretable was subjectively evaluated evidence.

The configurationally validated conclusion was that the 23 variables might more efficiently be considered as a lesser number of variables. The relationship of non-intellectual variables to motivation remains unclear because of lack of theory and empirical validation.

Middleton and Guthrie[1] employed the configurational technique of transposed factor analysis for selecting sub-groups of individuals from a non-homogeneous population. Their goal was to establish functional unities among persons rather than among items. Middleton and Guthrie used a sample of 28 business students, 14 with grade point averages of 2.5 or above and 14 with grade point averages below 2.0. The obtained subject intercorrelations were based upon responses to a 300 item questionnaire designed to measure 18 of the needs in Murray's system. All of the students had done equally well in high school. The higher grade point group had significantly higher scores on a college aptitude test than the lower grade point group. Thus, the criterion of grades was initially confounded in school level and aptitude.

The subject's intercorrelations were factor analyzed. The resulting factor loadings (structure values) were correlated with Murray's scales. Only 21 subjects (10 and 11 from high and low respectively) were assigned to one or more sub-groups. The interpretations of personality syndromes were based on the Murray scale which correlated with a factor. Thus, high achievers are described as having subgroups which have needs for I) Power;

1. Middleton, George, Jr. and Gutherie, George M., "Personality Syndromes and Academic Achievement," Journal of Educational Psychology, Vol. 50, No. 2, 1959 (April) 66-69.

II) Resentment; III) Dependence; IV) Social Acceptance; and V) Aggression. Contrarily, low achievers have subgroups with needs for I) Pleasure Seeking; II) Extroversion; III) Denial of Normal Shortcomings; and IV) Power. The factor of Power appeared in both groups which indicated that it does not differentiate groups but is a factor common to both groups.

Middleton and Guthrie's study contained no empirical evidence of validity or reliability coeffecients. The centroid factor solution was used without designating the method of rotation. No statistical inference to either a peopled population or an item population was warranted. Twenty-one students were assigned to one or more subgroups by factoring and then related to one or more of Murray's personality needs. The strength of the study was in its attempt to provide sub-groups on an objective basis from a non-homogeneous group. Some of the sub-groups correlate higher with criteria than the total non-homogeneous group.

An investigation with more subjects but with less purpose was reported by Michael, Jones and Trembly.[1] Using a sample of 236 males and 131 females from a required American History course at the University of Southern California, answers were obtained to a 34 item inventory on study methods and attitudes. The subject's scores on an aptitude test and the grade average from courses which are based on comprehensive examinations were added.

The 36 items were factor analyzed by the principle axis method and rotated to simple structure analytically by the varimax method. In the search for factors, aptitude and achievement were included as two of the

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1. Michael, W. B., R. A. Jones and W. A Trembly, "The Factored Dimensions of a Measure of Motivation for College Students," Educational and Psychological Measurement, 1959, 19, 667-671.

items and followed through the procedure into the respective factor groupings as marker items. However, instead of two factors, ten male factors and 12 female factors were produced. The marker items thus lost their identity in the numbers of factors, seven of which were interpreted. Motivation, it was concluded, is a highly complex group of variables.

Both the principle axis method and the varimax method are precise in structuring factors. It was the empirical methodology that was lacking in the Michael, Jones and Trembly study. No evidence of validity or reliability was presented nor was there a theory to clarify the raw data. Research on the configural basis like the Michael study was not to test but to suggest hypotheses.

Thorpe[1] recently completed a study of motivation on over- and under-achievers (eleventh grade high school males). His purpose was to advance motivation theory and its measurement. Thorpe developed items from theory which were validated and cross-validated by empirical methods and then the configural methods were applied. Through the principle axis method of analysis and the quartimax rotational procedure, the 22 validated items revealed a base of five factors; I) Chance-taking versus no chance-taking; II) n-academic Achievement; III) Intrinsicness versus Extrinsicness; IV) Speed versus Thoroughness; and V) Situational Involvement. The factors were used to clarify the theory.

Thorpe's methodology was acceptable with one exception. Both Thorpe and Taylor introduced a procedure for appraising the significance of

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1. Thorpe, Marion D. The Factored Dimensions of an Objective Academic Achievement Inventory in Eleventh Grade High School Males. Unpublished Doctoral Dissertation. Michigan State University. 1961.

factors that was based on fallacious reasoning. To test the "significance" of the factors, both Thorpe and Taylor generated random factors from tables of random numbers which were correlated with the obtained factors. To be considered "significant", the obtained factors must not correlate with the random factors. Both Thorpe and Taylor apparently failed to recall that the mean correlation between random numbers and any set of numbers equal zero. They substituted the logic that one set of random numbers will correlate with another set of random numbers. This procedural error distorted the conclusion that the factors were due to chance.

Thorpe's study was a part of the Farquhar research project which developed 200 items from the extension of McClelland's theory and then empirically tested the items on over and underachievers. The present study used the same extension of McClelland's theory, the same 200 items and the same population of high school subjects as Thorpe's. However, the methodology of the present study selected a different sample of subjects and the aptitude, motivation and achievement relationships were different from Thorpe's. In this study, stress was placed on maintaining independence between aptitude and motivation. The items were examined empirically with aptitude controlled instead of handling aptitude through sample selection. The configurational methods of factor analysis and rotation were used to rearrange and aid in the interpretation of the inventory.

Summary

A comparison of the results of these studies was not indicated in that only Thorpe's study contained an empirical validation of items purporting to measure motivation and achievement. His items were based

on high school students in contrast to the others which were based on college students. Also, only Thorpe presented a theory base.

The studies of McQuary and Michael, Jones and Trembly suggested that factor analytic procedures provided an objective and helpful method of arranging the data into relevant groups. Thorpe, in a similar plan, used the factor method to rearrange his inventory.

Middleton and Guthrie used the factor analytic method to arrange the subjects, but Thorpe accomplished the grouping of subjects by sample selection. No generalization was indicated.

The present investigation was most like Thorpe's.

CHAPTER III

THEORY AND DESIGN

McClelland[1] experimented with selected and similarly constructed Thematic Apperception cards in developing measures of motivation. His procedure was similar to that used in the Thematic Apperception Test but the test situation was structured to be variously relaxed, neutral or achievement-oriented. The subject's stories were scored in accordance with a special set of criteria. These criteria, McClelland hypothesized, enveloped achievement motivation (Achievement Imagery) into the dimensions of 1) long term involvement; 2) unique accomplishment; and 3) competition with a standard of excellence.

Farquhar and associates[2] extended and modified these three dimensions and postulated that each dimension was a continuum. Two of McClelland's dimensions were logically extended. The third dimension, competition with a standard of excellence, was first modified to competition with a maximum standard of excellence and then extended. The opposite or low n-achievement would then be reflected by 4) short term involvement; 5) common accomplishment; and 6) competition with a minimum standard of excellence.

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1. McClelland, D. (Ed.) Studies in Motivation, Appleton-Century-Crofts, New York, New York. 1955.

2. Farquhar, William W. A Comprehensive Study of the Motivational Factors Underlying Achievement of Eleventh Grade High School Students, Research Project No. 846(8458) in cooperation with the U.S. Office of Education.

The theoretical base for the present study is presented in Table 3.1.

Table 3.1 Summary of a Bi-Polar Theory of High and Low Academic Need-Achievement

High Academic n-Achievement	Low Academic n-Achievement
1. Need for long term involvement.	4. Need for short term involvement.
2. Need to compete with a maximum standard of excellence.	5. Need to compete with a minimum standard of excellence.
3. Need for unique accomplishment.	6. Need for common accomplishment.

The contemporaneous aspect of the theory was also modified. McClelland structured the test situation to modify motivation; the amount of motivation modification was measured. The bi-polar theory (high n-achievement versus low n-achievement) assumes a more enduring motivation. Thorpe,[1] for example, developed a measure from the bi-polar theory with students who had either over- or underachieved for more than a year.

DESIGN

The empirical method with an objective instrument was used to verify the bi-polar dimensions as a continuum free of qualifying test conditions and free of aptitude.

Instrument

To empirically test the postulated dimensions, it was assumed

1. Thorpe, Marion D. The Factored Dimensions of an Objective Academic Achievement Inventory in Eleventh Grade High School Males. Unpublished Doctoral Dissertation. Michigan State University. 1961.

that the bi-polar dimensions could be expressed as statements and administered as a forced choice inventory. For this purpose, 400 statements were constructed into 200 pairs; one statement of each pair logically relating to one, two or all three dimensions theoretically descriptive of high n-achievement and the other statement contrastingly related to low n-achievement. The 200 forced choice items were combined into the Generalized Situational Choice Inventory (GSCI). The instrument of Farquhar and associates was objectively scored as either choice a or b. No special test situation was structured in an attempt to elicit the achievement motive. The paper and pencil inventory could be administered alone or as one of a group of tests.

