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DIMENSIONS OF TALENTED BEHAVIOR¹

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WHAT kinds of variables combine most effectively to explain and forecast talented behavior among adolescents in their junior and senior high school years? Are abilities relatively fixed or, as Ferguson (1954, 1956) suggests, do some of them transfer and produce different effects from one stage of learning to another and from one type of valued performance to another? To what extent can school people modify the educative process so as to foster and influence these changes? Which boys and girls respond to such opportunities? How are different kinds of abilities affected by variations in personality makeup and by pressures imposed by parents, age-mates, and significant elders in the community? Some answers to these and related questions, as well as to problems of method, are being sought in the Human Talent Project begun in 1957 with all boys and girls entering the seventh grades in the schools of four medium-sized Texas communities.

The focus of this first major report is upon the measurable dimen-

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sions of talented behavior among boys and girls in their junior high school years. First, a psychological model for research in human talent is proposed. The model leads to the generation of propositions and hypotheses to be tested. In essence, the general hypothesis being tested in this report is that variations in valued performances in the junior high school are a function not only of cognitive skills and attributes but also of elements of personality and motivation, as well as ways in which boys and girls are valued and have pressures imposed upon them by parents, age-mates, and teachers.

Methodologically, multiple regression and factor analytic techniques are combined in this study of the dimensions of talented behavior. The multiple regression approach provides a useful means of identifying classes of dimensional or predictor variables which account for a significant portion of the variance in several kinds of performance or criterion measures. Then factor analysis is employed to determine whether or not the dimensional variables do fit into classes in accord with the model and derived hypothesis. As a result, second-order variables are proposed, each with factor scores, for subsequent phases of the longitudinal project.

Model for Research in Human Talent

The term "talent" usually is employed to designate a specific ability or aptitude, either natural or acquired, or a capacity for achievement or success. In the school settings of the present research, "human talent" refers not only to various kinds of scholastic aptitude and academic achievement, measured by objective tests and evaluated by teachers, but also to personally significant and socially valued performances and competencies, including signs of creativity, which may be developed or acquired by learners. The antithesis is illustrated by limited educational attainment and socially unacceptable forms of behavior which tend to reduce the pool of talent in school and, later, in adult populations.

A model for conceiving and formulating tests of specific hypotheses about talented behavior, at a given time, may be represented by

$$B_a = f(P_a, E_{a,b}, R_{b,a}), S_a, C_{ab}$$

where the three elements in parentheses are influenced by the two not included, and

- B_a = the observed behavior of the person (a) or the performance or talent to be explained or predicted on the basis of some linear combination of variables and their interactions;
- P_a = the potentialities of the person, pertinent to the behavior, in terms of variables representing significant aspects of cognitive structure, perceptual strategies, psychomotor skills, deeper elements of personality, and other relevant attributes;
- $E_{a,b}$ = the kinds of motivation and other elements of personality which govern the person's expectations regarding the supportive or nonsupportive behavior of others (b), phrased in terms of pertinent attitudes or motivations such as "to attain success and approval" or "to avoid failure and disapproval" with reference to parents, age-mates, and teachers;
- $R_{b,a}$ = the pressures imposed upon the person by these cultural agents and the probable responses of the individual to them, or the selective reinforcements of some aspects of the person's behavior, phrased in terms of specified experimental conditions or pertinent assessments by others indicating acceptance or avoidance, or other valuations;
- S_a = sex-role identification and sex-typing of socialization pressures upon the person and his or her behavior;
- C_{ab} = a cultural context, or location, or an institutional framework and pattern of educational experiences, or a sample population and setting for a natural experiment in which the person studied and cultural agents participate.

Originally, the model stems from preceding studies of adolescent behavior through time in natural settings (McGuire, 1956; Peck, 1958). Nevertheless, the present formulation has been influenced by contemporary psychological theory and research. Certain aspects of the model fit with a dyadic representation of the processes of human learning and on-going action by Sears (1951) and, more recently, by Goethals (1958) for an educational setting. Many of the potentialities to be considered have been explored by Guilford (1956, 1957, 1959) in a series of papers on the structure of the intellect.

The model also provides for the possible existence of cognitive

control structures which may mediate between personal intensions and external objects and events. For example, Barron (1955) has shown that originality, the ability to make uncommon but adaptive responses, is related to independence of judgment and a preference for complexity as opposed to simplicity. In another instance, Adelson and Redmond (1958) have demonstrated variations in the efficiency with which verbal stimuli are apprehended among college women classified according to personality makeup. Although Atkinson (1957) is more concerned with immediate behavior, his account of the joint influence of motive, expectancy, and incentive upon selection among tasks and level of performance can be rephrased to explore long-term action. Finally, Haggard (1957) has found that children with high achievement in arithmetic, in reading, and in spelling and language differ from one another not only in cognitive and personality attributes but also in responses to the pressures of socialization. Not the least of these are the peer-imposed pressures included in the present model and represented among the variables selected for the research.

Description of the Variables

The variables considered in this first major report from the Human Talent Project have been selected from the 120 measures obtained during the first stage of the research. Hindsman and Duke (1960) have described the battery of data-gathering devices used from the seventh to the ninth grades as well as the objectives, procedures, and preliminary findings from the project. Decisions about the inclusion and exclusion of variables have been based upon a series of studies which they have summarized, with references, and further work more recently published (McBee & Duke, 1960; Phillips, Hindsman & Jennings, 1960; Phillips, King & McGuire, 1959; Pierce-Jones, Reid & King, 1959; Reid, King & Wickwire, 1959).

The first fourteen variables described below have been selected to measure the cognitive, perceptual, and psychomotor potentialities of each boy and girl in the seventh grade year. For convenience, each variable is identified with the name of the instrument employed and references are made to research where the tests have been used. The underlying ability or intellectual factor which, in part, may be measured by the variable also has been indicated.

The next fourteen variables have to do with the kinds of motivation and other elements of personality which govern expectations about oneself and others. Insofar as objective tests provide distributions of scores to represent attitudes and motives, they appeared to have the greatest promise as dimensional variables for junior high school students in the light of previous work. Nevertheless, variable 28 was discarded during the analyses and, later, variable 24 was adjudged to be inefficient.

Variables 29 to 35 reflect pressures imposed upon the boy or girl by parents and by age-mates. Among the seven, variable 29 added relatively little unique information and was discarded. The five sociometric variables, 31 to 35, were derived from a factor analysis of the 46 different kinds of nominations the subjects at each location directed toward one another. These factor scores for nomination variables, developed by two of the authors, are to be described in greater detail in another report from the project.

The remaining variables, 36 to 41, are measures of valued performances toward the end of the seventh grade year. Since this initial study of the dimensions of talented behavior is restricted to several kinds of educational achievement as criterion measures, other dependent variables, such as assessments of creativity (Reid, King & Wickwire, 1959), have been excluded for the present.

1. *CTMM Mental Function*. California Test of Mental Maturity, Junior High Level, Form S, 1957; seven subtests to measure spatial relationships, logical reasoning, numerical reasoning, and verbal concepts.
2. *STEP Listening*. Sequential Tests of Educational Progress, Cooperative Test Service, Forms 3A and 3B, 1957; comprehension of passages and questions read aloud; to measure *cognitive apprehension*, efficiency in apprehension of verbal stimuli (Adelson & Redmond, 1958).
3. *DAT Mechanical Reasoning*. Differential Aptitude Tests, Psychological Corporation, Form A, 1947; pictorially presented mechanical situations with simply worded questions; to measure an aspect of *general reasoning*, ability to formulate complex conceptions of many kinds (Guilford, *et al.*, 1956).
4. *Gestalt Transformation*. Indicates which of five objects has

a part that could be used in carrying out a stated operation; employed by Guilford and associates (Guilford, *et al.*, 1951; Wilson, *et al.*, 1954; Hertzka, *et al.*, 1954); to measure an aspect of *conceptual redefinition*, ability to shift the function of a part of an object and use it in a new way (Guilford, 1956, 1957, 1959; Wilson, 1958, pp. 108-126).

