

## Research in Tests and Measurement

### A TREND REPORT

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#### INTRODUCTION

Earlier commentaries on tests and measurement in the field of education and educational psychology had reflected on studies reported up to 1983 (Menzel, 1956; Jalota, 1965; Harper, 1960; Krishnan, 1961; Mitra, 1961, 68, 72; Mitra and Kuldip Kumar, 1974, 79; Pareek, 1980; Kulkarni and Kuldip Kumar, 1986). This review updates these studies up to 1988. Parameters of tests and measurement are taken as sets of tasks or questions intended to elicit particular types of behaviour when presented under standardized conditions and to yield scores that will have desirable psychometric properties such as reliability and validity. Accordingly, standardized ability tests, diagnostic or evaluative devices, interest and other personality-related inventories, projective instruments, related clinical techniques and other kinds of personal history forms have been included. An attempt has been made to identify gaps in terms of selected aspects of a theoretical framework, the choice of methodology to ensure satisfactory evidence of reliability and validity of the data, together with the need for applying proper procedures and tools leading to adequate interpretation, synthesis and technical as well as non-technical dissemination of findings.

#### GENERAL METHODOLOGICAL CONSIDERATIONS

A simple count of available studies on tests and measurement in the field of education suggests that a little over 200 investigations have been reported. Decade-

wise distribution reveals that the upward trend during the fifties, the sixties and the seventies has started showing a downward trend during the eighties. Table 10.1 gives supporting evidence in this regard.

Methodologically, as reflected in the earlier trend report (1987), the majority of investigators have not devoted much thought to supporting their measurement operations with theoretical and empirical backing. Rarely has the distinction been made between fundamental and derived scores. For example, once a measure is constructed, seldom are questions such as the following considered: (1) Has an adequate procedure been followed to measure the particular property of a specified behaviour as conceptually defined? (2) What type of scale is derived from the data collected from the use of the test in question? (3) Does the score on the test reflect the intended property of the behaviour in question vertically as evident in predictive validity studies? (4) Are the scores insensitive to extraneous variables such as testing conditions and various known factors such as social desirability, acquiescence, verbosity, extremity, and so on? (5) Do subjects' responses on this test remain stable over time? (6) How free is the test from any reactive or interactive effect of testing, that is, what is the extent to which the testing is likely to modify the very behaviour in question in the course of measuring it? (7) Does the test show high concurrent and convergent discriminant validities? (8) Does it have fine calibration for making fine distinctions among individuals? (9) How far is it easy to administer, score and interpret? (10) Are the statistical techniques for data reduction and inference really appropriate? There are many other such questions representative of the problems involved in es-

Table 10.1  
DECADEWISE CLASSIFICATION

	Before 1951- 1950	1961- 60	1971- 70	1981- 80 onwards	NK	Row Total	Sub-cate- gory Total
A. <i>Intelligence</i>							91
(a) Verbal	0	11	18	22	10	61	
(b) Non-verbal	0	2	10	7	2	21	
(c) Performance	0	0	2	5	2	9	
B. <i>Social Intelligence</i>	0	1	0	3	0	4	4
C. <i>Creativity</i>	0	0	1	9	6	16	16
D. <i>Aptitude</i>							43
(a) Scholastic	0	0	9	9	4	22	
(b) Differential	0	0	5	3	0	8	
(c) Vocational	0	1	6	3	5	13	
E. <i>Personality</i>							42
(a) Multi-phasic	0	0	2	1	4	1	8
(b) Non-Multi-phasic	0	1	5	7	5	18	
(c) Adjustment	0	1	9	5	0	15	
(d) Value	0	0	0	1	0	1	
F. <i>Interest</i>	0	0	8	4	1	13	13
G. <i>Attitude</i>	0	0	0	4	1	1	6
<i>Total</i>	0	17	75	83	38	2	215

tablishing reliability, validity and scalability.

In personality assessment mostly American or British inventories have been used (such as Bell's Adjustment Inventory, the Kuder Preference Record, Guilford-Zimmerman Inventory, Strong Vocational Interest Blank, MMPI, Maudsley Personality Inventory), with or without minor modifications, and without taking the trouble to examine the non-equivalence of measurement due to cultural variations. In many instances

investigators have used the technique of internally consistent items whereby items are chosen essentially according to their relation to other items intended to measure the same characteristic. The evidence of validity in such cases should be sought only after the items have been chosen through item-validation but rarely has this been done. Application of the 'empirical technique' had not been attempted, wherein the items to be included in a measure are chosen primarily on the basis of their validity evidence for each item—especially according to whether responses to the questions are related to evidence or actual behaviour which is conceptually related to the behavioural disposition under study. Other inadequacies observed in personality measures include, (1) validation against other questionnaires or inventories from which, in turn, a large number of items were taken in the former, giving rise to spurious results; (2) indifference of investigators towards estimating the amount of faking and other types of falsification and distortions in responding to personality questionnaire items; (3) lack of concern to study how far people belonging to different regions differ with respect to the interpretations given to questions in personality inventories; (4) male and urban bias in studying personality characteristics; indifference towards interaction, effects of interpersonal and situational factors in personality assessment; (5) absence of studies on social desirability, response set, and other types of stylistic responding, such as favouring particular alternatives, differential guessing tendencies, choice of extreme responses, preference for middle categories; and (6) need to reduce the effect of observers' presence or other factors which might influence the very observation (measurement) made, that is the reactivity problem. Many such problems posed by questionnaires or interview techniques for personality assessment could be avoided by using unobtrusive measures.

Ability and aptitude tests form the largest group of studies reported under tests and measurement. Most of these are, however, adaptations of western batteries, including those of Binet, Weschler, and Progressive Matrices. Amongst the new intelligence and aptitude tests reported, rarely has a theoretical framework such as Guilford's SI model, or the facet design or a hierarchical model of abilities, guided test construction. The application of discriminant and convergent validations through the multi-trait multi-method matrix has been lacking in establishing the validity of ability tests. Preparation of local norms has often been taken to be stan-

standardization. Standardization of a test is seldom taken to include the structure of the test (apparatus), administration procedure and scoring, as well as meaningful interpretation of scores made uniform and precise on the basis of a study using a randomly drawn large sample. Even in estimating reliabilities, coefficients are not always clearly described. The question of estimating the relative magnitude of the effect of various sources of inconsistency in determining the observed score on a test had also not received attention.

In addition to many technical inadequacies reflected in developing different types of tests, we need to look into various requirements in making the tests usable by various socio-economic groups. We should determine the nature of scholastic achievement and other ability differences, including reading skills, that separate pupils in the rural area and slums from those belonging to well-to-do families. Identification of the causes underlying social class differences, in addition to the gross inequalities in life opportunities, may be the second step of investigation, once the nature of the differences have been identified. On the basis of a thorough item-analysis and cross-validation of these item-analysis results, it is possible to come out with a test of ability for children which will be more or less free from social class bias and urban bias. But this exercise calls for systematic planning.

### RECENT STUDIES

Studies reported in professional journals, submitted for doctoral degrees, or sponsored by educational and research institutions, after the publication of the Third Survey of Research in Education (1987), are covered here.

Group and individual measures of intelligence (or problem-solving) have been developed for target groups ranging from infancy to adolescence. Ghosh (1958) reported the adaptation of the Terman-Merrill scale for Bengali children of three to seven years drawn from Calcutta city. Nair (1984) worked on the construction and standardization of a battery of tests for measuring intelligence of children below six years. The study included motor, adaptive, language and personal behaviours of boys and girls of Bombay city. Kerkar (1981) developed a measure of problem-solving ability, based on Davis and Eells' scale for Gujarati children of grades III to VII drawn from Ahmedabad city. Rathore (1983) and Mishra (1985) made group measures of intelligence for

age groups 8 + to 12 + and 12 + to 15 + respectively for Oriya-speaking groups. Veerbhadraiah (1985) worked on an intelligence scale for Kannada pupils of age groups 10 + to 13 +, that is, for upper primary stage children.

These studies indicate growing interest amongst researchers to develop measures of intelligence in their respective regional languages. A test of basic abilities, including vocabulary, reading, language, work-study and problem solving, was attempted by Mishra (1981) in Hindi for secondary school students in Sitamarhi in Bihar.

Quite a few investigators worked on various aspects of creativity. Singh (1978) reported a test of scientific creativity for high school students. The battery of tests covered flexibility, novelty, observing minutely, imagination, analysing and transformation. The standardization sample of students was drawn from Delhi schools. Rao (1982) limited his scale to literacy creativity in Telugu for students of secondary schools, including boys as well as girls from rural and urban areas. Parasnia (1985) measured creativity in mathematics of tenth grade students of Marathi-medium schools in Pune. Tripathi (1987) included verbal and non-verbal measures to assess creativity of high school students in Orissa. The sub-tests were related to instances, problem-solving, possibilities, alternative uses, seeing defects, design formation, pattern measuring and line meaning.

Aptitude measures were related to the Mechanical Aptitude Test in Oriya by Swain (1986), the General Aptitude Test Battery by Roy (1982), a Test of Mechanical comprehension by Vaidya (1983).

Diagnostic tests for arithmetic, vocabulary for grades six to eight by Sinha (1971), reading achievement in Hindi for students of class eight by Trivedi (1984), achievement in general science for students of classes five to seven studying in Hindi-medium schools in Greater Bombay by Ansari (1984), are some of the subject-specific scales which have been reported during the eighties.

Measures of silent reading comprehension in Gujarati by Patel (1985), and in Marathi by Khanapurkar (1984) for school going children, have also appeared.