Empirical Steps in GSCI Construction The testing of the GSCI as an appropriate instrument involved the following considerations: (1) Logically, high or low needs for academic achievement should be reflected by behavior which, in most schools, is measured or assessed by a common grading system. (2) The term "academic" as it is used in this study does not include all behavior which is school related but is restricted to courses of learning which require outside-of-class preparation or home-work assignments. (3) Achievement varies in quality and quantity and was thus described by the grades of A, B, C, D and F. The grades constituted the criteria with which the GSCI was to covary.

Intellectual instruments are available which covary with the academic grades criteria. The intellectual measures have been refined into specific instruments for academic aptitude prediction, like the California Test of Mental Maturity (CTMM) and the

Differential Aptitude Test (DAT). The question was whether a non-intellectual measure like the GSCI could predict grade point averages and remain independent of the already established intellectual measures.

Population and Sample The following steps were taken to establish the variables:

1) Nine schools in eight Michigan cities which had 9th grade Differential Aptitude Test scores available on their current 10th graders were asked to cooperate in the study.

2) A second aptitude measure was obtained so that reliable estimates of academic aptitude could be made. California Tests of Mental maturity were administered while the students were in the 10th grade. Administration was necessary in all but one of the schools.

3) Grade point averages (GPA) were calculated using grades in 9th and 10th grade subjects. Only academic subjects were included. Activities courses were eliminated from the calculations.

4) The DAT-Verbal Reasoning and CTMM-Language sub-tests scores were used in obtaining a stable estimate of academic aptitude after empirically examining possible DAT and CTMM sub-score combinations.

5) A pilot study was conducted to appraise the relative predictor value of the DAT-VR and the CTMM-L sub-test scores. The correlation of the DAT-VR with GPA was found at +.65 and the CTMM-L with GPA to be +.50.

6) Because McClelland's theory was most valid with males, the female subjects were not used.

7) In order to enhance the stability of the intellectual variable, regression lines were established for each school, assuming a correlation of +1.00 between DAT-VR and CTMM-L. Separate equations were calculated for each school because a pilot study indicated that one was not applicable across schools. Only those individuals who fell within one standard error of estimate above and below the regression line were included in the item-validation samples.

For the purposes of this study, the requirement was made that the motivation instrument must not relate to already developed intellectual instruments. Therefore, attention was paid to intellectual instruments within the sampling procedure and in the validation steps.

Procedure The validation of the instrument consisted of three separate procedures; item validation, partial cross-validation and inventory validation. The interpretation of the valid instrument was facilitated by factor analysis.

Item Validation It was assumed that two criteria (aptitude and grade point averages) would rank the individuals in the sample. The search was for a third criteria of ordering academic motivation. The specific statistical hypothesis stated in null form to test the validity of item selection was:

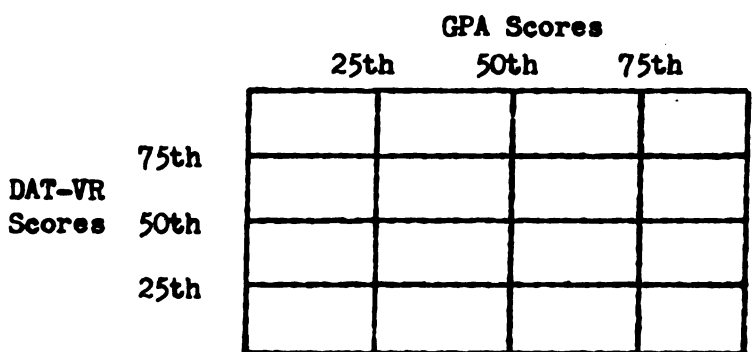
Hypothesis I There is no difference in preference for the alternative designated as related to high n-achievement by the higher achievers than lower achievers when aptitude is controlled.

One hundred and fifty male subjects were selected at random from the total population of all nine schools. Based on this sample, the 25th, 50th and 75th percentile points on both aptitude and GPA were established. Percentile points were used in making a 16-cell two-way

classification table with achievement quartiles as columns and aptitude quartiles as rows.

The scores of all male subjects from all nine schools were searched to fill the corner cells representing the greatest scarcity of subjects within the extreme classification; i.e., highest quartile aptitude, lowest quartile GPA and lowest quartile aptitude, highest quartile GPA. The search established that 12 subjects were available for the corner cells. The remaining cells of the two-way classification table were filled with 12 randomly selected subjects.

The percentage of each group of 12 subjects choosing the alternative of each item designated as related to high n-achievement was entered into each cell. Two hundred two-way classification tables (one table for each item) were constructed. An example of the tables is shown in Figure I.



Note-The percentage of individuals choosing the high motivation alternative was entered in each cell and the rows were ranked.

Figure I. Example of a Two-Way Classification Table

The percentage figures were ranked in each row, resulting in a

control of the aptitude criterion in that the means of ranks in each row were equal.

Cross-Validation Because the extreme groups of the population of available subjects were exhausted by the method of validation sample selection, only a modified cross-validation could be attempted. As a partial cross-validation, a sample of 100 subjects was drawn on a stratified random basis to obtain 25 subjects on each of four grade point levels; A, B, C and D. Within these groups, aptitude scores were disregarded.

The number of subjects choosing the alternative of each item designated as related to a high n-achievement was entered into the appropriate cell of a four-fold contingency table and tested by the chi square analysis. Only items which were established as significant in the first validation step were retested. The level of significance or the probability of a Type I error for validation was set at .20 and for cross-validation at .10.

Inventory Validation As a further empirical check on the grouped significant items (inventory) all the male students from one high school were treated as a sample.

The student's responses to the significant items were extracted and scored on a 1 or 0 basis. If the response was predictive of high n-achievement it was scored 1; the reverse was scored 0. By simple addition of the 1 scores, each subject was given a score on the shortened (Form S) motivation inventory. The students' scores were used to test hypothesis II in relation to DAT-VR and GPA.

Hypothesis II The items resulting from the choices will not correlate with achievement when aptitude is partialled out.

Factor Analytic Method The principle axis method of factor analysis developed by Hotelling[1] was used because it gives the smallest number of factors which extract the maximum amount of variance with a mathematically unique solution. Because unities were used in the diagonal of the matrix, all variance, reliable and unreliable, was factored. The results of the factoring method include all variance in the sample with the unreliable variance randomly distributed among factors. The factors do not refer to the population but to the empirically functioning components within the sample. The components describe the source of the variance. The principle axis method gives a unique resolution of the common factors or components for each sample when unities are inserted in the diagonal. These common factors, based on empirical observation, aid in the interpretation of the inventory, which to this point was based on face falidity items developed from the earlier presented theory.

The further facilitation of an interpretation is offered by rotation. The criteria used in this study were that the sum of the square of the loading of all items on a factor must exceed unity (the variance expected of one item) before a factor was included in the rotation and that an item must load on a factor to at least .40.

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1. Hotelling, H. "Simplified Calculation of Principle Components," Psychometrika. Vol. 1, 1935. pp 27-35.

The purpose of the rotation was to transform the initial factor solution to a "preferred" solution to achieve simple structure, factor invariance and interpretability. Mathematically, each solution is correct but psychologically, certain solutions are preferred as being more interpretable.

Two objective methods of rotation were available: the Quartimax method of Wrigley and Neuhaus[1] and the Varimax method of Kaiser.[2] Both methods attempt to achieve simple structure principles based on the following criteria of Thurston.[3]

1. Each row of the factor matrix should have at least one zero.

2. If there are m common factors, each column of the factor matrix should have at least m zeros.

3. For every pair of columns of the factor matrix there should be several whose entries vanish in one column but not in the other.

4. For every pair of columns of the factor matrix, a large proportion of the variables should have vanishing entries in both columns when there are four or more factors.

5. For every pair of columns of the factor matrix there should be only a small number of variables with non-vanishing entries in both columns.

In contradistinction to the Quartimax method, which stresses the simplification of each row or variable, the Varimax method places emphasis on the simplification of factors. To quote Harman,[4] "The

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1. Wrigley, C. and J. O. Neuhaus, "The Quartimax Method: An Analytical Approach to Orthogonal Simple Structure," British Journal of Statistical Psychology, Vol. 7, 1954, pp. 81-91.

2. Kaiser, Henry F. "The Varimax Criterion for Analytic Rotation in Factor Analysis," Ed. Psych. Measurement, 19 (1959), 413-20.

3. Thurston, L.L., Multiple Factor Analysis. Chicago: University of Chicago Press. 1947.

4. Harman, Harry H. Modern Factor Analysis. The University of Chicago Press, Chicago, 37. 1960.

Varimax method proposed by Kaiser is a modification of the Quartimax method which more nearly approximates simple structure." For the above reasons, the principle axis and the varimax methods were applied to the data.

Summary

The bi-polar theory of high and low academic need for achievement includes (1) Need for long term involvement versus short term involvement, (2) Need to compete with a maximum standard of excellence versus a minimum standard of excellence, and (3) Need for unique accomplishment versus common accomplishment.

