

Tests and Measurement

A Trend Report

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Most of the available published work in test construction has been reviewed from time to time by Menzel (1956), Harper (1960), Krishnan (1961), Jalota (1965) and Mitra (1961, 1968 and 1972). The present review concentrates on doctoral studies which have not been published so far, and projects related to test construction which have either escaped the notice of earlier reviewers or which have been completed recently. The scope of this review is limited to tests only.

Contrary to popular belief the number of doctoral studies in test construction is much less in comparison to other fields of Psychology or Education. A total of only sixtythree studies have so far been awarded Ph.D.s in test construction and another nineteen have been completed by institutions engaged in educational or psychological research in the country. Maximum number of tests have been devised to assess general intelligence, while other aspects of human behaviour have been rather neglected. A detailed break-up of studies under intelligence, aptitude, personality and interest tests is given in Table 1.

Most of the studies are adaptations of foreign instruments of measurement like Binet-Simon, WISC, WAIS, NIIP, DAT, Goodenough's Draw-a-Man Test, Bell's Adjustment Inventory, Kuder Preference Record—Personal, and Strong Vocational Interest Blank.

The frequently used item-format in these studies has been either the yes/no or the true/false variety with few exceptions where the multiple-choice, the omnibus spiral type and the forced-

TABLE 1

DISTRIBUTION OF Ph.D. AND INSTITUTIONAL STUDIES

| <i>Major Areas</i> | <i>Ph.D. studies</i> | <i>Institutional Total Studies</i> | <i>Total</i> |
|------------------------|----------------------|------------------------------------|--------------|
| Intelligence | 30 (48%) | 8 (42%) | 38 |
| Verbal Group | | | |
| Verbal Individual | | | |
| Nonverbal | | | |
| Performance | | | |
| Aptitude | 13 (21%) | 4 (21%) | 17 |
| General Aptitude tests | | | |
| Special areas | | | |
| Personality | 8 (13%) | 4 (21%) | 12 |
| Interest | 6 (9%) | 3 (16%) | 9 |
| Others | 6 (9%) | — | 6 |
| Total | 63 | 19 | 82 |

choice formats have also been tried. Harper's and Flanagan's techniques of item analysis have been employed by almost all the test constructors. For reliability estimation, the mostly used procedures have been the split-half, the test-retest, and different forms of K-R formula. Recently, the methods of rational equivalence and analysis of variance, and procedures suggested by Mosier and Rulon have also been used for reliability purposes. For validation of measures, the external criteria used have been the examination marks, teachers' estimates of pupils' ability and scores on other tests. Some attempts have been made

to apply Thomson's Inverse Matrix Method and Aitken's Method of Pivotal Condensation for obtaining validity estimates. Spearman's and Thurstone's techniques of factor analysis have been frequently used for studying the factor structure of tests.

An annotated account of doctoral level work as well as projects related to test construction is given in the following paragraphs.

INTELLIGENCE TESTS

The first Indian doctorate in test construction was awarded to Desai (1954) for developing a battery of group tests of intelligence in Gujarati for the students of twelve to eighteen years studying in standards VII to XI of secondary schools. The battery was standardised on a representative sample of 4755 boys and 4770 girls from various classes of Gujarati medium schools. The test-retest reliability coefficient of the test on the sample of 400 was .77 and split-half corrected by the Spearman-Brown formula was .94. Age and grade-wise distribution of IQs was worked out. The correlation coefficient of IQs with examination marks was .42, with teachers' estimate .53, and with Shukla's adaptation of the Stanford-Binet Intelligence Scale was .82. A revision of this test was attempted by Bhatt and Desai (1969) to standardise it for urban and semi-urban areas of Gujarat state. The revised version was standardised on a stratified sample of 1106 boys and 897 girls of grades VIII to XI of schools in Gujarat. Age norms for boys and girls were worked out for urban population only. The reliability coefficient by split-half method was .86 and by test-retest method .84. The correlation coefficient of the test with the original test was .77 and with other intelligence tests in Gujarati, it varied from .65 to .69.

Other group tests of intelligence in Gujarati are by Bhatt (1962), Patel (1966) and Patel (1970). Bhatt designed his scale for Gujarati children of standards V to VII belonging to urban, semiurban and rural cultures. The test was partly verbal and partly nonverbal and it was standardised on a sample of 5173 boys and 4649 girls drawn from fiftyeight schools representing urban, semiurban and rural schools in Gujarat. The reliability coefficient of the test was computed by K-R formula, split-half method, Guttman's formula and Rulon's formula and it ranged from .91 to .98. The correlation of this test with the Desai's

Group Test of Intelligence was .88, with Shukla's adaptation of the Stanford-Binet Intelligence Scale .82 and with Joshi's Group Test of General Mental Ability .68.

The group test constructed by Patel (1966) contained verbal as well as figural items covering reasoning, perceptual, memory, numerical and spatial relations aspects of intelligence. The test was standardised on a sample of students in the age range thirteen to sixteen studying in grades VIII to XI of schools in Gujarat. The reliability coefficient of the test by test-retest was .87 and that by split-half .99. The validity coefficients with other tests of intelligence in Gujarati and examination marks ranged between .65 and .80. Another group test of intelligence in Gujarati by Patel (1970) consisted of only verbal items related to series, analogy, synthesis and classification functions. This test was standardised on 4471 students of age range fourteen plus to sixteen plus, randomly selected from seventy schools in Gujarat. The test-retest, split-half, K-R formula 20, and various other methods were applied to estimate the reliability of the test which varied between .82 and .97. The correlation coefficient of scores on this test with school marks was .54 and it ranged between .65 and .80 with other local verbal and nonverbal tests of intelligence. The grade expectancy and the mental age norms were computed and the IQ scores and percentile ranks for each group were worked out.

Besides Gujarati, group tests of intelligence have been constructed in Assamese, English, Hindi, Marathi, Malayalam, Panjabi and Urdu.

Bora (1969) developed an omnibus type verbal group test of intelligence in Assamese for pupils of classes VII to X of schools in Assam. The test items were based on foreign tests like the Otis Group Test of Intelligence, the Pressey Group Point, the Army Alpha Test, the Terman Group Test of Intelligence and the Thorndike Intelligence Examination. The test was standardised on 1193 girls and 2028 boys of schools of Greater Gauhati area. The test-retest reliability coefficient was .94 and by K-R formula 20, it was .89. The split-half reliability coefficient varied from .91 to .96 for different classes. The correlation coefficient of scores on the test with the 'Hermon-Nelson Tests of Mental Ability, Grade 9-12, Form A, 1957' was .73.

Ahuja (1966) and Ahuja (1969) constructed group tests of intelligence in English for Bombay children in age groups of thirteen to seventeen and

nine to thirteen years respectively. The Ahuja (1966) test was standardised on 10132 children drawn from fiftythree schools on the stratified random basis. Age and grade norms were worked out and deviation IQs were computed. The test-retest and split-half reliability coefficients were .84 and .97 respectively. Correlation coefficient of the test with school marks was .53, with teachers' judgement .61 and with other tests of intelligence, it varied from .55 to .80. The Ahuja (1969) scale was administered to 10373 students, randomly selected from fifty-three English medium schools of Greater Bombay. Age norms and grade norms were worked out separately for boys and girls. The reliability coefficients by test-retest and split-half techniques were found to be .85 and .94 respectively. The validity coefficients against examination marks and teachers' judgements were .49 each, with Nafde's Nonverbal Test .56 and against the Ahuja's Group Test of Intelligence (1966), it was .73.

Mehta (1958) revised his own test of intelligence and standardised it for Rajasthani school going children in the age range twelve to fourteen years. This test was in Hindi and its split-half reliability coefficient was .93 and that by K-R formula it was .91. The correlation coefficient of test scores with school marks was .44.

Another group test of intelligence was developed by Joshi (1961) in Hindi for school and college going students. His test format was verbal omnibus spiral group point scale. The test was standardised on students of grades VIII to XII. The reliability coefficients ranged from .81 to .86 for different class levels and all the seven subtests were found to be highly saturated with 'g'. Two group tests have so far been developed in Marathi. One of them is by Pathak (1961) for the age group nine to thirteen years standardised on a random sample of 10738 boys and girls of Bombay, Poona, Ratnagiri, Thana and Surat schools. The test-retest reliability coefficient of the test was .89 and the validity coefficient against Kamat's Intelligence Test was .74. The other test in Marathi is by Oak (1967) who used the omnibus spiral arrangement in his test which was standardised on 4350 boys and 3596 girls of classes VII to XI, randomly selected from eighteen schools of Bombay city. Age norms, grade norms, IQ percentile ranks and stanine scores were computed. The stability and internal consistency coefficients varied from .84 to .93 and .88 to .94 respectively. The test scores were correlated with

Otis Advanced Examination (.65), the Army Alpha Test (.68), Desai's Test in Gujarati (.82) and Nafde's Nonverbal Test of Intelligence (.51).

Hundal (1963) and Singh (1963) devised their scales for Panjabi speaking children. Hundal administered the scale on a random sample of 1882 students of age group thirteen to seventeen years selected from the schools in the Panjabi speaking areas of Panjab. The test-retest reliability coefficients for different grades ranged from .87 to .90 and the validity coefficient against academic achievement was .83. Singh's group test of general mental ability for school going children in Panjab was mainly an adaptation of Jalota's General Mental Ability Test in Hindi. Out of seven subtests five were taken from Jalota's scale and only two were developed afresh. The test was standardised on a sample of 2985 school going students of classes VIII to X of schools in Panjab. The split-half reliability coefficient was .93 and correlation coefficient with school marks varied from .41 to .50 for different subjects.

Pillai (1955) constructed the general mental ability test in Malayalam for school children. The standardisation sample consisted of 2000 students of all school going age groups from the upper, middle and lower social strata representing the Malayalam speaking population of Travancore-Cochin State. All the seven tests included in the scale were found to be highly saturated with 'g'.

Kaul (1966) developed a group test of intelligence in Urdu for age group of twelve plus to sixteen plus in Kashmir. The test was standardised on a sample of 5872 pupils of thirtyone schools of three districts in Kashmir. The split-half reliability coefficient of the test was .94 and that by test-retest method .90. The correlation coefficient of test scores with teachers' estimate was .52 and that with the Raven's Progressive Matrices .77.

Pandey (1961) prepared and standardised a group test of intelligence for school going children in Nepal. The standardisation was done on 2674 Nepalese students of classes VIII to X representing different social strata of Nepal. The K-R formula 21 was used to estimate the reliability and the reliability coefficients were found to be varying between .83 and .89 for different classes. The 'g' factor loading on various elements of the test ranged between .54 and .76.

Attempts have been made to adapt WISC and WAIS for use in India, Mallin (1964) worked on the first Indian adaptation. Only verbal subtests

were modified to suit Indian conditions and performance part was retained as it was in the original WISC. The test was standardised on 656 children in the age range of six to fifteen years drawn from urban schools with English medium. The test-retest reliability coefficient for the verbal part was .92 and that for performance scale .93 and for the full scale .91. The scale was validated against teachers' ratings (.61), the Draw-a-Man Test (.71) and the California Test of Mental Maturity (.63). Bhatt's (1970) adaptation of WISC was primarily meant for Gujarati population. All the twelve subtests were adapted in Gujarati. The scale was standardised on a sample of 440 children of Ahmedabad city in the age group of five plus to fifteen plus. The test-retest reliability coefficient for the verbal scale was .98 and the split-half reliability coefficient was .90. For performance scale the test-retest reliability coefficient was .97 and for full scale it was .99. Validity was established against school marks and other tests of intelligence in Gujarati. The Hindi adaptation of the verbal part of WISC was attempted by Yadav (1970). He standardised the scale on about 700 school going children in the age group of eight to twelve years selected from schools in Delhi. Using Mosier's formula the reliability coefficient for the total scale was found to be .96. The unifactor structure of the scale as a whole was evidenced by the centroid method of factor analysis where seventy percent of variance was accounted by the first factor. The validity coefficients of the total scale against a nonverbal test and other measures ranged from .51 to .66. Ramalingaswami (1969) adapted the performance scale of WAIS. The test was standardised on a sample of 604 literate adults of both sexes in the age group fifteen to fortyfive years representing Delhi's population. Reliability coefficients for subtests, viz., picture completion, block design, picture arrangement and object assembly were worked out by using the formula Coefficient Alpha, suggested by Cronbach. The test-retest method was employed to determine the reliability of digit symbol. Total test reliability was determined by Mosier's formula. The reliability coefficients of individual subtests ranged from .63 to .94. Apart from determining the construct and factorial validities, the test was also validated by comparing the results with those obtained by Wechsler. The results indicated that the test could be considered as a valid measure for assessing the intelligence of an Indian adult.

Shah (1971) adapted the 1960's revision of

the Stanford-Binet Intelligence Scale, for Gujarati children of the age group of two plus to eighteen plus. The scale was standardised on a group of 400 children, representing each age group between two plus and eighteen plus. The reliability coefficient of the test by test-retest method was .95 and that by the average difference method was .96. Validity coefficients against eight different tests of intelligence ranged from .48 to .79.

In the area of nonverbal tests of intelligence, Phatak (1955) made the pioneering study of Goodenough's Draw-a-Man Test and developed a new scoring method in her standardisation of the test for Gujarati children. Validity of the new scoring plan was established by correlating the scores with Kamat's Intelligence Test and the correlation coefficient was found to be .50. The reliability coefficient for scoring system by test-retest method was .81. Norms were developed on 722 drawings of children in the age range of six plus to eight plus. Validity of the major scoring points was tested by simple criterion of increase in the scores at successive ages. Nafde (1961) prepared a nonverbal test of intelligence on the model of NIP 70/23 and Test of Abstract Reasoning (DAT). The test was administered to 10,000 boys and girls mainly from the high schools in Bombay city. The sample also included college students of science and arts as well as students of engineering, medicine and some post graduate students. For norm purposes, however, answers of 6654 students were found to be useful. The split-half reliability coefficient of the test on a sample of eightyone was .88 and test-retest reliability coefficient on a sample of eighty was .91. The validity coefficients of the test against school marks in three classes were found to be .47, .54 and .35 for a sample of 29, 26, and 27 children respectively. The correlation coefficient of the test with marks in mathematics was found to be .62 and that with science .43, with English .45 and with Hindi .49. Age norms, class norms and IQ distribution were worked out. Premalatha's (1962) battery of nonverbal tests of intelligence was designed for children of age group seven to thirteen years. The test was standardised on a sample of 7841 boys and girls drawn from rural and urban areas of Mysore state. The split-half reliability coefficient of the test was .97 and the reliability coefficient by K-R formula was .99. The test was correlated with school marks (.37), teachers' estimate (.35) and a standardised verbal test of intelligence in Kannada (.69). Shah (1964) develop-

ed a nonverbal measure of intelligence and standardised it on Gujarati children in the age range seven to thirteen years. The reliability coefficient was found to be .96 by the method of rational equivalence, .94 by the test-retest method, and .92 by the split-half method. The validity coefficient of the test was .70 against verbal test, .55 against examination marks, and .53 against teachers' estimate. Bhavsar (1967) prepared a nonverbal test for high school students of grades IX to XI corresponding to the age group of thirteen to eighteen years. A sample of 3184 boys and 2718 girls drawn from fortyfour schools of sixteen districts of Gujarat was used for standardisation. Age norms, grade norms and sex norms were worked out. The reliability coefficient of the test by test-retest method was found to be .91 and that by split-half method was .93. The correlation coefficients of the test with Desai's Group Test of Intelligence, Desai-Bhatt's Group Test of Intelligence and Nafde's Nonverbal Test of Intelligence were .61, .79 and .77 respectively. Nair (1970) developed a nonverbal measure of intelligence and standardised it on a sample of 5252 students of classes VIII to X selected from twelve educational districts of Kerala. Proportional representation was given to sex, rural-urban residence, school management, and the three levels of students in the sample. Reliability coefficients by test-retest method with an interval of three months, one month and one week were .76 (N = 246), .75 (N = 124) and .80 (N = 121) respectively. By rational equivalence method the reliability coefficient for the whole test was found to be .86 (N=100). The test was validated against the Raven's Progressive Matrices, Kerala University Verbal Group Tests of Intelligence, teachers' ratings and school marks and the correlation coefficients varied from .21 to .78 for a sample of 256 students. Deviation IQ norms were worked out for the age group of thirteen to seventeen years. Separate and combined norms were prepared for boys, girls, rural and urban subjects. Jain's (1965) nonverbal test was based on Spearman's two factor theory. The test, with a parallel form, was administered to 1000 cases which included students of Delhi region who had appeared for the higher secondary examination, and applicants for commission in the officer cadre of the Defence Services. The correlation coefficient between the scores on the two forms of the test was .80. Factorial study demonstrated that the two forms of the test had high 'g' saturation.

The only performance scale of intelligence

other than that of Bhatia is of Bhatia and Tandon (1964). The battery consisted of two forms; Form A for the age group of three to five years and Form B for the age group of six to thirteen years. The scale was standardised on a stratified sample of 1100 children in the age range of three to thirteen years, 100 children for each age level, drawn from Moradabad town and its suburbs. The reliability coefficients of the test by the split-half method and K-R formula 20 for Form A ranged from .87 to .95 and those for Form B varied from .91 to .93. The test was validated against parents' and teachers' estimates of child's ability.

APTITUDE TESTS

In the area of aptitude tests, Varma (1960) made the first systematic attempt at the Ph.D. level and constructed a battery of differential aptitude tests based on Thurstone's primary mental abilities. The tests were in Marathi and standardisation sample consisted of only boys of classes IX and X of Nagpur schools. Decile norms were prepared for rural and urban boys separately. Reliability coefficients for individual test ranged between .60 and .93 and validity coefficients varied from .45 to .66. An adaptation of DAT battery was attempted by Ojha (1965) in Hindi for students of higher secondary schools. A sample of 251 students of class XI, selected at random from two rural and two urban schools of Delhi, was utilised for developing norms. Intercorrelations between various tests of the battery ranged between -.19 and .46. Reliability coefficients for the battery by K-R formula 21, split-half and parallel form methods were found to be above .90 for most of the tests. The battery showed satisfactory predictive validity for different school courses. Mukherjee (1966) prepared another differential aptitude test battery in English which was standardised on 2000 students of class VIII.

Some special aptitude tests have also been constructed though their number is very small in comparison to the number of occupations. Sharma (1963) developed a mechanical aptitude test battery in Hindi. He administered the battery to 640 students belonging to class IX of ten multipurpose higher secondary schools of Madhya Pradesh and Uttar Pradesh who were admitted to first year class of Delhi Technical Higher Secondary School in 1962, for developing norms. Reliability coefficients

for the battery by split-half technique were between .80 and .98 for different tests. Correlation coefficients between the scores on the battery and aggregate marks in different technical subjects ranged from .64 to .72. Dave's (1964) Scientific Aptitude Test was designed to select students for science at the university level. It was standardised on a sample of 1218 students of S.S.C. class in Gujarat schools, selected randomly from among thirtytwo schools and three coaching classes of seven districts of Gujarat. Reliability coefficients for the test by test-retest, split-half, rational equivalence, and analysis of variance methods were .92, .92, .91 and .89 respectively. Deshpande (1967) and Venkataramana (1970) also devised tests for assessing aptitude for science. Deshpande's battery was meant for selecting students for science courses at the end of class VIII and its normative sample consisted of 856 students from seven schools of Nagpur and Amravati. The reliability coefficient by Mosier's formula for the composite test was .94. The validity coefficient of the test, using Thomson's Inverse Matrix Method and Aitken's Method of Pivotal Condensation, was found to be .56. Venkataramana's Aptitude Test in Science was standardised on a sample of 2000 students, of class IX, drawn from thirtynine schools in Andhra Pradesh. The split-half reliability coefficient of the test was found to be .88 and the reliability coefficient by K-R formula was .90. Validity coefficients against examination marks and teachers' ratings were .72 and .76 respectively.