Investigators have also examined the effect of selected demographic variables on psychomotor performance. Sharma (1984) analysed the effect of variables of age, education and experience with performance on the tests of strength of grip, motor coordination, manual dexterity, perceptual motor coordination, and simple

and choice reaction time. Shah (1985) made a psychometric exploration to study the relationships between achievement in arithmetic and three psychological factors including intelligence, problems faced by children, and parent-child relationship. Reddy (1983) adapted the WISC and analysed the relationship of obtained scores on the scale with socio-economic-background-related variables. Puttabuddi (1983) made a comparative study of general intelligence, as measured by Cattell's Culture-Fare Test in relation to socio-economic status, caste affiliation and the sub-culture of ninth and tenth grade students in Karnataka.

Some studies have charted dimensions of behaviour like physical fitness. Yadav (1986) developed physical fitness norms for school children in Haryana. Nehra (1984) worked out athletic norms in field events for boys of Haryana. Monga (1984) developed a physical

fitness test battery for girl students of Delhi.

Amongst personality measures, the MMPI model was adapted by Jotwani (1980) for Gujarati-speaking college students and by Vaya (1985) for Gujarati-speaking people with a psychiatric condition. Other studies were related to adjustment by Prasad (1975), intolerance of ambiguity by Misra (1974), and Prasad (1985), emotional behaviour by Murthy (1976), neuroticism by Joshi (1983), level of aspiration by Varma (1983), academic achievement motivation by Khanapuri (1987) and Banerjee (1974), word-association by Patel (1985), adaptation of Cattell's Children's Personality Questionnaire for Gujarati children of ages 8 to 12 by Patel (1986), and construction of attitude scale and measurement of students' attitudes toward mathematics by Kolhe (1985).

**ABSTRACTS : 613—646**

- 613.** AMAL PRASAD, S.B., *Development and Standardization of a Test of Intolerance of Ambiguity*, Ph.D. Psy., Bhagalpur U., 1985

The main purpose of the study was to develop and standardize a test of intolerance of ambiguity suited in the Indian context.

Eight dimensions of intolerance of ambiguity (novelty cognitive, novelty affective, novelty avoidance, novelty aggressive, complexity cognitive, complexity affective, complexity avoidance and complexity aggressive) served as the basis for framing items. Items were prepared in statement forms in Hindi. The test was developed through experts' rating, pretesting, tryout and item-analysis. The final form of the Situational Test of Intolerance of Ambiguity (STIA) included 40 items (21 were positively and 19 were negatively worded).

The standardization sample included 920 (480 males and 440 females) undergraduate college students in Katihar district, drawn randomly from six colleges. Test-retest and split-half reliability, content, concurrent and construct validity, and separate percentile norms for males and females were determined. Effects of age, education and sex on intolerance of ambiguity were found out.

The major characteristics of the test were that STIA had fairly high reliability and validity. The norms were satisfactory. Male students of B.A. and of higher age scored higher on STIA than females, intermediate and younger students, respectively.

- 614.** BANERJEE, T., *Academic Motivation—Development of a Questionnaire*, The Bureau of Educational and Psychological Research, Govt. of West Bengal, Calcutta, 1974

The main aim was to develop a questionnaire for measuring academic motivation of pupils.

A questionnaire consisting of 80 items (self-rating type) was prepared to measure such dimensions as pupils' desire for school accomplishment, willingness to try, utility for competition, etc. The instrument was applied to 200 students of classes IX and X of the science and humanities streams. Out of these, 100 formed the highly motivated group with respect to academic work

and the remaining 100 formed the low motivated group. The groups were selected on the basis of teachers' ratings. An attempt was made to select both the groups from good, average and below average schools. The chi-square values discriminating the two groups for all the items with the corrected contingency coefficients were found out. In all 48 items were found to discriminate between the two groups with respect to academic motivation.

The study revealed substantial relationship between academic motivation and the different qualities as tapped by the items of the questionnaire.

- 615.** BANMALIDAS, *Construction and Standardization of a Scientific Aptitude Test in Oriya for the 10th Class Students of Orissa*, Ph.D. Edu., Kur. U., 1987

The major objective of the study was to construct and standardize a scientific aptitude test in the Oriya language for the class X students as a tool for use in schools of Orissa for selection and identification of scientific talent.

For the construction of the test, four components of scientific aptitude were selected, viz., general intelligence, reasoning ability, operational ability and scientific knowledge. For the purpose of measuring general intelligence the Cattell's Test of General Intelligence was adapted for Indian children. In order to measure reasoning ability, the test had two sections having 36 and 12 items respectively. Similarly the test of operational ability was divided into two sections having 22 and 18 items respectively. The scientific knowledge test had 92 items in total. The first try-out of the test was done on a sample of 200 tenth grade students. On the basis of the performance of sample students, item difficulty and item validity were computed.

The final form of the test battery had 215 items in total whereas the area of general intelligence had 35 items, reasoning ability 48 items, operational ability 40 and scientific knowledge had 92 items. The time required for all these components was 15, 25, 25 and 35 minutes respectively. The test-retest reliability was established for all the four components of the test battery. The reliability coefficients for the four components were 0.81, 0.91, 0.92 and 0.80 respectively. The validity of the test battery for making predictions was computed on the achievement scores of science and mathematics.

The four sub-tests correlated significantly with science and mathematics achievement scores and the correlation coefficient ranged from 0.29 to 0.81. The norms were established on a sample of 1450 students selected randomly from the 13 districts of Orissa. The norms were established on the basis of standard scores with a mean of 50 and SD of ten.

\*616. DAVE, B.G., *Adaptation of Cattell's Early School Personality Questionnaire for Gujarati Children of Ages 6 through 8*, Ph.D. Edu., Guj. U., 1988

The main objective of the study was to translate the Early School Personality Questionnaire (ESPQ) into Gujarati, adapt it to the socio-cultural environment of Gujarat and standardize it as a tool for measurement of personality of the children of ages 6 through 8.

Parts A<sub>1</sub> and A<sub>2</sub>, each consisting of 80 items of Form A of ESPQ were translated and refined by carrying out a try-out on ten testees individually. The modified Gujarati version was administered to 250 children studying in standards II to IV of three different schools selected from Surat (urban) and Bardoli (semi-urban). An item analysis was carried out by computing point biserial coefficient correlation of each item on 100 pupils selected randomly from the total lot. The minimum value of the coefficient of the selected item was 0.21. The standardization sample consisted of 2017 subjects (B = 1065 and G = 952) selected from ten primary schools of five different zones of Gujarat state by stratified cluster sampling method. Separate S-Stens norm tables were presented for three age groups, sex-wise as well area-wise. Reliability coefficients for 13 different factors were computed by test-retest method at one week's interval (0.29 to 0.67), at two weeks' interval (0.23 to 0.50). The temporal stability of the ESPQ was studied at about three months' interval (0.18 to 0.45). Reliability by method of rational equivalence was also studied (0.25 to 0.61). Validity of the ESPQ was estimated by point biserial correlation of each item as item validity. Out of 160 items, 152 items were significant at 0.1 level and only eight items at 0.5 level. The correlation of ESPQ with PQ factor-wise ranged from 0.31 to 0.52.

The major findings were : 1. There was a significant sex difference between the means on different factors. 2. There was a significant difference between the performance of urban and semi-urban subjects. 3. There was a

significant difference in means among different age groups.

617. EMMANUEL, S. J., *Adaptation of Cattell's Sixteen Personality Factor Questionnaire for the Gujarati Population*, Ph.D. Edu., Guj. U., 1986

The following hypotheses were examined: (1) On the adapted Gujarati version, there would not be any significant difference between the mean scores of different age groups. (2) There would not be any significant difference between the means of the subjects of urban areas and those of semi-urban areas. (3) There would not be any significant sex difference between the means of the different factors of the 16 PF Questionnaire.

Forms A and B of the 16 PF Questionnaire were translated and culturally modified by carrying out different try-outs. Item analysis was carried out on 100 cases randomly selected from a total of 235 by computing point-biserial coefficient correlation for each item. Out of 374 coefficients, 323 were significant at .01 level and remaining point-biserials at .05 level. The standardization sample consisted of 1890 subjects drawn from 12 higher secondary schools and 13 colleges scattered over ten different districts of Gujarat State, by stratified cluster sampling method. The data collected were factor analysed. Explore computer programme developed by Skinner was used for providing multivariate results like linear regression analysis, factor analysis solution (full rank and reduced rank), orthogonal and oblique rotation and canonical correlation, all in a single run. The S-Stens norm tables were prepared for A and B Forms factor-wise, for urban as well as semi-urban boys and girls separately for age groups 16 to 18 and 19 to 21. The reliability coefficients for 16 factors were computed by (i) test-retest method at one week's interval (0.45 to 0.81), (ii) parallel form method (0.26 to 0.67) and (iii) the method of rational equivalence (0.34 to 0.74). The validity of the 16 PF Questionnaire was estimated by (i) point-biserial correlation of each item as index of item validity, (ii) correlation with HSPQ, (iii) occupational profiles of nurses and C.P. Ed. trainees, and (iv) by factor analysis.

The major findings were : (1) The two groups—16 to 18 and 19 to 21 years—were significantly different from each other. (2) The means of subjects of urban and semi-urban areas were significantly different. (3) There was a significant sex-difference between the means of differ-

ent factors. (4) The results on Form A were significantly different from those on Form B.