An instrument was developed for the Farquhar motivation project from the bi-polar theory and subjected to verification procedures which treated aptitude as coincident and independent. The instrument was developed as a predictor of grade point averages -- the criterion variable of academic achievement. The steps preparatory to testing such an instrument include population and sample selection, item development and validation, inventory validation, estimate of internal consistency reliability and the factor analysis of the inventory.

The analysis results are presented in the fourth chapter.

CHAPTER IV

ANALYSIS OF THE DATA

The analysis of the data is presented in three sections. The validation and partial cross-validation of items in relation to achievement with aptitude controlled, based on selected samples of subjects, is presented in section I. The degree and significance of the concurrent validity of the resulting inventory in relation to achievement and aptitude is presented in section II. The evidence in section II was based on a normal group and also provided an estimate of internal consistency reliability. The chapter is concluded in section III which contains the factor analysis results, similarly based on the selected items and the same group as in section II.

Section I: Item Validation and Partial Cross-Validation

Item validation was tested through the null hypothesis pertaining to motivation and achievement.

Hypothesis 1. There is no difference in preference for the high item alternative by the higher achievers than the lower achievers when aptitude is controlled.

Subjects from each quartile on aptitude within each quartile on grades were extracted from the total population. Thus, 16 groups of 12 subjects each were selected to represent aptitude and grades equally in the 16 combinations.

The percentage of subjects in each group choosing the high motivation alternative were ascertained. These percentages were ranked and tested to ascertain if item choices covaried with grades

across the equalized aptitude.

The test of significance which was applied is described by Edwards[1] as either Analysis of Variance of Ranks for a Two-Way Classification or the Coefficient of Concordance (Wc). The level of significance or probability of a Type I error was set at .20.

This statistical analysis indicated that 52 items were significant in relation to GPA with DAT-VR controlled; 45 in the predicted direction and 7 counter to prediction.

Cross-Validation One hundred different subjects containing 25 each of A, B, C and D grade level students were picked on a stratified random basis without regard to aptitude and entered in a four-fold contingency table. The independence of the item choices in relation to grade groups was examined with the chi square statistic. The level of significance required was .10.

Twenty-eight of the 45 items remained as significantly related to the grade point criteria through this partial cross-validation procedure.

These 28 items provided the shortened GSCI (Form S) which was used for inventory validation and the factor analysis.

Section II: Inventory Validation and Estimation of Reliability

Hypothesis 2. The items resulting from the choices will not correlate significantly with achievement when aptitude is partialled out.

To test this hypothesis, the responses of all the male students

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1. Edwards, Allen L. Statistical Methods for the Behavioral Sciences, Rinehart & Company, Inc. New York. 1954.

in one high school (N = 180) to these 28 items were extracted and scored on a 1 or 0 basis. If the response was in the direction predictive of high achievement, it was scored 1; the reverse was scored 0. By simple addition of the scores, each subject was given a score on the shortened motivation inventory. The possible range of scores, for clarification, then became 0 to 28. Also each subject's aptitude score (DAT-VR) and his GPA were obtained.

The statistical treatments necessary to produce the partial and multiple correlations of these three variables were administered as described by Garrett[1] and the results are presented in Tables 4.1 and 4.2.

Table 4.1

Intercorrelation for Differential Aptitude Test - Verbal Reasoning (DAT-VR), Grade Point Average (GPA) and Generalized Situational Choice Inventory (GSCI, Form S) for Males. (N=180)

	GPA	DAT-VR
DAT-VR	.59	
GSCI Form S	.39	.25

Table 4.2

Partial Intercorrelations for DAT-VR (1), GPA (2) and GSCI, Form S (3) For Any Two With the Third Partialled Out. (N=180)

$r_{12 \cdot 3}$ = .62	(significant beyond .01)
$r_{13 \cdot 2}$ = .31	(significant beyond .01)
$r_{23 \cdot 1}$ = .03	(not significant)

1. Garrett, Henry E. Statistics in Psychology and Education 4th Ed. Longmans, Green and Co. New York. 1953.

The correlation technique was used because it provides a measure of the degree of relationship as well as its significance. The three major scale intercorrelations were: DAT-VR to GPA = +.59, the GSCI to GPA = +.39 and the DAT-VR to GSCI = +.25. In addition, this method also produced the partial intercorrelations between any two scales with the third partialled out, and the correlation of multiple prediction.

The correlation of the DAT-VR with GPA increased from +.59 to +.62 when the GSCI was partialled out. The correlation of the GSCI with GPA decreased from +.39 to +.32 when the DAT-VR was partialled out. The correlation of the GSCI with the DAT-VR when GPA was partialled out was zero (r =+.03). The multiple correlation of DAT-VR and GSCI with GPA was +.65, which was a significant increase over the DAT-VR with GPA correlation of +.59.

The estimated amount of GPA variance predicted by the GSCI on the sample was 10 percent. The estimated amount of GPA variance predicted by the DAT-VR on the same sample was 36 percent. By adding the predicted variance of both the GSCI and the DAT-VR, the estimate of total predicted variance of GPA was 46 percent.

Both the DAT-VR and the GSCI, Form S were correlated with the GPA singularly with the other partialled out and in combination beyond the .01 level of confidence.

The correlation of the DAT-VR and GSCI, Form S with GPA partialled out was not significant, appearing near zero.

The correlation evidence was interpreted as supporting the hypothe-

sis that motivation, as empirically measured, was a significant predictor of achievement independently of aptitude. The motivation measure combined with aptitude increased the precision of achievement prediction.

Hoyt's[1] method of estimating internal consistency indicated that the 28 items were at the .76 level of reliability which was slightly less than desired for a scale of practical utility.

Section III: Factored Dimensions of the Motivation Inventory

The responses of all the male subjects in one high school were entered into an item by individual matrix (28 items by 180 individuals). The responses were scored as 1 or 0, depending upon the alternative which had been chosen. This matrix was punched into a computer tape (MISTIC - the electronic computer on the campus of Michigan State University) and programmed to provide item product moment coefficients of intercorrelation. The resulting 378 item intercorrelations provided the data for the factor analysis and are tabled in Appendix A.

The item intercorrelations were factored into 28 factors by the principle axis method which extracts as many factors as variables (items) entered in the matrix. The resulting unrotated 28 factors with rounded loadings for the 28 items along with the factor eigenvalues (factor variance) are tabled in Appendix B. Ten of the 28 factors were of acceptable magnitude with eigenvalues which exceeded 1.00.

The ten factors were ranked in terms of their eigenvalues and then rotated; first the two largest at a time, then the three largest, four largest and so on until all ten were rotated.

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1. Hoyt, C. J. "Test Reliability Estimated by Analysis of Variance", Psychometrika, Volume 6, 1941, pp. 153-60.

Table 4.3

Rotated 28 GSCI Items on Eight Accepted Factors. (Male N = 180)

Factor No.	1	2	3	4	5	6	7	8	Communalities
Item No.									
1	.157	.101	-.184	.167	.445	-.046	.032	-.272	+.372
2	.520	.226	-.328	.020	.016	-.166	.215	.124	+.518
3	.556	-.069	-.153	-.048	-.097	.216	-.058	-.042	+.401
4	.587	-.122	-.244	.099	.212	-.119	.121	-.132	+.519
5	.190	.006	-.783	.009	-.027	.062	-.038	-.138	+.672
6	.204	-.564	.189	-.159	.063	-.037	-.084	-.015	+.433
7	.055	.126	-.335	.056	-.070	.055	.441	-.468	+.555
8	.035	.078	.052	.831	-.040	.072	-.164	.005	+.734
9	.053	-.258	.036	.109	.678	.037	-.080	.233	+.603
10	.047	-.170	.067	-.018	.011	.519	-.268	-.072	+.382
11	-.144	-.256	-.166	.167	.015	-.582	.028	-.175	+.512
12	.174	-.066	-.779	-.058	.181	.096	.167	.228	+.765
13	.378	-.194	.132	.175	-.096	.061	.521	-.026	+.514
14	.022	.045	-.083	-.132	-.065	.052	.646	-.025	+.451
15	.188	-.571	-.061	.017	-.007	.116	.105	.150	+.412
16	.233	-.225	-.406	.279	-.195	-.328	.430	.172	+.707
17	.403	.088	-.029	.063	.399	.004	-.087	-.213	+.387
18	.667	-.154	-.036	.146	.022	.073	.158	.060	+.525
19	.139	-.177	.025	.325	-.561	.041	.127	.042	+.490
20	-.027	.035	-.225	.234	.176	.570	.135	-.138	+.501
21	.112	.087	-.031	.744	.085	-.013	.065	-.026	+.587
22	.793	-.072	.018	.061	-.036	.032	-.036	-.124	+.656
23	.229	-.125	.066	.130	-.284	.522	.108	.136	+.472
24	-.083	-.089	-.291	.076	-.011	.589	.244	-.038	+.512
25	.208	-.080	.127	-.005	.059	-.009	.014	-.775	+.670
26	.465	-.012	-.070	.025	.078	.291	.332	-.133	+.440
27	.114	-.408	-.096	.396	-.069	.317	.156	.012	+.475
28	.231	.618	.172	.097	.075	.068	.091	.294	+.579
Factor Variance	2.973	1.658	2.024	1.861	1.421	1.991	1.572	1.352	

Table 4.4

The Rotated 28 GSCI Items Loading Above .40 On Eight Factors Which Provided The Factor Interpretations. (Male N = 180).