Two tests have been developed to measure numerical aptitude. Bhavasar's (1970) Numerical Aptitude Test was designed for students of classes IX to XI of schools in the Saurashtra area of Gujarat. Norms were prepared for different age groups of boys and girls separately. The normative study was done on a sample of 5431 students, drawn from rural and urban areas of Saurashtra region. The reliability coefficients for the test by test-retest and split-half methods varied from .84 to .94 and validity coefficients ranged between .43 and .75 for different subtests. Shah's (1971) Numerical Ability Test had the spiral-omnibus format and it was administered on 3743 boys and 3249 girls of secondary schools in Gujarat for computing percentile grade norms separately for boys and girls of high schools in Gujarat. The test-retest reliability coefficients for different parts of the test ranged between .52 and .88 and the split-half reliability coefficients for the same ranged from .76 to .93. The correlation coefficients for the

test with marks in the annual examination varied from .33 to .75 for different subjects. Desai (1970) constructed a language aptitude test in Gujarati for students of classes VIII to X of secondary schools in Gujarat. Stratified random sample of 4044 boys and 2477 girls, drawn from urban and semiurban areas of Gujarat and studying in grades VIII to X of secondary schools in Gujarat, was used for developing norms. Separate norms were worked out for each grade, sex and culture. The reliability coefficients for different subtests by test-retest and split-half methods ranged from .32 to .82. The test was validated against examination marks, teachers' estimates of pupils' language aptitude and the validity coefficients varied from .30 to .51. An office work aptitude test was prepared by Naik (1970) and it was standardised on a sample of 9150 subjects, drawn from high school boys and girls, students of first year, intermediate, senior classes of arts, and commerce colleges of Greater Bombay, and persons belonging to industrial and educational organisations in Bombay. Age norms and grade norms were prepared separately for boys and girls and for different professional groups. The test-retest reliability coefficient for the test was found to be .81 for one month interval. The test was validated against the Clerical Aptitude Test of the Institute of Vocational Guidance and the validity coefficient was .70 (N=282). Buch (1960) constructed a test of social intelligence for the selection of salesmen, insurance agents and supervisors. A representative sample of 954 girls and 3480 boys of S.S.C. class, was drawn from eleven districts of the bilingual Bombay State (including Saurashtra and Greater Bombay regions), for the preparation of the test. Reliability of the test was examined by K-R formula, analysis of variance and test-retest methods and the reliability coefficients ranged between .91 and .93. Factor analysis revealed that the test had only one factor and correlation coefficient of .15 with Desai's Group Test of Intelligence showed that the general factor of the present test was not 'g' factor.

Among the nondoctoral studies carried out by some institutions in the areas of intelligence and aptitude testing, the work of the National Council of Educational Research and Training, the Indian Statistical Institute (Calcutta), the Bureau of Psychology (Allahabad), the College of Educational Psychology and Guidance (Jabalpur) and the Faculty of Education and Psychology (M. S. University of Baroda) deserves a mention here. Shanker and his

associates (1957) in the Central Institute of Education (CIE) constructed an individual scale of intelligence in Hindi for the age group of three to sixteen years. These tests were adaptations of Terman-Merrill Scale. The validity of test items was examined by calculating biserial correlations for each item as against the test as a whole. The scale has not so far been validated against any external criterion. Another scale was developed by the CIE (1959) for assessing general mental ability of children of age group eleven to fourteen years. This was an omnibus test in Hindi with a variety of items generally accepted as measures of intelligence. The normative sample consisted of 633 boys and 581 girls, selected randomly from schools in Delhi. The split-half reliability coefficient for the test was .97 and the test-retest reliability coefficients for various types of retest reliability coefficients for various types of coefficient against school marks was .42 for boys and .33 for girls. The correlation coefficients for the test were .60 with teachers' estimate, .71 with Jenkin's non-verbal test of intelligence and .43 with Raven's Progressive Matrices. Verbal group tests of intelligence were developed by the Bureau of Psychology (Allahabad) for age groups of twelve plus, thirteen plus and fourteen plus. The test for twelve plus was standardised on 1970 twelve year old children studying in sixty-nine junior and higher secondary schools of Uttar Pradesh. The split-half reliability coefficient corrected by Spearman-Brown formula for a sample of 100 was found to be .97. Distribution of raw scores was found to be slightly negatively skewed. Mean and standard deviation were 51.71 and 25.06 and the large standard deviation suggested that the test is efficient in discriminating children particularly in the middle range of ability. The test for children of age group thirteen plus was standardised on about 1000 students drawn from twenty-seven high schools in Uttar Pradesh. Distribution of scores had a mean of 28.96 and standard deviation of 19.8 which was significantly skewed in the positive direction. Forty-one percent cases were found to be falling between mean scores of 29 and 100, meaning thereby, the test is more discriminating for the higher range of intelligence. The test for children of age group fourteen plus was standardised on 952 students of schools in Uttar Pradesh. The representativeness of the sample was determined on the basis of results in public examination, and the socio-economic status. The split-half reliability coefficient was found to be .96 and the test showed better discrimination at

middle and higher levels of intelligence. Lele and associates' (1957) group test of intelligence was designed for age groups between eleven plus to sixteen plus. The test was administered to 3685 students, drawn from all over Gujarat for establishing norms. The test-retest method was used for examining the reliability, and validity was established against Desai's Group Test of Intelligence, teachers' ratings and Raven's Progressive Matrices. Chatterji and Mukherjee (1967) developed a non-language test of verbal intelligence for class VIII students. The normative sample was drawn from six schools in Calcutta. The K-R formula (21) reliability coefficients for the four sections of the test were .64, .69, .76 and .79. Validity coefficients for the test against school marks ranged between .22 and .64 for different subtests. Rao (1966) constructed tests to measure aptitudes of boys of grade VIII of higher secondary schools. The battery of seven subtests was administered to a sample of 800 students, selected at random from eighteen schools in Madhya Pradesh. Percentile ranks and percentile age norms were computed for students of age groups of thirteen, fourteen and fifteen years. The split-half reliability coefficient for each of the subtests varied between .88 and .95. An attempt was made to observe the effectiveness of the battery in revealing intra-individual differences in cognitive abilities. This was done by plotting test profiles of fifty cases, picked up at random from standardisation sample. Differentiation of abilities was clearly evident in the profiles. Lele and Parikh (1965) standardised a scholastic aptitude test for admission to preparatory science courses. Five hundred students served as a sample for this test. Split-half technique was used for examining the reliability of the battery and marks in the preparatory science course of the M. S. University of Baroda were used for validation purposes. The validity coefficients ranged from .43 to .58 for various subtests. Shukla and his associates (1970) developed a scholastic aptitude test in Hindi for grades VIII to X. The standardisation sample was drawn from schools in Delhi, Rajasthan, Uttar Pradesh, Madhya Pradesh and Bihar using stratified random sampling technique. Reliability coefficients were worked out for each subtest separately on a sample of 200 cases from each state, which varied from .71 to .92. Correlation coefficients for the test with school marks varied from .26 to .75 in respect of different grades and states.

PERSONALITY INVENTORIES

Very few doctoral studies have been attempted in personality measurement. Sohoni (1953) standardised a method of studying temperament including dispositions and character traits of children of high schools. A sample of 2129 students in the age group of fourteen to fifteen years was used for this purpose. The test-retest reliability coefficients for different traits were found to vary from .44 to .54. Validity coefficients for the different traits against teachers' estimates were in the range of .23 and .45. Another test of temperament was devised by Tarachand (1965) to serve English and Gujarati speaking pupils of classes X to XI. Percentile and stanine norms were calculated for boys and girls separately. The test-retest reliability coefficients varied between .53 and .87 and split-half reliability coefficients between .66 and .76 for different parts of the test. The validity coefficients by graphic scales varied between .34 and .74. The personality inventory standardised by Palsane (1965) measured introversion-extraversion, normal-neuroticism and normal-psychoticism dimensions of personality of college students. A sample of 370 college students was used in the study. The K-R, split-half and test-retest techniques were used to study the reliability of the inventory and the reliability coefficients varied from .55 to .91 for different dimensions of personality. Concurrent and cross validities of the inventory were also examined. Singh (1967) attempted a personality adjustment inventory for college students and standardised it on a sample of 11083 men and women of Patna University and various other states. The sample was considered to be the representative of the total population of India. The reliability coefficients by split-half, test-retest, K-R and Hoyt's methods were found to vary between .92 and .94. Validity of the inventory was estimated against Asthana's Adjustment Inventory. The obtained validity coefficient was .62. Percentile norms were worked out separately for men and women. Hussain (1969) attempted Hindi adaptation of the Bell's Adjustment Inventory and provided percentile norms for males and females separately, for different educational levels. Another Hindi adaptation of the Bell's Adjustment Inventory was done by Saxena (1959) on 2529 students in the age range of eleven to twenty years representing the state of Uttar Pradesh. The reliability coefficients by split-half, test-retest and rational equivalence techniques varied from .87 to .90. The validity of the

inventory against Asthana's Inventory was .80. Tutoo (1968) developed a mirror tracing test to measure social maladaptation, and Dass (1967) developed a group test of personality for adolescents on the lines of TAT.

Among the studies conducted at the institutional level adjustment inventories constructed by Pasricha and her associates (1964), Bhattacharya and his associates (1967), Dasgupta (1969) and Ramji (1971) may be mentioned. Pasricha's inventory covered areas like personal, familial, educational, social and vocational and it was designed for college students to locate their adjustment problems in the above areas. Bhattacharya and his associates aimed at locating adolescents who were considerably maladjusted with respect to their school and society. Dasgupta's study measured traits which he named as love-giving, love-seeking, self-love, self-aggression, object-aggression, assertion and submission, and happiness. Ramji on the other hand, developed rating scales to assess some situational behaviours in school of primary school pupils.

INTEREST INVENTORIES

Relatively little work is done on interest measurement. Kuder's model seems to have been popular with Indian researchers. Four investigators have attempted to adapt the Kuder Preference Record (KPR). Naik (1969) adapted the KPR in Oriya, Singh (1965) in Hindi, Parikh (1971) in Gujarati and Gopalan (1972) in Malayalam. Trivedi (1969) constructed an interest inventory for undergraduate students and Kaur (1970) developed a battery of tests to assess school students' abilities, aptitudes and interests.

What has been presented above is an overview of studies conducted in the field of psychological test construction during the last two decades. A study of Tables 2(a) and 2(b) makes it clear that over the years, researchers' interest in this field had been growing steadily. Universities like Bombay, Baroda, Banaras, Gujarat and Sardar Patel have contributed more to research in this field than other universities. Among the institutions, the National Institute of Education, (New Delhi), the Bureau of Psychology (Allahabad), the Indian Statistical Institute (Calcutta) and the Faculty of Education and Psychology of M. S. University of Baroda have done substantial work in test construction.

TABLE 2(a)

DISTRIBUTION OF Ph.D. STUDIES DURING THE
LAST TWO DECADES

| | 1950- 54 | 1955- 59 | 1960- 64 | 1965- 69 | 1970- 72 | Total |
|------------|-------------|-------------|-------------|-------------|-------------|-------|
| Agra | — | — | 1 | — | — | 1 |
| Allahabad | — | — | — | 2 | — | 2 |
| Banaras | — | 3 | 3 | — | — | 6 |
| Bombay | 2 | — | 2 | 4 | 1 | 9 |
| Calcutta | — | — | 1 | 1 | — | 2 |
| Delhi | — | — | — | 2 | — | 2 |
| Gauhati | — | — | — | 2 | — | 2 |
| Gujarat | — | — | 1 | 1 | 4 | 6 |
| Kerala | — | — | — | — | 2 | 2 |
| MSU | — | 1 | 3 | 4 | 1 | 9 |
| Nagpur | — | — | 2 | 1 | — | 3 |
| Patna | — | — | 1 | 3 | — | 4 |
| Panjab | — | — | 1 | 1 | — | 2 |
| Panjabi | — | — | — | — | 1 | 1 |
| Ranchi | — | — | — | 1 | — | 1 |
| Rajasthan | — | 1 | — | 1 | 1 | 3 |
| Saugar | — | — | — | — | 1 | 1 |
| Saurashtra | — | — | — | — | 1 | 1 |
| SPU | — | — | 1 | 1 | 3 | 5 |
| Utkal | — | — | — | 1 | — | 1 |
| Total | 2 | 5 | 16 | 25 | 15 | 63 |

Within the field of test construction, almost fifty percent of studies fall in the area of intelligence testing and construction of interest inventories has been neglected. Qualitatively, there has been considerable sophistication in the use of statistics during the last decade. Due attention has been given to representation of the heterogeneity of the population, through better and larger sampling. Certain trends are, however, disturbing. Although in most cases item analysis data are reported with difficulty and discrimination indices for each item, there is little evidence of the use of item statistics in improving distractors of a multiple-choice item. Sampling has improved, but there is still a good deal of incidental rather than probability sampling. Discrimination validity as proposed by Campbell and Fiske has not been utilised so far by Indian researchers.

TABLE 2(b)

DISTRIBUTION OF INSTITUTIONAL STUDIES
DURING THE LAST TWO DECADES

| | 1950- 54 | 1955- 59 | 1960- 64 | 1965- 69 | 1970- 72 | Total |
|---|-------------|-------------|-------------|-------------|-------------|-------|
| NCERT CIE (New Delhi) | — | 2 | — | — | 2 | 4 |
| ISI (Calcutta) | — | — | — | 2 | — | 2 |
| Bureau of Psy. (Allahabad) | 1 | 2 | — | 1 | — | 4 |
| Faculty of Edu. and Psy., MSU | — | 1 | 1 | 2 | — | 4 |
| A.G. Trs. Coll., Ahmedabad | — | — | — | 1 | — | 1 |
| College of Edu. | — | — | 1 | — | — | 1 |
| Psy. & Guid. Jabalpur | — | — | — | — | — | — |
| K.G.K. College, Moradabad | — | — | 1 | — | — | 1 |
| Gandhian Inst., Varanasi | — | — | — | — | 1 | 1 |
| David Hare Trg. College, Calcutta | — | — | — | 1 | — | 1 |
| Total | 1 | 5 | 3 | 7 | 3 | 19 |

Indian adaptations of Binet Tests, WISC, WAIS, DAT Battery, NIIP Tests, Goodenough's Draw-a-Man Test, Bell's Adjustment Inventory and many other foreign tests are now available, though each one may not be equally good and usable. Group tests of intelligence for the higher ages in schools are available in most Indian languages, but good tests for adults as well as for primary schools are badly needed. A performance test battery, like Bhatia's needs to be standardised in different language areas to provide the link test in equivalence studies. The differential aptitude tests developed in Hindi need to be translated and adapted in other languages. Work on personality tests has started recently. It is to be hoped that researchers' interest in these areas will grow in the years to come.

ABSTRACTS: 229-310

229. AHUJA, G. C., *The Construction and Standardisation of a Group Test of Intelligence in English for the Age-Group 13 to 17 Years*, Ph.D. Edu., Bom.U., 1966.

The purpose was to devise a test to assess the general mental ability of the students of age group thirteen to seventeen years, studying through English medium in the secondary schools of Greater Bombay.

The preliminary draft consisted of 216 items. It contained eight subtests, viz., analogies, classification, arithmetic reasoning, best answer, comprehension, following directions, vocabulary and series. In the first tryout these subtests were administered on a sample of eight students (two from each grade VIII through XI). The second tryout was done on 370 students, drawn from four randomly selected English medium schools. On the basis of item validity index and the difficulty level of items, twenty items were included in the subtest of analogies, twenty in classification, six in arithmetic reasoning, twenty in best answer, eight in comprehension, forty in vocabulary and twelve in series. The items were arranged in an ascending order of difficulty. The time limit of four minutes was fixed for each subtest. The standardisation sample comprising 10,132 pupils of both the sexes was selected by the method of stratified random sampling and was drawn from fiftythree schools from thirtyfive different postal zones of Greater Bombay. The test was administered on groups varying in number from ten to fifty. Age norms and grade norms were established and percentile ranks, sigma scores, standard scores, T scores and deviation IQs were computed.

The coefficients of reliability as calculated by test-retest method and split-half method were $.84 \pm .021$ and $.97 \pm .003$ respectively. The validity coefficients obtained by comparing the test results with scholastic marks and teachers' judgements were found to be $.53 \pm .040$ and $.61 \pm .040$ respectively. The validity coefficients found against other tests of intelligence varied from .55 to .80. The internal validity as well as factorial validity were also computed.

230. AHUJA, P., *The Construction and Standardisation of a Group Test of Intelligence in English for the Age-Group 9 to 13 Years*, Ph.D., Edu., Bom. U., 1969.

The study aimed at developing a standardised group test of intelligence in English which would have a predictive value for scholastic aptitude too.

Out of a pool of 400 short and unambiguous items, only 226 items were selected for the pre-tryout. The pre-tryout was done on twelve students of an English medium secondary school. The second preliminary administration was done on 370 students of grades V to VIII, drawn from three randomly selected English medium schools of Greater Bombay. Item validity was found out using six different methods.

After item analysis, 100 items were retained for the final form. The number of items in each subtest are: analogies-16, classification-16, same-opposite-26, disarranged sentences-10, series-16, and best answers-16. Selected items in each subtest were arranged in ascending order of difficulty. The time limit was scheduled in such a way that there was little emphasis on speed. The final order of the battery was (i) scrambled words (practice test), (ii) analogies, (iii) classification, (iv) disarranged sentence, (v) same-opposite, (vi) series and (vii) best answers. A third tryout was done on students of classes V through VIII of an English medium school. For the final administration a sample of 10,373 students was randomly selected from fiftythree schools of forty different postal zones under Greater Bombay. Age norms and grade norms were worked out separately for boys and girls. Along with the deviation intelligence quotients, percentile ranks, T scores, sigma scores, standard scores and stanine scores were also found out. Test-retest and split-half reliability coefficients were found to be .852 and .943 respectively. The validity was measured by comparing the test results with examination marks and teachers' judgement. The coefficients of validity were found to be .494 and .491 respectively. Against the Nafde's Non-verbal Test of Intelligence, and the Ahuja's Group Test of Intelligence, the validity coefficients were .565 and .731 respectively. The factorial validity was calculated by Thurstone's centroid method, 'g' saturation by Spearman's formula, and accordingly, the rank order of the subtests was found out.