618. GHOSH, S.E.R., *Measuring Intelligence of Bengalee Pupils of Infants' Schools*, Ph.D. Psy., Cal. U., 1958

The main aim was to measure intelligence of Bengalee children of infants' schools.

The Terman-Merrile Scale of Intelligence was adapted for the Bengalee children. The Bengali version of the scale was administered to 1006 subjects (701 girls and 305 boys) selected from the infants' sections of four secondary girls' schools in South Calcutta. Their ages on an average ranged from three to seven years. Teachers' estimates of the merit of their pupils from the respective schools were collected.

The study revealed: 1. The majority of the subjects were superior, and some very superior. 2. There was close affinity between the class report and the intelligence of a pupil. 3. The subjects possessed a fair degree of normal intelligence. 4. The distribution was slightly biased in the direction of superiority of occupational status. 5. The I.Q.s. showed a range of 104 (highest 169, lowest 65) and the mean and S.D. were 117.3 and 17.9, respectively. 6. The Binet-Simon type of Intelligence Scale could be accepted as a standard scale for measuring the intelligence of infants whose ages ranged from 3 to 8 years.

619. JOSHI, B.H., *Development of Neuroticism Scale in Gujarati*, Ph.D. Psy., Guj. U., 1983

The objective of the study was to develop a neuroticism scale in Gujarati to be used for normal as well as abnormal adolescents and adults.

The first try-out scale consisted of 251 items selected from 350 items drawn from the survey of existing literature, current psychological tests and discussion with experts. It was administered to a sample of 200 subjects belonging to various institutions and item analysis was carried out. Only 100 items were selected for the final form which consisted of ten different areas, namely, (i) inadequacy, (ii) egocentricity, (iii) overprotected emotional sensitivity, (iv) submissiveness, (v) depression, (vi) worry and guilt proneness, (vii) ergic tension, (viii) ego weakness, (ix) indecisiveness and rigidity, and (x) psychometric symptoms. The equivalent form was also

evolved having 35 new items and the remaining items taken from the first one but being arranged in a new order. The sex norms as well as subgroup norms in terms of stanine, T score and percentile rank were established on a sample of 1500 male and female students studying at various levels of education (higher secondary schools and colleges) in different institutions. Reliability of the scale was estimated by different methods: odd-even method (0.98, N=100), first half and second half ( $r=0.69$ , N=100), Rulon's formula (0.71, N=100), Flanagan's formula (0.96, N=100), Moiser's formula (0.97, N=100), test-retest method (0.83, N=40, one weak internal), equivalent forms A and B (0.95, N=55), Hoyt's formula (0.87, N=50) and K.R. formula (0.83, N=50). The internal validity was determined through the process adopted for item analysis and selection. Intercorrelations among the sub-scales were also calculated. The external validity was determined by correlating the scores with the scores of Eysenck n-scale (0.41), extraversion scale (0.42) and mental health analysis questionnaire (0.82, N=35). The technique of contrasted groups was also used to establish the validity of the scale. The differences between means of criminals and normals (N=37 in each), neurotics and normals (N=35 in each), group awaiting final disposition drawn from Vikas Gruh and Remand Home and normals were highly significant.

A neuroticism scale consisting of ten sub-scales each having ten items was developed and its reliability and validity were determined. Separate norm tables for the entire sample of the male and female groups, adolescents, post-adolescents and adult groups in stanine, percentile rank and normalized T scores were presented.

620. JOTWANI, J., *Adaptation Standardization of Minnesota Multiphasic Personality Inventory on Gujarati Speaking Population*, Ph.D. Psy., Guj. U., 1980

The main objective of the study was to adapt and standardize three M.M.P.I. scales, namely Depression, Hysteria and Schizophrenia, along with the useful validation scales L & F, for Gujarati speaking population.

In a pre-pilot study, the translated and adapted version of five sub-scales of M.M.P.I. was administered to 30 students drawn from two colleges of Ahmedabad city, individually. Nineteen items which were culturally loaded or involved socially tabooed concepts or were not understood by the majority of the students, were to-

tally deleted and the remaining 258 items were given to 370 boys and girls studying in six colleges in three streams in order to assess the internal consistency and the discriminating power of the items. The internal consistency was checked by point biserial correlation while the discriminating power was tested by phi-coefficient. On the basis of these, 185 items were selected for the final run. As 42 items were duplicate items, five sub-scales consisted of 227 items in all. (D scale, 54 items; Hys. scale, 50 items; Sch. scale, 62 items; L score, 12 items; F score, 49 items). The final try-out was carried out on a representative sample of 1490 subjects drawn from various colleges in Ahmedabad ( $M=792$  and  $F=98$ ). For all the five scales, the mean, standard deviation and other statistics were calculated separately for the males and the females and for each age group. In order to assess the validity of the scales as a diagnostic tool, the final form was administered to 150 psychiatric patients. The reliability by test-retest method (time interval of 90 days) was in the range from 0.76 to 0.83 ( $N=50$ ), split-half reliability was in the range 0.88-0.90, Standard errors of measurement ranged from 0.946 for L score to 2.15 for Hy. scale. Centile and T-score sex-norms were computed for the five scales. Profiles of three different clinical groups were also prepared and interpreted.

The data revealed significant differences between the mean score of males and females but no significant difference among the mean scores of the different age groups was found. Significant differences among the mean scores of clinical groups as well as between the clinically diagnosed group and normal group were found.

621. KESKAR, P.U., *Development of a Test of Problem-Solving Ability for Gujarati Children of Grades III to VII*, Ph.D. Psy., Guj. U., 1981

The study was an attempt to develop a group test of problem-solving ability similar to that of Davis and Eells for the age group of 7+ years to 11+ which would measure an individual's problem-solving ability in general, employing verbal and non-verbal material.

The pre-preliminary form consisting of 198 items, divided into seven categories was prepared with the help of three sources, viz., experts' opinion, literature (national and foreign) available and discussion with school teachers. Two preliminary try-outs were then carried out for item analysis as well as cluster analysis.

The final form consisting of 100 items was sub-divided into seven sub-tests of Spatial Relations, Similarities, Reasoning (non-verbal) The Best Way, Indispensable Part, Reasoning (verbal) and Numerical Ability. The final test was administered to 1010 pupils of primary schools selected from the city of Ahmedabad. An attempt was made to see that each of the cultures, viz., rural, semi-urban and urban, as well as each of the low, lower middle and upper middle socio-economic classes were proportionately represented in the standardization sample. Grade norms as well as age norms were presented.

Some of the characteristics of the test were: 1. Split-half reliability ( $N=100$ ) by Spearman-Brown formula, Flanagan's formula and Moiser formula was found to be the same, that is 0.97, while by Rulon's formula it was 0.75. 2. Test-retest reliability ( $N=77$ ) at the time interval of two and six weeks was found to be 0.72 and 0.62 respectively. 3. Reliability found by K.R. formula as well as Hoyt's formula (by analysis of variance) was exactly the same (0.96). 4. The test was validated against examination marks. Correlations of the test with Ashabdik Samuha Buddhi Mapan Kasoti (G. Shah), Samuh Buddhi Kasoti (C. Bhatt) and the Gujarati Adaptation of Stanford-Binet Test (N. Shukla) were 0.57 ( $N=52$ ), 0.55 ( $N=45$ ) and 0.83 ( $N=20$ ) respectively. 5. The differences between mean scores of different grades were found to be significant.

622. KULKARNI, B., *Identifying the Ability of Decision-making in Social Situations among Young Adolescents*, Ph.D. Psy., Poona U., 1987

The study was undertaken with a view to constructing a tool for measuring the decision-making ability and to determine the nature of decision-making ability.

In all, 57 multiple-choice type items representing the universe of behaviour related to home, school and entertainment areas were prepared. The items were drawn from social situations experienced by the children within the age group of 12 to 13½ years. Appropriate statistics were used at different stages while constructing the test and determining the nature of decision-making ability. The comparisons were made between boys and girls, three content areas and four different schools. It included the item-pass percentage, distractor strength and item-test correlation also. The Decision-Making Test was prepared in two parallel forms consisting of the items maintaining the homogeneity of the test.

Agreement between the teachers' rating and the performance on the Decision-Making Test was studied in case of extreme groups. The survey followed by the selection, adaptation, and modification of the available tools helped to locate the cognitive and non-cognitive variables that could be correlated with decision-making ability. In all 23 variables were correlated with eight scores on the Decision-Making Test. The correlation matrix of  $31 \times 31$  variables was obtained and was further factor-analysed.

The analysis revealed: 1. The decision-making ability, as measured by the Test of Decision-Making consisted of accurate perception of the problem, awareness of available information and making proper use of it, tendency to face the situation, selection of appropriate course of action, awareness of implications of various alternatives, and taking risk whenever required. 2. The test was different from Verbal Reasoning, though it correlated positively and significantly. 3. Intelligence was positively and significantly related to problem understanding though not significantly with the selection of correct action. 4. Decision-making ability was positively influenced by personality variables such as emotional stability, adventurousness and self-control, whereas it was negatively correlated with rigidity, assertiveness and worry. 5. No significant sex-difference was found regarding the decision-making ability of children. This pointed out that both boys and girls had equal potential for decision-making.

623. MISHRA, C., *To Construct and Develop the Test of Basic Abilities for Secondary School Students*, Ph.D. Psy., Bih. U., 1981

The main aim of the study was to construct and develop tests for measuring basic abilities for secondary school students.