Factor No.	1	2	3	4	5	6	7	8
Item No.								
1					.445			
2	.520							
3	.556							
4	.587							
5			-.783					
6		-.564						
7							.441	-.468
8				.831				
9					.678			
10						.519		
11						-.582		
12			-.779					
13							.521	
14							.646	
15		-.571						
16			-.406				.430	
17	.403				.399			
18	.667							
19					-.561			
20						.570		
21				.744				
22	.793							
23						.522		
24						.589		
25								-.775
26	.465							
27		-.408		.396				
28		.618						

Each item loaded .40 or above on one or more of the factors at the point concluding the rotation of eight factors. The rotation of seven or less factors did not include all items when a loading of .40 was the minimum acceptable criterion. The rotation of nine and ten factors revealed factors with eigenvalues less than unity (1.00). It is characteristic that eigenvalues change during rotation because the item loadings on the factors change. The reduction in the number of factors was the parsimony sought in rotation. Therefore, the eight factor solution was the preferred solution to the item intercorrelation matrix.

The rounded factor loadings of 28 items on eight rotated factors along with item communalities and factor variance are presented in Table 4.3.

The rounded factor loadings of 28 items with acceptable magnitude on the eight factors are presented in Table 4.4.

The individual factors, the items loading on each and the item loadings on each are presented in the following eight tables, (tables 4.5 through 4.12). The theme or content similar to all items loading on a factor provided the basis for interpreting and naming the factor.

Table 4.5

Item Content of Factor I

Item Number		Content	Loading
22.	x*	a. Study to go to college, or b. Study to get out of high school	.793

Note,* denotes the predicted item alternative related to high n-ach.

Table 4.5 (cont.)

18.		a. Work overtime to make more money, or	
	x	b. Get more schooling to make more money	.667
4.		a. Be well prepared for a job after graduation from high school, or	
	x	b. Be well prepared to continue learning	.587
3.		a. Buy a car, or	
	x	b. Continue my education	.556
2.	x	a. Have the best teachers in the state in my school, or	.520
		b. Have a large recreation center in my school	
26.	x	a. Study for an exam one night and know that I would receive an "A", or	.465
		b. Go to a party on this night and take a chance on a lower grade	
17.	x	a. Receive a grade on the basis of how well I did on my teacher's test, or	.403
		b. Receive a grade on the basis of how I compare with my classmates	

The seven items of Factor I point to a need for academics: the expressed choice "to go to college," to "get more schooling," to be "prepared to continue learning," "to have the best teachers," to "study for an exam," and to be graded on "how well I did." The pattern of the academic choices suggested a relationship to the original dimension of long term involvement, but in the restricted range of education. Factor I was interpreted as supporting and clarifying this dimension of the original theory and named long term academic involvement versus short term academic involvement.

Two items loaded relatively high on Factor II, with a third loading somewhat lower. Items 5 and 12 had nearly identical content and loadings. The chance-taking versus no chance-taking alternative

Table 4.6

Item Content of Factor II

Item Number			Content	Loading
5.		a.	Have the teacher give everyone the same grade at the beginning of the term and know I had passed, or	
	x	b.	Take a chance on getting a higher or lower grade at the end of the course	-.783
12.		a.	Have everybody in the class get a "C" at the beginning of the course, or	
	x	b.	Be graded at the end of the course with the possibility of getting a higher or lower mark	-.779
16.	x	a.	Consider all the possible outcomes when faced with a choice, or	-.406
		b.	Make a decision and not worry about all the possible outcomes	

named the factor. This factor was also reported by Thorpe.[1] Instead of its being the largest in terms of factor variance as in Thorpe's study, here it appeared as a strong second. It was interpreted as an unhypothesized factor in this research and as a replication of a factor in Thorpe's research.

Table 4.7

Item Content of Factor III

Item Number			Content	Loading
24.	x	a.	Be very happy, or	.589
		b.	Have lots of money	
11.		a.	Be a minor actor in a large theater production, or	
	x	b.	Play the lead in a small theater production	-.582
20.		a.	Inherit a great deal of money, or	
	x	b.	Earn a great deal of money	.570

1. Thorpe, Marion D. The Factored Dimensions of an Objective Academic Achievement Inventory in Eleventh Grade High School Males. Unpublished Doctoral Dissertation. Michigan State University. 1961.

Table 4.7 (continued)

23.		a.	Live a life of leisure, or	
	x	b.	Live a life of many new experiences	.522
10.		a.	Be paid for how fast I did a job, or	
	x	b.	Be paid for how well I did a job	.519

Five nearly evenly loaded items defined Factor III. The psychological quality of experiencing was chosen by varying achievers on items 24, 20 and 23 on an activeness versus passiveness continuum. Uniqueness versus the common was expressed by item 11 and speed versus thoroughness on item 10. The most general content pointed to experiencing or being and was named active experiencing versus passive experiencing and appeared as an unhypothesized factor.

Table 4.8

Item Content of Factor IV

Item Number			Content	Loading
8.		a.	Work at many less important jobs which I know I could finish, or	
	x	b.	Work at one very important job which may never be entirely finished in my lifetime	.831
21.		a.	Work on a not so important project which I may finish, or	
	x	b.	Work on an important project which I may never finish	.741
27.		a.	Discover a gold mine, or	
	x	b.	Discover a new medicine	.396

Three items loaded on Factor IV, with two much higher than the third. The hypothesized dimension of long term involvement was clarified as a job challenge of importance with long term involvement. This was interpreted as supporting and refining the similar hypothesized dimension; named long term work challenge versus short term work challenge.

Table 4.9

Item Content of Factor V

Item Number			Content	Loading
28.	x	a.	Have a few "fine" clothes, or	.618
		b.	Have many ordinary clothes	
15.	x	a.	Study my assignments during study hall, or	-.571
		b.	Wait to study until the mood strikes me	
6.	x	a.	Be successful in finishing a job, or	-.564
		b.	Finish a job	
27.		a.	Discover a gold mine, or	
	x	b.	Discover a new medicine	-.408

Four items exceeded the minimum .40 loading on Factor V. Two of the same items appeared on Thorpe's[1] Factor III which he named Intrinsicness versus Extrinsicness (materialism versus non-materialism plus inner-directedness versus outer-directedness). Structure value was indicated by partial replication of Thorpe's factor but there was some difficulty in naming it. Accomplishment, success and a maturity in seeking lasting quality seemed suggested. Item 15 suggested a maturity toward attainments and items 28, 6 and 27 a lasting quality of rewards. The name offered this factor was abiding interests versus terminal interests.

To have a capable and working mental ability characterized the items of Factor VI. The choice of doing mental work in favor of accepting an easier way out suggested the name long term mental

1. Thorpe, Marion D. The Factored Dimensions of an Objective Academic Achievement Inventory in Eleventh Grade High School Males. Unpublished Doctoral Dissertation. Michigan State University. 1961.

Table 4.10

Item Content of Factor VI

Item Number			Content	Loading
14.		a.	Be Thought of as being shrewd, or	
	x	b.	Be thought of as being intelligent	.646
13.		a.	Be known as a person who doesn't let problems worry me, or	
	x	b.	Be known as a person who can solve problems well	.521
7.	x	a.	Be graded at the end of a course with the possibility of making an "A", or	.441
		b.	Get a "C" at the beginning of a course along with everyone else.	
16.	x	a.	Consider all the possible outcomes when faced with a choice, or	.430
		b.	Make a decision and not worry about all the possible outcomes	

activity versus short term mental activity. This was interpreted as both supporting and clarifying the dimension of long term versus short term involvement.

Table 4.11

Item Content of Factor VII

Item Number			Content	Loading
9.	x	a.	Be paid for how well I did a job, or	.678
		b.	Be paid the same amount no matter how I did the job	
19.		a.	Take it easy and conserve my energy, or	
	x	b.	Put forth my best effort all the time	-.561
1.	x	a.	Receive a grade on the basis of how well I did on the teacher's test, or	.445
		b.	Get a grade on how hard I tried	
17.	x	a.	Receive a grade on the basis of how well I did on my teachers test, or	.399
		b.	Receive a grade on the basis of how I compared with my classmates	

The theme or content of quality of performance is expressed in all four items loading on Factor VII. This content referred to "how well I did" and "put forth my best" and reflected the quality of the effort or standard of performance. This reliance on the production of one's own quality was perhaps different from the more social aspects of competition with a maximum standard of excellence. A personalized standard of excellence was suggested; a self secure feeling in relation to the competition; a brand of certainty. The content led to the name maximum confidence versus minimum confidence in one's own effort.