5. *Rhymes*. Write words that rhyme with given words; employed by Guilford and associates (1951); presumed to measure an aspect of *verbal facility* or word fluency, listing words satisfying a specified requirement (Guilford, 1959).
6. *Unusual Uses*. List different uses for common objects, employed by Guilford and associates (Guilford, *et al.*, 1951; Wilson, *et al.*, 1954); to measure an aspect of *spontaneous flexibility*, ability to shift from one class idea to another (Guilford, 1959; Wilson, 1958, pp. 108-126), and an element of *originality* (Barron, 1955; Wilson, Guilford & Christensen, 1953; Frick, *et al.*, 1959).
7. *Consequences*. List different consequences or possible results of changes in human or natural situations; employed by Guilford and associates (Guilford, *et al.*, 1951; Wilson, *et al.*, 1954); to measure an aspect of *conceptual foresight* (Guilford, 1959), ability to go beyond what is given and extrapolate outcomes, and an element of *originality* (Barron, 1955; Wilson, *et al.*, 1953; Frick, *et al.*, 1959).
8. *Common Situations*. List problems suggested by everyday situations; employed by Guilford and associates (Guilford, *et al.*, 1951; Wilson, *et al.*, 1954; Frick, *et al.*, 1959); to measure an aspect of *ideational fluency* (Guilford, 1959; Wilson, 1958, pp. 108-126), ability to call up as many ideas or responses as possible in a given time.
9. *Seeing Problems*. List five problems that might arise in connection with the structure, use, or operation of common objects; employed by Guilford and associates (1951); to measure an aspect of *sensitivity to problems* (Wilson, 1958; Wilson, *et al.*, 1954; Guilford, 1957), awareness that problems exist.
10. *Mutilated Words*. Identify words composed of partial letters; from a kit of selected reference tests, Educational Testing Service; to measure an aspect of *symbolic closure* or visual figural recognition (Guilford, 1957; Wilson, *et al.*, 1954).

11. *Gestalt Completion*. Identify objects with parts missing; from a kit of selected reference tests, Educational Testing Service; to measure an aspect of *perceptual closure* or visual figural recognition (Guilford, 1957; Wilson, *et al.*, 1954).
12. *Short Words*. Encircle groups of four consecutive letters that spell out a common English word embedded in rows of letters; from a kit of selected reference tests, Educational Testing Service; to measure *speed of perceptual closure*.
13. *Dotting*. Place three pencil dots in each of a series of small circles; Psychomotor Test II, used by special permission of the Air Research and Development Command, U.S.A.F., Lackland Air Force Base, Texas; to measure *psychomotor speed*.
14. *DRT*. Place a check mark in an appropriate space according to the position of a white circle in relation to a black circle in a preceding square; also from Psychomotor Test II; to measure *discrimination reaction time*.
15. *JPQ 1: Emotional Sensitivity vs. Toughness*. IPAT Junior Personality Quiz, 1952 (Cattell & Beloff, 1953; Cattell & Gruen, 1954); similar to tender vs. tough-minded factor among adults.
16. *JPQ 3: Neurotic, Fearful Emotionality vs. Stability or Ego Strength*. IPAT Junior Personality Quiz, 1952; combines the two factors recognized among adults as main elements in neuroticism.
17. *JPQ 6: Cyclothymia vs. Schizothymia*. IPAT Junior Personality Quiz, 1952; sociable, easy-going, warm-hearted contrasted with dislike of groups, some rigidity, and seriousness.
18. *JPQ 8: Socialized Morale vs. Dislike of Education*. IPAT Junior Personality Quiz, 1952; acceptance of school and cultural standards contrasted with dislike of learning and negative reaction to authority.
19. *JPQ 9: Independent Dominance*. IPAT Junior Personality Quiz, 1952; subjects with high scores represent themselves as being dominant, competitive, unrestrained, with some difficulty in communication.
20. *JPQ 11: Surgency vs. Desurgency*. IPAT Junior Personality Quiz, 1952; talkative, excitable, gay, and likes variety in contrast to being serious, quiet, and interested in detailed, exact undertakings.

21. *SSHA Scholastic Motivation*. Experimental form of the Brown-Holtzman Survey of Study Habits and Attitudes (Holtzman, Brown & Farquhar, 1954); items adapted for use with junior and senior high school populations; odd-even reliability .95, with Spearman-Brown correction, on 55 items keyed for boys and girls.
22. *CMAS Anxiety*. Experimental forms of the Casteneda-McCandless Anxiety Scale (Casteneda, McCandless & Palermo, 1956) adapted for use with adolescents; odd-even reliability .90, with Spearman-Brown correction, for 41 items.
23. *CYS Authoritarian Discipline*. Experimental form adapted from Texas Cooperative Youth Study (Moore & Holtzman, 1958); average item-test reliability .77 for nine items such as "Strict discipline develops a fine strong character."
24. *CYS Criticism of Youth*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .67 for six items such as "Teen-agers gossip too much about each other."
25. *CYS Criticism of Education*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .86 for 10 items such as "Most teachers are too rigid and narrow-minded."
26. *CYS Negative Orientation to Society*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .78 for eight items such as "When you get right down to it no one is going to care much what is going to happen to you."
27. *CYS Personal Maladjustment*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .90 for 21 items such as "Sometimes I feel things are not real."
28. *CYS Social Inadequacy*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .93 for 12 items such as "I don't feel sure how to act on dates."
29. *CYS Family Tension*. Experimental form adapted from Texas Cooperative Youth Study; average item-test reliability .93 for 20 items such as "Everyone in my family seems to be against me."
30. *ISS Family Status*. Index of Social Status derived from

weighted values (McGuire & White, 1955) for occupation, source of income, and education of the status parent as reported on an identification blank and checked with informants.

31. *N-1: Peer Acceptance*. Sociometric variable with a factor score (Fruchter, 1954, pp. 204-205) based upon stanine values of nominations for "party with" .74, "behavior model" .71, "work with" .64, "active approach" .63, "wheel" .61, and "independent orientation" .61, received from age-mates in the junior high school (McGuire, 1956; McGuire & Clark, 1952; Hindsman & Duke, 1960).
32. *N-2: Model Value*. Sociometric variable with a factor score based upon the *reversed* stanine values of nominations for "negative model for dress and behavior" —.71, "impulsive one" —.69, "not ask for help" —.69, "not party with," —.67, and "negative personal model" —.66, received from age-mates in the junior high school (McGuire, 1956; McGuire & Clark, 1952; Hindsman & Duke, 1960).
33. *N-3: Social Effectiveness*. Sociometric variable with a factor score based upon stanine values of nominations for "self confident" .79, "enjoys everything" .79, "does things on own" .78, "likes school" .78, "rationale altruistic" .73, and "conscientiousness" .67, received from age-mates in the junior high school (McGuire, 1956; McGuire & Clark, 1952; Hindsman & Duke, 1960; Peck, 1958).
34. *N-4: Nondeviant vs. Deviant Behavior*. Sociometric variable with a factor score based upon *reversed* stanine values of nominations for "dislikes school" —.77, "has to be told" —.77, "gets by" —.75, "desires peer approval" —.65, and "does what feels" —.60, received from age-mates in the junior high school (McGuire, 1956, McGuire & Clark, 1952; Hindsman & Duke, 1960).
35. *N-5: Quiet Dependency*. Sociometric variable with a factor score based upon stanine values of nominations for "quiet one" .56, "left out of things" .29, "adult oriented" .29, "wheel" —.30, and "wild one"—.30, received from age-mates in the junior high school (McGuire, 1956, McGuire & Clark, 1952; Hindsman & Duke, 1960).
36. *GPA Teacher Evaluation*. Grade point average derived from

teacher evaluations of performance in "content" subjects for the school year.

37. *CAT Reading*. California Achievement Tests, Junior High Level, Form W, 1957; two subtests, reading vocabulary and reading comprehension.
38. *CAT Language*. California Achievement Tests, Junior High Level, Form W, 1957; two subtests, mechanics of English and spelling.
39. *CAT Arithmetic*. California Achievement Tests, Junior High Level, Form W, 1957; two subtests, arithmetic reasoning and arithmetic fundamentals.
40. *STEP Social Studies*. Sequential Tests of Educational Progress, Cooperative Test Service, Forms 3A and 3B, 1957; ability to comprehend and draw conclusions about maps, charts, and other illustrative material as well as concise expositions about people and human affairs.
41. *STEP Science*. Sequential Tests of Educational Progress, Cooperative Test Service, Forms 3A and 3B, 1957; ability to comprehend and draw conclusions about realistic problems, unfamiliar experiments, tabular and graphic data of a scientific nature.