In all, five tests of basic abilities, viz., vocabulary test, reading test, language test, work-study test and problem solving test were developed. Questions were formulated in Hindi. The sample was selected at random, which included 520 students of classes X and XI of five secondary schools in Sitamarhi. Three empirical methods were followed in developing the tests. Reliability and validity were found out for all the five tests. Norms were also determined.

The study revealed that the tests were sufficiently reliable and valid. Norms were also satisfactory.

The significant educational implication is that the developed tests of basic abilities can be utilized by the secondary schools in particular for measuring the basic abilities of students.

624. MISHRA, D.C., *Construction and Standardization of a Verbal Group Test of Intelligence in Oriya for the Age Group 12+ to 15+*, Ph.D. Edu., Utkal U., 1985

The objectives of the study were (i) to standardize two parallel forms of intelligence test, (ii) to ensure the highest possible test validity and adequate reliability, and (iii) to ensure better judgement in identifying intellectually advanced children using both forms of the test.

The item areas of the test were verbal analogy, verbal reasoning, vocabulary, general information, and numerical relations. The test was tried out on a sample of 1200 boys and girls of the target group. The final test was standardized on the sample of 2000 boys and girls chosen on a stratified random basis. Split-half, test-retest and other reliability coefficients were calculated. The inter-item correlation and factor analysis with varimax rotation were used for a study of validity of the test. Age norms, percentile norms and other norms were calculated.

The study resulted in developing a verbal group test of intelligence in two parallel forms. The test had five sub-test areas of 50 items and required 30 minutes for administration in the classroom situation using answer sheets. The reliability indices were split-half: 0.89 and 0.90, test-retest: 0.79, 0.81, 0.80, age-wise parallel form: 0.74, 0.77, 0.73, 0.78 and K.R. Reliability Form A: 0.84 to 0.84, Form B: 0.82 to 0.86, and whole 0.90 to 0.92. The concurrent validity with Raven's Standard Progressive Matrices were Form A: 0.73, Form B: 0.52 and whole: 0.55. The concurrent validity with Cattell's Culture-Fare Test Form Scale II was 0.63, 0.58 and 0.58 for forms A, B, and whole test respectively. The factors identified through factor analysis were general reasoning and verbal comprehension.

625. MISRA, V.S., *A Study of Essay Type Test Reliability with Some Suggestions for its Improvement*, Examination Research Unit, Gau. U., 1968

The main aim of the study was to analyse on aspect of

the examinations, viz., reliability, and suggest some ways of improving it.

The reliability of marks of English I Paper of the Pre-University Examination (1966) of Gauhati University was found out. This question paper was selected because it had been shown by some studies that essay type examinations were generally more reliable in language papers than in most other papers. A random sample of 191 cases was selected from the arts group of the Tezpur zone, which was approximately 6.4 per cent of the population. The content reliability was estimated by applying the analysis of variance method and split-half method. The total reliability of the question paper was also found out. The test reliability was estimated by applying Gulliksen's approach. The errors of measurement were computed.

The major findings were: 1. The standard error of measurement for the English I Paper was 6.6 marks out of 100. 2. The standard error of substitution for the English I Paper was 9.2 marks out of 100. 3. The coefficient of content reliability for the English I Paper was 0.83. 4. The coefficient of total reliability was 0.64.

626. MONGA, R., *Construction and Standardization of Physical Fitness Test Battery for Girl Students of Delhi 10+ to 14+ of Age*, Ph.D. Phy. Edu., Kur. U., 1984

The objectives of the study were (i) to construct a test battery to measure different elements of physical fitness of school girls, (ii) to standardize the test battery by determining its reliability and validity, and (iii) to establish norms for physical fitness of Delhi schoolgoing girls.

It was intended to develop a battery which could measure different elements of physical fitness like strength, agility, endurance power, and flexibility. Keeping in view these elements and the facilities available in the schools, five sub-tests were selected. These sub-tests measured different elements of physical fitness, viz., Six Pounds Shot Put that measured strength, Step-up that measured endurance, Standing Broad Jump that measured power, Halasana that measured flexibility and Side Stepping that measured speed and agility. The first try-out of this test battery was carried out on a sample of 1000 girls selected from different schools of Delhi. After some modification in the measuring and scoring procedures, these sub-tests were tried out on a sample of 5000 girls from different

schools of Delhi. The selection of schools was done on the basis of management, location, types of students and parental socio-economic status. The test-retest reliability of the five subjects was 0.81, 0.85, 0.86, 0.87 and 0.90 respectively. The test stability was also found by re-administering the sub-tests after a gap of ten days. For the purpose of validation, face validity, criterion-related validity and factorial validity were established for the test battery. Criterion validity was established by finding out the validity coefficient between the sub-tests and the criterion test. These ranged from 0.75 to 0.86 for all the five sub-tests. The factorial validity was established through factor analysing the scores on the sub-tests. Five factors emerged from factor analysis. On this basis, equal weightage was assigned to all the sub-tests at the time of assessing physical fitness.

Norms were established on a sample of 5000 girls belonging to different socio-economic groups, age-range and physical standards. Norms were developed through percentiles and t-scores. The test battery was found to be easily usable in schools as per the facilities and equipment available. These were found to be helpful to educationists for the harmonious development of personality of women.

627. NAIR, B.S., *Construction and Standardization of a Battery of Tests for Measuring Intelligence of Indian Children Between the Age Group Two Months and Six Years*, Ph.D. Edu., Bom. U., 1984

The major objective of the study was to construct and standardize a battery of tests for English speaking children of six years and below.

The study was applicable to all infants and children of six years and below, who were born and bred in big cities like Bombay and were very fluent in English. The children selected for this study were carefully chosen from different socio-economic strata and belonged to various castes and religious creeds. The method of simple random sampling was used for the selection of the sample. The study was conducted on 1084 children of whom 529 were girls and 555 were boys from 16 schools in the city of Bombay. The try-out tests were carefully administered to about 100 children in all with at least three to four of each age group. The final data were collected by means of (i) test-I consisting of four major fields of behaviour, namely, motor characteristics, adaptive behaviour, language and personal social behaviour, and meant for two- to thirty-month-olds and

(ii) test-II consisting of problems that involved discovery of relations and the education of correlates. These problems involved thinking and reasoning, viz., classification, mixed sentences, sentence completion, etc. The age norms, grade norms and validity of the tests were established. Percentile ranks, stanine scores, sigma scores, standard scores, T-scores, standard deviation, mean correlation coefficient and standard error were computed. The reliability of the tests was calculated by the split-half method using the Spearman-Brown Prophecy Formula, Rulon's Formula and K-R 21 Formula. The coefficients of reliability as calculated by the above formula ranged from 0.75 to 0.89.

The main findings of the study were: 1. On comparing the mean I.Q.s of girls and boys belonging to four different age groups, the mean I.Q. of the girls was slightly higher than that of the boys while in the remaining three, it was lower. The mean I.Q. of the total sample of girls was also slightly higher than that of the boys. 2. The mean I.Q. of children whose parents were well educated was higher than that of children whose parents were of low educational status. 3. The mean I.Q. of children whose parents belonged to the lowest income group was significantly lower than that of children whose parents had a better economic status. 4. It was noticed that children who were exposed to nursery schools were far quicker in responding to the tests and performed better too. 5. Almost all the children came from well-to-do homes as the poorer classes could not afford a nursery school training for their children.

628. NATARAJAN, V., *An Application of Item Response Theory to Aid Discrimination Function in Achievement Testing*, D. Litt., Poona U., 1984

The main objectives of the study were (i) to establish the inadequacy of the traditional item analysis procedures, (ii) to establish the inadequacy of number right scores in providing finer discrimination at higher levels of scores, (iii) to establish the new concept of scoring weight scores over number right scores, (iv) to establish the superiority of scoring weight scores over number right scores, (v) to formulate the concept of scoring weight on invariant item difficulty values yielded by Rasch and Lord models, (vi) to establish the superiority of scoring weight scores based on these invariant item difficulty values, and (vii) to prove the increasing levels of accuracy in the order number right scores, scoring weight scores (traditional), scoring weight scores (item re-

sponse theory), ability estimates of Rasch and ability estimates of Lord.

A 20-item test on 76 candidates was administered taking care to see that all the items in the test measured one ability, and the test was semi-dimensional. A comprehensive item analysis procedure was adopted to analyse statistically the whole test in terms of central tendencies, variability, reliability, etc. and item analysis to give item facility and item discrimination for all the items. After reviewing the basic Rasch model, a mathematical formulation was done for the estimation of item difficulty parameters and person ability parameters. The same procedure was computerized in the form of a programme written in fortran language, given with its listing, input and output. The output from this programme gave item difficulty values of the 20 items, and the ability parameters of 76 persons. A separate computer programme to calculate scoring weights, based on Rasch and Lord models, was derived. Correlations were worked out adopting both Pearson product moment correlation and the rank order correlation.

The following were the findings of the study: 1. Item facility or item difficulty was group dependent and for the same item it was not an invariant; item discrimination was also group dependent and not invariant; number right scores for a candidate did not take into consideration the varying levels of item difficulties of the different items of the test, and there was no finer discrimination at the higher levels of number right scores. 2. The matter of choosing the top ten out of 76 was meaningful since each one of the ten selected had a different scoring weight score. 3. The new concept of scoring weight score was superior to the traditional scoring weight score. 4. The scoring weight scores given by the Rasch model were superior to number right scores, and the scoring weight scores given by the Lord model were still more superior. 5. The scoring weight score by the Rasch model was more useful for finer discrimination among the higher ability groups. 6. The estimates of abilities of persons based on the Lord model were the most superior.