Table 4.12

Item Content of Factor VIII

Item Number			Content	Loading
25.		a.	Accept what someone else says even though I don't agree, or	
	x	b.	Argue for what I believe to be right	-.775
7.	x	a.	Be graded at the end of a course with the possibility of making an "A", or	-.468
		b.	Get a "C" at the beginning of a course along with everyone else	

Item 25 was loaded on Factor VIII higher than item 7, but both suggested the dichotomy of staying with the crowd versus going it alone. Item 7 also loaded on Factor VI which referred to long term involvement. Both the longer effort versus the "easy way out" and chance-taking were perhaps indicated on Factor VIII, but the degree of joining was interpreted as the major content which led to the naming of the factor as individuality versus anonymity.

Summary

The empirical methods indicated that 28 of the original 200 items differentiated academic achievement levels when aptitude was a controlled variable. The evidence indicated that the 28 items were additive as valid predictors of academic achievement in a total group of eleventh grade males. The relationship between the motivation measure and academic achievement was significant both with and without aptitude and with aptitude partialled out.

Configurational methods suggested a relevant re-arrangement of the 28 items into eight factors. The factors were interpreted and named in terms of their most obvious content as follows:

I) Long term academic involvement versus short term academic involvement.

II) Chance-taking versus no chance-taking.

III) Active experiencing versus passive experiencing.

IV) Long term work challenge versus short term work challenge.

V) Abiding interests versus terminal interests.

VI) Long term mental activity versus short term mental activity.

VII) Maximum confidence versus minimum confidence.

VIII) Individuality versus anonymity.

The fifth and last chapter contains the summarization of the study, the discussion of the relationships between the results of the data analysis and the original hypothesis, and a listing of research implications.

CHAPTER V

SUMMARY, CONCLUSIONS AND RESEARCH IMPLICATIONS

Summary

The summary is presented in four sections: the problem, the theory and instrumentation, the design and procedure, and the analysis.

The Problem

The basic problem was to determine whether eleventh grade male high school students could be differentiated by a theory-based measure of motivation in the direction consistent with their academic achievement. The rigor of this task was increased by requiring that the motivation measure function independently of academic aptitude.

Theory and Instrumentation

The McClelland theory hypothesized three dimensions as the basis for the need for achievement: 1) long term involvement, 2) unique accomplishment and 3) competition with a standard of excellence. Farquhar extended and modified these three dimensions into three continuums. Each continuum was hypothesized as bi-polar and described as dichotomous; e.g. high n-achievement versus low n-achievement. The continuums were: long term involvement versus short term involvement, unique accomplishment versus common accomplishment, and competition with a maximum standard of excellence versus competition with a minimum standard of excellence.

Two hundred items were developed, each with two statements, one statement logically related to the pole of high n-achievement and one statement logically related to the pole of low n-achievement. The two hundred items were administered as a forced choice inventory named the Generalized Situational Choice Inventory.

The Design and Procedure

Students in the eleventh grade in nine schools in eight cities in Michigan took part in the study. The grade point averages, the scores on two aptitude tests taken a year apart and the responses to the motivation measure were obtained on the male students. The total sample included approximately 2100 students. Students with the most stable aptitude scores were selected by constructing a regression line between the two aptitude predictors assuming a correlation of +1.00 between the two variables. Two lines were drawn parallel to and above and below the regression line (fiducial limits) which were a distance away equivalent to the average of the standard error of estimate of the two aptitude predictors. Only those individuals who fell within the limits around the regression line were included in the validation and partial cross-validation samples.

The Analysis

Two null hypotheses were advanced:

1. There is no difference in preference for the high motivation item alternative by the higher achievers than the lower achievers when aptitude is controlled.
2. The items resulting from the choices will not correlate with achievement when aptitude is partialled out.

Two statistical procedures were used for the validation and partial cross-validation of items. The validation of items was studied by the analysis of variance of ranks for a two-way classification. Students were classified into quartiles on aptitude within quartiles of grade point averages (DAT-VR by GPA). The percentage of students favoring the high n-achievement item alternative was ranked and the ranks were

compared with GPA with DAT-VR controlled. The partial cross-validation of items was studied by the chi square analysis of a four-fold contingency, e.g. four levels of GPA compared to motivation with aptitude disregarded. The level of significance required in validation was .20 and in partial cross-validation .10.

The second null hypothesis was studied in a sample of one school with correlation technique. Correlation methods were used because they give an indication of the magnitude of the relationship as well as the significance. Second order correlations were used to compare both aptitude and motivation as valid predictors of GPA. The motivation measure correlated .39 with achievement and did not correlate with aptitude. The measure was reliable at the .76 level.

Both null hypotheses were rejected.

Factor Analysis

Factors were sought to aid in the interpretation of the valid and reliable inventory (28 of the original 200 items designated by form S). The principle axis method of factoring, the varimax method of rotation and unities in the diagonal of the matrix were used to analyze the item intercorrelations. The sum of squares of item loadings on a factor of 1.00 and an item loading of .40 on a factor were the minimum acceptable criteria for inclusion of an item or a factor in the interpretation. The factor analysis procedure was concluded by interpreting eight factors named as follows:

1. Long term academic involvement versus short term academic involvement.
2. Chance-taking versus no chance-taking.
3. Active experiencing versus passive experiencing.

4. Long term work challenge versus short term work challenge.

5. Abiding interests versus terminal interests.

6. Long term mental activity versus short term mental activity.

7. Maximum confidence versus minimum confidence.

8. Individuality versus anonymity.

Conclusions

The Farquhar bi-polar theory contained sufficient import to predict the achievement of students in an academic situation. The bi-polar theory was able to accomplish the predictions on the basis of non-intellectual variables independent of intellectual variables.

Factor analysis of the items stemming from the bi-polar theory indicated that the hypothesized three continuums were insufficient in terms of numbers and complexity to describe the valid and reliable instrument. The configurational methods revealed eight components functioning within the inventory which provided explication of the original bi-polar theory.

The hypothesized dimension of long term versus short term involvement proved to be the most fruitful. This dimension seems clearly supported. Further explication of this dimension was suggested in terms of (1) Academics, Factor I; (2) Work Challenge, Factor IV; (3) Rewards Interest, Factor V; and (4) Mental Activity, Factor VI.

The hypothesized dimension of competition with a maximum standard of excellence versus a minimal standard of excellence was supported. However, the factoring procedure indicated two factors: (1) Maximum

confidence versus minimum confidence, Factor VII; and (2) Individuality versus anonymity, Factor VIII.

The hypothesized dimension of unique versus common accomplishment remained unclear. Evidence in relation to this dimension was lacking; it may be that none of the items measured the dimension as it was hypothesized.

The "bootstraps" value of factor analysis suggested itself in the appearance of two unhypothesized factors. One of these factors, chance-taking versus no chance-taking, Factor II, constitutes a replication of the similar factor reported by Thorpe. Factor III, Active experiencing versus passive experiencing, was another unhypothesized factor.

Research Implications

Objective measures of motivation have been developed which are valid and feasible. The measuring has been accomplished with non-intellectual variables which stemmed from motivation theory. However, it was found that the bi-polar theory was insufficient to account for the total measure. In this regard, certain recommendations are offered:

1. New items ought to be developed in an attempt to ascertain more definitely the factors revealed in this study.
2. The motivation of people should be studied as transactional with other criteria in differing situations.
3. Differing age groups and cultural groups should be explored in search of the structure of motivation.
4. Research pertaining to motivation theory should be planned which includes the eight factors revealed in this study.
5. The impact of motivation and aptitude upon achievement might be

conceived of as dynamic and as predictable by differential equations following the isolation of factors.

6. Interrelated methods of arranging test responses and subjects should be explored with the various techniques of factor analysis.
7. Multiple predictive studies based on discriminant functions within motivation theory in companion with factor analytic techniques are indicated.

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The Generalized Situational Choice Inventory was reproduced in the following appendix and throughout this dissertation with the permission of Dr. William W. Farquhar.

Appendix

THE GENERALIZED SITUATIONAL CHOICE INVENTORY

This is a survey of your choices. There are no right or wrong answers. The results will in no way affect your grades in school.

The inventory is made up of pairs of statements. Read each pair carefully. Choose the one you would most prefer or like to do.

Answer all questions as honestly and frankly as you can. Only in this way will the results be meaningful. Remember this inventory is about you and you alone. This is not a survey of what you can do, but of what you would like to do.

Do not Write On This Booklet. You will be given an answer sheet and a special pencil to mark your answers with. Mark between the two small lines under the letter of your choice.

EXAMPLE:

Which would you prefer to do?