Procedures

All of the data for this report were gathered by a trained field staff during 1957 and 1958. As explained by Hindsman and Duke (1960), the battery of data-gathering devices was administered to all students in the seventh grades of four communities in Texas. Although more than 1500 students responded to the instruments at one time or another, distributions of scores for the 41 variables were available for only 1,242 subjects, 608 girls and 634 boys. The entries for sample population in Table 1 show the distribution by sex in the two Northeast Texas cities, Sherman and Corsicana, and the two Gulf Coast communities, Port Lavaca and Victoria.

To permit maximum use of the IBM 650 facilities at the University Computing Center, all distributions of scores were transformed to stanine values "1" to "9" with "5" as the mean value for the total population. Programs with built-in checks were written to carry out each step in the transformation and subsequent analyses. By these means a larger number of variables could be included in each set of operations with the data.

An iterative technique, developed by Greenberger and Ward (1956), was programmed for the multiple regression analyses. Their technique, which is a modification of the Kelly-Salisbury method, was adopted since the dimensional variables were so numerous. Iteration was carried out to that point in the program where the sums of squares of regressed values, R^2 , were not raised more than a specified criterion value of .0005 in the analysis. The stop criterion provided a solution which avoided overfitting the regression line. This solution was regarded as one which would have minimum shrinkage upon application of the regression weights to subsequent samples.

In the factor analyses of the dimensional variables, centroid factors were extracted (Fruchter, 1954, pp. 59-85) with the use of the IBM 650 computer. Then this same equipment was programmed for rotation of the factors to the orthogonal normal varimax solution developed by Kaiser (1958). The varimax criterion for analytic rotation was chosen since it had the likelihood of portraying factors invariant under changing samples of tests.

Multiple Regression Analyses

The multiple regression approach permits the determination of the relative strength of the relation between a dependent or criterion measure and a set of independent or predictor variables. Since all of the variables are expressed in stanine values rather than raw scores, the regression coefficients obtained in this research are directly comparable. By and large, in the tables to follow, beta weights of less than .08 indicate variables which contributed least to the regression line. In general, coefficients of .08 or greater serve to identify dimensional variables which add appreciable amounts to the regression variance for the several measures of educational achievement used as criteria of talented behavior in the junior high school.

Regression Analyses by Sex and Community

The first analyses to be considered are by community and sex role. Table 1 for regression of GPA Teacher Evaluations and Table 2 for CAT Arithmetic achievement serve to illustrate the results. To conserve space, the results for achievement in Reading, Language, Social Studies, and Science are not shown. As demonstrated in the two illustrations, each of the proposed dimensional variables has a

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beta weight which contributes to the regression on the criterion measures for boys or girls in one or more of the communities.

The eight regression analyses summarized in Table 1 would lead one to infer that a remarkably high proportion of the variance in

TABLE 1
*Regressions of GPA Teacher Evaluations for Grade VII upon
 Selected Dimensional Variables by Community and Sex Role
 (Decimal points omitted)*

Dimensional Variable*	Sherman		Corsicana		Pt. Lavaca		Victoria	
	M	F	M	F	M	F	M	F
Regression of GPAs, R^2	72	59	72	70	65	71	64	68
Multiple correlation, R	85	77	85	84	81	84	80	82
Sample population, N	161	157	94	112	113	98	266	241
1. CTMM Mental Function			19	10	35	10	18	13
3. DAT Mech. Reasoning			-06		04		-10	
4. Gestalt Transform'n	04		14	08	17	07	03	13
5. Rhymes	26	08	06	06	03	23	11	10
6. Unusual Uses			05	17	03	-25		09
7. Consequences			-15	-06	-13	-10	-03	05
8. Common Situations		-11	-03	-04	06	06	17	
9. Seeing Problems	08	13	17	16	11	18		15
10. Mutilated Words	-03	08	-06	15	04	12	10	09
11. Gestalt Completion	-11	-09	10	12			-06	03
12. Short Words	11	17	17	07	-06	-16	06	10
13. Dotting	-10	05	-10		04	16	07	-03
14. DRT	09			-04		16	07	-05
15. JPQ 1 Sensitivity			02	03	10	-08	-03	
16. JPQ 3 Emotionality	-11		-10		-10	06		-03
17. JPQ 6 Cyclothymia	04			03	-08	-06	-06	07
18. JPQ 8 Soc. Morale	-05		-08		14	-11		-02
19. JPQ 9 Dominance	10	-06	06	-06	15	-16		03
20. JPQ 11 Surgency		-10	07	-15	05	10		03
21. SSHA Schol. Motiv'n	10	23		12	14	26	20	12
22. CMAS Anxiety	-06		-19			-10	04	
23. CYS Authoritarian			11	-20	03	-13	-04	
24. CYS Critic. Youth	06	-09	13	11	-04			
25. CYS Critic. Education	-11		-07	03	07	-15	02	
26. CYS Neg. Orientation		07			-03		-07	
27. CYS Maladjustment		-09			-11	18		
30. ISS Family Status			12	-08	04	18	-04	-04
31. N-1 Peer Acceptance	29	23	06	09	24	39	28	23
32. N-2 Model Value	17	07	-08	07		16	19	07
33. N-3 Soc. Effectiveness	19	20	18	19	13	-04	20	14
34. N-4 Nondeviant	05	15	20	07	12		08	05
35. N-5 Quiet Dependency	09	-02	04		10		14	05

* Beta weights with zero values have been left blank.

GPA Teacher Evaluations for the seventh grade is accounted for by the selected dimensional variables. Multiple correlation coefficients range from .77 for girls in Sherman to .85 for boys in the same city and in Corsicana. But the pattern of variables selected

TABLE 2
Regressions of CAT Arithmetic Achievement in Grade VII upon Selected Dimensional Variables by Community and Sex Role (Decimal points omitted)

Dimensional Variable*	Sherman		Corsicana		Pt. Lavaca		Victoria	
	M	F	M	F	M	F	M	F
Regression variance, <i>R</i> ²	61	59	67	60	62	61	61	65
Multiple correlation, <i>R</i>	78	77	82	77	79	78	78	81
Sample population, <i>N</i>	161	157	94	112	113	98	266	241
1. CTMM Mental								
Function	21	22	36	15	40	17	21	19
3. DAT Mech. Reasoning	15	12	22	11	-03	03	08	09
4. Gestalt Transform'n	04	03	-14	10	13	17	10	06
5. Rhymes	04	16	25	17	-07	28	25	25
6. Unusual Uses			06	05		-15	-05	05
7. Consequences	04	14		-16	-17			08
8. Common Situations	06			13	13	-12	-04	-10
9. Seeing Problems	13	04	-03		14	15	04	10
10. Mutilated Words	05	11		32			05	07
11. Gestalt Completion		-09	08	-04	-07	13		
12. Short Words	11	03	28		14	03	13	11
13. Dotting			-19		-21			
14. DRT	09	-03	-04		09	21	11	07
15. JPQ 1 Sensitivity			-19	-13	04	15	-02	05
16. JPQ 3 Emotionality	-04		-12	-26	-04			
17. JPQ 6 Cyclothymia	12	03	-19	-05	-04	-03		02
18. JPQ 8 Soc. Morale	-13	-04	-02		13	10	-04	-02
19. JPQ 9 Dominance	03	-04	06	-05	05			
20. JPQ 11 Surgency		03	-05		-10	10	-03	06
21. SSHA Schol. Motiv'n	03	05	13	13	17		08	09
22. CMAS Anxiety	04	10	-09		06	-16	03	
23. CYS Authoritarian	06	02	14	-10	-09	-14		
24. CYS Critic. Youth		-03		-04		20	-07	
25. CYS Critic. Education	-13	-03	-10		19	-27		
26. CYS Neg. Orientation		-10		13	03	06	-03	
27. CYS Mala djustment		-14		08	-04		06	
30. ISS Family Status	-04		03		03	-17
31. N-1 Peer Acceptance	05		-09	04	20	07	15	12
32. N-2 Model Value	13		-19		07	23	12	03
33. N-3 Effectiveness	08	26	08	-13	10	-16	08	04
34. N-4 Nondeviant	03	15	39	10	03	03	11	13
35. N-5 Quist Dependency	07	-03	-04		-06	-06	09	06

* Beta weights with zero values have been left blank.

by the analytic procedure fluctuates from community to community and for boys and girls. For example, boys assigned the highest grades by teachers in Sherman can be identified largely in terms of three of the sociometric variables and what may be a measure of verbal facility or word fluency (Rhymes). For girls, nondeviancy replaces absence of negative model value in the nominations; among the other variables, scholastic motivation (SSHA) and speed of perceptual closure (Short Words) apparently are given heavier weights. In the remaining three communities, the cognitive variables more frequently have appreciable beta weights but the noncognitive ones still are well represented. Whatever is being measured by CTMM Mental Function appears to be more important for boys than for girls in the assignment of grades by the teachers in Corsicana, Port Lavaca, and Victoria.