629. PARNIAN, S., *Standardization of Bender-Gestalt Test of Children*, Ph.D. Psy., Del. U., 1985

The main objective of the study was to standardize the Bender-Gestalt Test on Young Indian Children living in the region of Delhi and New Delhi. The following hypotheses were formulated in the study: (1) The perform-

ance of the boys and the girls would differ on the Bender-Gestalt Test. (2) The economic level of children would influence their performance on the Bender-Gestalt Test. (3) The performance of children on the Bender-Gestalt Test would improve with age.

A sample of 972 children of both sexes, equally distributed in six age groups (5 to 10 years), were randomly selected from three different types of schools to represent different economic levels from the north, central and south zones of Delhi. To analyse the effect of sex, economic level and age of children on their performance on the Bender-Gestalt Test, a  $2 \times 3 \times 6$  factorial design was followed, where sex varied in two ways (male, female), socio-economic status in three ways (high, middle and low) and age level in six ways (5-year old, 6-year old, 7-year old, 8-year old, 9-year old and 10-year old). The tool used in the study apart from the Bender-Gestalt Test, was the Kulshreshta Hindi Adaptation of the Stanford Binet Intelligence Test.

The study revealed: 1. The performance of the boys and girls averaged over the factors of economic level and age on the test was not found to be significantly different. 2. The performance of children belonging to high, low and middle economic levels on the test was not found to be significantly different. 3. The performance on the test improved as the age of the children increased. 4. The reliability of the Bender-Gestalt Test was found to be 0.97 and the test-retest reliability varied from 0.87 to 0.95 on different age groups. 5. The validity coefficients with intelligence test for all the six age groups were found to vary between 0.79 and 0.88 with an average correlation of 0.82.

630. PATEL, P.G., *Construction and Try-out of a Word Association Test*, Ph.D. Edu., Guj. U., 1985

The study had the specific objective of constructing a Word Association Test which would work as a projective tool. The main hypotheses in the study were: (1) The frequency of responses revealed the normality or abnormality of the respondents. (2) There were sex differences in responses. (3) The level of intelligence as well as verbal ability was a determinant of the speed and the nature of responses. (4) Verbal association between the stimulus and the response affected the speed of the response.

The commonly used 350 Gujarati words were selected and evaluated for their comprehensibility on 25 pupils of grade VIII. For pilot testing, 100 words were

selected and the test was administered to a class of 40 pupils of grade IX. The final run was carried out on 600 pupils of grades VIII to XI as group testing and 90 pupils of grades IX and X as individual testing. The other tools utilized in the study were: Desai-Bhatt Group Test of Intelligence (N=64), Urvashi Desai's Verbal Ability Test (N=69) and Bell Adjustment Inventory (N=40). The responses obtained through the Word Association Test were studied with three approaches—statistical approach, classification approach and reaction time approach.

The major findings were: 1. The frequency tables showing a large proportion of primary responses had less variety. 2. The rate of associative hierarchy of responses was also less. 3. The variety of responses was more in the girls' group than in the boys' group. 4. There were no sex differences in the frequency of responses. 5. The relationship between reaction time and IQ was negative. 6. Intelligence affected the verbal associations. 7. Correlation between reaction time and verbal ability was 0.08. 8. Verbal ability affected the verbal association of responses. 9. The creatives possessed high individuality and less commonness. 10. The frequent responses were statistically quicker than other responses, thus confirming Marbe's law. 11. Valuation type of responses took more reaction time and definition type of responses were quicker.

631. PATEL, R.S., *Adaptation of Cattell's Children Personality Questionnaire for Gujarati Children of Ages 8 through 12*, Ph.D. Edu., Guj. U., 1986

The main objective of the research study was to translate the Children Personality Questionnaire (CPQ) into Gujarati, adapt it to the socio-cultural environment of Gujarat, and to standardize it as a tool for measurement of personality of the children of age 8 through 12 years. The hypotheses for the study were: On the adapted Gujarati CPQ, (i) there would be no significant sex difference between the two means, (ii) there would be no significant difference between the means of the subjects living in urban areas and semi-urban areas, and (iii) there would be no significant difference among means of children of age group 8-12 years.

Forms A and B of CPQ were translated and refined by carrying out two try-outs. Item analysis was done by computing point-biserial coefficient correlation for each item. The standardization sample consisted of 2205 subjects (B=928 and G=1277) selected fr

primary schools and ten secondary schools of five different zones of Gujarat state by the stratified cluster sampling method. The data collected were factor-analysed. Explore computer programme developed by Skinner was used for providing multivariate results like linear regression analysis, factor analysis solution (full rank and reduced rank), orthogonal and oblique rotation and canonical correlation all in a single run. Separate Stens norm-tables were then prepared for A and B forms, urban and semi-urban boys, as well as urban and semi-urban girls. The reliability coefficients for 14 factors were computed by (i) test-retest method—at one week's interval (0.50 to 0.92), (ii) parallel form method (0.28 to 0.06), and (iii) the method of rational equivalence (0.21 to 0.73). The validity of the CPQ was estimated by (i) point-biserial correlation of each item with the total score as an item validity, (ii) correlation of CPQ with ESPQ (factor-wise) (0.31 to 0.52), (iii) correlation of CPQ with HSPQ (factor-wise) (0.28 to 0.58), and (iv) factor analysis.

The major findings were: 1. There was a significant sex difference between the means on different factors. 2. There was a significant difference between the performance of urban and semi-urban subjects. 3. There was a significant difference between the two forms A and B of CPQ.

**632. PRAKASH, A.,** *Isolation of Musical Ability by Factorial Methods*, Ph.D. Edu., Del. U., 1984

The objectives of the study were (i) to identify the components of musical ability on the basis of theoretical considerations and empirical data by the application of techniques of factorial analysis, (ii) to identify the components of musical aptitude on the basis of theoretical consideration and empirical data by the application of techniques of factorial analysis, (iii) to find out whether sex differences played any role in musical ability and in musical aptitude, and (iv) to find out whether formal musical instruction played any role in musical ability and in musical aptitude.

The sample of the study consisted of 540 children (340 girls and 200 boys) studying in class VII of five schools of Delhi. The following tools were used: (i) Musical Aptitude Tests, (ii) A Schedule for Measuring Interest and Aptitude towards Music, (iii) Cattell's Culture Fare Test of Intelligence, (iv) Cattell's Junior-Senior High School Personality Questionnaire, and (v) The Baqer Mehdi Verbal Test of Creative

Thinking. The analysis of data was made by using descriptive statistics for each of the five groups separately and factorial analysis.

The main findings of the study were: 1. The main components of musical ability had been identified as group factors of general musical ability, scholastic achievement, creativity, interest and attitude towards music and intelligence. 2. The following factors were obtained for the total group (N=540) through factor analysis: A broad group factor of general musical ability, scholastic achievement, creativity, responsiveness, emotionalism, self-confidence, reticence, surgent sensitivity, intelligence, discerning autonomy, timbre-rhythm discrimination and discipline. The first three factors among these constituted more than 50 per cent of the musical ability. 3. A broad (group) general factor of musical aptitude was found which was connected with the performance of specific musical tasks as discriminatory skills of pitch, duration, loudness, timbre, time (tempo and rhythm) and memory and appreciation skills. 4. In addition two more factors from these tasks, viz., tonal imagery, and musical appreciation were identified. 5. A basic difference had been observed in the composition of the factors of the girls' group and that of the boys' group, both in respect of musical ability and musical aptitude. 6. Formal instruction in music did not play an appreciable role in musical ability or musical aptitude.

**633. PRASAD, H.,** *Development of Adjustment Inventory for Teenagers*, Ph.D. Psy., Bhagalpur U., 1975

The main purpose of the study was to develop a test which could locate the problems of adjustment in teenagers in home, social, school, health, and emotional areas, and such factors which may be obstructing teenagers in accepting themselves for the sake of personal adjustment.

An adjustment inventory was developed. Item construction was followed by item analysis. Contents of items were also examined for social desirability. Finally, 279 items covering seven areas of adjustment (parental, home and family, social, school, health, emotional adjustment, and self acceptance) were selected. The standardization sample included 800 (650 males and 150 females) high school students, drawn from randomly selected rural and urban schools of Bihar. Test-retest and split-half reliability of the inventory were

determined. The inventory was validated against a criterion group of 45 remand home pupils. The sub-tests were also validated against personal data blank. Intercorrelations among sub-tests were calculated for 350 rural boys, 300 urban boys and 150 girl students. Percentile norms for each sub-test for both the sexes were established. Mean, medium, phi-correlation, chi-square, t-test, etc. were employed for data analysis.

The major findings were: 1. The inventory was highly reliable and valid. Norms were also satisfactory. 2. Intercorrelations indicated a positive direction in different areas of adjustment. 3. Boys and girls differed significantly on home and family adjustment. 4. The sub-tests were significantly related to a number of personal factors.

634. RASHID, M.I., *An Investigation into the Problems of Sampling in Educational Research Designs*, Ph.D. Edu., Bom. U., 1987

The objectives of the study were (i) to classify sampling studies problems research method-wise, (ii) to classify sampling methods applied in educational research designs research method-wise, (iii) to diagnose sampling studies problems in every sampling method applied in educational research, (iv) to find out sample size chosen in every sampling method applied in educational research, and (v) to relate sampling studies problems with sample size. Corresponding to these objectives, six research hypotheses were formulated. The research was limited to investigate Ph.D. theses in education in India during the period 1940-86.