1. a.) Go to a party, or
   b.) Read a book

Answer Sheet

1.) A B C D E
*// // // // //
Ignore

This person marked under the letter "A" on the answer sheet which means that he would prefer to go to a party to reading a book. Ignore columns "C", "D", "E".

If you have any questions, raise your hand. If not, turn to the next page and answer all the questions. Do Not Skip Any Questions! Work as rapidly as you can and do not spend too much time on any one item.

Remember this is not a survey of what you can do but of what you would prefer to do.

PLEASE DO NOT WRITE ON THIS BOOKLET

I would prefer to:

1. a.) Find out why a piece of machinery won't work, or
   b.) Put together a piece of machinery

2. a.) Avoid failing in school, or
   b.) Do well in school

3. a.) Use my free time to watch television, or
   b.) Give up my free time to learn something

4. a.) Have no outstanding abilities, but be liked by others, or
   b.) Be able to do things well, even though others didn't like me for it

5. a.) Successfully complete a group project, or
   b.) Successfully complete a project by myself

I would prefer to:

6. a.) Make my own plans, or
   b.) Follow someone else's plans

7. a.) Be praised at home, or
   b.) Be praised at school

8. a.) Face danger with a group, or
   b.) Face danger alone

9. a.) Be quick, but often incorrect, or
   b.) Be slow, but often correct

10. a.) Find out how well I did on a school test right away, or
    b.) Find out how well I did on a test later, if at all

I would prefer to:

11. a.) Be thought of as being clever in dealing with people, or
    b.) Be thought of as being clever in working with ideas

12. a.) Work hard for what I get, or
    b.) Just get what I want

13. a.) Create something useful, or
    b.) Create a thing of beauty

14. a.) Be graded on how much the teacher thinks I have learned, or
    b.) Be graded on how much I think I have learned

15. a.) Work hard to satisfy my own curosity, or
    b.) Work hard to become famous

I would prefer to:

16. a.) Be alone, or
    b.) Be with people

17. a.) Make something I have planned myself, or
    b.) Make something planned by somebody else

18. a.) Be thought of as being intelligent, or
    b.) Be thought of as being practical

19. a.) Play all games or sports about average, or
    b.) Be exceptionally outstanding in one sport or game

20. a.) Accomplish a task slowly, but in an orderly manner, or
    b.) Accomplish a task in a hurry, but less carefully

I would prefer to:

21. a.) Receive a grade on the basis of how well I did on the teacher's test, or
    b.) Get a grade on the basis of how hard I tried

22. a.) Be known as someone who doesn't need others, or
    b.) Be known as someone who depends on others

23. a.) Solve an easy puzzle that I had difficulty with, or
    b.) Solve a puzzle that other people have difficulty with

24. a.) Work hard to be smart, or
    b.) Take it easy and become rich

25. a.) Be graded compared to the rest of the class, or
    b.) Be graded compared to a standard held by the teacher

I would prefer to:

26. a.) Be thought of as being a studious person, or
    b.) Be thought of as being a carefree person

27. a.) Receive one of several "A's" in class, or
    b.) Receive the highest test grade and get the only "A"

28. a.) Work with others, or
    b.) Work alone

29. a.) Have the best teachers in the state in my school, or
    b.) Have a large recreation center in my school

30. a.) Have a few expensive clothes, or
    b.) Have a lot of less expensive clothes

I would prefer to:

31. a.) Be the holder of one state record, or
    b.) Be the holder of several city records

32. a.) Write for a weekly newspaper, or
    b.) Write for a paper which has nation-wide distribution

33. a.) Go to an amusement park, or
    b.) Buy a book

34. a.) Buy a car, or
    b.) Continue my education

35. a.) Finish a very important job, or
    b.) Finish several less important jobs

I would prefer to:

36. a.) Be able to do difficult things better than other people, or
    b.) Be able to do difficult things just as well as other people

37. a.) Be well prepared for a job after graduation from high school, or
    b.) Be well prepared to continue learning

38. a.) Be known as a person who can solve problems better than anyone else, or
    b.) Be known as a person who can solve problems well

39. a.) Work on a difficult short puzzle, or
    b.) Work on a difficult long puzzle

40. a.) Be on a quiz program, or
    b.) Be on a give-a-way program

I would prefer to:

41. a.) Pass a usual classroom examination, or
b.) Pass a college entrance examination

42. a.) Draw a freehand picture which may or may not be good, or
b.) Trace an excellent picture drawn by someone else

43. a.) Wait and receive one large award, or
b.) Receive several small awards

44. a.) Have the teacher give everyone the same grade at the beginning of the term and know I had passed, or
b.) Take a chance on getting a higher or lower grade at the end of the course

45. a.) Develop a <u>new</u> product which may or may not be good, or
b.) Make a product as good as the best one available

I would prefer to:

46. a.) Receive a gift I could use right away, or
b.) Receive a gift I had to put together in order to use

47. a.) Be disliked but do well in the activities I undertake, or
b.) Be well liked but be relatively unsuccessful at most jobs

48. a.) Have friends that are a lot of fun,or
b.) Have friends that I learn something from

49. a.) Receive money for my good grades, or
b.) Be allowed to take any course I wanted because of good grades

50. a.) Be successful in finishing a job, or
b.) Finish a job

I would prefer to:

51. a.) Play a game against experts and lose but learn how to play better, or
    b.) Play a game against inexperienced players and win

52. a.) Get excellent grades because I have a great deal of ability, or
    b.) Get average grades because I have average ability

53. a.) Be graded at the end of a course with the possibility of making an "A", or
    b.) Get a "C" at the beginning of a course along with everyone else

54. a.) Be thought of as a person with usual ideas, or
    b.) Be thought of as a person with unusual ideas

55. a.) Get one of many "C's" in a course and learn something, or
    b.) Get the only "A" and not learn as much

I would prefer to:

56. a.) Make quick decisions and sometimes be right and sometimes wrong, or
    b.) Deliberate over decisions and usually be right

57. a.) Be known to my parents as an intelligent person, or
    b.) Be known to my parents as a practical person

58. a.) Be a person of leisure, or
    b.) Be a person of action

59. a.) Be allowed to take extra courses before or after school, or
    b.) Just take courses offered during the school day

60. a.) Complete a job which I recognize as difficult, or
    b.) Complete a job which other's recognize as difficult

I would prefer to:

61. a.) Receive money for good grades, or
b.) Have my picture in the paper for good grades.

62. a.) Receive grades which are like everyone elses', or
b.) Receive grades that please my parents

63. a.) Do as well as most of my classmates, or
b.) Do better than most of my classmates

64. a.) Catch many fish everytime I go fishing, or
b.) Catch the biggest fish of the day

65. a.) Study hard enough just to get by, or
b.) Study hard enough to do very well

I would prefer to:

66. a.) Be known to my acquaintances as a friend of everyone, or
b.) Be known to my friends as a self-confident person

67. a.) Be considered as being strong but not very smart, or
b.) Be considered as being weak but smart

68. a.) Have someone show me the solution to a problem, or
b.) Take a long time to figure out a problem for myself

69. a.) Be the designer of a new type of airplane, or
b.) Be one of the first persons to ride in a new type of airplane

70. a.) Be known as a person with much ability, or
b.) Be known as a person with adequate ability

I would prefer to:

71. a.) Work at many less important jobs which I know I could finish, or
b.) Work at one very important job which may never be entirely finished in my life-time

72. a.) Work for a commission, or
b.) Work on a straight salary

73. a.) Be paid for how well I did a job, or
b.) Be paid the same amount no matter how I did the job

74. a.) Work rapidly just "skimming" along, or
b.) Work slowly with great thoroughness

75. a.) Start a model plane from scratch, or
b.) Assemble a model plane from a kit

I would prefer to:

76. a.) Make a little or no progress on a difficult job and have to get help from others, or
b.) Work slowly and complete a difficult job alone

77. a.) Do a less recognized but complete job, or
b.) Do a recognized but incomplete job

78. a.) Have a better Job than my father has, or
b.) Have a job like my father has

79. a.) Begin a task, or
b.) Complete a task

80. a.) Buy a thing of beauty, or
b.) Create something useful

I would prefer to:

81. a.) Have a great deal of money, or
b.) Be an expert in my favorite school subject

82. a.) Be criticized at school, or
b.) Be criticized at home

83. a.) Be paid for how <u>fast</u> I did a job, or
b.) Be paid for how <u>well</u> I did a job

84. a.) Have average ability and be liked by many people, or
b.) Have superior ability but not be liked by as many people

85. a.) Be a minor actor in a large theater production, or
b.) Play the lead in a small theater production

I would prefer to:

86. a.) Have everybody in the class get a "C" at the beginning of the course, or
b.) Be graded at the end of the course with the possibility of getting a higher or lower mark

87. a.) Read one long story, or
b.) Read a book of short stories

88. a.) Receive a grade on the basis of how much my teacher thinks I have learned, or
b.) Take a course from an instructor who only gives "C's"