231. BHATIA, D. R., *A Test for Measuring Achievement Motivation, Ph.D. Psy., Ran. U., 1968.*

The study was undertaken to prepare a test for measuring achievement motivation, and to test the hypothesis that the students who possess high achievement motivation achieve better than those who are less motivated.

A random sample of 100 students was selected for the preliminary tryout and of 530 students for the final test. A tentative list of 120 items was prepared. Through a tryout, only such items which were intelligible to the pupils were retained. Thus, the number was reduced to 106. On a reference to teachers of psychology who acted as judges, twentysix items were further eliminated, since they were items on which there was no unanimity. The preliminary form thus consisted of eighty items. It was administered to a sample of 100 students. The 'yes' response was given a score of '1' and 'no' response, a score of '0'. The total score of a subject was the number of 'yes' responses given by him. After finding that the data did not depart significantly from a normal distribution, the point biserial correlation of each item with the total score was computed. All those items which did not yield significant biserial correlation were dropped. This led to a further reduction of the items to thirtytwo. The test in this final form was administered to a random sample of 530 students. The chi-square test was employed to test the normality of the distribution of the scores.

For establishing the reliability of the test, the split-half method, the test-retest method and K-R formula 20 were employed. The reliability coefficients were found to be .94 by the split-half method with a P.E. of $\pm .007$, .93 by the test-retest method with a P.E. of $\pm .009$. The K-R formula 20 yielded a reliability coefficient of .92. In order to determine the concurrent validity, the test was correlated with the Bending's Need Achievement Scale. The validity coefficient obtained was .80. Percentile norms and T score norms were worked out, both for male and female students separately.

232. BHATIA, H. R., TANDON, R. K., SOMVANSHI, A. K. S. and SAXENA, J. K., *Construction and Standardisation of Performance Tests of Intelligence for Ages 3 to 13,*

Dept. of Psy., K. G. K. College, Moradabad, 1964. (NCERT financed)

The project aimed at constructing a battery of performance tests of intelligence consisting of two forms: Form A for the lower age group of three to five years and Form B for the higher age group of six to thirteen years.

The subtests included in Form A were: cube construction test, picture construction test, bead test, form board test and objective identification test; and those included in Form B were: cube construction test, picture construction test, bead test, form board test and passalong test. Two tryouts were carried out before the final administration. The total number of items used in the final form for Form A and Form B were thirtysix and thirtyfive respectively. Out of these items twenty were common to both the forms to provide the overlap in the two measures. The sample used for developing the norms consisted of 1100 children in the age range of three to thirteen years—100 cases for each year age level, drawn from the town and suburbs of Moradabad. The stratified random sampling method was used for drawing the sample.

The reliability of the tests was determined by the split-half method, K-R formula 20, and Gulliksen's formula, for both the forms separately. The test was validated against parents' and teachers' estimates of child's ability, and scores on the Bhatia's Battery of Performance Tests. Factorial analysis of the battery was carried out. Comparisons of performances of various ages and socio-economic groups were made. Centile, standard scores and T score norms were established. It was found that the reliability coefficient for Form A ranged from .87 to .95 and for Form B from .91 to .93.

233. BHATT, C., *Desai-Bhatt Group Test of Intelligence in Gujarati, A. G. Teachers College, Ahmedabad, 1969.*

The problem of the present research was to make a revision of the Desai's Group Test of Intelligence for grades VII to XI, originally standardised by K. G. Desai in 1951.

The test battery included ten subtests, viz., following directions, opposites, disarranged sentences, classification, meanings of proverbs, number sequence, analysis, differentiation, arithmetical rea-

soning and verbal reasoning. Sixteen items for each type of test, some selected from the original test, but most of them newly coined, were prepared. All the 160 items were arranged into sixteen sets, so that each set was made up of ten items and included one item each of the ten types of tests. The first set was used as a practice test and the remaining fifteen for item analysis. These tests were administered to a group of 550 boys and girls of grades VIII to XI of Ahmedabad schools and other semiurban areas of Gujarat. Out of this group, 370 pupils who were neither too young and nor too old for their grades, were selected. The responses of these students were used for item analysis. Extreme groups method was used for this purpose. Items with poor discrimination power were discarded. From the remaining items, ten best items for each of the ten tests were selected. The final version of the test comprised 100 items of which fortyfive items were retained and modified from the original Desai's Group Test of Intelligence and the remaining were altogether new. Then the test was administered finally to a sample of 1106 boys and 897 girls (from grades VIII to XI) from the schools selected by stratified sampling method. The time limit for the completion of the test was fixed at forty minutes. By giving a score of one to every correct response, raw scores were obtained which were used directly for fixing the norms and calculation of reliability and validity coefficients.

Age norms for boys and girls (of eleven to seventeen years) were established for the urban population only. Reliability was determined by split-half and test-retest methods, and the coefficients were found to be 0.86 and 0.84 respectively. The concurrent validity of the test was estimated by correlating the IQs on the present test with IQs on three other tests, viz., the Desai Group Test of Intelligence, the Bhatt's Group Test of Intelligence, and the Bhavsar's Nonverbal Group Test of Intelligence. The validity coefficients with these three tests were .77, .65 and .69 respectively.

234. BHATT, C. L., *The Construction and Standardisation of Group Tests of Intelligence for Gujarati Pupils of Standards V, VI and VII*, Ph.D. Edu., Guj. U., 1962.

The aim was to construct and standardise a group test of intelligence for Gujarati pupils of

standards V, VI and VII, suitable to the exigencies of the urban, semiurban and rural cultures.

The final test consisted of matching legs of tables (nonverbal), matching professions and things (verbal), analogies (verbal), classification (nonverbal), pictorial absurdities (nonverbal). The test was made of 139 items and the time required to answer it was fixed at thirtyfive minutes. The method of subdivision or stratification was used to get twelve subpopulations of internally homogeneous nature. A representative sample from each subgroup was secured by adopting the method of incidental sampling. The total sample comprised 5173 boys and 4649 girls of fiftyeight schools of three cities, seventeen towns and thirteen villages. The scores of boys and girls were classified for each age group from nine plus to fifteen plus and the mean, median and SD were computed. Separate norms for boys and girls were computed. The scheme offered by Wechsler was used in classifying the pupils according to their IQs.

The reliability coefficients of the test by K-R formula 20, split-half method, Guttman's formula and Rulon's formula were 0.93, 0.91, 0.97 and 0.98 respectively. The congruent validity of the battery was estimated by correlating the IQs on the present test with those obtained on the other intelligence tests. The results were (i) $r=0.819$ with the Shukla's Adaptation of Stanford-Binet ($N=30$); (ii) $r=0.880$ (after correction for attenuation) with the Desai's Group Test of Intelligence ($N=245$) and (iii) $r=.683$ with the Joshi's Group Test of General Mental Ability ($N=115$). The concurrent validity coefficients found with teachers' estimates of intelligence ($N=537$), marks in academic subjects ($N=460$), marks in drawing ($N=460$), marks in crafts ($N=460$), marks in physical education ($N=460$), were 0.45, 0.57, 0.29, 0.21 and 0.16 respectively. The other observations were : (i) the data for the age groups of nine, thirteen, fourteen and fifteen plus were found to be truncated; (ii) the increase in the mean score of age groups from nine to ten years was less than that from ten to eleven years; (iii) there was no significant rise in the mean score at the age of thirteen and it decreased during the subsequent years; (iv) the correlation coefficient between verbal and nonverbal tests was 0.578 ($N=100$); (v) correlation coefficient of subtests with the entire battery ranged from 0.40 to 0.83; (vi) Thurstone's centroid method and Spearman's formula revealed only one factor; (vii) the mean IQs for age groups of ten, eleven and twelve

were found to be nearly 100 and those for age groups of thirteen and fourteen years were lower than 100 as they included retarded pupils; (viii) the chi-square test indicated slight skewness in the distribution of scores; and (ix) the average IQs of urban, semiurban and rural school pupils showed significant differences as expected.

235. BHATT, M. C., *Adaptation of the Wechsler Intelligence Scale for Children (WISC) for Gujarati population, Ph.D. Edu., Guj. U., 1970.*

The study aimed at adapting WISC as an individual test of intelligence for Gujarati population for the age groups from five plus to fifteen plus.

The scale was standardised on a sample of 440 children (220 boys and 220 girls) of Ahmedabad city drawn from twelve schools, of age groups from five plus to fifteen plus. The children were equally distributed amongst the eleven age groups. Each child was tested within one and a half months of his midyear. The WISC consisted of twelve subtests, viz., information, comprehension, arithmetic, similarities, vocabulary, digit span, picture completion, picture arrangement, block design, object assembly, coding A & B and mazes. Item analysis was done. For all the subtests, there was no method of uniform weightage wherein all subtests were given equal weightage irrespective of the number of items they had. The scaled scores were derived to provide at each age and each of the separate subtests, a mean scaled score of ten with an SD of three. This was accomplished by preparing a cumulative frequency distribution of raw scores for each test, at each age level and setting each percentile point at its appropriate standard score value on a theoretical normal curve with a mean of ten and SD of three. The scores for all ages on a single test were then listed in parallel columns and irregularities were smoothed. It was decided to have mean IQ at 100 with an SD of fifteen. The conversion of sums of scaled scores to verbal IQs, therefore, was simply a process of setting the average sum of obtained scores equal to 100 and SD of the sum of six verbal scaled scores equal to fifteen and making other transformations accordingly. The same process was followed for all six performance scales. The pupils were classified into six categories, viz., (i) defective (IQ=69 and below); (ii) borderline (IQ = 70—79); (iii) dull normal (IQ = 80—89); (iv) average (IQ=90—109); (v) bright normal

(IQ=110—119); (vi) superior (IQ=120—129); and (vii) very superior (IQ=130+).

The reliability coefficients by split-half technique, test-retest method for verbal score were 0.90 and .98 respectively and for performance score, test-retest reliability coefficient was .97 and for full score, it was .99. Validity was found out by using seven well standardised intelligence tests of Gujarat, school marks, teachers' ratings and speed and accuracy tests. The 'r' values were calculated for verbal IQs, performance IQs and the IQs on the full scale. The validity coefficients against the Stanford-Binet Intelligence scale (.653), the Desai's Group Test of Intelligence (.729), the Bhatt's Group Test of Intelligence (.701), the Desai-Bhatt's Group Test of Intelligence (.679), the Shah's Nonverbal Group Test of Intelligence (.499), Draw-a-Man Test (.484), and the Bhavsar's Nonverbal Group Test of Intelligence (.546) have also been found out.

236. BHATTACHARYA, S., SHAH, M. M. and PARIKH, J. C., *Construction and Validation of an Adjustment Inventory for the Study of Maladjustment particularly among Adolescents, Centre of Advanced Study in Education, MSU, Baroda, 1967.*

The investigation sought to construct an adjustment inventory in order (i) to identify the children who were considerably maladjusted to school and to society; and (ii) to locate the exact area of maladjustment. In this investigation it was expected that there would be marked difference between the behaviour responses given by the poorly adjusted and the fairly adjusted persons. It was further expected that the poorly adjusted would be detected by means of a suitable test.

First of all, 144 items, in the form of statements, covering twelve different areas, were constructed in English. In order to judge face validity of these items, the opinions from the experts were collected. They were also asked to judge whether each item could discriminate the fairly adjusted and maladjusted population. In order to know whether the items can discriminate between the two groups, chi-square test was employed. The sample of 400 children was selected from the certified schools (remand homes) and from other schools. On the basis of the results of item analysis, fiftyfive items covering eleven areas were selected.

The validity was established by correlating the adjustment score with the teachers' and officers' ratings on five point scale. The correlation coefficient between the ratings and adjustment scores came up to .63, which is fairly significant. The ratings by the teachers and officers were also used in the formation of two clear cut groups by eliminating borderline cases.

The study reveals that (i) construction and validation of an inventory will be useful to an educationist, a teacher or researcher in identifying or detecting the maladjusted children in schools or in other groups in society and (ii) with the help of the inventory, it should be possible to locate the exact area of problems of an adolescent, so that their origin can be traced out and the adolescent can be given proper guidance.

237. *BHAVSAR, D. M., The Construction and Standardisation of Nonverbal Group Tests of Intelligence for Standards, IX, X and XI. Ph.D. Edu., Guj. U., 1967.*

The present study aimed at preparing a non-verbal group test of intelligence for high school students of grades IX, X and XI, (age range of thirteen to eighteen years) of Gujarat.

The test consists of six subtests, viz., (i) similar figure test (fourteen items); (ii) classification test (fifteen items); (iii) analogy test (seventeen items); (iv) mirror reflection test (eighteen items); (v) series test (eighteen items) and (vi) completion test (eighteen items). The initial tryouts were done using the manuscript of the subtests with individuals as well as using the printed materials with groups. The item analysis was done by using the Thorndike's procedure and the difficulty and discriminating indices were calculated using the Psychometric Research and Service Chart showing the Davis' difficulty and discriminating indices for item analysis. The sample consisted of a total of 3184 boys and 2718 girls from classes VIII, IX, X and XI, from fortyfour schools, of sixteen districts of Gujarat. The administration of tests to the students of class VIII was done in order to cover low age group. For the present tests, age norms, grade norms and separate norms for boys and girls were established.

The reliability of the test by using test-retest method was found to be .91 (N=345) and by split-half method it was .93 in two schools and .94 in one school. The present test gave a correlation co-

efficient of .613 with the Desai's Group Test of Intelligence, .79 with the Desai-Bhatt's Group Test of Intelligence, .77 with the Nafde's Nonverbal Test. The test battery was validated against achievement of pupils in various school subjects like Hindi (.455), Gujarati (.51), social studies (.325), English (.37), science (.659), mathematics (.59) and total marks of all the subjects (.49). Regarding the internal validity, using the product moment correlation for each subtest with the whole of the battery, and each subtest with the rest of the battery, the coefficients of correlations were found to range from .47 to .769. The coefficient of correlation of each subtest with the whole battery (except in the case of similar figure test) was found to be above .50.

238. *BHAVSAR, S. J., Construction and Standardisation of Numerical Aptitude Test for the Students of Standards IX, X and XI of Secondary Schools of Saurashtra Area, Ph.D. Edu., Sau. U., 1970.*

The study aimed at standardising a test of numerical aptitude (N.A. Test). The constituents proposed by the investigator included fourteen subtests, which could further be classified under three categories, viz., (i) computation ability in four fundamental processes on the following types of numbers, viz., integers, fractions, decimals and numbers with units; (ii) computation ability with reasoning in percentage, ratio and proportion, square, squareroot, cube and cuberoot and averages; and (iii) understanding of important concepts and processes as given in problems like transformation of fractional numbers to decimals and vice versa and transformation from one unit of measure to another, brackets, place value, H.C.F. and L.C.M., counting things in a given interval and number series completion.

For each of the fourteen subtests 100 items were selected for final tryout. These were administered to 370 students and the item analysis of final tryout was done thoroughly including difficulty index, discrimination value of each distractor. For final administration of the test, a sample of 5431 students from urban and rural schools, was selected. Norms were prepared in terms of percentiles, standard scores, normalised standard scores, stanines and letter grades.

The final form of the test consisted of fifty items. The reliability coefficients have been calculated using

study. The time required was sixty minutes for the whole test. Reliability coefficients found by K-R formulae 20 and 21, analysis of variance formula and test-retest method were .92, .93, .91 and .92 respectively. Concurrent validity and cross validity were found by using sociometric technique on a sample of hostel students, insurance agents and general adults.

From the factor analysis, it was found that the test contained only one factor in the six variables studied. The validity coefficient of the test against the Desai's Test of Intelligence was .16 showing that general factor of the present test was not 'g' factor. The other observations of the study were: (i) girls scored higher on an average than boys, the difference though small was statistically significant; (ii) the correlation between the present test and the scores on the Desai's Test of Intelligence, though positive (.16) was not statistically significant; (iii) the mean scores of salesmen were more than that of insurance agents or supervisors on the test of judgment in social situations; (iv) the ability of remembering names and faces was more pronounced with supervisors rather than with salesmen or insurance agents; (v) there was no marked difference in the ability to recognise, 'the mental state of the speaker' between the three groups of insurance agents, salesmen and supervisors; (vi) the salesmen were found to have less pronounced ability to observe human behaviour than insurance agents; (vii) the sense of humour was pronounced in insurance agents more than in supervisors and salesmen; (viii) salesmen were found to have better knowledge of social interactions than what insurance agents and supervisors had.

241. BUREAU OF PSYCHOLOGY (U.P.), *Verbal Group Test of Intelligence for 12 Plus*, B.P.T. 12, Allahabad, 1953.

The test is designed primarily for male students of class VII and above falling in the age group of twelve plus and attempts to discriminate more or less uniformly at all levels of intelligence.

The test was standardised on 1970 twelve year old children reading in sixty-nine junior high and higher secondary schools of the state of Uttar Pradesh spread over five educational regions of the state. In all, 2688 students were put to test. How-

ever, 718 students of class VI were excluded from the sample because reading ability of this class was found to be poor.

Distribution of raw scores of these 1970 cases was found to be slightly negatively skewed. Mean and SD were found to be 51.71 and 25.06 respectively. The large standard deviation suggested that the test is quite efficient in discriminating children particularly in the middle range of the ability. Scores for the twelve month-groups corresponding to age, 12:0, 12:1, . . . 12:11 were calculated for 2nd, 5th, 16th, 50th, 84th, 95th, 98th and 99th percentiles and regression lines were set up for these percentiles. The table of norms for the test was drawn. IQ between 85 and 140 were to be relied upon with full confidence. However, IQ below 85 were considered tentative. Reliability coefficient of the test was calculated by split-half method and corrected by Spearman-Brown formula on the basis of a random sample of 100 scripts. It was found to be 0.97 corresponding to a standard error of 2.52 points for a child's IQ. Classification chart of IQ into various groups has been provided.

242. BUREAU OF PSYCHOLOGY (U.P.), *Construction and Standardisation of Verbal Group Test of Intelligence*, B.P.T.Z. (revised) for Age Group 13 plus, Allahabad, 1955.

The test was constructed and standardised for assessing the intelligence of school going population, particularly in Uttar Pradesh for the age group of thirteen plus. Since this is also the age of transfer from junior high school to the higher secondary school in the state, the specific aim was to provide an effective instrument for facilitating this transfer. Therefore an attempt was made to make it more discriminative for higher ranges of intelligence than for the lower ones.

Firstly, a draft of 160 items comprising word grouping, analogy, sentence completion, number series, reasoning, arithmetical and factual code, perceptual analysis, geometrical patterns, etc., was prepared. A try-out was made on 160 Hindi speaking class VII boys of three schools known for above average, average and below average results. These were divided into six equal piles and the answers were entered itemwise in the chart for each group or pile in a descending order. The chart showed

group value for each item and also its pass percentage and its E 13 value. It also bore the remark whether the item was selected for the final draft or not. Only items with pass percentage twenty to eighty, preferably those between thirty and sixty, were selected. These items were arranged in descending order of their group values. Care was taken to select items which were comprehensive in variety, content and cognitive functions sampled by them. Some lengthy items were rejected due to practical considerations of time and size of the test. From the 160 items of which draft was made, only 58 were finally selected. Another draft was prepared and a total of 100 items were thus selected. The average time taken for taking the test was nearly forty-five minutes and was therefore, limited to this period. The items on the final draft were found to have an average pass percentage of 49.5 and E 13 value .64.