Similarly, in Table 2, the test-based dimensional variables combine to account for a high proportion of the regression variance in an objective measure of educational achievement, CAT Arithmetic in this illustration. The multiple correlation coefficients are remarkably alike, ranging from .77 to .82 in the eight analyses. As one might expect, the cognitive variables more frequently have appreciable beta weights than in the preceding study of teacher evaluations. Nevertheless, the noncognitive self report and sociometric variables are well represented. Again, the pattern of variables selected by the analytic procedure varies from one community to another and for boys and girls.

Regression Analyses by Sex Role

At this point in the analysis of the data, two possibilities had to be considered. The first was that the sex-role identification and cultural context elements of the model were more important than the investigators had first postulated. If so, a unique combination of dimensional variables to explain and predict talented behavior would have to be worked out for males and females of each community. The alternative possibility followed from the other three classes of variables postulated in the model. In each analysis, potentialities, expectancies, and pressures of parents and peers were represented by variables with beta weights contributing to the regression variance. During the iterations, the analytic procedure could be picking up certain of the variables in a category and

TABLE 3

Regression of Measures of Educational Achievement and STEP Listening upon Selected Dimensional Variables for Grade VII Boys, N = 634
(Decimal points omitted)

Dimensional Variables*	Criterion Variables						
	36 GPA Year	37 CAT Read	38 CAT Lang	39 CAT Arith	40 STEP So. St.	41 STEP Science	2 STEP List
Regression variance, R^2	57	61	57	51	58	57	55
Multiple correlation, R	75	78	75	71	76	75	74
1. CTMM Mental Function	15	34	32	25	23	17	**
3. DAT Mech. Reasoning	-03	10	09	12	16	22	**
4. Gestalt Transform'n	08	14	06	08	14	20	21
5. Rhymes	10	20	19	13	13	07	**
6. Unusual Uses	04				08	08	18
7. Consequences	-04				03	08	10
8. Common Situation	10		-05	-04	-04	-05	-05
9. Seeing Problems	04	05	05	04	10	06	05
10. Mutilated Words	06		16	06			-07
11. Gestalt Completion	-05						18
12. Short Words		09	12	10	03	04	05
13. Dotting		-03		-04	-07	-05	
14. DRT	04		04	12	06		09
15. JPQ 1 Sensitivity		-03					
16. JPQ 3 Emotionality	-05			-06	-04	-03	-06
17. JPQ 6 Cyclothymia		03			03	03	03
18. JPQ 8 Soc. Morale							-09
19. JPQ 9 Dominance	05		03	04	03		
20. JPQ 11 Surgency		-03		-05		-06	
21. SSHA Schol. Motiv'n	15	12		04	11	11	14
22. CMAS Anxiety				03	06	04	09
23. CYS Authoritarian						-04	-13
25. CYS Critic. Education			-08				-05
26. CYS Neg. Orientation	-05		-04		-03		-09
27. CYS Maladjustment		03				02	
30. ISS Family Status		05			07	06	16
31. N-1 Peer Acceptance	25	03	03	09		06	-02
32. N-2 Model Value	13			07		02	
33. N-3 Effectiveness	21	05		04	09	09	12
34. N-4 Nondeviant	09	04	09	12	07	10	05
35. N-5 Quiet Dependency	08	04		03	03	08	-03

* Beta weights with zero values have been left blank.

** Variable omitted in the computation of beta weights on IBM 650.

rejecting others closely associated. The variables picked by the procedure could vary from one analysis to another. An examination of the printouts from the computer and of the tables led to the hypothesis that such was the case. The remaining regression studies and factor analyses were carried out with these two possibilities in mind.

Tables 3 (for boys) and 4 (for girls) summarize the regressions of six measures of educational achievement at the end of the seventh grade upon each of 31 dimensional variables. In both tables, variable 24, CYS Criticism of Youth, has been omitted since no beta weights were obtained for it in the analyses. The seventh column in each table permits a multiple regression analysis of STEP Listening, the proposed measure of cognitive apprehension or efficiency in the apprehension of verbal stimuli.

When the data for the four locations are combined in Tables 3 and 4, comparisons may be made among the dimensional variables for boys and girls with reference to each of the six criterion measures. In general, the regression variances are appreciably lower than in the analyses by community and sex role. Nevertheless, the multiple correlation coefficients are larger than those usually obtained, ranging from .71 to .78 for boys and from .72 to .81 for girls.

Teacher evaluations (GPA) of both boys and girls in the seventh grades clearly are related to what has been termed peer acceptance and social effectiveness in the assessments by age-mates. Scholastic motivation, insofar as the SSHA measures the attribute, also is a factor in the assignment of final grades for school subjects. Differences appear in the beta weights attached to the cognitive variables with general intellectual qualities (CTMM) being valued for boys and more specific qualities, such as sensitivity to problems, for girls.

When the criterion is a standard achievement test, however, the cognitive dimensions appear to become more important than the noncognitive. Among both girls and boys, performances on CAT Reading appear to depend upon general level of mental function (CTMM), verbal facility (Rhymes), conceptual redefinition (Gestalt Transformation), and scholastic motivation (SSHA). Symbolic closure, measured by Mutilated Words, seems to be important for both sexes in CAT Language. Some differences in regression coefficients for CAT Arithmetic occur between boys and girls, but being

TABLE 4

Regression of Measures of Educational Achievement and STEP Listening upon Selected Dimensional Variables for Grade VII Girls, N = 608
(Decimal points omitted)

Dimensional Variables*	Criterion Variables						
	36 GPA Year	37 CAT Read	38 CAT Lang	39 CAT Arith	40 STEP So. St.	41 STEP Science	2 STEP List
Regression variance, R^2	56	65	60	52	65	60	56
Multiple correlation, R	75	81	77	72	81	77	75
1. CTMM Mental Function	05	30	23	20	27	16	**
3. DAT Mech. Reasoning		08	03	10	11	13	**
4. Gestalt Transform'n	11	10	04	07	12	16	19
5. Rhymes	13	17	23	23	19	11	**
6. Unusual Uses	07	06	06		05	12	20
7. Consequences		09	06	04		06	09
8. Common Situations	-05	-03	-08	-05	-04	-11	-04
9. Seeing Problems	16	03		03	07	11	13
10. Mutilated Words	12	08	17	13	03	03	-03
11. Gestalt Completion	-04				09		08
12. Short Words	03	03	11	08			05
13. Dotting			07		-03		-05
14. DRT		06		05	06	13	09
15. JPQ 1 Sensitivity					03	-02	
16. JPQ 3 Emotionality		-04		-03	-04	-05	-03
17. JPQ 6 Cyclothymia	05			04		06	03
18. JPQ 8 Soc. Morale			-03	-02	-07	-04	-06
19. JPQ 9 Dominance			-03	-09	-04		
20. JPQ 11 Surgency		05	06	06	03		03
21. SSHA Schol. Motiv'n	20	10	11	10	07	10	09
22. CMAS Anxiety		07	05		04	10	04
23. CYS Authoritarian	-06				-04	-06	-10
25. CYS Critic. Education		-03			-04	-06	-05
26. CYS Neg. Orientation		-09	-08		-07	-09	-11
27. CYS Maladjustment		02			05	04	
30. ISS Family Status		-05	04	-03	04	03	14
31. N-1 Peer Acceptance	24	03	08	09	05	11	05
32. N-2 Model Value	09	03	05	06	03	04	
33. N-3 Effectiveness	13	06	03		09	03	03
34. N-4 Nondeviant	07	05		12	07		05
35. N-5 Quiet Dependency	05		03	03	04	05	04

* Beta weights with zero values have been left blank.

** Variable omitted in the computation of beta weights by IBM 650.

a nondeviant in appraisals by one's peers has some importance for both sexes. The patterns for both males and females are reasonably alike for STEP Social Studies, but there apparently are some differences for performances on the STEP Science instrument. For example, successful boys tend to be motivated and nondeviant, whereas the girls have anxiety and peer acceptance associated with the measure of scholastic motivation and the cognitive attributes.