89. a.) Go down in history as a person who settled a country already discovered, or
b.) Go down in history as the discoverer of a new country

90. a.) Be known as a person with unusually good ideas, or
b.) Be known as a person who goes along with the crowd

I would prefer to:

91. a.) Be known as a person who doesn't let problems worry me, or
b.) Be known as a person who can solve problems well

92. a.) Influence people, or
b.) Help people

93. a.) Be graded on how much effort I put forth, or
b.) Be graded on how much I have learned

94. a.) Be an able person, or
b.) Be wealthy

95. a.) Be thought of as being shrewd, or
b.) Be thought of as being intelligent

I would prefer to:

96. a.) Be paid for the amount of work I did, or
b.) Be paid by the hour

97. a.) Be comfortable and get what I want now, or
b.) Be uncomfortable and get what I want in the future

98. a.) Make decisions, or
b.) Follow directions

99. a.) Work with a group on an ordinary project which other groups in the class are working on, or
b.) Work by myself on a different project

100. a.) Have my classmates know how I did on a test, or
b.) Be the only person who knows how I did on a test

I would prefer to:

101. a.) Work hard in everything I do, or
b.) Work at things as they come along

102. a.) Have a hard job which pays well, or
b.) Have an easier job which pays less

103. a.) Have a hard teacher who makes me work, or
b.) Have an easier teacher who makes class interesting

104. a.) Study my assignments during study hall, or
b.) Wait to study until the mood strikes me

105. a.) Wait to do an unpleasant task in hopes that I might not have to do it, or
b.) Do an unpleasant task and get it over with

I would prefer to:

106. a.) Consider all the possible outcomes when faced with a choice, or
b.) Make a decision and not worry about all the possible outcomes

107. a.) Be known for what I <u>could do</u>, or
b.) Be known for what I <u>do</u>.

108. a.) Win an argument with my friends, or
b.) Win a school sponsored debate contest

109. a.) See my name as author of the Book-of-the-Month, or
b.) Score the points that wins the game for my team

110. a.) Think of an idea that nobody has ever thought of, or
b.) Set a world's speed record

I would prefer to:

111. a.) Perform well in class, or
b.) Watch television

112. a.) Memorize someone else's poem, or
b.) Create a poem of my own

113. a.) Make many friends, or
b.) Complete a very difficult job

114. a.) Learn by defeating an inexperienced player, or
b.) Learn by defeating an expert

115. a.) Date a lot of different people, or
b.) Date one person steady

I would prefer to:

116. a.) Take a job in a new city, or
b.) Take a job in my home town

117. a.) Be thought of as being smart, or
b.) Be thought of as being practical

118 a.) Save enough money to buy something with cash, or
b.) Buy something on credit and pay for it as I use it

119 a.) Do what I think is right, or
b.) Do what others think is right

120. a.) Receive a grade on the basis of how well I did on my teacher's test, or
b.) Receive a grade on the basis of how I compared with my classmates

I would prefer to:

121. a.) Feel confident about dealing with people, or
b.) Feel confident about handling money

122. a.) Be known as a person who is able to do many things, or
b.) Be known as an expert

123. a.) Read, or
b.) Talk

124. a.) Investigate something, or
b.) Join a club

125. a.) Work overtime to make more money, or
b.) Get more schooling to make more money

I would prefer to:

126. a.) Take it easy and conserve my energy, or
b.) Put forth my best effort all the time

127. a.) Take an unknown short-cut through the woods, or
b.) Follow the route through the woods which is known but is longer

128. a.) Do things as other people would do them, or
b.) Do things better than other people

129. a.) Inherit a great deal of money, or
b.) Earn a great deal of money

130. a.) Watch my favorite television program, or
b.) Plan for a vacation to be taken next year

I would prefer to:

131. a.) Wait ten years and receive fame throughout the nation, or
b.) Receive fame in my community overnight

132. a.) Wait until I had finished college and make a better salary, or
b.) Get a job right after high school and make a good salary

133. a.) Prepare a familar food, or
b.) Prepare a new food

134. a.) Work on a not-so-important project which I may finish, or
b.) Work on an important project which I may never finish

135. a.) Play a game for the sake of playing it, or
b.) Play a game in order to win

I would prefer to:

136. a.) Plan my life in advance, or
b.) Live my life from day to day

137. a.) Have decisions made for me, or
b.) Make my own decisions

138. a.) Take a long vacation at the end of the year, or
b.) Take a short vacation once a month

139. a.) Accomplish a difficult task well, or
b.) Accomplish a difficult task fast

140. a.) Be graded on the basis of the effort I put forth, or
b.) Be graded on the basis of how well I got along with my classmates

I would prefer to:

141. a.) Study to go to college, or
b.) Study to get out of high school

142. a.) Work on a short-term project, or
b.) Work on a long-term project

143. a.) Be known as a good group member, or
b.) Be known as a leader

144. a.) Live a life of leisure, or
b.) Live a life of many new experiences

145. a.) Enjoy myself at a museum, or
b.) Enjoy myself at a night-club

I would prefer to:

146. a.) Find out right away how I did on a test, or
b.) <u>Wait</u> to find out how I did on a test

147. a.) Study, or
b.) Do things with my friends

148 a.) Make progress on a task, or
b.) Complete a task once begun

149. a.) Belong to a club, or
b.) Organize a club

150. a.) Make my own decisions, or
b.) Help others make their decisions

I would prefer to:

151. a.) Do my home work, or
b.) Watch my favorite television program

152. a.) Have a great deal of influence over people, or
b.) Have a great deal of ambition

153. a.) Be known as being patient in working with people, or
b.) Be known as being patient in working with ideas and objects

154. a.) Develop a new and better way to study, or
b.) Make many new and close friends

155. a.) Be thought of as having average intelligence and be wealthy, or
b.) Be thought of as being quite intelligent and be poor

I would prefer to:

156. a.) Work hard and become rich, or
b.) Take it easy and become smart

157. a.) Play a "tie" game with an expert, or
b.) Win a game from an inexperienced player

158. a.) Receive proper credit for accomplishments, or
b.) Be thought of by others as being "a lot of fun"

159. a.) Help my friends pass an examination and receive a "C" myself, or
b.) Study alone and receive an "A" on the examination

160. a.) Stand up for my rights, or
b.) Keep my thoughts to myself

I would prefer to:

161. a.) Carry out the plans of others, or
b.) Create something of my own

162. a.) Paint one very large picture, or
b.) Paint several small pictures

163. a.) Invent a new musical instrument, or
b.) Play a musical instrument already invented

164. a.) Be able to say I had successfully completed a task, or
b.) Be able to say I had attempted a difficult task

165. a.) Be known as a person who makes the classroom pleasant, or
b.) Be known as a person who knows what he's talking about

I would prefer to:

166. a.) Be criticized at home and praised at school, or
b.) Be criticized at school and praised at home

167. a.) Be known as being a "good guy" or a "good gal", or
b.) Be known as a person who "does things well"

168. a.) Be a big frog in a little pond, or
b.) Be a little frog in a big pond

169. a.) Do something which will cause your name to be in history books, or
b.) Become a well-known popular singer

170. a.) Be very happy, or
b.) Have lots of money

I would prefer to:

171. a.) Be known as a person who knows his own mind, or
b.) Be known as a person who gets help in making decisions

172. a.) Be thought of as being like everyone else, or
b.) Be thought of as being different

173. a.) Choose a familiar well liked food, or
b.) Try a new food in a restaurant

174. a.) Write a novel or play, or
b.) Read a novel or play

175. a.) Do something like everyone else, or
b.) Do something outstanding

I would prefer to:

176. a.) Have an instructor who gave an "A" and not care whether I learned anything or not, or
b.) Have an instructor who gave me a "C" but made sure I learned something

177. a.) Read an interesting story, or
b.) Take an examination to find out about myself

178. a.) Put together a new object, or
b.) Develop new ideas

179. a.) Be demanding on myself to do good work, or
b.) Be demanding on my friends so that they will do good work

180. a.) Accept what someone else says even though I don't agree, or
b.) Argue for what I believe to be right

I would prefer to:

181. a.) Receive the only "A" in a class, or
b.) Receive the same grade as most of the students in my classes

182. a.) Receive an "A" on a test in which I missed several questions, or
b.) Receive an "A" on a test and only miss one of the questions

183. a.) Study for an exam one night and know that I would receive an "A", or
b.) Go to a party on this night and take a chance on a lower grade

184. a.) Be graded on the basis of how much effort I put forth, or
b.) Be graded compared to my classmates

185. a.) Choose a friend because I could learn something from him or her, or
b.) Choose a friend because I could have fun doing things with him or her

I would prefer to:

186. a.) Be responsible to somebody, or
b.) Be given responsibility for doing something

187. a.) Date the smartest girl or boy in class, or
b.) Date the girl or boy who is the most fun

188. a.) Do something like everyone else does, or
b.) Do something which is different

189. a.) Do something that I have done before, or
b.) Do something that I never have done before

190. a.) Work hard enough to be outstanding, or
b.) Work hard enough to pass my courses

I would prefer to:

191. a.) Buy a set of encyclopedias for my children, or
b.) Buy a bicycle for my children

192. a.) Discover a gold mine, or
b.) Discover a new medicine

193. a.) Have one of my children win a beauty contest, or
b.) Have one of my children win a college scholarship

194. a.) Get some new clothes, or
b.) Get a years' subscription to the Book-of-the-month Club

195. a.) Have a few "fine" clothes, or
b.) Have many ordinary clothes

I would prefer to:

196. a.) Be the smartest person in the world, or
b.) Be the happiest person in the world

197. a.) Play a game, or
b.) Be the planner of a game to be played

198. a.) Be a boss, or
b.) Be a worker

199. a.) Be an employer, or
b.) Be an employee

200. a.) Learn by defeating an experienced player, or
b.) Learn by losing to an expert

Appendix A

Rounded Intercorrelation Matrix for Twenty-eight Significant Items of GSCI. (All males in one School, N = 180). Values are positive unless otherwise indicated and decimals are omitted.