The research method adopted was a statistical normative library method. Data were collected from primary and secondary sources. The study was undertaken in three phases. In the pre-pilot stage, 16 Ph.D. theses of the Bombay University Library formed the sample. In the pilot studies, 31 theses from the ICSSR Documentation Centre were studied. In the final phase, all Ph.D. theses completed in Indian universities during the period 1940 to 1986 formed the sample. The study focused on eight variables, viz., sampling method, sampling size, population size, sampling studies problems, sampling studies improvements, research method, research decade and educational field. Statistical methods such as percentages, averages, product-moment correlation were applied.

The major findings were: 1. The average number of problems per study was the highest in experimental

designs and lowest in factorial designs. 2. Sixty-three per cent of all sampling studies used purposive selection. The highest percentage of purposive selection was in case study designs and the lowest in factorial designs. 3. The average number of problems was higher in non-probabilistic sampling studies than in probabilistic studies. 4. Average sample size in a probabilistic sampling study was 1564 while it was 1097 in a non-probabilistic study. As sample size increased, the percentage of probabilistic sampling studies increased. 5. The average number of problems per study decreased as sample size increased. 6. Sampling studies of non-probabilistic selection used smaller sample size, less number of improvements and larger number of problems per study in comparison with those of probabilistic selection. 7. As one moved from 1940 to 1986, the studies had a decreasing size of sample. 8. The largest sample size was used in factorial designs while the smallest was in case study designs.

635. RATHOR, J.M., *Construction and Standardization of a Group Test of Intelligence (verbal and non-verbal) in Oriya for the Children of Age Group 8+ to 12+*, Ph.D. Edu., Utkal U., 1983

The purpose of the study was to construct and standardize a group test of intelligence in Oriya for the children of age group 8+ to 12+ and to compare the intelligence of tribal and non-tribal students of Orissa. The hypotheses of the study were: (1) Average intelligence of a higher age group is higher than that of lower age group subjects. (2) Intelligence is related to academic achievement in science and mathematics. (3) Sub-tests of intelligence test are intercorrelated and can be interpreted in terms of a few factors.

The verbal form of the test contained seven parts, namely, general information, arithmetic problems, logical reasoning, verbal comprehension, numerical series, verbal relations and vocabulary. The non-verbal form included seven components like similarities, figure analogies, seeing the opposites, classification, progressive series, story sequences and matrices. There were 255 items in the verbal test and 162 items in the non-verbal test. The sample for try-out consisted of 150 pupils from each class (IV to VIII) selected from rural and urban areas of Orissa state. After item analysis 85 items were included in the verbal test and 64 items in the non-verbal test. For standardization purposes, 2500 students studying in classes IV to VIII of Orissa state were taken.

1. The split-half reliability of the test varied from 0.84 to 0.94 in the verbal test and 0.78 to 0.83 in the non-verbal test for different age groups. 2. The KR-21 reliability coefficients ranged from 0.80 to 0.91 for the verbal test and from 0.79 to 0.85 for the non-verbal test. 3. The test-retest reliability coefficient over one month of time varied from 0.78 to 0.88 for different age group students. 4. The validity coefficients of the test against Cattell's CFIS-2 Form A, ranged from 0.50 to 0.75 and 0.63 to 0.76 for the verbal and the non-verbal tests respectively. 5. With Raven's Coloured Progressive Matrices, the validity coefficient varied from 0.64 to 0.71 and 0.61 to 0.70 for verbal and non-verbal tests respectively. 6. The intercorrelation coefficient between verbal and non-verbal coefficient varied from 0.79 to 0.86 for different groups of subjects. 7. The factors identified for the verbal test scores were a general factor, numerical ability, verbal ability and verbal reasoning. 8. The factors for the non-verbal test were a general factor, perceptual reasoning ability, and perceptual comprehension ability. 9. The tribal and non-tribal students were equal in intelligence. 10. The boys were more intelligent than the girls. 11. There was no significant difference between intelligence level of urban and rural students.

636. ROY, A., *A Study of the General Aptitude Test Battery (GATB) in Respect of its Parts and Aptitudes, and Job Performance of Clerical and Supervisory Technical Personnel in Textile Industry*, Ph.D. Psy., Guj. U., 1982

The purpose of the study was to find out whether some of the GATB parts could be clustered into one, and if so, would they reveal information more or less similar in nature, thus saving time for test-administration for textile personnel involved in clerical and technical job categories. It was also to examine whether future job performance scores could be obtained directly from the raw test scores of these parts that might emerge from the elementary linkage analysis.

The investigation was carried out in three textile mills of Ahmedabad, on 230 clerical and 170 supervisory technical personnel. Two short performance standard inventories, each having ten items, were developed after piloting them for clerical and technical personnel. They were handed to the department heads to evaluate the performance of their subordinates selected in the sample. The first seven paper-pencil tests

out of 12, of GATB were selected and administered to the same sample. Means and SDs of all the scores were computed separately for two groups across the different demographic variables—departments, length of service, level of education and occupation. ANOVA and t-test were applied to test the significance of differences in means. Mcquitty's Elementary Linkage Analysis was applied to the intercorrelations to examine whether a few tests could be substituted by a single one.

The main findings were: 1. In the clerical group, (i) there were no significant differences among the mean scores across departments, (ii) personnel with length of service up to 25 years showed significantly higher mean scores than those having length of service from 26 to 35 years, (iii) on some parts of GATB, the graduates scored significantly higher than matriculates, while the latter scored higher than non-matriculates. 2. In the supervisory technical group, (i) personnel mean scores than those of the spinning, weaving, finishing and engineering departments, (ii) the mean scores of the personnel having up to 15 years' service were significantly higher than those having service from 16 to 30 years, (iii) graduates scored significantly higher than diploma-holders, and the latter, higher than certificate holders or persons having practical experience. 3. Elementary linkage analysis reflected that the seven GATB parts could be shortened to three parts only viz., name comparison, three-dimensional space and arithmetic reasoning. 4. Multiple correlations between the job performance scores and scores on the three parts were also highly significant.

The findings appeared to be encouraging to the extent that the seven GATB parts could be shortened to three parts only, thereby reducing the time for test-administration. This would also motivate managerial staff in the industries to go in for more psychological testing for purposes of personnel selection.

637. SANTOSH KUMARI, *An Investigation into Facet-Factorial Approach to Measure Writing Ability*, Ph.D. Edu., JMI, 1984

The hypotheses of the study were: (1) Writing ability is a complex ability and its structure has more than one facet. (2) A scale may be developed on the basis of factor structure of writing ability. (3) Factorial approach may produce a reliable and valid scale for securing measures of writing ability.

The tools used in this study were: (1) Language Usage

Test constructed by the investigator used to validate the Writing Ability Test. The contents of the test were selected from the curriculum prescribed for class X and included items on vocabulary, spelling, and grammar; (ii) a scale to measure writing ability was also constructed by the investigator. The construction of the final form of the scale involved the following procedure: an essay test having a general topic 'my ambition in life' was assigned to the students of class X and was scored by a language teacher. A sample of 152 essays (27 per cent top and 27 per cent bottom) was selected from it. A systematic sample of 30 essays was selected from this sample. These 30 essays were assigned to 30 experts (ten each from journalists, social scientists, natural scientists and teachers). They were requested to grade the papers into three piles A, B and C and also to give written comments as to why certain essays were placed in pile A (good essays) while other were placed in C (below a reasonable standard essay). On analysing the comments of experts 22 characteristics were identified for comparing the essays. These characteristics were arranged in a graphical numerical scale and a five-point scale was devised covering each of these characteristics. It was further modified and the final form of the Writing Ability Test had three factors, namely, organization, literary factor and language usage. Each of these facets had several elements. The reliability of the test i.e. the degree of agreement between various evaluators was calculated. The product moment correlation for language usage was found to be 0.694, for literary factor 0.638, for organization it was 0.738 and the correlation between global scores was 0.305. The Writing Ability Test was validated against the Language Usage Test and scholastic achievement (Hindi). Two hundred and eighty-two students and 24 experts (out of 30 experts who completed the assignment) constituted the sample of the study.

The findings of the study were: 1. Writing ability was an educational outcome of great significance. Objective measurement of writing ability was possibly using a rating scale based on the structure of writing. 2. The marking of essays in languages might be simplified by concentrating on three independent factors, viz., organization, literary factor and language usage. 3. The literary factor which included originality, maturity and creativity, would hardly be taught though it could be discriminated.

638. SHAH, S.G., *Discalculia amongst First Graders of Choryasi Block: A Psychometric Exploration*, Dept. of Edu., SGU, 1985 (SGU financed)

The major objectives of the study were (i) to identify children suffering from discalculia in the first grade of primary schools of Choryasi Block, (ii) to study relationships between the achievement in arithmetic and three psychological factors, viz., intelligence, problems faced by the children and parent-child relationship, (iii) to offer suggestions for decreasing the discalculia amongst the first graders, and (iv) to carry out case studies of ten children having severe problems of discalculia.

The sample was selected through the purposive sampling technique. A total population of 897 children was included in the sample from 22 primary schools of Choryasi Block. The schools were selected by the stratified random sampling method. One class of grade I students was taken up from each school for investigation. In all, 465 boys and 432 girls were the subjects of study. During the study, the tools used to collect various types of data were: (i) Arithmetic Evaluation Test, (ii) Individual Intelligence Test (by Sunil Patel), (iii) Student Problem Inventory, (iv) Parent-Child Relationship Scale by Sharma and Chauhan, and (v) Interview Schedule for the Parents. The Arithmetic Evaluation Test was used to find out the discalculia amongst first graders. The test was administered on 897 children studying in the first grade. The programme of testing was completed within 21 days. Other data were also collected simultaneously.