Tables 3 and 4 also show the regression of STEP Listening upon the dimensional variables with three of the multi-factor tests omitted in order to obtain a clearer picture of what is involved in cognitive apprehension. The two analyses, one for boys and the other for girls, would lead one to infer that students who have an efficient apprehension of verbal stimuli also are marked by the ability to shift the function of a part of an object and use it in a new way (Gestalt Transformation), a capacity to shift from one class of idea to another (Unusual Uses), experiences in the upper-middle or middle-class family background (ISS), and a non-authoritarian outlook (CYS). Boys who comprehend verbal material most successfully also have good perceptual closure (Gestalt Completion), high scholastic motivation (SSHA), and social effectiveness in terms of valuations by age-mates. Girls, on the other hand, seem to be sensitive to problems and positively oriented socially.

Regression Analysis for the Total Population

The last link in the chain of evidence to explore the contributions of and to validate the dimensional variables with reference to certain criterion measures of talented behavior in junior high school involves analyses for the total Grade VII population. Two illustrations have been chosen. In Table 5, STEP Listening replaces CTMM Mental Function which, in turn, is analyzed in the seventh column for its dimensional variables. In Table 6, the multi-factor cognitive variables, CTMM Mental Function, STEP Listening, DAT Mechanical Reasoning, and Rhymes, all have been omitted from the analyses. Rhymes, presumed to measure verbal facility or word fluency, has been included among the deleted variables since its actual factor content is as yet unknown. Table 6 thus permits an estimation of the reduction in regression variance accounted for by the dimensional variables when complex cognitive measures are left out.

In Table 5 for the total Grade VII population, the introduction

TABLE 5

Regressions of Measures of Educational Achievement and Mental Function upon Selected Dimensional Variables for Grade VII
 Population, $N = 1242$
 (Decimal points omitted)

Dimensional Variables*	Criterion Variables						
	36 GPA Year	37 CAT Read	38 CAT Lang	39 CAT Arith	40 STEP So. St.	41 STEP Science	1 CTMM IQ
Regression variance, R^2	56	61	56	49	64	63	48
Multiple correlation, R	75	78	75	70	80	80	69
2. STEP Listening	17	33	20	19	42	42	21
3. DAT Mech. Reasoning	-04	10	-05	10	12	16	17
4. Gestalt Transform'n	05	10	06	08	11	15	09
5. Rhymes	13	21	26	22	15	06	17
6. Unusual Uses	04				03	05	
7. Consequences			03			03	05
8. Common Situations			-07	-03	-02	-04	
9. Seeing Problems	08	04	05	03	06	05	
10. Mutilated Words	15	10	19	13	08	06	08
11. Gestalt Completion	-06			-03		-03	
12. Short Words		07	11	09			06
13. Dotting	03		04		-03	-04	
14. DRT				07	04	04	05
15. JPQ 1 Sensitivity			04		03		
16. JPQ 3 Emotionality	-04	02		-07	-04	-03	-04
17. JPQ 6 Cyclothymia						04	
18. JPQ 8 Soc. Morale							
19. JPQ 9 Dominance							03
20. JPQ 11 Surgency	03		07		02	-03	
21. SSHA Schol. Motiv'n	15	08	03	04	03	06	
22. CMAS Anxiety						04	
23. CYS Authoritarian			03				
25. CYS Critic. Education			-04			-03	
26. CYS Neg. Orientation	-03	-03	-07				
27. CYS Maladjustment		03			04	03	
30. ISS Family Status		-07			-06	-03	15
31. N-1 Peer Acceptance	23	03	04	10	06	07	
32. N-2 Model Value	11			07	04	03	03
33. N-3 Effectiveness	16	06	07		04	04	03
34. N-4 Nondeviant	07	04	07	12	06	05	02
35. N-5 Quiet Dependency	08	04	04	05	05	07	

* Beta weights with zero values have been left blank.

TABLE 6

Regressions of Teacher Evaluations and Grade VII Achievement Upon Selected Dimensional Variables for Grade VII Population, N = 1242 (Decimal points omitted)

Dimensional Variables	Criterion Variables					
	36 GPA Year	37 CAT Read	38 CAT Lang	39 CAT Arith	40 STEP So. St.	41 STEP Science
Regression variance, R^2	55	52	50	43	53	52
Multiple correlation, R	74	72	71	63	72	72
4. Gestalt Transform'n	13	23	13	15	22	26
6. Unusual Uses	08	13	12	13	18	17
7. Consequences		06	08	04	05	07
8. Common Situations		-04	-10	-05	-05	-10
9. Seeing Problems	12	10	11	08	14	14
10. Mutilated Words	15	10	24	16	05	03
11. Gestalt completion	-04	04			06	04
12. Short Words	05	14	17	13	10	06
13. Dotting			05		-05	-03
14. DRT		06	03	09	08	09
15. JPQ 1 Sensitivity	02					-04
16. JPQ 3 Emotionality	-04	-04		-06	-06	-04
17. JPQ 6 Cyclothymia		02		03	03	04
18. JPQ 8 Soc. Morale		-04		-04	-07	-05
19. JPQ 9 Dominance	03	02				
20. JPQ 11 Surgency	05		07			-05
21. SSHA Schol. Motiv'n	19	11	05	08	09	10
22. CMAS Anxiety		04	04		08	08
23. CYS Authoritarian	-02	-03		-03	-05	-06
25. CYS Critic. Education		-04	-07	-03	-05	-06
26. CYS Neg. Orientation	-06	-08	-09		-07	-05
27. CYS Maladjustment						
30. ISS Family Status		12	-08	-06	12	11
31. N-1 Peer Acceptance	25	04	07	10	05	05
32. N-2 Model Value	11			06	03	03
33. N-3 Effectiveness	18	07	06	03	07	09
34. N-4 Nondeviant	08	07	09	13	08	08
35. N-5 Quiet Dependency	08	03	06	04	04	06

* Beta weights with zero values have been left blank.

of STEP Listening and deletion of CTMM Mental Function has some interesting consequences. The new variable has relatively large beta weights for the tests in the same series, STEP Social Studies and STEP Science, with an accompanying increment in the regression variance. Efficiency in the apprehension of verbal stimuli, insofar as it is measured by STEP Listening, now can be regarded as a

factor contributing to GPA Teacher Evaluations along with symbolic closure (Mutilated Words), verbal facility or word fluency (Rhymes), scholastic motivation (SSHA), and the three nomination variables. With the foregoing exceptions, the two variables do not seem to make much difference in the six regression analyses.

In the last column of Table 5, CTMM Mental Function regresses, for the most part, on four variables. In terms of these variables, the general measure of intellectual performance depends largely upon cognitive apprehension (STEP), spatial orientation and reasoning (DAT), verbal facility or word fluency (Rhymes), and variations in culturally typed learning experiences (ISS).

When the multi-factor cognitive tests are deleted, as in Table 6, the regression variance attributable to the dimensional variables is reduced, but much less than one might expect. In general, the beta weights for Gestalt Transformation, Unusual Uses, Seeing Problems, Mutilated Words, and Short Words all become larger. These changes would seem to indicate that redefinition, flexibility, sensitivity to problems, and two aspects of closure are important elements of cognitive behavior. Variations in cultural background and socialization pressures, indexed by ISS Family Status, appear to play a part in reading, social studies, and science as measured by objective tests of achievement. On the other hand, the regression coefficients for the other noncognitive variables shift only to a very small degree.