The test was standardised by administering it on about 1000 students from twentyseven higher secondary schools of five educational regions of Uttar Pradesh, viz., Meerut, Bareilly, Lucknow, Banaras and Allahabad. Scores on the test and other information regarding each child was written on a card in which was entered his/her personal information data, raw score, percentile rank and IQ. Distribution of scores was found to have a mean of 28.96, SD 19.8 and median value 25.12. Distribution was thus found to be positively skewed (+.86) and this skewness being highly significant, fortyone percent of the cases were found to be spread between scores of 29 (mean) and 100 meaning thereby, that the test is more discriminatory on the higher range of intelligence. Also, it was found that number of cases between IQ 90 and 115 corresponding roughly to raw scores between 16 and 49 was about 58 percent, i.e. spread over 33 scores, whereas with mean 50 and SD 15, it would have been crowded in a narrow range of 25 scores. Again it was found that within IQ range 90-115, there was better discrimination in the range of 100 to 115 than between 90 to 100. The test can, therefore, very well be used for discriminating students of higher intelligence as it provides wider range.

For each monthly distribution of age group of thirteen plus, of 995 students, 98th, 95th, 84th, 50th, 16th, 5th and 2nd percentile scores were calculated. From these points, regression equations were calculated for each of the percentile rank.

243. *BUREAU OF PSYCHOLOGY (U.P.), Verbal Group Test of Intelligence for 14 Plus, B.P.T.S. (revised), Allahabad, 1955.*

The test is designed primarily for class VII and above students, of age group of fourteen plus and attempts to discriminate more or less uniformly at average and higher levels of intelligence so as to be efficacious in selecting children for scientific and literary courses of higher secondary education in the state of Uttar Pradesh.

The test was standardised on 952 fourteen year old boys reading in twentyseven higher secondary schools of Uttar Pradesh, spread over five educational regions of the state. Out of every three schools chosen, one was average, one above average and the other below average. The representativeness of the schools was determined on the basis of results in public examinations, the socio-economic status of the population they generally catered for.

The mean of the distribution of the raw scores was found to be 34.19 and SD 20.03. The distribution was found to be positively skewed for which it was designed so as to discriminate better at middle and higher levels of intelligence. Regression coefficients of raw scores on age were calculated for 2nd, 5th, 16th, 50th, 84th, 95th, 98th percentiles for twelve month-groups corresponding to 14:0, 14:1, ... 14:11. These were found to be respectively .50, .12, .50, .09, .16, .10 and .01. Surprisingly, coefficients were found uniformly very low and actually negative in the middle range. Under the circumstances, age allowance was not granted. Norms of the test were set up, the table of which shows the raw scores and corresponding IQs at different percentile levels. For standardising the test, the mean of IQs was kept 100 and S.D. 15. The reliability coefficient of the test was calculated by split-half method and corrected by S-B formula. It was found to be .96. It corresponded to a standard error of 3 points for a child's IQ. Classification chart for interpreting IQ into various groups of intelligence has been provided.

244. *BUREAU OF PSYCHOLOGY, (U.P.), Interest Inventory (Ruchi Pattri), Allahabad, 1968.*

The aim was to construct an interest inventory to measure the interest of students of classes X and XII.

In preparing the inventory, the method of 'logical keying of items' as named by Cronbach was used. Based on this method, activities of each interest area were described. These items for each interest area were classified. In the present inventory, the areas of interest used were the same as suggested by Kuder in his Vocational Preference Record Manual C. They were: outdoor, mechanical, computational, scientific, persuasive, artistic, literary, musical, social service and clerical. Inventory has five parts. Each part has fifty items. Thus, it consists of 250 items. In part one—most liked items were put, in part two—liked items, in part three—generally liked items, in part four—less liked items and in part five—least liked items were put. For each interest area, twentyfive items were selected and put in the order most liked to least liked items. For administration and scoring, instructions were prepared. For calculating the reliability of instrument, it was administered to students of three local colleges in classes X and XII, keeping in view the socio-economic status of the parents of the students. As many as 122 students took the test. By product moment method, correlation coefficients among all the ten interest areas were found out.

The product moment r 's among the ten interest areas ranged between .51 (musical) and .67 (mechanical). All the correlations were significant at .01 level. As regards the validity, it is suggested that the interest inventory was constructed on the basis of the interest area given by Kuder. Items were selected on logical analysis based on definition of interest area given by Kuder. Items put were based on the suggested vocational activities described in the manual. Thus, its validity has been proved. With its popular use more evidence could be collected. Standard criterion was based on the scores obtained by the students of classes X and XII for which percentages were found out. Interpretation of the scores, their vocational meanings have been given at the end of the manual.

245. *CIE, C.I.E. Individual Scale of Intelligence, New Delhi, 1957.*

The study aimed at constructing an individual scale of intelligence in Hindi for the age group of three to sixteen and above. The idea was to adapt essentially the Terman - Merrill Revision and some other tests for Indian children so as to evolve

an age scale for groups three to sixteen years and above.

The work began with a survey of the various tests devised elsewhere as based on the old Stanford-Binet. Test items were put in the age groups which were generally assigned by the various authorities. One hundred and fortyseven items constituting the provisional battery for tryout were split into two forms. The number of items included in every age group in the original battery varied from eight to twelve. The test was administered to a random sample of 1436 school children of fifty schools in Delhi metropolis. The random sample of school children was made first by randomising the schools and then randomising the children in these schools. Out of 1436 children, 712 were boys and 724 were girls. From the analysis of the socio-economic status of parents numbering 1345, it was found that a large majority was from middle class families. The percentage of passes for each test item, in each age group, for boys and girls together, was determined and so also the difficulty values of each test item, in terms of the percentage of passes on individual items in the entire sample of children were calculated. Care was taken that the scale was not overloaded with verbal items and that nonverbal and performance items had a fair share in at least earlier stages. In assigning ages to various test items, Burt's method was followed in preference to that of Terman. Thus assigning the ages to the various good items, a tentative scale was formed. The finding of IQs on the scale could be possible for children of ages upto eleven plus with the items selected upto the age of eleven. The test items put in the scale for ages three to eleven plus could be accepted as valid for finding IQs of children of age below eleven and the validity of items beyond that age level (exactly beyond twelve years of age) in the same had to be further determined after selecting items for age level of fourteen years and for the adult level. The validity of various test items was further examined by calculating biserial r 's for each test item as against the test as a whole. Mental ages for each age group were taken to represent the total score on the test. For tests allocated to a particular age, biserial r 's were calculated for that age and also for the ones preceding and succeeding.

The validity of the scale, so far finalised, has not been examined against any other external criterion. For the present, the scale consisting of valid items and having the criterion of internal consis-

tency fairly fulfils the necessary conditions of a standardised test of intelligence and can be used for children of age groups below eleven years for estimation of their IQs.

246. *CIE, Construction and Standardisation of a Verbal Group Test of Intelligence (13+)*, New Delhi, 1959.

The purpose of the study was to develop a test for assessing general ability of school going children of age group eleven to fourteen years. It is an omnibus test in Hindi having a variety of items generally accepted as measuring intelligence.

A pool of 300 items of different types was constructed, which was divided for ease of administration into four forms A, B, C and D of seventyfive items each. These forms were administered to a sample of 1341 children of age groups eleven plus to fourteen plus from Delhi schools. The items were subjected to item analysis. The final form of the test consisted of eightyfive items distributed among the types of matching the rhyme, same or opposite, classification, numerical problems, syllogistic reasoning, analogies, essential thing, code, number series, best answer and synonyms. For the final standardisation of the test, due to several reasons, all primary schools, all rural schools, craft and vocational schools and schools with languages other than Hindi as medium of instruction were excluded. From the rest of the schools, 633 boys and 581 girls were randomly selected to form the final sample. Norms, reliability and validity of the test were established.

The split-half reliability coefficient of the test was 0.97. The test-retest reliability coefficient ranged between 0.73 and 0.87. The validity coefficient for the test against the previous school examination marks was 0.42 for boys and that for girls was 0.33 (only thirteen year old children were considered). The validity coefficient for the test against the teachers' estimate was 0.60. The validity coefficients for the test against the nonverbal test of intelligence (prepared by J. W. Jenkins and published by National Foundation of Educational Research in England and Wales, translated in Hindi at the Central Institute of Education) and against the Raven's Progressive Matrices were respectively 0.71 and 0.43.

247. *CHATTERJEE, B. B., Exploration of Some Structural Components of Creativity Through Projective Tests*, Gandhian Institute of Studies, Varanasi, 1970.

The aim of the study was to find the impact of schooling received by the child on his productive imagination.

Children of age group eight to fourteen years were drawn randomly from five different schools. These schools were—one well equipped convent school run on Western lines, one equally well equipped convent run on combined Indian and Western lines, one well equipped Basic school at Sewapuri near Varanasi, and two poorly equipped village schools. Chatterjee-Sharma's adaptation of Lownfeld Mosaic Test, and Indian adaptation of Raven's Controlled Projection Tests were administered to the whole sample. In the latter test, only drawings made by the children were considered for analysis and scoring. Both the tests were rated on a fifteen point scale fashioned on the lines of Semantic Differential of Osgood.

The investigator arrived at the following findings: (i) In terms of productivity, children from well equipped and advantaged schools seem to do somewhat better than their counterparts in ill equipped schools. But in terms of aesthetic qualities, such clear-cut differences are found only in drawing. (ii) The consistencies in performance across projective outputs using two modalities of expression can be accounted for by the construct of response set rather than any intrinsic projective process.

248. *CHATTERJI, S., Development of Nonverbal Interest Inventory based on Adaptation of Certain aspects of Kuder Preference Record*, D.Phil. Psy., Cal. U., 1961.

The study was undertaken to develop an interest inventory for the students in India.

The pilot inventory was constructed using stick figures to depict the activities. Ten fields of interest such as fine arts, literary work, science, medical services, agriculture, mechanical work, crafts, outdoor sports, household work, clerical and musical were considered. About 500 pictures using stick figures were prepared and 350 were used in the first triadic form of the inventory. Experienced judges were asked to rate the activity pictures. In the first stage, twenty pictures were taken and were given to a representa-

tive group of arts and science students. This gave scores on ten broad interest areas. On the basis of judges' opinions and students' responses, the experimental version consisting of nine areas was prepared. This experimental version was administered on 800 boys of topmost class of their school career in Calcutta, Patna, Allahabad, Agra, Bombay, Sholapur and Ranchi. This test had undergone four revisions. Intercorrelations between the different scales, scale reliability coefficients and intercorrelations between the stages were calculated for the scores obtained after each revision of the scoring scale. As the correlation coefficients between the last two sets of scores were all .90 or above, the scales were considered sufficiently purified.

Considerably higher correlation coefficients between the scientific, the medical and the technical scores on Kuder Preference Record, were found on a sample of thirtythree first year arts and science students. The obtained correlation coefficient between the Kuder Preference Record scientific and mechanical scales was as high as .72. Correlation between the scientific and the mechanical scales was the highest. Between the outdoor and the scientific scales the relation was reversed. Intercorrelations for the ten scales of CNPR-962 were calculated on the basis of stratified random sample of 200 cases picked up from 1300 cases collected earlier. The relation between KPR and CNPR scores, CNPR scores and achievement, CNPR scores and manifest interest were also found out. Lastly, stability of interest measured by the KPR and the CNPR was found out. The reliability coefficients for ten CNPR-962 scales (calculated by K-R formula 21) ranged from .69 to .95 for all the scales. It was observed that students' interests had shown high stability in those fields which were in some way connected with the training given.

249. CHATTERJI, S. and MUKHERJEE, M., *Non-Language Test of Verbal Intelligence*, ISI, Calcutta, 1967.

The study aimed at developing a test which would measure verbal ability through a nonlanguage or language fair medium. It was hypothesised that such a nonlanguage test may meet the dual challenge of language and accurate prediction.

In the beginning, the pilot study was carried out. A small test of fiftyfive items consisting of three parts, viz., similarity, classification and picture series

was constructed in a nonlanguage form. With this nonlanguage test, test of abstract reasoning and test of verbal reasoning were also included. The test was administered to about 1075 students of class VIII belonging to thirteen different schools of Calcutta. The reliability coefficient (K-R formula 21) of this pilot study was .82 and validity coefficient was as high as .39 even at the stage of development. As a result of the pilot study, experimental form with large number of items was prepared and tried out. This experimental version consisted of four parts, viz., classification, opposites, analogy and picture arrangement. The experimental form was administered on 500 students of class VIII in different schools of Calcutta situated in different areas. Two other tests which were used in the pilot study were also used this time. Mean and standard deviation for each part of the test were calculated separately for boys and girls. There was no significant difference between the two sexes. The intercorrelations between the different parts of the test were round about .52. The reliability coefficient for the total test score was .91 (K-R formula 21). The validity coefficients of the part and total scores on the test calculated against total school examination marks ranged from .22 to .40 with a median of .28. On the basis of the scores obtained by the candidates on the three tests, viz., the non-language test of verbal intelligence (NLTVI), the test of verbal reasoning (VR) and revised test of abstract reasoning (AR), the three stages of item analysis as done in the pilot study were repeated. The difficulty and discrimination values were obtained with NLTVI scores. Validity coefficients were obtained on the basis of the selected items of NLTVI. The experimental form was revised. The values of revised NLTVI held great predictive value specially for the science groups. This was also true for the girls' humanities group, while the obtained validity coefficients for the boys' humanities and commerce groups were of much lower order. The revised items were arranged on the basis of their difficulty values separately for the four parts of the NLTVI. The final test was administered on the students of class VIII of randomly selected three boys' and three girls' schools of Calcutta which had Bengali as the medium of instruction. The total time taken was fortyfive minutes. The intercorrelations among the NLTVI part scores were calculated along with means and standard deviations.

The values of intercorrelations between parts of the test were significant at .01 level. The reliability coefficients (K-R formula 21) were .64, .69, .76, and .79 for all the four parts of the test. The regional norms were developed on the basis of data collected. The validity coefficients were calculated against the total annual school examination marks. They ranged from .22 to .64 with a median of .38. All the obtained coefficients were significantly different from zero.

250. *CHATTERJI, S., and MUKHERJEE, M., Predictive Validity of an Aptitude Test Battery used for Differential Prediction, ISI, Calcutta, 1967.*

The present study dealt with the validity study of an aptitude test battery developed for measuring the potential ability of students studying in the delta class, in different streams of study, viz., science, humanities, commerce, home science, agriculture, technical and fine arts. The test battery consisted of the following tests — English knowledge and comprehension, clerical aptitude, abstract reasoning, verbal reasoning, mathematical knowledge and aptitude, scientific knowledge and aptitude, and mechanical comprehension.

A total of 1042 students (386 girls and 656 boys) of class VIII of twelve Bengali medium higher secondary schools at Calcutta in the year 1963 formed the sample. The schools were selected on the basis of stratified random sampling. The mean, median, mode, and the standard deviation for the scores were calculated. The split-half reliability coefficients were more or less satisfactory, though for some of the tests the obtained values were a bit low in comparison with the number of items included in the test. To obtain the estimates of the performances of the students at a future date on the basis of the scores on the aptitude tests in different courses of study, multiple regression equations were developed. For regression equations, Class IX annual examination marks were taken as criterion. For finding out whether the intra-group differences in the regression equations for four of the five broad classifications were statistically significant or not, the method described by Rao, C. R., was used. In order to check the accuracy with which the aptitude tests could predict success, the scores were combined in the way indicated by the regression equations obtained for different streams and expectancy tables using the

weighted scores were developed. This was compared with the predictive validity of school examination marks in English and mathematics, the performances on which were usually considered for the allocation of the students to different streams. For testing the predictive validity, the students were grouped as high, average and low on the basis of their marks in mathematics and English separately.

The results indicated that (i) when the students were classified on the basis of their scores in mathematics, it could be seen that the predictive efficiency of these scores with respect to later success in science stream was lower than that of the weighted combination of the aptitude test scores, specially for boys' group; (ii) this score in mathematics was related in a better way with success in humanities; (iii) those who were in the low group according to mathematics marks had more than fifty percent chance of passing the science course; (iv) in the case of the commerce stream, these marks had negligible relation with future success; (v) the marks in English were better related to success in science than were the marks in mathematics; and (vi) the English marks were highly related to later success in any of the three streams — science, humanities and commerce.

251. *DASGUPTA, J. C., Assessment of Personality, David Hare Training College, Calcutta, 1969.*

The study was undertaken to prepare and validate a battery of inventories for quantitative measurement of certain personality traits and to see how the childhood experiences and the personality traits influence the mental health and happiness of a subject.

The battery contained items pertaining to traits, viz., (i) love-giving, (ii) love-seeking, (iii) self-love, (iv) assertion and submission, and (v) happiness. The sample of 1150 persons of both males and females of the age groups ten to eleven and forty to fortynine was drawn from Calcutta and California. Some subjects of the sample had clinical experience. The inventories were validated against the average of independent ratings of forty subjects by three competent observers.

The product moment 'r' revealed that for each, the value was significant at 1 percent level. Reliability coefficients of individual subtests by test-retest method ranged from .68 to .86, by split-half method they ranged from .46 to .77, while the r's

of the whole battery with individual subtests ranged from .64 to .79. Following observations were also made: (i) Upto certain age, love-giving was found to increase as one grew older. Females in each age group were, on the whole, more loving than males. (ii) The capacity of love-giving was largely genetically determined. Parental love versus aggression received during childhood by the subjects bore no relationship to the love-giving capacity during adolescence or adult years. (iii) While love-giving was not influenced by the fact of receiving parental love, the wish to be loved was found to be highly susceptible to such influence. (iv) Adolescents were found to have greater self-love than adults. Men displayed greater love than women. (v) Self-aggression and object aggression were significantly and positively correlated. The levels of self-aggression and object-aggression were the same in the case of seventyfive percent men and seventyone percent women. (vi) The experimental work confirmed a clinical finding that a person rejects himself if his parents have rejected him. (vii) Males showed significantly greater assertion, while females showed interest in submission. (viii) Happiness was found to have the highest negative correlation with aggression. Self-love was found to show a small but significantly positive relationship with neuroticism. (ix) American women were found to be much more assertive than their Indian counterparts.

252. DASS, S. L., *Developing a Motion Pictures' Group Test of Personality for Adolescents on the lines of Thematic Apperception Test*, Ph.D. Psy., Pan. U., 1967.

The study aims at developing a group thematic test of personality for adolescent boys. Short movie picture sequences have been used as stimuli for obtaining stories from subjects. The test is trait oriented and has been developed on psychometric lines. The ten sequences are related to ten personality qualities, one sequence referring to only one quality. All the sequences are silent and each one of them takes about half a minute for projection. Ten personality qualities of the Guilford-Zimmerman Temperament Survey form the basis of the test.

Movie pictures of the finally selected ten situations presented only midportions of activities taken from the day to day life of adolescents and provided adequate scope to the subjects not only

for subjectively interpreting the portions presented, but also for formulating their preceding and concluding portions. Stories were assessed following a normative scheme in which the assessor, after going through the story of a boy written to its related sequence, answered three questions by tick-marking a five point rating scale for each question. Interrater reliability coefficients ranged from .01 to .70 with a median of .39. The test-retest reliability coefficients with a time gap of forty days ranged from .42 to .85 with a median value of .74.