The major findings were: 1. The general mean achievement score of the group (N=897) was 19.49 (maximum marks: 70). 2. The mean achievement score of the Surat Municipal Corporation school children (N=333) was 14.35 (maximum marks: 70). 3. The mean achievement score of the District Panchayat school children (N=293) was 8.4 (maximum marks: 70). 4. The mean achievement score of the children of private schools (N=271) was 37.82 (maximum marks: 70). 5. The children of private schools were significantly superior to other groups. 6. The difference between the means of boys and girls' achievement scores was significant at 0.01 level and boys were significantly superior to the girls in arithmetic achievement. 7. The difference between the mean IQs of all the three groups was significant at 0.01 level. 8. Coefficient of correlation of achievement scores with IQs of the whole group was found to be 0.59 and it was significant at 0.01 level. 9. Children were found suffering from the following misconcepts and errors: (a) Application of knowledge (they considerably failed to take a decision about the process, whether to make addition or subtraction). On

items testing application of knowledge, they claimed only 0.70 mean score (out of 10 marks). On another application type test item they secured a mean score of 1.26 (out of 10 marks). (b) The children had a habit of answering the question without understanding or pre-thinking. (c) Due to poor grasp of words and language children failed to write the number in words and vice versa. They gained 2.6 mean score (out of 10 marks). It was found that they knew the answer and they could identify the numbers correctly but because of lack of expression they could not write the answer in words. 12. The case studies of the children revealed: (a) Parents were remarkably inattentive towards the children. Children were found confused in the subject of arithmetic and were in need of proper children. This was admitted by the parents too. (b) The schools had no special programmes for finding out academically backward children. None of the schools had schedule of remedial teaching. School climate was not favourable to disadvantaged children. (c) Some students suffered from an inferiority complex and lacked self-confidence. They were equally introvert in nature. (d) In spite of all the physical facilities and good IQs some of the cases were found to be very low in academic progress. The reason was the poor care taken by the parents and teachers. Some of the children were quite good in subjects other than arithmetic. It was found that some teachers were not qualified to teach arithmetic. They had to teach all subjects and they had not undergone any special training in the teaching of arithmetic.

The implications of the study are: (1) Teachers should take care to see that the concepts and principles involved in different topics are clearly understood by the children. Undue hurry in the early stages results in a child's failure which consequently leads him to diffidence. (2) The second implication of the study is for the policy makers and school authorities. The study suggested that the introduction of a non-graded system had made the teachers as well as pupils passive and careless towards teaching and learning. A policy of 'No examination' at the end of the year was converted into a 'No study' attitude. Mere attendance in the classroom could not be the criterion for promoting the children to the higher class. Continuous evaluation was needed to be done for improvement.

639. SHARMA, R.S., *Performance on Ability/Aptitude Tests—A Study of the Effect of Practice and Some Demographic Variables*, Ph.D. Psy., Guj. U., 1984

The investigation was an attempt to study the effect of practice/exposure and demographic variables on psychomotor performances. The main hypotheses were: (1) Demographic variables of age, education and experience would show a significant relationship with the performance on the tests of strength of grip, motor coordination, manual dexterity, finger dexterity, perceptual motor coordination, and simple and choice reaction-time. (2) Each of the above demographic variables would have a significant contribution in the performance on the selected ability/aptitude tests. (3) Groups differing in age, education, experience, state ethnicity and rural-urban background would differ significantly in the performance on the selected ability/aptitude tests. (4) Practice/exposure would show significant improvement in the performance on the selected ability/aptitude tests.

The sample of the study comprised 2,318 subjects out of which 930 were operatives from 12 textile mills of Gujarat State. The remaining 1,388 were fresh applicant seeking employment as operatives in the textile industry in five different states of India. An analysis of the job performed by the selected operatives was made to identify the various aptitudes that seemed relevant for performing the jobs. On the basis of this identification, the psychomotor tests numbered 8 to 12 from GATB measuring three aptitudes, namely, Motor Coordination (K), Manual Dexterity (M) and Finger Dexterity (F). Hand dynamometer for measuring physical strength, pursuit motor for measuring perceptual motor coordination and reaction-time apparatus for measuring simple and choice reaction-times were used in the study. For the purpose of testing the effect of practice/exposure on the performances on aptitude tests 41 operatives were tested four times, keeping an interval of 30 days between testings. Correlational analysis, multiple regression analysis, analysis of variance, factor analysis, etc. were carried out to test the hypotheses.

The main findings were: 1. Demographic variables like age, education and experience had their own distinct relations with the performance on the aptitude tests. 2. Each of the three demographic variables distinctly revealed their significant contribution to the variance in the performance on certain aptitude tests. 3. The groups differing in age, education, experience, state ethnicity and rural-urban background showed a significant difference in the performance on the aptitude tests. 4. There was a significant effect of practice on the test scores.

- \*640. SHUKLA, D.S., *The Construction and Standardization of a Musical Aptitude Test for Gujarati Children*, Ph.D. Edu., Guj. U., 1987

The purpose of the study was to construct and standardize a musical aptitude test suitable to the pupils of Gujarat State studying in grades V to IX.

After reviewing the test materials, four components of the MAT, namely, (a) pitch discrimination, (b) tonal length, (c) tonal memory, and (d) rhythm discrimination were selected and 145 items, in all, were coined. Item analysis was carried out on 100 pupils randomly selected from grades V to IX. To present the musical items at a constant rate and to maintain the volume and the tone of the musical instrument and the speaker constant, all the items as well as the instructions to be given to the testees were taperecorded. The final test consisting of 69 cassetized items was standardized on a normative sample of 640 schoolchildren drawn from 29 different schools of ten districts of Gujarat State. The time required to administer the entire test was 42 minutes.

Percentile norms for different grades were prepared. Reliability of the test was estimated by test-retest method ( $0.75 + 0.07$ ) and split-half method ( $0.80 + 0.03$ ) for the entire test. The construct validity was checked by careful analysis of the test items measuring each behaviour component of musical aptitude with the help of the expert. Out of 69 items, 62 items were held to be valid for the purpose of musical aptitude testing. Comparison of MA scores and teachers' rating of 108 pupils established concurrent validity of the test.

The main finding was that there was no significant difference between the grade means of two sexes and hence, there was no need to present sex norms.

641. SWAIN, S.K., *Construction and Standardization of Mechanical Aptitude Test in Oriya for 10th Class Students of Orissa*, Ph.D. Edu., Kur. U., 1986

The main objective of the study was to construct and standardize a mechanical aptitude test for class X students of Orissa in Oriya, as a tool for use in schools of Orissa for selection of the courses of study best suited to them and to help in early identification of mechanical talent.

The battery was prepared on the basis of job analysis done with the help of 25 lecturers of the Engineering College. After job analysis, five components were identified,

viz., general intelligence, spatial ability, perceptual ability, mechanical comprehension and mechanical information. In order to measure the component of general intelligence the Cattell's Test of General Mental Ability was used. For measuring spatial ability, three components such as spatial orientation, spatial visualization, and spatial practical factor were taken into account. In order to assess perceptual ability two tests were constructed, viz., matching form and form perception. In case of mechanical comprehension, a test was constructed which had items in figural form. In case of mechanical information test, the items used represented sets of instruments (tools). The final form of the battery having all the five components was administered to 200 students of class X. Reliability and validity were established with the help of 100 students. In order to establish norms, a sample of 1460 students of class X was taken. These students belonged to high schools of the 13 districts of Orissa.

The characteristics of the test battery were: 1. The battery had five sub-tests, namely, general intelligence, spatial ability, perceptual ability, mechanical comprehension and mechanical information. 2. Items selected for the final form had the item difficulty ranging from 0.20 to 0.80. 3. The test battery could be administered in two sets. The first set comprised tests concerned with general intelligence, spatial ability, and perceptual ability. The second set of tests were mechanical comprehension and mechanical information. 4. The time limit for the first set was 45 minutes and for the second set 20 minutes. 5. Scoring of the tests was done with the help of an answer key. Each correct answer was given one score. Only correct answers were counted towards scores on the test. 6. The reliability of the general intelligence test was estimated by the test-retest method and those of spatial ability, perceptual ability, mechanical comprehension and mechanical information were computed using the split-half method. The reliability coefficient for the general intelligence test was 0.86. The reliability of the test of spatial ability, perceptual ability, mechanical comprehension and mechanical information was 0.76, 0.69, 0.93 and 0.84 respectively. 7. The validity was established against the criterion of success in trades like fitters, wiremen and draftsmen. In all these three cases the coefficient of correlation between the various components of mechanical aptitude and trade criteria, was significant. The regression equation showed that in all the three trade criteria, with unit increase in each of the test components, the predicted scores on trade criterion increased. 8. Norms for the test battery were established for Oriya school students.

642. VAIDYA, V.S., *Construction and Standardization of a Test of Mechanical Comprehension*, Ph.D. Edu., Poona U., 1983

The objectives of the study were (i) to construct and standardize a test of mechanical comprehension, (ii) to study the test characteristics like homogeneity, reliability and validity, (iii) to find out gradewise norms on students studying in engineering colleges. (iv) to study the influence of the media of instruction, experiential background and caste of students on their test performance, (v) to study whether the test could be used as a tool for selection of engineering graduates for jobs.