Table 7 provides a convenient summary of multiple correlation coefficients obtained from the several regression analyses for each of the six criterion measures. Entries are taken not only from Tables 1 through 6 but also from the unreported tables which they serve to illustrate. The coefficients measure the degree of joint linear association among all of the variables, both criterion measures and dimensional variables, considered in the research. Corresponding values for R^2 would represent the regression variance, or degree to which the dimensional variables account for variation in the values of the six measures of talented behavior in the junior high school. Whichever way the entries are interpreted, the coefficients are highly significant and serve as one kind of evidence for the validity of the selected dimensional variables. In addition, the coefficients indicate that a small proportion of their predictive value is lost when data are combined for locations and for boys and girls. Finally, there is

TABLE 7
Multiple Correlation Coefficients for Criterion Measures
 (Decimal points omitted)

Regression Analysis*		Criterion Measures					
		36 GPA Year	37 CAT Read	38 CAT Lang	39 CAT Arith	40 STEP So. St.	41 STEP Science
Sherman	Males	85	82	81	78	80	79
	Females	77	84	82	77	84	77
Corsicana	Males	85	83	82	82	84	85
	Females	84	84	84	77	82	78
Port Lavaca	Males	81	81	75	79	79	77
	Females	84	83	81	78	85	81
Victoria	Males	80	81	81	78	79	79
	Females	82	85	83	81	86	85
All Males (<i>N</i> = 634)	A	75	78	75	71	76	75
	B	75	78	73	70	80	79
	C	74	71	68	66	71	71
All Females (<i>N</i> = 608)	A	75	81	77	72	81	77
	B	75	81	77	72	82	82
	C	74	75	73	67	76	75
Total Population (<i>N</i> = 1242)	A	74	78	75	69	77	73
	B	75	78	75	70	80	80
	C	74	72	71	63	72	72

* Each coefficient represents a separate regression analysis illustrated in the preceding tables. The three types of combined analyses are:

- A. CTMM Mental Function included, STEP Listening omitted;
- B. STEP Listening included, CTMM Mental Function omitted;
- C. Multi-factor cognitive tests omitted—CTMM Mental Function, STEP Listening, DAT Mechanical Reasoning, and Rhymes.

some loss of efficiency when multi-factor cognitive tests are removed from the set but there may be a corresponding gain in the specificity with which the cognitive factors can be identified.

Factor Analyses

The method of factor analysis has been chosen to determine whether or not the dimensional variables combine to form factors which correspond to the categories specified in the model for research in human talent. Three analyses have been carried out with 32

TABLE 8

*Orthogonal Factor Loadings and Communalities of 52
Dimensional Variables for Total Population, N = 1242
(Decimal points omitted)*

Variables	Factors							h ²
	I	II	III	IV	V	VI	VII	
1. CTMM Mental Function	.69	.12	.10	.02	-.03	-.08	-.17	.53
2. STEP Listening	.73	.19	.08	.03	.00	-.16	-.18	.64
3. DAT Mech. Reasoning	.59	-.01	.00	.36	-.06	-.01	-.06	.49
4. Gestalt Transform'n	.60	.06	.01	.12	-.03	.02	-.03	.38
5. Rhymes	.59	.11	.11	-.11	.00	-.08	-.34	.50
6. Unusual Uses	.57	.10	.06	.09	.00	.00	-.36	.48
7. Consequences	.29	.11	.07	.04	.03	.01	-.61	.48
8. Common Situations	.22	.09	.16	.00	-.01	-.05	-.60	.45
9. Seeing Problems	.38	.12	.07	-.05	-.04	-.08	-.61	.55
10. Mutilated Words	.35	.02	.22	-.34	-.17	-.06	-.32	.42
11. Gestalt Completion	.47	-.02	.13	-.07	-.15	-.14	-.25	.35
12. Short Words	.31	.04	.21	-.31	-.12	-.04	-.25	.32
13. Dotted	.29	.09	.24	-.17	-.20	-.04	-.16	.25
14. DRT	.41	.03	.21	-.04	-.14	-.06	-.10	.25
15. JPQ 1 Sensitivity	-.14	.17	-.10	-.56	-.05	.06	.04	.38
16. JPQ 3 Emotionality	-.12	-.60	-.14	-.15	-.06	.11	.11	.45
17. JPQ 6 Cyclothymia	.08	.39	.02	-.08	.01	.03	-.08	.18
18. JPQ 8 Soc. Morale	-.08	.66	-.07	-.31	-.07	.15	-.05	.57
19. JPQ 9 Dominance	.14	-.52	.00	.22	.08	.13	.05	.36
20. JPQ 11 Surgency	-.03	-.21	.10	-.19	.12	-.29	-.07	.20
21. SSHA Schol. Motiv'n	.24	.60	.11	.03	-.13	.06	-.07	.46
22. CMAS Anxiety	-.09	-.52	-.13	-.27	.06	.46	.03	.59
23. CYS Authoritarian	-.16	-.02	-.01	-.05	-.04	.46	.04	.25
25. CYS Critic. Education	-.16	-.51	-.04	.01	.00	.09	.02	.29
26. CYS Neg. Orientation	-.24	-.37	.03	.03	-.03	.49	-.01	.44
27. CYS Maladjustment	-.01	-.39	-.12	-.24	.24	.27	.06	.36
30. ISS Family Status	.45	.13	.08	-.01	.10	-.13	-.10	.26
31. N-1 Peer Acceptance	.24	.20	.72	-.05	.10	.02	-.09	.64
32. N-2 Model Value	.03	.12	-.07	-.01	-.63	.00	.01	.42
33. N-3 Effectiveness	.24	.19	.59	-.11	.17	-.05	-.09	.50
34. N-4 Nondeviant	.10	.06	-.06	-.06	-.59	.09	-.03	.37
35. N-5 Quiet Dependency	-.03	.07	-.45	-.15	.01	.05	.10	.24

* Centroid factors with varimax rotation to .95 by IBM 650.

dimensional variables retained throughout the multiple regression studies, one for boys, one for girls, and the third for the total population. Table 8 summarizes the orthogonal loadings for the seven factors extracted together with communalities of the variables for the total Grade VII population. Similar tables have been constructed for boys and for girls but, to conserve space, they are not shown. In

the three factor analyses, five factors remain relatively invariant with changes in the composition of the population, two are specific for boys, and two are specific for girls.

Identification of the Factors

The five factors found in the congruent factor space of the three analyses are presented in the order of their correspondence to the categories of variables postulated in the model. Each list has loadings for total population, boys, and girls. Then the factors specific to boys and to girls are identified. The dimensional variables are shown by number and name in the lists defining the factors. The highest loading for each variable is indicated by an asterisk.

Factor A. Cognitive Approach (CA)

Variable	Total	Boys	Girls
2. STEP Listening	.73*	.69*	.75*
1. CTMM Mental Function	.69*	.70*	.66*
4. Gestalt Transformation	.60*	.60*	.59*
3. DAT Mechanical Reasoning	.59*	.62*	.57*
5. Rhymes	.59*	.63*	.58*
6. Unusual Uses	.57*	.59*	.59*
11. Gestalt Completion	.47*	.35	.42*
30. ISS Family Status	.45*	.41*	.46*
14. DRT Discrimination Reaction	.41*	.25	.38
9. Seeing Problems	.38	.36	.36
10. Mutilated Words	.35*	.28	.27
12. Short Words	.31	.30	.23

Factor A (Cognitive Approach) clearly refers to the potentialities of the individual as postulated in the model. Each of the twelve variables defining the factor has a number of appreciable beta weights in the preceding regression analyses, the first six more frequently than the remainder. The set of abilities probably represented by the factor may be inferred from the descriptions of the variables. They are efficiency in the apprehension of verbal stimuli (STEP), recognition of spatial relationships (CTMM), several kinds of reasoning ability (CTMM, DAT), an ability to shift the function of a part of an object and use it in a new way (Gestalt Transformation) and to shift from one class idea to another (Unusual Uses), verbal facility or word fluency (Rhymes), speed and efficiency of closure upon objects and symbols, and discrimination reaction time. Sensitivity to problems seems to be associated to some

degree with these abilities and they, in turn, may depend in part upon variations in experiences and the socialization pressures of different family backgrounds (ISS).

Factor B. Divergent Thinking (DT)

Variable	Total	Boys	Girls
9. Seeing Problems	.61*	.62*	.59*
7. Consequences	.61*	.59*	.53*
8. Common Situations	.60*	.63*	.58*
6. Unusual Uses	.36	.37	.31
5. Rhymes	.34	.31	.38
10. Mutilated Words	.32	.40*	.39*

Factor B (Divergent Thinking) is defined by variables for which the tests have no one conclusion or answer. Responses are less goal-bound and subjects may go off in different directions, choosing their strategies according to different perceptions of the tasks posed by the instruments. The first three variables have their highest loadings for this factor and they probably represent an awareness that problems exist, an ability to go beyond what is given and extrapolate outcomes, and the capacity to call up a large number of ideas or responses in a given time. Some of the responses may be original in the sense of being uncommon, yet adaptive. Symbolic closure (Mutilated Words) seems to facilitate divergent thinking for both boys and girls. Two variables which have their highest loadings for Factor A, Unusual Uses and Rhymes, also have no required answers and are also represented in Factor B. Thus a second factor referring to the potentialities of the individual as postulated in the model can be identified as a result of the factor analyses.