The concurrent validity coefficients against Indian version of the Guilford-Zimmerman Temperament Survey ranged from .26 to .27 with a median value of .26. The validity coefficients against teacher ratings ranged from .18 to .52 with a median value of .37. The validity coefficients against the criterion of sociometric assessment ranged from .22 to .41 with a median value of .31. The test can be used for selection of boys for situations in which the personality qualities like general activity, sociability, restraint, ascendance, emotional stability, friendliness, objectivity, personal relations and masculinity come into play.

253. DAVE, B. M., *Construction and Standardisation of Scientific Aptitude Test*, Ph.D. Edu., SPU, 1964.

The present test was designed to measure scientific aptitude of high school students and to help the authorities concerned in selecting and admitting pupils to the science courses at the university level and help in early identification of exceptional science talent.

The term 'scientific aptitude' was analysed in terms of basic traits, viz., (i) scientific comprehension, (ii) mechanical reasoning, (iii) numerical ability, (iv) space relations, and (v) scientific information. In the beginning, 180 items were prepared and administered to two criterion groups consisting of students having high and low scientific aptitude, selected on the basis of teachers' ratings and achievement in a general science test. Chi-square technique was employed and the items which discriminated between the two groups were considered valid. The item difficulty and internal consistency of each valid item was found out by administering the test to 370 S.S.C. class pupils, selected at random from thirteen different schools of five districts of Gujarat state. The final test consisting of 100 items was

standardised on a sample of 1218 S.S.C. class pupils selected randomly from thirtytwo schools and three coaching classes of seven districts of Gujarat. The time limit for the whole test was fifty minutes.

The values of the mean, median and standard deviation of the test scores were found to be 28.17, 28.00 and 9.90 respectively. The chi-square test of goodness of fit showed that the scores were normally distributed. The reliability coefficients calculated by test-retest, split-half, rational equivalence and analysis of variance methods were .92, .92, .91 and .89 respectively. Content, construct, concurrent, predicitive and cross validity co-efficients were also computed.

254. *DESAI, K. G., The Construction and Standardisation of a Battery of Group Tests of Intelligence in Gujarati for the Age-Group 12-18 Studying in Standards VII to XI of Secondary Schools, Ph.D. Edu., Bom. U., 1954.*

The purpose of the study was to develop a battery of group tests of intelligence in Gujarati. The investigation sought to prepare a tool to measure verbal ability, number ability, ability to perceive relations and follow directions, imagination, reasoning, judgement, memory, suggestibility, and speed of response.

Accordingly, the subtests included in the tests were: (i) following directions, (ii) opposites, (iii) disarranged sentences, (iv) proverbs, (v) reasoning, (vi) number sequence, (vii) analogies, (viii) similarities, (ix) narrative completion, (x) memory and suggestibility, (xi) synonyms and antonyms, (xii) classification, (xiii) arithmetical problems, (xiv) geometrical figures, (xv) family tree, (xvi) arranging in alphabetical order-imagery tests, (xvii) code language or foreign language tests, (xviii) mirror images, and (xix) general information. All tests were intended to be verbal. A pre-tryout was done on a sample of fifty students and the actual tryout on a sample of 246 boys and 149 girls drawn from two schools in Greater Bombay. The final form prepared through item analysis was administered on a sample of 4735 boys and 4770 girls with a time limit of seventy minutes.

The coefficients of reliability found by split-half and test-retest methods were 0.77 and 0.88 respectively and that for the whole test by Spearman-Brown formula was 0.94. Coefficients of correlation

of IQs with the marks in the annual examination, teachers' estimate and Gujarati adaptation of the Stanford Revision were found to be .42, .53 and .82 respectively. As regards internal validity, the validity coefficients were found to vary from .503 to .845. The centroid method was employed on a sample of 100 cases for factorial validity and Spearman's method for detecting 'g' saturation was also attempted. The correlation between the caste and intelligence was found to be very low. As regards sex, the VII grade girls scored much lower than the boys of the same class. No difference in intelligence upto the age of fourteen was noticed due to sex but after that age, girls were found to be a bit better.

255. *DESAI, U. R., Construction and Standardisation of a Language Aptitude Test for High School Students in Gujarati, Ph. D. Edu., Guj. U., 1970.*

The study was undertaken to construct a language aptitude test battery for pupils in the age-range of 10.6 to 18.5 studying in different grades of secondary schools of Gujarat.

The battery included various subtests, viz., (i) spellings; (ii) synonyms; (iii) meaning of idioms; (iv) word meaning; (v) meaning of proverbs (similarity); (vi) meaning of proverbs (dissimilarity); (vii) multi-meaning words; (viii) words for a phrase; (ix) sentence structure and punctuation; and (x) regionalism, styles and comprehension. The test was tried out twice to remove ambiguities and to check adequacy of instructions. For item analysis, the test was administered on 266 boys and 130 girls. Item analysis was separately done on each of the sixteen groups formed on the basis of grade, sex, and culture, using Harper's Psychometric Research and Service chart. Guilford's formula for correction was used. Out of 220 items, 100 items were chosen. The mean difficulty value was about fifty percent. The subtest designed to measure 'style' was eliminated completely on account of poor discrimination indices. The items were arranged in a spiral omnibus form and printed in a single booklet. In total, there were 100 items distributed over ten different subtests. The stratified sample drawn included both boys (4044) and girls (2477) of urban and semi-urban areas studying in grades VIII and falling in the age-range of eleven to nineteen years. The mean scores of different age groups in each of the four

grades, separately for the two cultures and sexes were calculated and the significance of their differences was studied by calculating critical ratios. Separate norms for each grade, sex and culture were established. Percentile rank was used as a measure of brightness. Stanines were also calculated for each subgroup. Reliability, validity and the measures of central tendency were also computed. The reliability of test was found out by test-retest method, split-half method, Rulon's formula, Guttman's formula and K-R formula 20. The values ranged from .32 (test-retest, students of grade XI, $N=50$) to .82 (K-R formula 20, entire group, $N=290$). The test was validated against the criteria of examination marks and teachers' estimates of pupils' language aptitude. The validity coefficients ranged from .30 to .51. The product-moment correlation coefficient between PRs on the test and the deviation IQs on the Desai-Bhatt's Group Test of Intelligence was found to be .37. The correlation between this test and a test of numerical ability was low ($r=.2$). Factor analysis by Thurstone's centroid method revealed only one general factor. A study of the frequency distributions of the scores for each of the sixteen norm groups revealed that the rise in the mean score with grade was consistently observed and could be treated as test validity. The other observations were (i) the frequency distribution was normal; (ii) regarding sex difference in language aptitude, the mean scores of girls were found to be consistently superior to that of boys in each grade and culture group.

256. *DESHPANDE, K.H., Preparation of a Predictive Battery of Tests for Aptitude for Science for Boys of Secondary Schools, Ph.D. Edu., Nag. U., 1967.*

In this study, an attempt has been made to evolve a battery of tests to measure aptitude for science. The major purposes for constructing the test were (i) to help and select students for science courses at the end of class VIII and (ii) to provide a tool to predict the likely achievement of the pupils in science courses in future. The test was constructed for use in the Vidharbha area of the Maharashtra State.

The battery consists of six subtests on (i) number, (ii) reasoning, (iii) problem-solving, (iv) memory, (v) physical relations and (vi) finger dexterity. The test was tried out on a sample of 409 students of grade VIII from eight high schools of Nagpur,

Amravati and Washin. In the tryout form, there were 268 items in addition to the finger dexterity test. Davis' tables were used for item analysis. The final draft of the test consisted of 201 items and the finger dexterity test. For normative data, the final test was administered to 856 students from seven schools of Nagpur and Amravati. The students had passed class VIII.

The distribution of the scores was found to be normal. The reliability coefficients of the individual tests ranged from .65 to .92. The reliability coefficient for the composite test, by using Mösier's formula, was found to be .94. The validity coefficient for the test, by using Thompson's inverse matrix method and by Aitken's method of pivotal condensation and corrected for shrinkage, was found to be .56. A sharp differentiation between the poor and good achievers was made available by the use of discriminant function. The factor analysis exhibited more clearly the nature of functions involved in the test and criterion performances. The existence of a substantial 'g' as a first major factor running through all the variables was displayed. The highest loading of .72 of the second factor was obtained by the criterion. This factor showed that there was a sort of 'Motor Mechanical Manipulative' factor in the criterion which linked it with higher dexterity. The factor matrix without criterion showed the highest loadings of .68 in the first general factor on problem test which nearly assumed the character of achievement in science examination. The school factor was a pure 'N' factor having no linkage with other test. In both the analyses, the second factor was of subordinate nature, particularly in the bipolar grouping of variables. The variables in the order of their saturations by the factor had the following pattern—criterion, number, problem, reasoning, memory, physical relations and finger dexterity. This process demonstrated that the tests were working together in the common direction of a functional unity which had a major share in the criterion of examination marks with unknown reliability and validity.

257. *GOPALAN, N.P., Construction and Standardisation of a Vocational Interest Inventory for the Secondary School Pupils of Kerala, Ph.D. Edu., Ker. U., 1972.*

The main purpose of the study was to develop a standardised instrument to assess the interests of

secondary school pupils in Kerala to reveal educational and vocational choices.

Kuder format was followed in developing the inventory. First, fourteen interest areas were tentatively selected on the basis of the areas measured by the Kuder Preference Record, Chatterji's Non-Language Preference Record, etc. Then these areas were presented to pupils of standard X in different schools to write down those areas in which they had some interest and under each of the areas a number of activities which they thought were indicative of their interest in those areas. After analysing the activities the following eleven areas were finally selected, (i) outdoor, (ii) computational, (iii) engineering, (iv) scientific, (v) medical, (vi) agricultural, (vii) persuasive, (viii) artistic, (ix) literary, (x) special service and (xi) household. Thus, for pilot inventory, 165 triads were formed which included a total number of 495 activities and each area being represented by fortyfive activities. This pilot inventory, with necessary instructions and answersheet, was administered to 100 students of standard X—fifty boys and fifty girls, drawn from seven schools. After scoring the answersheets, item analysis was carried out. The final inventory included 132 triads which were found to be significant as a result of item analysis. This final inventory was administered to 1071 students selected by proportionate stratified sampling technique. Only 1058 answer sheets were used for analysis and preparation of norms. The answersheets of the standardisation sample were scored and grouped according to sex. Each sex group was further divided according to rural-urban locality and each of these was further arranged in ascending order of age. Means and standard deviations of all the subgroups were calculated and were used to find significant differences, if any, between the different groups. On the basis of these findings, it was decided to prepare a set of separate norms for rural boys, urban boys, rural girls, and urban girls. A second set of norms for boys (rural and urban combined) and girls (rural and urban combined) was prepared. A third set of norms based on the total sample was also prepared. The percentile was adopted as the type of norm for the present inventory and the tables of norms were prepared from cumulative percentages. The reliability was estimated by the split-half as well as by the test-retest methods. Face validity and construct validity were estimated. An indirect indication of validity by the low inter-correlations between the different scales and factorial

validity were also attempted for the present inventory.

The present study has resulted in the development of an inventory consisting of 227 valid items presented in 132 triads in twelve statement sheets to measure the vocational interests of the secondary school pupils of Kerala. Answersheets, scoring stencils, a manual containing general background information, instructions for administration, and norms for various groups are also developed.

258. HUNDAL, P.S., *Construction and Standardization of a Verbal Group Test of General Mental Ability for the Panjabi Speaking School Children of Age-Group 13-17 years, Ph.D. Psy., Pan. U., 1963.*

The objective was to standardise a verbal test of general mental ability for Panjabi speaking school children of age group thirteen to seventeen years.

The preliminary draft having seven subtests was prepared and administered on a sample of 378 school children. The items were analysed and suitable test items from different subtests were selected and arranged in ascending order of difficulty. In the second stage, the test draft was administered to a new group of 351 students drawn from grades VII to XI. In the third stage, the test booklet was administered to 340 students drawn from grades VII to XI. Item analysis was carried out on the basis of both the second and third tryouts. It was found that the two sets of results, with regard to item difficulty, were quite comparable. Hence, the average item difficulty for each item was computed and on this basis the test items in the final version of the test were arranged. The final test was administered on a random sample of 1,882 students from grades VII to XI selected from the Panjabi speaking area of the Punjab. T-scale and C-scale norms for grades VII to XI, for age range thirteen to seventeen years were established for boys and girls, separately. The reliability was established by test-retest and by split-half methods. Validity coefficient against academic achievement scores of 345 selected students of grades VII to XI was found out. To find out the factorial validity, answersheets of 400 students of grades VII to XI were used. The centroid solution, followed with rotation through extended vectors methods, was employed for this purpose.

It was found that (i) the reliability coefficients found by test-retest method ranged from .87 to .90

for different grades; and that by split-half method, they were around .95 and (ii) the validity coefficient against academic achievement scores was .83 and the test measured a factor of 'General Mental Ability.'

259. *HUSSAIN, S., Hindi Adaptation of Bell's Adjustment Inventory and Construction of Norms for College Students, Ph.D. Psy., Pat. U., 1969.*

The study aimed at adapting the Bell's Adjustment Inventory in Hindi for college students.

The items initially adapted by Educational and Vocational Guidance Bureau, Patna, Bihar were used in this study. The inventory was administered to a sample of college students of Patna University. After item analysis, 135 items were retained. Inter-correlations among the four areas of adjustment were computed. Reliability and validity of the inventory were found out and were quite high. Percentile norms were developed separately for male and female students at different educational levels. Separate norms were also developed for rural and urban male college students.

260. *JAIN I., A Non-verbal Test of Intelligence, Ph.D. Psy., Del. U., 1965.*

The study aimed at preparing a standardised nonverbal test of intelligence.

Spearman's two factor theory was used for constructing the test with the assumptions that (a) in representative populations, the general factor accounts for a large proportion of the total common factor variance and (b) the general factor is less liable to vary in different populations or with alterations in the battery of tests. Spearman's general factor hypothesis regarding the nature of intelligence was selected in preference to the more comprehensive hypothesis postulated by Vernon and Holzinger. Perceptual medium was chosen for this test. A pool of 300 items were selected and administered on a sample of 370 final year degree students of Delhi University. Davis' procedure for item analysis was employed for the selection of items. Two hundred items were suitable on the criteria of internal consistency and external validity. For the construction of the parallel forms of the test, the selected items were matched for three indices, viz.,

item difficulty, internal consistency and item validity, and allocated to the two forms of the test. To this end, a procedure of successive subgrouping was devised by the author. A preliminary check on the extent of parallelism achieved was also made. The final forms of the tests were tried out along with a number of criterion referenced tests for determining the most suitable time limit for the test forms, for verifying their parallelism and finding their reliability and validity. The testing programme was conducted in two phases. In the first phase, the two forms of the test were administered, along with four criterion tests to 210 candidates for commissions in the Armed Forces. In the second phase, 277 candidates for admission to the various technical/nontechnical trades in the Indian Air Force were given form B of the test and a number of reference tests.

The parallel forms reliability for the test was .80 and the index of reliability was .90. K-R estimates of reliability indicate that the test forms are fairly homogeneous. Factorial validity was studied by analysing the test, first against a battery of various reference tests. The former study showed that the two forms of the test had fairly high 'g' saturation, viz., .77 and .73 for form A and form B respectively, and 'g' saturation for the two forms was found to be the highest. The final forms were administered to a fresh sample to determine a suitable time limit for the test forms and was fixed at fifty minutes. The criteria of maximising power component, reliability and validity of the test forms in addition to maximum variance and suitable location of the mean in the score range were used. A set of norms applicable to the higher secondary school leavers of Delhi region on a sample of 1,000 subjects was prepared. The norms were prepared on a sample of 1,000 higher secondary school leavers, applicants for commission in the officer cadre of the Defence Services. Analysis of the scores for various age groups revealed an interesting fact that higher age group scores, on the average, were lower than lower age group scores.

261. *JOSHI, M.C., Construction and Standardisation of a Group Test Of General Mental Ability in Hindi for School and College Students, Ph.D. Psy., BHU, 1961.*

The objective of this study was to construct and standardise a group test of general mental ability.

The verbal spiral omnibus group point scale type test was chosen to be the test format. It included seven subtests, viz., synonyms, antonyms, number series, classification, best answers, reasoning and analogies. Each of these subtests was administered to separate groups of 200 students, in each of the classes VIII and X for first tryout and revision. At this stage, 100 items were taken from the seven subtests and were put in spiral omnibus arrangement which was tried on a new sample of 863 students of classes VIII to XII with a time limit of twenty minutes. For final standardisation of the test an additional sample of 1,054 students was selected. The final form of the test consisted of eightyseven items.

The reliability coefficients were found to range between .81 and .86 for the different class-levels and between .84 and .90 for the different age levels. The 'g' saturation was computed by the Spearman's technique. The inter subtest correlation coefficients ranged from .27 to .55, while the subtest-total test correlation coefficients ranged between .53 and .91. All the seven subtests were found to be highly saturated with 'g'. The 'g' loading ranged between .60 and .72. Construct validity coefficient was found to be .88. The factorial analysis revealed a general factor and three minor factors in relation to 'Reasoning', 'Education of Relations and Correlates' and 'Verbal Abilities', respectively. The urban students were found superior in intelligence to those from rural areas. Students coming from the lower socio-economic status differed significantly from those coming from the upper socio-economic status of the urban sample. Caste was not found to discriminate students in terms of intelligence.

262. KAUL, B.L., *Construction and Standardisation of a Verbal Group Test of Intelligence in Kashmir State (Age Group 12+ to 16+)*. Ph.D. Edu., MSU, 1966.

The investigator aimed at constructing and standardising a verbal group test of intelligence for the age group twelve plus to sixteen plus in Kashmir.

The present test consists of seven subtests, viz., opposites, similarities, classifications, analogies, problems, number series, jumbled sentences, with a total of 148 items and a time limit of 100 minutes. The items were selected on the basis of item analysis using biserial 'r' and the difficulty values of the items. The test was standardised on a sample of

5,872 pupils of age groups twelve plus to sixteen plus, drawn from thirtyone schools of three districts of Kashmir. To obtain the value of IQ from the observed score in the test, agewise means, standard deviations, norms and the appropriate deviations were found out.

The reliability coefficient by split-half method was found to be .94 and by test-retest method was .90. Against the criterion of teachers' estimates, validity coefficient was found to be .52. Also the test was found to correlate highly ($r = .77$) with the Raven's Standard Progressive Matrices. The other observations were: (i) a normal distribution of the scores was observed both statistically and graphically; (ii) an increase in the mean scores with age was observed; but an irregular ascent in the age group from twelve plus to thirteen plus and a steep growth in the age group from fourteen to fifteen years were observed, while in the age group from sixteen to seventeen it was more horizontal. Thus, with the exception of age group from twelve to thirteen other groups showed a constant rise in intellectual growth.

263. KAUR, A., *To Develop Battery of Tests and Procedure for the Educational Guidance of the Pupils in Different Streams of the Higher Secondary Schools*. Ph.D. Edu., Raj. U., 1970.