Items testing the ability to comprehend and solve problems of a mechanical nature were designed and composed into an experimental form. The experimental form was administered to 449 students of five engineering colleges of Maharashtra state for the purpose of analysis. Items showing an acceptable level of facility and discrimination were selected and arranged in a final test form. The final test form was then administered to 1055 students of the Engineering College, Pune, by following standardized procedures for working out norms. On different sub-groups of engineering students like those taking civil, mechanical and electrical subjects, studies were conducted for understanding homogeneity, reliability and validity of the test.

The following were the characteristics of the test: 1. The test was homogeneous in composition. 2. The standard errors of obtained scores were between 3 and 4 score points and showed an acceptable level of accuracy of measurement offered by the test. 3. The test measured mechanical comprehension ability and could predict performance of entrants to engineering colleges. 4. The aptitude scores had shown an increase with training. 5. The test showed potential for use as a screening device for selection of students to engineering colleges and for selection of students to engineering graduates to positions as engineers. 6. At the entry point of engineering courses, the media of instruction at SSC, experiential and social class backgrounds of students influenced test scores, but these parameters did not influence the test scores at the graduation level. 7. The test had high positive significant coefficient correlation of 0.80 with Bennett's Test of Mechanical Comprehension. 8. The test showed positive significant coefficient of correlation with tests of Space Relation ( $r=0.53$ ) and Abstract Reasoning ( $r=0.42$ ). 9. It showed positive significant relationship ( $r=0.33$ ) with criterion marks for admission to engineering colleges and showed positive signifi-

cant relationship ( $r=0.31$ ) with performance at first year engineering course. 10. The reliability estimate from KR-20 was 0.81 and that KR-21, ranged from 0.62 to 0.86 on various samples. 11. The split-half reliability coefficients ranged from  $r=0.73$  to  $r=0.87$  on different samples. 12. Stability of test scores over a period of ten to 18 days ( $r=0.71$ ,  $r=0.67$  respectively) and 3½ years ( $r=0.55$ ) was established through retest procedures.

643. VAYA, S.L., *Adaptation of Minnesota Multiphasic Personality Inventory for Gujarati Population*, Ph.D. Psy., Guj. U., 1985

The main purpose of the study was to adapt M.M.P.I. scales for a Gujarati speaking population, having psychiatric conditions rather than normal ones.

The Gujarati translation of the M.M.P.I. was accomplished using three bilinguals translating independently and then conjointly to eliminate the differences. The translated form of 566 items was administered to ten volunteers from Gujarati professional communities. Items that were found not to convey the appropriate meaning were changed and the revised version was administered to 160 subjects individually. The internal consistency of the items was determined by point-biserial correlation and the discrimination value of each item was determined by phi-coefficient. The final M.M.P.I. of 13 scales consisted of 322 items. It was administered to 500 normal voluntary subjects and 300 psychiatrically diagnosed cases selected by purposive sampling technique. The analysis, however, was carried out on 226 male and 214 female normal subjects along with 168 male and 66 female psychiatric patients. Norms were reported as T scores for both male and female subjects, separately. The coefficients of stability for M.M.P.I. scales, after a time interval of 180 days as well as one year, varied from 0.55 to 0.94 and 0.41 to 0.82 respectively. Reliability coefficients calculated by the method of rational equivalence ranged from 0.42 to 0.90. The validity of the 13 M.M.P.I. scales was established against different criteria.

Major conclusions of the study were: 1. There was a significant difference among the mean values of male and female normals only on four scales, viz., hypochondrias (Hs), hysteria (Hy), interest (Mf) and psychopathic deviance (Pd). 2. Significant difference among the mean values of the clinically or psychiatrically diagnosed group and the normal standardization sample re-

vealed high validity. 3. Significant differences among the mean values of clinically diagnosed cases of schizophrenia on the one hand and other psychiatric categories diagnosed on the other hand proved that M.M.P.I. clinical scales were valid for diagnostic purposes for the Gujarati population.

644. VEERABHADRAIAH, B.M., *Construction and Standardization of a Verbal and Non-Verbal Group Test of Intelligence for Kannada Pupils of Standards V, VI and VII in the Age-group 10 to 13+ with special reference to the Karnataka State*, Ph.D. Edu., Guj. U., 1985

The objective of this study was to construct and standardize a verbal and non-verbal group test of intelligence for Kannada pupils of standards V, VI and VII in the age group 10 to 13+, thus providing a useful instrument for assessing the intellectual abilities of children of Karnataka state, in their second stage of schooling at the higher primary level.

Three try-outs were carried out for refining and selecting different items for the final run. Item analysis was done on the sample of 370 pupils in the age range 9 years 6 months to 14 years 5 months and 165 items were finally selected from the total of 275. The final test consisting of four verbal and four non-verbal sub-tests was administered to 3250 boys and an equal number of girls drawn from 50 government and private schools as well as from rural and urban areas of 11 districts of Karnataka. Sets of norms as Deviation IQs with a mean of 100 and SD of 15 were presented for ages 10 to 13 years 11 months at half-year intervals.

The reliability of the test was measured by (i) test-retest methods ( $N=300$ , two months' interval,  $r=0.88$ ) and (ii) split-half method ( $N=300$ ,  $r=0.97$ ). The test was validated against (i) total marks obtained in the preceding annual examination ( $N=110$ ,  $r=0.64$ ), (ii) teachers' estimate of intelligence ( $N=110$ ,  $r=0.59$ ) and (iii) M.G. Premalatha's non-verbal tests ( $N=100$ ,  $r=0.58$ ). Correlation between verbal and non-verbal sub-tests was found to be 0.71 and internal consistency of tests was found out by canonical correlation method using Hotelling's Principal Component Method. The test was analysed factorially and eight factors were extracted. As subsequent studies, relation between the occupation of parents and the intelligence of children was found out ( $r=0.41$ ), and relation between caste and intelligence was studied ( $r=0.24$ ).

645. VERMA, N.K., *Development of a Paper-Pencil Test of Level of Aspiration (For School and College Students)*, Ph.D. Psy., Ran. U., 1983

The major objectives of the study were (i) to develop a comprehensive paper-pencil test of level of aspiration for school and college students, and (ii) to develop separate norms of level of aspiration for rural, urban, school and college students.

A paper-pencil test, consisting of 48 items, related to idealistic and realistic aspirations, covering four main areas of student interest and endeavour (economic, social, educational and occupational) was developed. Item analysis was done. The test included three sub-tests with multiple-choice, agree-disagree and completion type items. A random sample of 800 male class X and XI school students and I year to IV year college students was selected from rural and urban areas of Bhagalpur district. There were eight groups of students (each group had 100 students). Test-retest, split-half reliability; content, concurrent validity; and percentile and T-score norms (separately for rural, urban, school and college students) were established.

The test was considerably reliable and valid. Norms were fixed.

646. YADAV, B.S., *Standardization of Physical Fitness Norms of the School Children of Haryana (13+ to 16 Years of Age)*, Ph.D. Phy. Edu., Kur. U., 1986

The objectives of the study were (i) to measure the present level of physical fitness of school boys of Haryana with age group 13+ to 16 years, (ii) to establish norms of physical fitness of the school boys of Haryana with the age group 13+ to 16 years, and (iii) to compare the standard of physical fitness of the urban and rural boys.

The study was a normative survey of physical fitness of boys belonging to three different age groups, viz., 13+ to 14 years, 14+ to 15 years and 15+ to 16 years. The sample for the study was selected through multi-stage randomized design. In the first stage two schools were selected randomly from the boys' schools of each district. Secondly 100 students were selected randomly from each school from amongst the students of classes VII, VIII, IX, X and XI. In this way a total sample of 3600 boys was selected. The sample students were administered a physical fitness test battery. The batter

included such test items as the 50-metre run, standing broad jump, shot put, zig-zag run, sit-ups and Harvard step test. The scores of the students in these tests were taken to establish norms.

The findings of the study were: 1. In case of boys of the age group 13+ to 14 years there was no significant difference in the event of the 50-metre run, zig-zag run, sit-ups and step test. The urban boys had shown a slightly better performance at shot put whereas rural boys had shown a slightly better performance at standing broad jump. But the range of performance in urban as well as rural boys showed that 70 per cent of boys (in both groups) had almost a similar pattern of performance. The scores of urban as well as rural boys on all the six events (50-metre run, shot put, standing broad jump, zig-zag run, sit-ups and step test) were normally distributed. 2. In case of boys of the age group 14+ to 15 years, statistical analysis showed that there was no significant difference between the performance of urban and rural groups in the events of 50-metre run, shot-put, sit-ups and step test. The difference in the rural and urban group was directional in the events of standing broad jump and zig-zag run. In this case rural boys had shown better performance than their urban counterparts. The scores of the students of this age group belonging to urban and rural areas were normally distributed on all the six events. 3. In case of students belonging to the 15+ to 16 years age group, it was observed that the difference between rural and urban boys was not significant for events like sit-up and the step test. However, the difference in the rural and urban boys was significant in the events of 50-metre run, shot put, standing broad jump and zig-zag run. In these events rural boys showed better performance than the urban boys. The distribution of scores of urban as well as rural boys belonging to this age group was normal in all the six events. 4. The results of t-ratio had shown that performance of boys in the age group 15+ to 16 years was better than that of boys in the age group 13+ to 14 years and 14+ to 15 years in all the six events. So also, performance of boys of the age group 14+ to 15 years was better than that of the boys of 13+ to 14 years on all the six events. The comparison of performance on the six events further showed that with increase in age, the mean value of performance also increased.

## ALSO SEE

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