Factor C. Socially Oriented Achievement Motivation (AM)

Variable	Total	Boys	Girls
18. JPQ 8: Socialized Morale vs. Dislike of Education	.66*	.72*	.58*
21. SSHA Scholastic Motivation	.60*	.55*	.56*
16. JPQ 3 Emotionality vs. Stability	-.60*	-.41	-.67
22. CMAS Anxiety	-.52*	-.26	-.70*
19. JPQ 9: Independent Dominance	-.52*	-.48*	-.53*
25. CYS Criticism of Education	-.51*	-.44*	-.51*
27. CYS Personal Maladjustment	-.39*		-.52*
17. JPQ 6: Cyclothymia vs. Schisothymia	.39*	.37*	.33*
28. CYS Negative Social Orientation	-.37		-.47*

Factor C (Socially Oriented Achievement Motivation) is made up of variables that portray the kinds of motivation and other elements of personality which govern an individual's expectations, as postulated in the model. The factor is defined positively by acceptance of school and cultural standards (JPQ 8) and by scholastic motivation (SSHA). In both boys and girls, these attributes are accompanied by stability or ego strength (JPQ 3), restraint (JPQ 9), relatively little criticism of education (CYS), and a tendency to be sociable (JPQ 6). In addition, girls high on this factor represent themselves as anxious (CMAS) and somewhat maladjusted (CYS), yet positively oriented to society (CYS). For this reason, Factor C eventually may have to be split into two factors, one for boys and one for girls.

Factor D. Peer Stimulus Value (SV)

Variable	Total	Boys	Girls
31. N-1 Peer Acceptance	.72*	.71*	.72*
33. N-3 Social Effectiveness	.59*	.64*	.58*
34. N-5: Quiet Dependency	-.45*	-.35*	-.46*

Factor D (Peer Stimulus Value) is defined by variables which indicate a positive response to pressures imposed by age-mates, as postulated in the model. In terms of descriptions of the nomination variables, persons high on the factor are active, accepted, self-confident, effective individuals who are regarded as models by their peers. They are not viewed as quiet ones who are often left out of activities and dependent upon adults.

Factor E. Age-Mate Avoidance (AA)

Variable	Total	Boys	Girls
32. N-2: Model Value	-.63*	-.62*	-.61*
34. N-4: Nondeviant vs. Deviant Behavior	-.59*	-.61*	-.57*

Factor E (Age-Mate Avoidance) also fits the model and the pair of variables represent negative valuations of the individual by age-mates. Lack of model value is associated with impulsivity and avoidance by peers. The deviant person is regarded by age-mates as one who dislikes school, has to be told what to do, gets by, and does

what he feels, yet depends upon peers for approval. Although factors D and E would appear to have a bipolar relationship, the three analyses show that they are independent of one another.

Factor F (Boys). Anxious Emotionality (AE)

Variable	Loading
22. CMAS Anxiety	.68*
27. CYS Personal Maladjustment	.57*
16. JPQ 3: Emotionality vs. Stability	.43*
15. JPQ 1: Sensitivity vs. Toughness	.33*

Factor F (Anxious Emotionality) is specific to boys and was the second factor extracted in the factor analysis for males. The names of the variables describe the factor rather well. In terms of the model, the factor combines elements of personality specific to boys.

Factor G (Boys). Anti-Social Wariness (AW)

Variable	Loading
26. CYS Negative Social Orientation	.51*
25. CYS Criticism of Education	.31
23. CYS Authoritarian Discipline	.30*
12. Short Words	.31*
10. Mutilated Words	.30

Factor G (Anti-Social Wariness) also is specific to boys but it was the seventh and last factor extracted for them. Two of the variables defining the factor have higher loadings on other factors. The extent to which the three attitudinal and two perceptual variables actually belong together is a matter to be tested. The factor seems to represent an interaction between two elements of the model specific to males in the population.

Factor H (Girls). Sensitive Dependency (SD)

Variable	Loading
15. JPQ 1: Sensitivity vs. Toughness	.45*
23. CYS Authoritarian Discipline	.43*
18. JPQ 8: Socialized Morale vs. Dislike of Education	.40
20. JPQ 11: Surgency vs. Desurgency	-.35*

Factor H (Sensitive Dependency) is specific to girls and was the fourth of the seven factors extracted in the analysis for females. The factors combine to describe a person who is sensitive and tender-minded (JPQ 1), amenable to the control of authority figures (CYS), acceptant of school and cultural standards (JPQ 8), serious, quiet, and concerned about detailed, exact undertakings (JPQ 11). In terms of the model, the factor represents elements of personality specific to females in the junior high school population.

Factor I (Girls). Perceptual-Motor Skills (PM)

Variable	Loading
11. Gestalt Completion	.39
13. Dotting	.31
14. DRT Discrimination Reaction	.28
26. CYS Negative Social Orientation	-.29

Factor I (Perceptual-Motor Skills) also is specific to girls but it was the last one extracted. None of the variables have their highest loadings on this factor. Further work would seem to be necessary to validate this factor.

Estimation of Factor Scores

The factor analyses lead to a hypothesis that the 24 dimensional variables identified in the preceding regression studies may be represented by a smaller number of factor variables. Nine have been proposed, five common to both sexes, two specific to boys, and two specific to girls. The assumption is that the interpreted factors are unities or variables by which individuals can be assessed just as meaningfully and more economically than by a fluctuating selection of tests for different locations. These fluctuations are most evident in the regressions upon criterion measures of talented behavior for boys and girls in different communities. The hypothesis is to be tested in a subsequent report after computation of sets of factor scores for each boy and girl in the total population. Meanwhile, the remaining task to be accomplished in this report is the estimation of regression weights for the derived factor variables.

Table 9 shows regression weights for each of the nine derived factor variables. Following the recommendations of Fruchter (1954, pp. 204-205) and Guilford (1954, pp. 524-526), the multiple re-

TABLE 9
Regression Weights for Derived Factor Variables
 (Decimal points omitted)

Dimensional Variables*	Common Factors					Boys		Girls	
	A	B	C	D	E	F	G	H	I
1. CTMM Mental Function	21*								
2. STEP Listening	28*								
3. DAT Mech. Reasoning	18*								
4. Gestalt Trans- form'n	19*								
5. Rhymes	11*	-02							
6. Unusual Uses	09*	01							
7. Consequences			32*						
8. Common Situations			27*						
9. Seeing Problems	-03	32*							
10. Mutilated Words	03	04					22*		
11. Gestalt Completion	09*								25*
12. Short Words	01						21*		
13. Dotting									16*
14. DRT	08*								11*
15. JPQ 1 Sensitivity						20*		33*	
16. JPQ 3 Emotionality			-19*			12*			
17. JPQ 6 Cyclothymia			11*						
18. JPQ 8 Soc. Morale			32*					26*	
19. JPQ 9 Dominance			-16*						
20. JPQ 11 Surgency								-15*	
21. SSHA Schol. Motiv'n			21*						
22. CMAS Anxiety			-13*			45*			
23. CYS Authoritarian							18*	34*	
25. CYS Critic. Educ'n			-16*				16*		
26. CYS Neg. Orientation							42*		-19*
27. CYS Maladjust- ment			-07			29*			
30. ISS Family Status	09*								
31. N-1 Peer Acceptance					50*				
32. N-2 Model Value					44*				
33. N-3 Effectiveness					25*				
34. N-4 Nondeviant					37				
35. N-5 Quiet Dependency					-23*				
Regression on factor, R^2	78	56	77	61	54	59	45	45	23
Multiple correlation, R	88	75	88	78	73	77	67	67	48

* Dimensional variable selected for estimation of factor score.

gression method has been used to obtain weighted combinations of the dimensional variables which most efficiently predict each factor. Each computation, carried out on the IBM 650, required an inter-correlation matrix for the designated dimensional variables with their loadings on the factor in the last row and column as validity coefficients. The solutions maximize the multiple correlations of the composite tests with the factors. In the table, the values for regression weights and other entries have been rounded to two decimal places.