Item No's	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	1																											
2	12	1																										
3	09	23	1																									
4	20	31	40	1																								
5	12	25	21	27	1																							
6	00	-05	11	10	-04	1																						
7	15	17	11	23	19	-13	1																					
8	07	05	03	02	00	-10	05	1																				
9	15	00	05	18	-08	09	-16	11	1																			
10	-04	-04	-02	-04	-04	07	01	-00	07	1																		
11	03	03	-06	08	07	05	-02	02	-02	-14	1																	
12	08	30	17	23	56	-01	20	-04	03	21	-06	1																
13	08	13	17	23	06	11	11	14	-12	13	-06	09	1															
14	05	13	15	01	08	-04	15	00	-06	-05	15	09	20	1														
15	-05	06	12	02	08	18	-04	06	07	07	-13	12	23	06	1													
16	14	25	12	18	20	00	18	13	-12	-14	10	25	23	12	19	1												
17	31	20	05	21	10	-01	02	03	09	07	-05	14	14	01	10	10	1											
18	13	31	31	35	10	10	13	04	07	05	-03	18	33	-00	18	29	18	1										
19	-13	11	11	11	04	01	05	15	-12	04	02	-05	24	03	11	27	-09	15	1									
20	08	01	17	10	16	-15	13	15	05	03	-14	17	10	01	12	-01	07	12	-01	1								
21	09	09	05	17	10	-01	08	49	03	04	02	07	11	-01	-02	17	08	20	13	10	1							
22	07	26	27	48	19	11	21	10	07	-01	-05	15	30	06	23	26	23	50	03	00	06	1						
23	-04	08	18	07	-02	05	05	02	00	17	07	08	19	11	05	11	-07	19	21	18	10	13	1					
24	09	01	11	04	26	04	22	05	02	17	-18	11	07	05	05	05	-04	13	18	32	02	01	25	1				
25	07	09	02	15	14	12	21	-06	01	06	12	-02	13	05	05	-04	17	05	04	05	09	16	-10	-05	1			
26	06	25	27	26	15	05	16	-05	07	-04	-02	17	23	15	10	21	14	36	-01	26	16	30	30	23	18	1		
27	02	-01	11	14	11	09	05	23	05	08	00	16	20	10	27	20	05	18	19	25	16	21	31	19	04	22	1	
28	01	18	-03	04	-00	-11	-08	08	-05	-05	-16	04	06	-04	-19	-10	05	01	00	01	12	12	02	-02	-04	09	-05	1

Unrotated 28 Item Loadings on 28 Factors With Each Factor's Sum of Squares. Subjects from One High School. (N = 180) Values are Positive Unless Indicated, Decimals are Omitted.

Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Items																												
1	26	-16	-04	-05	00	-12	-05	-08	03	-14	34	23	06	-15	-16	05	07	-45	22	27	-08	-15	-10	-02	-20	-11	-08	-27
2	49	-40	-05	12	07	-08	06	-08	-12	04	34	-16	13	25	21	19	01	-03	-05	-02	15	-11	30	25	04	-16	-03	10
3	50	-16	-04	01	00	01	11	00	-04	10	04	24	-18	12	11	-03	-31	-06	01	09	19	06	-33	17	39	29	14	-16
4	60	17	12	-04	-15	13	-22	-20	06	01	35	-27	-05	-04	02	10	-27	-12	04	-05	-17	12	-15	06	22	-08	07	05
5	46	12	16	-17	20	-45	06	03	-19	-03	22	13	00	-33	23	02	04	21	-14	23	-08	-02	-07	-01	10	-13	-04	15
6	09	-17	03	12	04	45	-01	14	-00	-06	-03	-24	-43	-16	01	-04	-06	01	04	45	07	-23	-02	-35	09	01	06	16
7	37	-20	05	-02	09	-34	09	-03	-24	03	10	-15	14	-11	-42	-26	-01	-23	11	-25	-10	21	12	-28	11	09	04	03
8	20	-18	11	-04	-14	16	13	12	36	-17	-25	-05	64	-17	04	08	12	02	-18	-02	-02	03	-00	-06	27	11	-11	-09
9	06	17	-00	-05	10	15	10	06	60	10	08	-04	-23	-15	19	-10	-19	-10	11	-11	-16	-13	40	14	21	08	-19	-13
10	08	-06	07	08	08	-08	-18	-05	22	-04	-31	11	-29	-07	-01	12	29	-31	-05	-28	07	-09	-07	06	04	18	-06	58
11	06	-16	-04	02	-01	27	-14	00	-20	04	29	03	21	-45	-03	-19	-35	07	-21	-11	-07	-22	-12	18	-25	10	-26	13
12	47	07	-16	06	-22	-44	09	07	-07	-08	13	-06	-12	-19	42	-13	22	08	18	-13	-00	-18	-06	-07	02	02	-04	20
13	50	13	-06	-10	05	27	20	-06	-10	11	-18	-18	01	19	-22	02	29	-06	05	09	-02	-02	-31	08	-04	-01	-45	06
14	22	11	02	14	-01	-16	-20	07	-27	-00	-09	04	-03	21	-25	-08	23	-03	-17	-15	-04	-50	05	03	36	-06	-06	-40
15	31	-23	03	-23	-05	27	-16	-19	-05	03	-24	08	-31	-19	15	-16	42	25	05	01	11	21	16	05	02	-04	-06	-24
16	49	12	07	-00	01	15	-09	16	-37	16	03	-00	27	-15	21	20	14	-14	18	-00	07	-05	16	-10	-28	29	05	-22
17	32	07	01	-02	00	02	06	07	35	04	37	-16	-07	03	-10	-17	40	-08	-30	06	03	-00	-07	24	-29	09	37	-05
18	64	10	14	29	-07	25	06	10	04	01	05	23	-04	17	08	-16	-10	-12	-05	-10	20	22	04	-11	-18	-24	-14	04
19	26	15	-06	03	05	24	-03	00	-34	-21	-38	01	28	00	02	-16	-03	-21	10	26	-11	13	19	40	08	01	13	22
20	33	-06	-02	14	08	-41	-20	24	30	-02	-30	-19	-01	-11	-15	02	-14	27	16	01	12	24	-15	23	-11	-03	10	-19
21	32	15	-14	-05	09	11	-11	-12	32	13	-11	04	57	-12	-02	-08	-01	07	01	00	36	-15	-02	23	15	-14	16	18
22	62	-01	-21	-10	09	28	-13	18	01	-10	21	11	-09	20	01	10	03	09	-17	-17	-31	24	01	24	03	00	01	02
23	35	-14	05	-37	-05	-00	03	18	-01	04	-52	-01	-08	18	03	-02	-30	-13	03	-19	-06	-31	-06	05	-20	-20	17	07
24	32	02	-09	00	-13	-43	-03	-06	04	16	-43	00	-13	-10	-08	05	-18	-21	-32	37	-05	14	23	-11	08	04	-10	05
25	21	01	00	-04	-14	10	06	14	00	08	26	18	-09	-18	-65	13	06	30	14	06	00	-04	19	17	11	-02	06	32
26	58	13	02	-06	02	-06	06	-22	05	-26	-02	-01	-13	20	-18	02	-29	27	-03	-05	22	-19	16	-08	-26	22	-04	-07
27	44	-07	00	31	04	12	13	-20	08	07	-44	06	01	-25	-00	07	03	23	03	-08	-41	-14	-09	-01	-13	-04	21	-12
28	64	-11	08	01	-03	-14	-13	-01	23	09	08	07	29	63	11	-16	04	24	13	26	-28	-07	01	-05	-08	16	-07	26
Sum of Squares	420	64	21	53	25	170	40	46	156	32	195	54	163	139	124	43	124	103	58	90	78	95	80	84	98	50	66	117