The main objectives of the study were: (i) to develop a battery of tests and procedure which would help teachers and counsellors in collecting information about students' abilities, aptitudes and interests; (ii) to suggest suitable procedure to be adopted by teachers for giving educational guidance to students studying at 'delta class' level for the selection of educational streams in class IX; (iii) to enumerate the areas of educational guidance programme in terms of priority of research; and (iv) to suggest ways and means by which the battery of tests could be used for selection and allocation purposes.

The sample consisted of 697 boy students who were enrolled in class IX of higher secondary schools of the city of Ajmer. Selected measures of cognitive abilities, academic achievement and interest, employed to investigate the potent predictors of success for the referred streams were (i) Revised Minnesota Paper Form Board Test series AA; (ii) Abstract Reasoning Test-Form A (DAT); (iii) Numerical Ability Test-Form A (DAT); (iv) Ari-

thmetic Achievement Test (RCEA T-5); (v) Hindi Achievement Test (CIE T-7); (vi) General Science Achievement Test (RCET T-4); (vii) Group Test of Intelligence (CIE T-3); and (viii) Chatterji Non-Language Preference Record Form 962 (CNPR-962). The reliability of tests was calculated by various methods.

The findings of the study revealed that (i) for the humanities group, the multiple 'R' for Hindi Achievement Test, General Intelligence Test and the literary field of the CNPR-962, ranged from .1825 to .2605 for different criteria. The total variance accounted for by these batteries did not exceed seven percent for any of the three criteria, viz., elective subjects score, core subjects score and total subjects score; (ii) the coefficient of correlation between the scores predicted through this battery, and the actual performance of students of humanities group in the higher secondary examination was not found to be encouraging; (iii) all the predictors were found to have sufficient reliability, but the scrutiny of coefficients of correlation between the test variables and the criterion variable of humanities group revealed that only General Intelligence Test and Hindi Achievement Test were found to yield statistically significant correlation coefficient; (iv) the fields of the highest interest of this group were literary and agriculture, whereas that of lowest interest was science; (v) the combination of valid tests yielding maximum multiple 'R' for commerce group was not the same for all the three criterion variables: Space Relation Test, Abstract Reasoning Test, Hindi Achievement Test, General Science Achievement Test and teachers' ratings of students' interest yielded different combinations in case of three criterion variables; the multiple 'R' ranged from .4163 to .5324 and the total variance accounted for by these batteries did not exceed twentyeight percent; (vi) the coefficient of correlation between a combination of predictors and the elective subjects score in higher secondary examination results of eightyfour commerce students was found to be .55, significant at .01 level; (vii) Abstract Reasoning Test, Hindi Achievement Test and teachers' ratings of students' interests were found to discriminate between successful and unsuccessful students in the commerce stream; (viii) the interest patterns of commerce students who appeared in the higher secondary examination resembled that of humanities group more than the science group; fields of the highest interest of commerce group were fine arts and household and the lowest

were scientific and medical; (ix) Numerical Ability Test, Hindi Achievement Test and General Science Achievement Test were combined differently to give maximum 'R' ranging from .5618 to .6230 for different criterion variables; the total variance accounted for by these batteries did not exceed thirtynine percent; (x) the coefficient of correlation of .49 was found between the higher secondary examination results and the scores predicted by the battery developed for the elective subjects; (xi) with science and biology group, Achievement Tests in Arithmetic, Hindi and General Science and the General Intelligence Test proved to be potent predictors; (xii) the interest patterns of science and biology group was highest in scientific and medical and the lowest in outdoor and the fine arts fields and the multiple 'R' for the science-mathematics group, yielded by these batteries ranged from .506 to .521; the total variance accounted for by these batteries did not exceed twentyseven percent; (xiii) in science-mathematics group, the correlation between predicted scores and the actual performance of the students in higher secondary examination was found to be statistically significant; (xiv) in science-mathematics group, Space Relation Test, Numerical Ability Test and Achievement Tests in Arithmetic, Hindi and General Science were found to be discriminating between successful and unsuccessful students; and (xv) the field of the highest interest for science-mathematics group was scientific and the fields of least interest were agriculture and household.

264. LELE, T. P., THAKAR, R. S., BHAGAT-WALA, J. A., KOTWAL, S., DESAI, D. B. and PATEL, J., *Group Test of Intelligence, Faculty of Education and Psychology, MSU, 1957. (MOE financed)*

The study aimed at (i) constructing a group test of intelligence for age groups from eleven plus to sixteen plus and (ii) establishing norms for the age groups from eleven plus to sixteen plus.

This group test of intelligence included ten subtests, viz., synonyms, antonyms, word analogy, classification, number series, sentence construction, reasoning problems, code language test, memory test and figure completion test. The preliminary draft was administered to 300 pupils of the age groups eleven plus to sixteen plus in various schools of Gujarat for pre-tryout. Based on the item analysis, some modifications were done and

the pilot test was then administered to more than 100 pupils in three groups. The pilot test, with standardised instructions and the assigned time limit, was administered to 3685 pupils of age groups eleven plus to sixteen plus of thirtynine schools in various districts of Gujarat. Agewise item analysis was done. To determine the internal item validity, the upper twentyseven percent and the lower twentyseven percent for each age group were taken into account. The difficulty value and the discrimination index of each item were worked out for each age group. The final form of the test consisted of eight subtests and a total of 117 items. The final test was administered to pupils in nine districts of Gujarat, viz., Baroda, Kaira, Ahmedabad, Surat, Panchmahals, Mehsana, Banaskantha, Sabarkantha and Broach.

After the analysis of data, (i) the norms for the age groups eleven plus to sixteen plus were calculated; (ii) the reliability of the test was found by the test-retest method; (iii) the validity of the test was found against the Desai's Group Test of Intelligence, ratings given by teachers and the Raven's Progressive Matrices.

265. *LELE, T. P., and PARIKH, S. G., Standardisation of Scholastic Aptitude Test (for admission to Preparatory Science Course), Examination Reform and Research Unit, MSU, 1965.*

The aim was to devise a test which could serve as an additional criterion for admitting students to various faculties of the university.

For admission purposes, the unit undertook the work of standardisation of a scholastic aptitude test, consisting of an English test, a mathematical ability test and a test of abstract reasoning. First, three separate tryout tests were prepared. Each item in every test was an objective type multiple-choice item. These tests were administered to new entrants to the preparatory courses during the year 1963-64. From the preliminary tryout data, statistical measures of the difficulty and validity of each item were computed. Each of these tryout tests correlated better with the P.S.C.E. grand total marks than with the S.S.C.E. grand total marks. The correlation between the three tryout tests together and the P.S.C.E. grand total marks was also found to be high. After the tryout data, items for the composite test were

selected on the basis of discriminating indices and appropriate levels of difficulty. The Scholastic Aptitude Test so constituted, was administered to the students admitted to preparatory science course during June, 1964. Five hundred students served as a sample for analytical procedure. The composite scores of the whole Scholastic Aptitude Test were grouped into a frequency distribution and mean, median, mode and standard deviation were found out. Distribution of scores approached the normal form very closely. The effort was made to ascertain sex differences in respect to the abilities measured by these tests. It was found that sex differences were not significant as far as the English test and the abstract reasoning test were concerned; they were significant in the case of the numerical ability test. The intercorrelations of subtests were calculated by the product-moment method. For calculating reliability, the split-half method was used. Since the reliability found by this method holds only for one-half of the whole subtest, the Spearman-Brown formula was used to find the reliability of whole subtest. For validity calculations, the marks in P.S.C.E. subjects were taken as criterion measures. The test results were correlated with P.S.C.E. marks in English, mathematics and science. English test had the correlation coefficient of .50 with English at P.S.C.E., and the numerical ability test had a correlation coefficient of .43 with mathematics and .51 with science at P.S.C.E. The abstract reasoning test seemed to be not so well correlated as other tests. Further, to ascertain the advantage of the Scholastic Aptitude Test, multiple regression analysis was done. The correlation coefficient (r) of P.S.C.E. criterion with S.S.C.E. grand total alone was found to be .58, while multiple correlation coefficient (R) of the P.S.C.E. criterion with S.S.C.E. grand total and composite score on the Scholastic Aptitude Test together was .64. The relative weights of the individual tests in prediction were determined by further multiple regression. To determine the assessment of different factors by various predictor variables and criterion variables, factor analysis was carried out.

266. *MALLIN, A. J., Indian Adaptation of Wechsler's Intelligence Scale for Children, Ph.D. Edu., Nag. U., 1964.*

The objective was to prepare an Indian adaptation of Wechsler's Intelligence Scale for Children

The contents of each verbal subtest were adapted after the pretest and item analysis. The performance test did not need any content adaptations but needed new difficulty ranking which was done by administering the test on a small group. The verbal tests were administered principally in Nagpur, Bombay, Simla and Mangalore involving over 1000 children. The vocabulary test received special attention because it was proposed to make it unifactorial in the lower age levels and to use it only as an alternative in the upper age levels. The sample chosen for the standardisation of the test consisted of 656 children of age group ranging from six to fifteen years from urban schools. As compared to the original sample of the Wechsler's Intelligence Scale for Children, this sample was about twentyfive percent.

The statistical norms were established. In the adapted version, the usual scaled score technique was substituted by percentile IQ. The reliability coefficients of the Wechsler's Intelligence Scale for Children as found out by test-retest method were .92 for verbal scale, .93 for performance scale and .91 for the full scale. The test was validated against ratings by teachers (.61) Draw-a-Man Test (.71) and the California Test of Mental Maturity (.63). Other observations were that the performance of the boys was better on intelligence test than of the girls, whereas the girls' performance was better on the performance scale than that of the boys.

267. MEHTA, P., *A Study of Intelligence of Rajasthan Children of Age Group 12-14 years Reading in School Grades VII and above*, Ph.D. Psy., Raj. U., 1958.

The present study was concerned with exploring some of the sociological aspects of intelligence and was confined to the Rajasthani children of age group from twelve to fourteen reading in school grades VII and above.

A verbal group test of intelligence was revised and restandardised as a part of the study. The original test constructed by the investigator in 1949 contained 100 items, arranged equally in eleven subgroups. This test was administered to about 1800 school going boys of Jodhpur, in 1949. It had a time limit of twentyfive minutes. The original test of 100 items was subjected to item analysis. A sample of 140 pupils of age group from twelve to fourteen reading in school grades VII and above

was drawn for this purpose from two high schools one in urban and another in a semiurban area. After item analysis, sixty items were retained. One group of the original test was altogether dropped. The final study was conducted on a random sample of children drawn from thirtytwo randomly selected schools. The total sample consisted of 330 girls and 1275 boys. Alongwith the test, a sociological questionnaire was also administered. The reliability coefficient for the test was calculated by the split-half method and by K-R formula. By the split-half method it was found to be .79. After employing the Spearman-Brown formula, the reliability coefficient was found to be .93, whereas K-R formula gave a reliability coefficient of .91. Empirical validity coefficient for test with school marks was found to be .44. The correlation of the subtest with the total scores indicated satisfactory internal consistency. The centroid method was used for the factor analysis of the test and three factors were extracted. The McNemar's formula was employed to test the significance of residuals. The 'g' saturation of the test was also found out by the Spearman's formula. The results showed sufficient 'g' saturation. The first factor identified was similar to Spearman's 'g' factor of intelligence. The other two factors were identified as similar to Vernon's V: ed. Thus the test was found to be a good measure of 'g' + V: ed. factors. The sociological data were tabulated mostly on the lines of Scottish Mental Survey of 1947.

The study showed that most of the children under study came from non-manual occupations. The mean family size showed no variations for occupational classes. Nearly half of the children under investigation belonged to families where there were more than one earning member. The differences in occupational class showed difference in occupancy rates, but they were not very well marked. It was more closely related to differences in size of family. Overcrowding existed in all occupational classes. It appeared from the data that children, irrespective of their father's occupation grew under certain similar social values. Children from the professional class showed superiority over children belonging to other five occupational classes. The difference was marked and highly significant. Children from the occupational classes of salaried-employees, business people and skilled workers obtained similar mean test scores. These children differed significantly in their scores from children belonging to the class of farmers and unskilled manual workers. The children

from the class of unskilled manual workers showed the lowest mean test score. The mean test scores by family size for occupational classes showed no definite variations. The correlations between the two were not significant. The size of family and the number of earning members showed significant positive correlation. The mean test scores showed no definite variations for the earning members also. It was only when the number of earning members was held constant, that the negative effect of the size of family began to operate on the test scores. Then the two, i.e. the size of family and the test scores showed significant negative correlation. The mean test scores showed definite variations for the occupancy rates. The negative relationship between the two was evident. As the occupancy rate increased, the score tended to go down. This was so, for each occupational class, but not for the size of the family.

268. MISRA, R. G., *A Factorial Study of Psychological Test Results and School Marks of Students of Class VIII, Ph.D. Psy., All. U., 1960.*

The study aimed at discovering the order of abilities of students of class VIII and suggesting subject families, if any, to suit abilitywise groupings.

The sample comprising 929 students was drawn from seven towns of the Allahabad Educational Region. School marks in six compulsory subjects and scores on five psychological tests, in addition to certain other background variables formed the data of this study. Marks were converted into standard scores before further treatment. Variables were subjected to factorial analysis by Thurstone's centroid method resulting in the extraction of six factors which were then suitably rotated to make meaningful interpretation possible, viz., (i) verbal ability (V1) dealing mostly with the use and manipulation of the written words; (ii) spatial ability (K) involving perception and kinaesthetic manipulation of spatial relationships in two and three dimensions; (iii) a general factor (E) running through objective tests and school subjects comparable to Burt's general educability, reflecting more of industry than reasoning or abstraction; (iv) an ability (O) common to objective tests only, may be speed or form; (v) another form of verbal ability (V2) peculiar to mother tongue only; and (vi) some form of reasoning

(SM) peculiar to science, mathematics and English.

Multiple regression analysis revealed that the battery predicted E, O, K, SM, V1, V2 in that order from the highest to the lowest (.832 to .453). Certain other significant inferences are that: (i) performances in Hindi, social studies, and art and craft have little relationship to age, while those in English, mathematics and general science indicate a clear negative trend; (ii) institutions with students of lower mean age show better performance in all tests; and (iii) performance does not improve with age except in the test of spatial ability, where it indicates a sudden decline in the last age group.

269. MUKHERJEE, M., *Construction and Standardisation of a Differential Aptitude Test Battery, D. Phil. Psy., Cal. U., 1966.*

The study was an attempt to construct a differential aptitude test battery.

The battery consisted of seven subtests, viz., English usage, clerical aptitude, mathematics knowledge and aptitude, scientific knowledge and aptitude, mechanical comprehension, verbal reasoning and abstract reasoning. After following all the usual procedures, the test was standardised on a sample of 2000 students of class VIII.

A follow-up study for the same group was done. The multiple correlation coefficient between aptitude scores and the higher secondary marks was found as high as .70. The reliability and validity data revealed that the test was highly reliable and valid.

270. NAFDE, G. H., *Standardisation of Non-verbal Test of Intelligence, Ph.D. Edu., Bom. U., 1961.*

The study involved construction and standardisation of a nonverbal intelligence test.

Four types of subtests with thirty items in each subtest, were tried on 168 high school students for item analysis purposes. The final test has eighty items with twenty items in each subtest. Six practice items were included for each subtest. The final test was administered to a group of 10,000 students drawn from the high schools, first year colleges, engineering, medical colleges and B.Ed. classes studying in the institutions in and around

Bombay city. A total number of 8227 students answered the test, which gave all particulars regarding the examinees. Data were subjected to statistical analysis. The reliability of the test was established by split-half method on two groups and by test-retest method on three groups with an interval of one week, two weeks and three weeks.

Reliability coefficients for all the five groups came out to be 0.88 (N=81), 0.92 (N=80), 0.93 (N=48), 0.93 (N=66) and 0.93 (N=104) respectively. The test was validated against total school marks of the annual examinations for three successive classes, marks in individual subject in the class, and teachers' judgement. The validity coefficients against the total school marks in three different classes were found to be 0.48 (N=29), 0.54 (N=26) and 0.35 (N=27). Validity coefficients against individual subject marks were 0.62 for mathematics, 0.43 for science, 0.45 for English, 0.49 for Hindi and 0.12 for Sanskrit. The concurrent validity coefficients of the test against teachers' ratings and nonverbal test of National Foundation for Educational Research in England and Wales were .67 and .88 respectively. Factor analysis was carried out by the centroid method. Age norms and grade norms of scores were also worked out for boys and girls. Normality of distribution of scores was tested by chi-square test. The mean scores increased with higher age and grade levels of students. The SD also increased with age. Rural students had lower mean scores than the urban ones. The median IQ of males in Bombay was higher.

271. NAIK, M.C., *Adaptation and Standardisation of Kuder Preference Record in Oriya for High School Students of Orissa and its use to study the Interest Pattern and Vocational Plans of High School Leavers in Orissa*, Ph.D. Edu., Utkal U., 1969.

The objectives of this inquiry were: (i) translation and standardisation of the interest inventory, the Kuder Preference Record Form B, to find out the measured interest; (ii) to study the relation between measured interest and expressed interest; and (iii) to study the relation of measured interest and expressed interest with (a) school subjects liked most and liked least, (b) influence of home, (c) hobbies, (d) physical disabilities, (e) influence of the different factors of occupation, (f) influence of the different members of the society, (g) knowledge of information

about occupation, (h) intelligence and (i) academic achievement.

The Kuder Preference Record Form B was adapted and translated into Oriya and standardised for the high school population of Orissa. Certain modifications were made in the inventory. The reliability of the inventory was found out by test-retest method. The coefficient of correlation for the different areas of interest ranged from 0.80 to 0.90. The standard error and the predictive efficiency of the inventory for different interest areas were calculated. The inventory was validated against the Occupational Interest Inventory prepared by the State Bureau of Educational and Vocational Guidance and correlation coefficients ranging from .5 to .6 were obtained in most cases. The percentile and standard score norms were found out. The study of the distribution of scores revealed that there was no significant divergence from normality. Critical ratio was computed to test the significance of differences between various variables.

Some of the main findings were: (i) the urban and rural population differed significantly in all interest areas except those of mechanical and musical; (ii) there was a significant difference between urban and rural boys in all the areas of interest except those of persuasive, artistic and musical; (iii) there was a significant difference between urban and rural girls in the interest area of social service; (iv) there was a significant difference between boys and girls in all interest areas except that of scientific; (v) the coefficient of correlation between three highest measured interests and three highest expressed interests of 236 students was studied and it was 0.29, which though significant was not reliable enough to use the expressed interest as a substitute for measured interest; (vi) the liking of the school subjects was related to the interest of the pupils; (vii) the agreement between expressed interest and family occupation was significant, but the agreement between measured interest and family occupation was not significant; and (viii) the attainment of students in subjects like mathematics, social studies and general science had bearing on their interest, although such relation was not traced out in many other subjects.

272. NAIK, R. B., *Construction and Standardisation of Office Work Aptitude Test*, Ph.D. Edu., Bom.U., 1970.

The present test was prepared with a view to

measuring as many types of clerical work as verbal comprehension, numerical ability, checking, filing, classification and others.