The dimensional variables selected for the estimation of factor scores have been marked with an asterisk in Table 9. With a cutoff point at .08, each test is represented in only one of the composites for the five common factors. In terms of integral weights roughly proportional to the regression coefficients, factor variable A, *Cognitive Approach*, is defined by assigning a weight of three to scores for each individual on CTMM Mental Function, weights of two for STEP Listening, DAT Mechanical Reasoning, and Gestalt Transformation, and unitary weights for Rhymes, Unusual Uses, Gestalt Completion, DRT, and ISS Family Status. Factor variable B, *Divergent Thinking*, has equal weights for Consequences, Common Situations, and Seeing Problems. The test for sensitivity to problems apparently has only a negligible negative weight for the first factor. Factor variable C, *Socially Oriented Achievement Motivation*, can be estimated by assigning positive weights of three to Socialized Morale vs. Dislike of Education (JPQ 8), two to Scholastic Motivation (SSHA), and one for Cyclothymia vs. Schizothymia (JPQ 6), together with negative weights two for Neurotic Emotionality vs. Stability or Ego Strength (JPQ 3), Independent Dominance (JPQ 9), Criticism of Education (CYS) and one for Anxiety (CMAS). The result is the same distribution of factor scores as if the negative regression coefficients were reversed. Factor variable D, *Peer Stimulus Value*, is derived by allocating positive weights of five for Peer Acceptance (N-1) and three for Social Effectiveness (N-3) together with a negative weight of two for Quiet Dependency (N-5). The other sociometric factor variable E, *Age-Mate Avoidance*, would have equal weights for Model Value (N-2) and Non-deviant vs. Deviant Behavior (N-4).

Only four dimensional variables are used to estimate both a common factor and one of the composites for either boys or girls (tests

16, 18, 22, and 25). Factor variable F for boys, *Anxious Emotionality*, is defined by weights of four for Anxiety (CMAS), three for Personal Maladjustment (CYS), two for Emotional Sensitivity vs. Toughness (JPQ 1), and one for Neurotic Emotionality vs. Stability (JPQ 3). The other male factor variable G, *Anti-Social Wariness*, is derived by assigning a weight of four to each boy's score for Negative Social Orientation (CYS) together with two for each of Mutilated Words, Short Words, Authoritarian Discipline (CYS), and Criticism of Education (CYS). Factor variable H for girls, *Sensitive Dependency*, can be estimated by allocating positive weights of three to Authoritarian Discipline (CYS), Emotional Sensitivity vs. Toughness (JPQ 1), and Socialized Morale vs. Dislike of Education (JPQ 8), modified by a negative weight of two for Surgency vs. Desurgency (JPQ 11) which had a coefficient greater than .1500 before rounding. The last factor in Table 9 is of questionable value since the composite accounts for only 23 per cent of the regression variance and the multiple correlation of .48 is small compared with other entries. Tentatively, factor variable I for girls, *Perceptual-Motor Skills*, would have positive weights of two for Gestalt Completion and Dotting, unity for DRT, and a negative weight of two for Negative Social Orientation (CYS).

Discussion

This first major report from the Human Talent Project has been designed to make both substantive and methodological contributions to psychology and education. The methods of multiple regression and multiple factor analysis have been employed to complement one another and to demonstrate the value of the model for research in talented behavior. Before any test variable has been included in the factor analyses, the multivariate analyses show that the potential dimensional variable contributes to the regression variance for more than one criterion measure of talented behavior in the educational settings of the research. This step serves to identify a domain of dimensional variables which apparently belong together in a meaningful way. Then the method of factor analysis is used to translate the more numerous dimensional variables into a smaller number of factor variables for which factor scores can be estimated for each subject in the experimental population from a composite of test scores.

The factor variables derived as a result of the operations apparently fit the model for research in human talent. Two of them, *Cognitive Approach* and *Divergent Thinking*, clearly are underlying dimensions of the potentialities of an individual pertinent to talented behavior. One factor variable, *Socially Oriented Achievement Motivation*, apparently is a common element in a person's expectations regarding supportive or nonsupportive responses of self and others to one's actions. Boys and girls high on this variable represent themselves as being acceptant of school and cultural standards, motivated toward academic achievement, stable, somewhat restrained, positive toward teachers and people in general, and not overly anxious. Two factor variables, *Peer Stimulus Value* and *Age-Mate Avoidance*, represent essential affiliative and distance aspects of assessments boys and girls make of one another. The nomination variables apparently serve as estimates of the reciprocal expectations which adolescents have been shown to have about one another in an age-grade (McGuire, 1956; McGuire & Clark, 1952). Consequently, the valuations may be regarded as indices of each boy's and girl's responses to socialization pressures imposed directly by age-mates and, indirectly, by parents, teachers, and other adults.

The model provides for variations in talented behavior as a consequence of the sex-typing of socialization pressures as well as differences in institutional context and patterns of educational experiences. Tentatively, two factor variables have been identified specific to boys and two for girls. *Anxious Emotionality* for boys and *Sensitive Dependency* for girls clearly are sex-typed dimensions of behavior fitting into the second category of elements in the model. The remaining factor variables, *Anti-Social Wariness* for boys and *Perceptual-Motor Skills* for girls, represent interactions between cognitive and noncognitive variables. Eventually some tests may be found which load upon these factors, especially the one for girls. Then they may estimate more effectively certain aspects of the perceptual strategies which guide the interplay between a person's internal demands and external pressures upon the individual.

With regard to differences from one context to another, this report demonstrates them only for the predictive values of test-based dimensional variables on several criterion measures when the data are classified by sex and community. One hypothesis to be tested in the next report is that the factor variables are just as meaningful

and effective in predicting criterion measures as the fluctuating sets of test variables. The other is that variations from community to community are minimized when factor scores are used to represent dimensions of talented behavior in the junior high school boys and girls.

The multiple regression and multiple factor methods involve an assumption that the dimensional and factor variables identified in the research have a linear relationship to one another. On the one hand, the sizes of the multiple correlation coefficients and the clear separations of the factors provide persuasive arguments for this view. On the other hand, there may be a multiplicative as well as an additive relationship between certain pairs of variables, especially in predictions from the seventh to the ninth grades. For example, there may be an interaction between *Socially Oriented Achievement Motivation*, on the one hand, and *Anxious Emotionality* for boys or *Sensitive Dependency* for girls, on the other hand, when either teacher evaluations or performances on achievement tests are dependent measures. The work of Atkinson (1957) and his associates on achievement motivation in relation to the motive to avoid failure would lead one to test the possibility. This can be done by means of an analysis of variance design wherein boys and girls from each community are drawn to represent three levels of the factors hypothesized to interact and performances over three years on the criterion measures are compared. Similarly, potential interactions between *Cognitive Approach* and *Divergent Thinking*, and between pairs of cognitive and noncognitive factor variables have to be considered.

Moderator variables, developed by Saunders (1956), may be used to represent interactions between predictors along with independent variables. This can be done by adding stanine value for distributions of the products of pairs of interacting variables to the sets of stanine values of the independent factor variables at the beginning of the computations. Should variance analyses show that the interactions occur in some communities and not in others, or for one sex and not the other, the moderator effects can be exploited. In other words, the use of moderator variables may increase the possibility that the factor variables can be employed to describe the dimensions of human talent and to make predictions of future performances.

Concluding Remarks

The primary purpose of this research was to identify dimensions of talented behavior among boys and girls in their junior high school years. Although this task has been accomplished, further ones have been posed. Do the criterion measures of educational achievement for boys and girls in different communities regress upon the smaller set of factor variables more economically and meaningfully than on the fluctuating sets of dimensional variables shown in the report? Can the factor variables be used just as efficiently as selections of test scores in the differential prediction of talented behavior? To what extent are factor scores for each boy and girl of value in seeking answers to the foregoing and other questions asked at the beginning of this paper?

Thus the accomplishment of the first major analysis of data from the Human Talent Project gives direction to and makes possible succeeding reports. For the next step, factor scores on seven variables, five common and two specific, are being computed for each boy and girl in the total population. To do this, regression weights for factor variables A, B, and C are being recalculated using only the asterisked test variables. Then the predictive value of the new factor variables can be tested not only with the seventh grade criterion measures but also educational achievements in the eighth and ninth grades and other indices of talented behavior.

An alternative possibility also has to be considered. There is strong evidence in the regression analyses by sex and community that dimensions may be community bound as well as, in part, sex-typed. If so, the factor variables, although economical, may not be as efficient for differential prediction as the fluctuating combinations of test-based variables. Even the addition of moderator variables to represent known interactions may not be enough. These possibilities are being kept in mind in the subsequent analyses and predictions studies.

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