The preliminary form had seven subtests and this form was administered to 120 students of grades X and XI of three schools in Bombay to discover, if there was any, gross deficiency in the whole test. After modifications, the form was again administered to 400 students for item analysis. These subtests were administered in three sittings. Only 290 students, out of 400 students were found to have taken all the subtests and hence item analysis was done on 290 students only. The item analysis was done by using Flanagan's tables. The final form of the test had six subtests, viz., checking, tables, computation, file drawer, digit-symbol substitution and classification. There were 583 items in the test. The test was administered to about 9,150 subjects consisting of high school boys and girls of grades X and XI, students of first year, intermediate and senior classes of arts and commerce colleges of Greater Bombay and persons from industrial and educational organisations.

Age norms and grade norms and also norms according to sex, profession and language were prepared separately. The test-retest reliability coefficients varied from .812 (at one month interval) to .899 (at one day interval) with a median value of .820 (at two weeks interval). The test validated against the Clerical Aptitude Test of the Institute of Vocational Guidance and correlation coefficient was .706 (N=282). The ratings of supervisors of some industrial and educational organisations were obtained. The coefficient of contingency was found to be as high as .76 (N=25) and as low as .50 (N=72). The regression equations in terms of raw scores showing differential weightages for the different subtests were also worked out. Boys' performance tended to be higher than that of girls of the same class.

273. NAIR, A.S., *A Non-Verbal Group Test of Intelligence for Secondary Schools*, Ph.D. Edu., Ker.U., 1972.

This study was undertaken to develop a non-verbal test of intelligence for secondary school students of Kerala. The investigator intended to measure through this test, the Spearman's 'g' factor of intelligence or a close approximation to the same.

The test includes four subtests, viz., figure

matrices, figure series, figure classifications, and figure analogies, each with twenty items. The test provides a single summary score for general intelligence. It has been developed for the use of the students of classes VIII, IX and X of Kerala State. The actual testing takes twenty minutes. The test was administered on a statewide sample of 5252 students selected from twelve educational districts of Kerala. In selecting the standardisation sample, proportionate representation was given to the following factors: sex, rural-urban residence, government and private schools, and to the three educational levels (classes VIII, IX and X). After rejecting incomplete answer sheets, the remaining 5197 answer sheets were used for final analysis. Separate and combined norms were provided for the following groups: boys, girls, rural subjects, urban subjects, class VIII, class IX and class X. Deviation IQ norms were developed for ages from thirteen to seventeen years.

The test-retest reliability coefficients with an interval of three months, one month, and one week between two testings were 0.76 (N=246), 0.75 (N=124), and 0.80 (N=121) respectively.

Reliability coefficients for different subtests and the whole test by split-half method were: whole test 0.90; series 0.90; analogy 0.88; classification 0.92; and matrices 0.88, N being 123 in each case. The reliability coefficient for the test by K-R formula 21 was 0.86 (N=100). Standard error of measurement for the whole group was 2.96. The test was validated against the criteria of scores on the Raven's Progressive Matrices, the Kerala University Verbal Group Test of Intelligence, teachers' ratings, total school marks and also the marks in different subjects separately. Correlation coefficients were thus found to range from 0.208 to 0.784 (N being more than 256 in each case). Test correlated highest with the Raven's Progressive Matrices and lowest with school marks in Malayalam.

274. OAK, A.W., *The Construction and Standardisation of the Omnibus Self Administering Battery of Group Test of Intelligence in Marathi*, Ph.D. Edu., Bom.U., 1967.

The study sought to construct a test with omnibus spiral arrangement which would be a good measure of intelligence.

A pool of 200 items was prepared, but finally 172 items were selected for preliminary tryout.

The preliminary tryout was done on 100 students of standards IX and X from a school of Thana. The final tryout was done on 388 students of classes IX and X. Finally, ninetyfive items were selected for the final test on the basis of item analysis results. The items in the final form were arranged in an omnibus spiral form. The time limit was set to be thirtyfive minutes. The number of items included in each subtest were: twelve in classification, six in opposites, twelve in similarities, fifteen in series, eleven in arithmetical reasoning, fourteen in logical reasoning, fifteen in analogies, and ten in following direction. The test was administered to 4350 boys and 3596 girls of classes VII to XI randomly selected from eighteen schools of Bombay city. The age group was eleven plus.

Age norms, grade norms, IQ percentile ranks and stanine scores were calculated. The stability and internal consistency coefficients were found to vary from .84 to .93 and .88 to .94, respectively. Validity coefficients against teachers' judgement and annual examination marks for each school separately (predictive validity) were found sufficiently high. The test scores were also correlated with the Otis Advanced Examination ($r = .65$), the Army Alpha Test ($r = .68$), the Desai's Intelligence Test in Gujarati ($r = .82$) and the Nafde's Nonverbal Test of Intelligence ($r = .51$).

275. OJHA, J. M., *Revision of Differential Aptitude Tests for Higher Secondary Schools*, Ph.D. Psy., MSU, 1965.

The study was designed to develop a differential aptitude test battery in Hindi for use in India.

The items of the differential aptitude tests, prepared by G.K. Bennett, H.G. Seashore and A.G. Wesman were critically analysed. The test of verbal reasoning, language usage—spelling and grammar were completely prepared in Hindi. This, alongwith the tests of mechanical reasoning, abstract reasoning, space relations and numerical ability of the differential aptitude tests, was administered to the students of classes IX, X and XI, selected at random from five higher secondary schools in Delhi. Item analysis was carried out and on the basis of the results, some items were modified and the time limit was revised. No item analysis was done for the clerical speed and accuracy test. The tests were finally administered to 251 students of class XI,

selected at random from two urban and two rural schools of Delhi.

Intercorrelational coefficients between the tests of the battery ranged from $-.19$ (between language usage—grammar and abstract reasoning) to $.46$ (between language usage—grammar and spelling). The reliability coefficients were calculated by K-R formula 21, split-half and parallel form methods. They were above $.90$ for all tests, except for the mechanical reasoning and space relations tests, where they were $.75$ and $.70$, respectively by split-half technique. All tests, except mechanical reasoning and space relations had a good predictive validity with school courses. The study revealed that the language usage—spelling test had a higher correlation index than the grammar test with the various school subjects. All significant correlations of mechanical reasoning with science subjects were found in rural areas. The divergence of the internal assessment from stereotyped examination, from school to school was also revealed.

276. PALSANE, M.N., *Standardisation of Personality Inventory*, Ph.D. Psy., MSU, 1965.

The present work attempted to measure introversion-extraversion, normal-neuroticism and normal-psychoticism, as the three dimensions of personality. The purpose of the standardisation of the personality inventory was to provide a tool useful for counselling college students.

Items for the three scales were prepared and administered to 370 subjects, selected at random from college students, engineers, doctors, secondary school teachers, clerical personnel and others. Preference index and discrimination index for each of the items were found out and the items were paired into a forced choice kind of scale. Each pair had items with equal preference values, one of which was discriminating, while the other was not. In the normal-psychoticism scale, only five items were found discriminating and as a result, the scale was dropped from the inventory. Item validity indices for all the items for the other two scales were found out by administering the inventory to two criterion groups. Twenty items belonging to introversion-extraversion scale and twentytwo items belonging to normal-neuroticism scale were included in the final form. This form was administered to 3,114 subjects including men and women, students from the three universities of Gujarat, teachers, clerical and administrative personnel. The frequency distri-

butions for the two scales were drawn separately and the normality was tested by applying chi-square technique which showed that the scores were normally distributed. The coefficient of correlation between the two dimensions was found to be .105. Means and standard deviations for different groups were calculated separately. Differences between the various group means were tested for significance by analysis of variance method and no significant differences were found to exist. Means, standard deviations and standard errors of the means of the total sample on the two scales were calculated and were found to be 11.18, 2.70 and 0.05 (introversion-extraversion) and 11.24, 2.68 and 0.05 (normal-neuroticism), respectively. Categorized norms for both the scales were also established. The reliability coefficients of the two scales were estimated by split-half, test-retest and K-R methods and were found to range from .55 to .81 (normal-neuroticism) and .60 to .91 (introversion-extraversion), respectively. Content, concurrent and cross validity of the scales were also found out. The study reported that the underachievers tend to be more extravert and neurotic.

277. PANDEY, R. E., *The Preparation of a Standardised Group Test of General Mental Ability for School-Going Students in Nepal*, Ph.D. Psy., BHU, 1961.

The aim of this investigation was to prepare and standardise an omnibus spiral type of verbal group test of general mental ability in Nepal.

This test constituted seven subtests, viz., synonyms, antonyms, number series, classification, best answers, reasoning and analogies. Preliminary study was conducted on a sample of 468 students belonging to classes VIII, IX and X and item analysis was done. For first tryout, a sample of 356 students was selected from classes VIII, IX and X of seven schools in Nepal. For standardisation of the test, a sample of 2,674 Nepalese students, representing fairly the different social strata, was selected. The K-R formula 21 was used for determining reliability. The Thomson's method was used for calculating 'g' saturation.

It was found that (i) the reliability coefficients for ages thirteen, fourteen and fifteen were .89, .83 and .87, respectively; (ii) the 'g' factor loadings on the various elements ranged between

.541 and .762; (iii) the factor loadings indicated the dominance of one common factor with loadings ranging between .541 and .761; (iv) factor analysis indicated three factors, viz., Factor of Education of Relations or the Cognate Factor, Education of Correlates, and the third factor the nature of which remained undetermined; and (v) the students reached their maximum level of intelligence at the age of sixteen and remained almost constant till the age of eighteen.

278. PARIKH, J.C., *Construction and Standardisation of an Interest Inventory for S.S.C. Pupils of Gujarat State*, Ph.D. Edu., SPU, 1971.

The present study was undertaken to prepare a tool for measuring interest of the pupils of S.S.C. which could be used by the workers in the field of guidance and counselling in assisting individuals.

Items for the inventory were constructed concerning eleven different areas of interest, such as, natural, scientific, mechanical, fine arts, teaching, administrative, literary, social service, clerical, outdoor, and computational. The preliminary form of the inventory was administered to a representative sample of the pupils. Preference index, discriminative index, and chi-square values were computed for each item. The pairs of items were formed on the basis of equal preference values and different discriminating indices. The inventory was designed on the lines of the Kuder Preference Record and was administered on a sample of 3,921 boys and 979 girls. Sixtythree percent of them were from rural area and thirtyseven percent from urban area. Area norms, sex norms, T-scores and stanine scores were calculated for boys and girls separately. The final form of the inventory consisted of eight scales and therefore, eight indices of reliability were computed.

The reliability of the total scale was studied by test-retest and split-half methods and the reliability coefficients were .84 and .94, respectively. Criterion groups, against which the inventory was validated were selected from each area of interest included in the inventory. Their mean scores were 18.75 (administrative), 19.55 (computational), 22.75 (mechanical), 18.60 (natural and outdoor), 22.95 (scientific), 23.10 (teaching), 21.75 (fine arts), and 22.15 (literary). The data revealed that the criterion groups for all the scales scored higher in their own field of work than in other fields. This was the ample evidence of the validity of the inventory. The validity

of the inventory was further tested by correlating the interest scores of pupils with their teachers' estimates using five point rating scale and the coefficient of validity was found to be significant at .01 level. A study of the relationship between the attitudes and the interests of the pupils revealed that they were not positively correlated. Means and SDs were calculated for the eight scales separately for boys and girls and significant sex difference was observed. Interests of the pupils in the areas of teaching, scientific and mechanical were on the top, while in natural and outdoor areas they were at the bottom.

279. *PASRICHA, P., PAGEDAR, R. M. and GAJJAR, J.J., Adjustment Inventory for College Students, Centre of Advanced Study in Education, Baroda, 1964.*

The purpose was to develop an adjustment inventory through which problems of college students could be studied.

For developing the items, a few students were asked to list problems which bothered them most. From this list, 120 items were picked up which covered areas, such as, personal, family, educational, social and vocational. The scoring model of 1 and 0 was accepted for this inventory. This checklist was administered to sixty girls and 482 boys of the first year of the science, commerce and arts courses of the university of Baroda. The ten most frequently checked problems were sorted out and comparisons were made of the problems checked by students of the three classes. Comparisons of problems checked by higher and lower socio-economic status students were also made. The previous checklist was revised and refined. The final form of the inventory contained 232 items which covered eleven adjustment areas. The first and third year students' scores were calculated for each of the eleven areas and converted into standard scores for comparison and for developing profiles. Profiles of samples of first and third year students and within these two groups, profiles of boys and girls in the subgroups were drawn. The subgroups were of science, arts, fine arts, commerce, home science, engineering and polytechnic.

Some of the findings were as follows: (i) Boys of first year class showed more problems than girls, whereas with those of third year, the trend was just the reverse. However, their sensibility areas remain-

ed different from those of the males. (ii) The first year boys of science, commerce, fine arts and polytechnic subgroups exhibited more problems, while the first year boys of arts seemed to be more carefree as they scored consistently low in each problem area. (iii) Of the third year boys of the different subgroups, science boys scored significantly higher on all categories, except on the area of self and self images; commerce and arts boys scored higher than the entire population, but did not maintain a consistent pattern over all the categories. (iv) Scores of engineering group and of the first year girls of different subgroups, viz., the science, commerce and home science were consistently higher in almost all the categories, while the scores of those in arts and fine arts were considerably lower. (v) The third year girls of science scored lower in comparison to the entire female population in several areas. (vi) The third year students of science scored consistently higher in every category and indicated a steep rise in adjustment problems when compared to the first year group. (vii) The arts students of third year scored lower than the entire group, but not as low as the first year group.

280. *PATEL, J.M., Construction and Standardisation of a Group Test of Intelligence (for the Children of Age Group 13-16), Ph.D. Edu., SPU, 1966.*

The purpose was to construct and standardise a group test of intelligence with special reference to the age group thirteen to sixteen of the secondary schools of Gujarat State with Gujarati as the medium of instruction.

The test included both verbal and figural items covering five factors, viz., reasoning, perceptual, memory, numerical and spatial relations. The subtest items related to verbal analogies, nonverbal analogies, verbal classification, nonverbal classification, number series, picture series, geometric form and problems. Out of 250 items originally prepared, only 100 items were selected based upon difficulty level, internal consistency and item validity. The selected items were arranged in the order of difficulty. The standardisation sample consisted of rural, urban, boys and girls of grades VIII to XI of the age group thirteen to sixteen, attending secondary schools in Gujarat.

Skewness and kurtosis of the distribution were

calculated and were .21 and .80 respectively. Grade norms were computed for the present test. Test-retest reliability coefficient was found to be .87. Split-half reliability coefficient was .99. Concurrent validity was found out against the scores on an intelligence test, constructed by the M. S. University, Baroda and the validity coefficient was found to be .80. The correlation coefficient between the test scores and examination marks was .75. The test scores were also validated against the teachers' estimates of intelligence and the coefficient of correlation was found to be .65. Cross validation with two criterion groups was done and the difference between means of the two criterion groups was found to be significant.

281. PATEL, M., *Construction and Standardisation of a Test of Intelligence, Ph.D. Edu., SPU, 1970.*

It is an attempt to standardise a test of intelligence.

There are eighty items of four different types, viz., series, synthesis, analogy and classification in the test. The test was tried out twice for item analysis. The external as well as internal criteria were used for selection of items for the final form. The test was administered on 4471 students of grades VIII to X, of age group fourteen plus to sixteen plus, selected randomly from seventy schools.

The 'grade expectancy' and the 'mental age' norms were computed. The IQ scores and PR for each age group, for both the sexes were also found out. The split-half reliability coefficient was .88 for grade VIII and .93 for both grades IX and X. The reliability coefficients obtained by test-retest method with an interval of seven and eight days, Rulon's formula, Flanagan's formula, K-R formulae 20 and 21, Tucker's formula and by analysis of variance method were .938 and .820, .979, .925, .931 and .922, .939, and .937 respectively. The correlation coefficient of the test score with the total school marks was .54, with subjectwise examination marks it varied from .54 to .69 with a mean value of .61 and that with S.S.C. examination marks and teacher grade averages were .63 and .59 respectively. Concurrent validity coefficients ranged from .65 to .80 when measured against other local verbal and nonverbal tests of intelligence. Factor analysis showed that the test measured a 'General Factor' of intelligence.

282. PATHAK, A.K., *Construction and Standardisation of Group Intelligence Tests in Marathi for ages 9 to 13, Ph.D. Edu., Bom. U., 1961.*

This study attempted to develop a battery of group intelligence tests in Marathi, for the students of age group nine to thirteen studying in classes IV to VIII.

A pool of 160 test items was developed which included subtests like opposites (twentyfive items), disarranged sentences (twelve items), completion tests (twentyone items), series (sixteen items), similarity (sixteen items), classifications (twelve items), logical inference (twelve items), analysis (twenty items), simple reasoning (eight items), oral examples (twelve items) and alphabets (six items). After preliminary investigation, ineffective items were dropped out and 116 items were retained for the test. For the purpose of item analysis, this test was administered to 250 boys and 150 girls from five schools. The final test was administered on a sample of 10,738 boys and girls selected by random sampling technique from thirtysix primary and twenty-two secondary schools in Bombay, Poona, Ratnagiri, Thana and Surat. Most of the pupils were from standard VI, while relatively few were from standards IV and VIII. Analysis of the subjects according to parents' occupation, caste and place of residence (urban or rural) were carried out to study the effects of these variables on performance on the intelligence test.

Reliability of the test by test-retest method was found to be .89 (N=900) and index of reliability was 0.95. Validity of the test was established by correlating the test scores with scores obtained on the Kamat's Individual Intelligence Test and Samarth's translation of Northumberland Mental Test No. 2 and also by comparing with teachers' opinions and the school marks. Against Kamat's test, the validity of the present test was found to be 0.74. The IQs were tabulated separately for boys and girls. The frequency tables and frequency curves for each age, for boys and girls separately and for both sexes combined, were drawn. Kurtosis and skewness were calculated and T-scales were provided. The frequency curves were mostly found normal. The curves of mental growth were drawn and the original median scores were given for each age. The results obtained were broadly compared with those of Terman and of Kamat.

283. PHATAK, P., *Children's Drawings—a Measure of Intelligence, Ph.D. Edu., MSU, 1955.*

The inquiry aims to study the Draw-a-Man Test and evolve a suitable scoring method for Indian children.

The Goodenough's Draw-a-Man Test was selected for the purpose of this study. The Koh's Block Design Test and the Kamat's Intelligence Test were administered for validating the scoring method. The test was administered to a random sample of sixty boys of age group seven plus, drawn from seven Marathi medium schools. In the modified new scoring scale, there were twentyone major points and the highest weighted score was sixtyone. The scores were weighted according to the number of details included in the drawings and the symmetry and accuracy maintained. The major points were head, eyes, nose, ears, hair or hat, forehead, chin, mouth, neck, trunk, arms, fingers—indication of thumb, legs—indication of hip joint, toes or feet, motor coordination, dress, proportion of head, arms, legs, symmetry and general action.

The validity of the new scoring plan was thus established: (i) The coefficient of concurrent validity between the scores of new modified scoring scale and the Kamat's test was 0.50. (ii) The test was also found applicable to the age groups of six plus and eight plus as the validity coefficients were .51 and .54, respectively with reference to those age groups. (iii) The correlation coefficients between the scorings by the investigator and the scorings by three other scores were .959, .900, and .884. (iv) The reliability coefficient by the test-retest method was 0.817. (v) Norms were calculated on 722 drawings of children belonging to age groups of six plus, seven plus and eight plus. (vi) Validity of the major scoring points was tested by the simple criterion of increase in the scores at successive ages. (vii) Grade norms were calculated on a group of 561 boys from grades I, II, III and IV in primary schools. (viii) With the modified scoring scheme, the performance of Indian children was found to be similar to that of American children.

284. PILLAI, P. G., *Preparation and Standardisation of a Test of General Mental Ability in Malayalam for School Children, Ph.D. Psy., BHU, 1955.*

The present study aimed at developing a standardised test of general mental ability in Ma-

layalam for secondary school students.

At the first stage, the test was administered to 500 school children; at the second, to a new group of 700 students; and at the final to an unselected group of 2000 students. The sample included urban and rural, boys and girls of all age groups from the upper-middle through lower social strata, fairly representing the Malayalam speaking population of Travancore-Cochin State. The subtests selected for this purpose were: similars, opposites, number series, classifications, best answers, reasoning and analogies. The single spiral omnibus form of organisation was followed.

Results revealed that the test was neither a speed test primarily, nor a pure power test. The presence of a second order factor was found in the data obtained from the second revision, for each of the three age groups. All the seven subtests were found to be highly saturated with 'g'. Findings revealed that all the subtests were fairly diagnostic of the general ability of students.

285. PRASAD, G., *A Factorial and Validation Study of Psychological Tests for Entrants to ITI, Ph.D. Edu., All. U., 1966.*

The purpose was to see the efficiency of a battery of tests related to cognitive domain, for admission in Industrial Training Institutes (ITI).

The sample consisted of students of four trades, viz., fitters (N=273), electricians (N=284), mechanical draughtsmen (N=194) and motor mechanics (N=114) from all the industrial training institutes of Uttar Pradesh. The sample ranged from sixteen to twentyfive years in age. Ten different tests were administered to the subjects after they had completed a minimum of one-third of their training course. These tests were administered in group situations in the following sequence—the BPT-13 (Form A), the Raven's Progressive Matrices, the Arithmetic Test, the Akar Yogyata Pariksha, the Visual Discrimination Test, the Precision Test, the Co-ordination Test, the Inspection Test, the Angle and Length Estimation Test and the Space Tests (I, II, III and IV). The reliability of all these tests for different traders like fitters, electricians, mechanical draughtsmen and motor mechanics were found to be satisfactory. Reliability coefficients of the first criterion variable of the final examination marks for all the four trade group students were established, and were found to be .68, .86, .91 and .62 for fit-

ters, electricians, mechanical draughtsmen and motor mechanics respectively. The practical work in the institute workshops was also observed and that represented the second criterion variable. Observation of this criterion followed the worker-analysis approach for three trade groups. The fitters trade was observed from the point of view of muscular coordination, precision and steadiness, visual alertness, etc. The electrician trade group students were evaluated in the workshop for verbal and spatial reasoning, numerical ability and manual dexterity. The draughtsmen group was observed for space visualization, precision in drawing, numerical ability, etc.

The factor analysis of the predictor and criterion variables resulted into the factors of 'Intelligence' and 'Practical-Manual-Visual' for fitters group; a factor of 'Aptitude' for electrician group; and 'Intellectual', 'Visual' and 'Spatial' factors for draughtsmen group. At the validation stage, the Precision Test, the Visual Discrimination Test, the Inspection Test, the BPT-13, the Akar Yogyata Pariksha, the Angle and Length Estimation Test were found to be good predictors for fitters trade. All the tests except the Space Tests were found to play a significant role. Only the Space Test III was needed for the electricians trade, but rest of the Space Tests remained defunct. The Yogyata Pariksha which appeared to be predominantly a space test proved to be having a good deal of intellectual component and it emerged as an important predictor for the three trades.

286. *PREMALATHA, M. G., Construction and Standardisation of a Non-verbal Group Test of Intelligence with special reference to the Mysore State (for the children of age group 7+ to 13+), Ph.D. Edu., MSU, 1962.*

The aim of the study was to design a battery of nonverbal intelligence tests for the age group seven plus to thirteen plus.

The test containing 183 items, included seven subtests, viz., similarities, classification, progressive series, analogies, absurdities, substitution I, and substitution II. Difficulty values and the discriminating indices were found out for the selection of items. The test was standardised on a sample of 7841 pupils, both boys and girls, of age group seven plus to thirteen plus from both urban and rural areas.

The reliability coefficient by the split-half-

method was found to be .97, by the K-R formula 20 it was 0.9924 and by Flanagan method it was 0.98. Validity of the test was found out by correlating the test scores with school marks, teachers' estimates and standardised verbal test of intelligence in Karnataka and the validity coefficients were 0.37, 0.35 and 0.69 respectively. From the factor analysis, it was found that there was only one common factor 'g' and there were no other group factors. The Spearman's formula and the Thurstone's centroid method gave the same results. The other observations were: (i) the distribution was found to be negatively skewed but not significant; (ii) the curve was found to be significantly platykurtic in nature; (iii) the test could discriminate very well from age levels of eight to twelve years, but not significantly between the age levels of twelve to thirteen years; (iv) the mental growth of girls below eleven years was rather slower than that of boys of eleven and above eleven years; girls showed faster mental growth than boys, and even at the age of thirteen the girls kept up their higher rate of mental growth; (v) slight but significant difference was found between the mean scores of the urban and industrial areas (at .05 level), while the differences between the urban and rural areas or between industrial and rural parts were highly significant.

287. *RAINA M. K., Study of Some Correlates of Creativity in Indian Students, Ph.D. Edu., Raj. U., 1968.*

The aim of the study was to compare quantitatively significant differences between high creative and low creative groups of students on certain measures of cognitive abilities, personality, manifest anxiety, academic achievement and socio-economic status. It was hypothesised that high and low creative groups would differ from each other with regard to certain cognitive abilities, personality characteristics, socio-economic status and sex.

Alongwith a battery of tests for measuring cognitive abilities and personality characteristics, the Minnesota Tests of Creative Thinking and the Kuppusswamy's Socio-Economic Status Scale were used to collect the data. The other tools like the Jalota's Group Test of General Mental Ability, the Edwards Personal Preference Schedule, and the Taylor's Manifest Anxiety Scale were also used. The Minnesota Tests of Creative Thinking were administered to a sample of 500 students of classes

VIII, IX and X of seventeen schools from three educational zones of Rajasthan to select high and low creative groups. These groups consisted of ninety and eightyfive students with about equal number of boys and girls. F test, t test and correlational technique were used for the analysis of data.

The study revealed the following: (i) The high creative subgroups scored significantly higher than the low creative subgroups on all the four dimensions of creativity on the Minnesota Tests of Creative Thinking. (ii) A comparison of the high creative males with the low creative males elicited significant differences between group IQ means. Mean performance of the high creative females and the low creative females also revealed significant differences between group IQ scores. A positive but not significant r of .102 was recorded between the scores of the Jalota's Group Test of General Mental Ability and the Minnesota Tests of Creative Thinking. In the case of the low creative, r was $-.123$, which was not significant. (iii) The high creative students scored significantly higher than the low creative with respect to academic achievement. (iv) The high creative subjects exhibited greater achievement, autonomy, dominance, change and endurance than the low creative subjects. (v) The high creative females were higher in change and endurance than the high creative males, but the latter were higher in heterosexuality. (vi) The high creative females were significantly higher than the low creative females on achievement, autonomy, dominance, change and endurance, but the latter were characterised by deference, order, affiliation, succorance and heterosexuality traits. (vii) The high creative males showed greater achievement, autonomy, dominance, change, endurance and aggression than the low creative males. (viii) The low creative males exhibited greater deference and heterosexuality. (ix) The low creative females scored significantly higher than the low creative males on achievement, dominance, change and endurance. (x) The low creative group manifested significantly greater anxiety than the high creative group. (xi) A comparison of the high creative males with the low creative males elicited significant differences. (xii) In both the cases it was the low creative who manifested greater anxiety. (xiii) No significant differences were found between the high creative males and females in anxiety and the low creative females scored significantly

higher than the low creative males on the anxiety instrument. (xiv) Significant differences were noted in the socio-economic status of the high creative and the low creative on all the three dimensions of the socio-economic status scale; and the high creatives came from the second class socio-economic families and the low creatives from the third class.

288. RAMJI, M. T., *School Situational Behaviours and Rating Scales for assessing Personality Traits of Primary School Pupils*, NCERT, New Delhi, 1971.

The present study was concerned with the identification of school situational behaviours pertaining to selected personality traits of primary school pupils and the development of observation schedules and rating scales for assessing the selected personality traits of pupils in the age group six to eleven.

Twenty personality traits were selected in consideration to age and developmental level of children, common school programmes and desirability of the trait. The list was reduced to fourteen traits in the light of pooled judgement of principals and teachers of primary schools and the researchers. Desirability of the trait and practicability of developing and measuring it were the guidelines to prepare this list. Each trait was defined by way of specifying the school situations where rating was possible. The systematic observation of behaviours of primary school pupils was undertaken by two researchers to validate the school situations relevant to the selected personality traits in the modified list. Analysis of the observed data showed that the school situations through which traits of perseverance, concentration, respectfulness and cheerfulness could be manifested were very small. They were, thus, dropped and the observation schedules were developed for the traits such as (1) cleanliness, (2) punctuality, (3) regularity (4) cooperation, (5) leadership, (6) honesty, (7) helpfulness, (8) curiosity, (9) obedience and (10) self-confidence on the basis of the data obtained experimentally. Rating scales were developed for these areas with five descriptive points for each, ranging from 'almost always' to 'very rarely' to reflect the occurrence of a particular behaviour. Inter-observer reliability of the traits specifications was

established by applying the Osgood's formula to see the agreement in the observations made by two researchers independently. For all the traits, this agreement was found to be more than sixtyfive percent. Developed rating scales were tried on a sample of five schools. After due orientation to teachers, they rated the pupils in different classes. These ratings showed that all the pupils could be rated on all the traits during the period of twenty-one days along with their normal classroom duties. Interrater reliability of the scale was established by comparing the ratings given by a rater regarding each trait during first week, with those given by him during third week. The Osgood's formula was used for this purpose. For each trait the average percentage of arrangement was found to be more than sixtyfive.

The observations of the study were (i) primary schools which regularly organise the programmes, viz., classroom teaching, curricular and cocurricular activities, manual work, creative and artistic work, would help in the formation of traits like cleanliness, punctuality, cooperation, leadership, regularity, honesty, helpfulness, curiosity, obedience and self-confidence; (ii) observation schedules pertaining to the school situational behaviours of the personality traits would be helpful to teachers in carrying out systematic observations of the behaviours of the primary school pupils; (iii) the set of refined rating scales of personality traits prepared, would be a practical help to primary teachers; and (iv) the refined rating scales would provide reliable and useful data to the teachers.

289. RAO, N.C.S., *Differential Aptitude Testing Project, College of Educational Psychology and Guidance, Jabalpur, 1962. (MOE financed)*

These tests were developed to provide an integrated scientific and well-standardised procedure for measuring the aptitudes of boys in grade VIII of higher secondary schools, in order to predict their performance in educational courses offered by secondary schools.

The entire battery of differential aptitude test contains seven subtests, viz., numerical ability, numerical reasoning ability, space relations ability, linguistic ability, verbal reasoning ability, nonverbal

reasoning ability and perceptual speed. An experimental tryout of these tests was undertaken. Item analysis of each test was conducted separately. The test was administered to a sample of 400 boys belonging to the class VIII of schools of Jabalpur, Saugar, Khandwa, Raipur and Bilaspur. The item difficulty was first expressed as percentage of passes and later converted into sigma values. The items were then selected so as to avoid concentration of items at any particular level of difficulty and mean of the sigma values was as near zero as possible. Item consistency was expressed as a coefficient derived from a comparison of the percentages passing the item concerned from among the twentyseven percent of the highest and twentyseven percent of the lowest individuals in the tryout sample. Flanagan's table was used for this purpose. After selecting items for the test, another tryout administration of the tests was conducted for the purpose of fixing appropriate time limit for each of the test. The total working time for the entire battery of tests was set to be 162 minutes. These tests were administered to 800 students of standard VIII selected at random from eighteen schools of Madhya Pradesh.

Percentile ranks and percentile age norms for age groups of thirteen, fourteen and fifteen were computed. The reliability coefficients of each subtest were found out separately by split-half method and were found to be .95 for linguistic ability test, .92 for space relations test, .91 for nonverbal reasoning test, .88 for verbal reasoning test and .90 for numerical reasoning test. An attempt was made to observe the effectiveness of the test battery in revealing intra-individual differences in cognitive abilities. This was done by plotting test profiles of fifty testees taken at random from the entire standardisation sample. Differentiation of abilities was clearly evident in the profiles.

290. SAXENA, M. S. L., *Personality Testing: Construction and Standardisation of a Personality Inventory, Ph.D. Psy., BHU, 1959.*

The study aimed at constructing and standardising a personality inventory to measure the personality adjustments of students, and to discriminate between students of superior and poor adjustment. Areas covered in the inventory were home, occupation, society, health and emotions.

The tryout study was done with 150 items based on the Bell's Adjustment Inventory (Adult Form) on 200 boys and girls aged eleven plus and above. Items which had a phi-coefficient significant at .01 level were retained for the final form of the inventory, named as Vyaktitva Parakh Prashnavali. For standardisation, the inventory was administered to 2529 boys and girls representing all parts of Uttar Pradesh in the age group from eleven to twenty. Reliability of the inventory was examined by the methods of rational equivalence, split-half and test-retest. Validity was determined by correlating scores on the inventory with the Asthana's Inventory, and with teachers' estimates of adjustment. The discriminative power of the inventory was determined with teachers' cooperation. Cross validation was also carried out. Factor analysis was done by the Thurstone's centroid method to find factor loadings of different elements.

Findings of the study showed that (i) the reliability coefficients by methods of rational equivalence, split-half and test-retest were .90, .89 and .87, respectively with the median figure of reliability coefficient as .89; (ii) the validity coefficient against the Asthana's Inventory was .80; (iii) the discriminative power of the inventory was 70.37 percent; and (iv) the inventory measured three factors, viz., 'Health-Centred Emotionality', 'Social Tact' and 'Home-Centred Emotionality'.

291. *SHAH, G. B., Construction and Standardisation of a Non-Verbal Group Test of Intelligence with special reference to the Gujarat State (for the Children of Age Group 7-13), Ph.D. Edu., MSU, 1964.*

The purpose was to construct and standardise a nonverbal group test of intelligence for the children of age group seven to thirteen with special reference to Gujarat State.

The pilot study of the test was conducted on a sample of 1,150 pupils. After item analysis, the final form of the test consisted of 162 items. The various subtests included were similarity, classification, analogy, absurdity, progressive series, and substitution table. The standardisation sample consisted of 3,129 boys and 2,903 girls studying in grades III to VIII and drawn from seventynine schools in eleven districts of Gujarat. The reliability of the test was calculated by test-retest method, split-half method and method of rational equivalence. The validity of

the test was determined against (i) the verbal test of intelligence prepared by the Faculty of Education and Psychology, M.S. University of Baroda, (ii) the standard scores of the total examination scores in four subjects (science, mathematics, English and Gujarati) and (iii) teachers' estimates of intelligence. Also, 'g' saturation was calculated both by the Thurstone's centroid method and by the Spearman's method. Age norms were fixed.

It was found that (i) the coefficients of reliability of the test by the method of rational equivalence, test-retest method and split-half method were 0.961, 0.94 and 0.92 respectively; (ii) the validity coefficients of the test against the verbal intelligence test, examination scores, and teachers' estimates were 0.70, 0.55 and 0.53 respectively; (iii) boys and girls were found to be almost at par in intelligence upto age of eleven; (iv) the performance of girls was comparatively higher at the ages of twelve and thirteen, while that of boys was higher at the age of fourteen; (v) the differences between the means of rural and urban pupils were not significant at any age, except at the age of ten; and (vi) intelligence was slightly dependent upon the occupations of the fathers.

292. *SHAH, J. H., Adaptation of the Stanford-Binet Intelligence Scale (1960 revision) for the Gujarati Population, Ph.D.Edu., Guj.U., 1971.*

The purpose of the study was to provide an up to date adaptation of the third revision of the Stanford-Binet Scale (Form L-M) for Gujarati population.

Before translating the test forms from English to Gujarati, the items of each test of the scale were critically studied with a view to incorporating the desirable modification which were necessary because of cultural, social and economic differences. Necessary changes were incorporated in test items as per suggestions and criticism by experts. Then four different tryouts were undertaken. In all, about 480 students of different age groups from two plus to eighteen plus were administered the test, individually, during these four tryouts. For final tryout, a stratified sample taking into consideration age, sex, socio-economic status and occupational division of the parent as variables, was drawn. Ten boys and ten girls in each age group ranging from two plus to eighteen plus having half year intervals from two through five years age levels were selected. The provisional final scale was administered

individually to 400 subjects of the standardisation group.

The skewness of the IQ distribution of the total sample was .021. Student t test was applied to see the significance of differences between means of two sexes at each age level and the result indicated that there was no significant difference at any age group except at seven plus. F ratio when applied to see the significance of variation in variabilities at different ages indicated no significant differences at any age except at the age group of three plus, where the group was very homogeneous. Tables of constants for converting conventional IQs into deviation IQs, as well as of deviation IQs to be read directly from mental age scores had been prepared. Age norms were fixed for the test. The reliability coefficients of the test by test-retest method and average difference method (N=40) were found to be .95 and .96, respectively; the reliability estimated by analysis of variance method at different IQ levels varied from .76 to .98. The standard error of measurement was 3.00. Concurrent validity coefficients against eight different intelligence tests in Gujarati ranged from .48 to .79. Validity coefficients of IQs with teachers' estimate of intelligence and annual examination marks were .56 and .49, respectively. Biserial correlations of the tests with the total score were also computed and the value of average biserial 'r' was found to be .73. A few additional studies such as those of sex differences, occupational differences, sibling resemblance and twin resemblance were reported.

293. *SHAH, R.P., A Numerical Ability Test for High School Students, Ph.D. Edu., Guj. U., 1971.*

The test was designed to appraise the ability to deal with numerical concepts in different ways, of high school students.

The test items were first coined and tried out in the free response form. The distractors were drawn from the actual incorrect responses of a representative sample of pupils. The second pilot test, meant for item analysis, was printed in two equitable parts with sixty items in each. The difficulty and discriminating values of each item were calculated using the item analysis chart of Harper after applying Horst formula. The items for the third pilot test were selected on the basis of proper range of indices at all the grade levels considered separately, cumulatively and randomly. The selected items, ten in

each aspect, were arranged in the spiral omnibus format, to leave scope for further scrutiny of test performance. The final test contained fifty items. There were ten items each for numerical facility, number series, numerical concepts — lower and higher and numerical reasoning. The test was administered to 3,743 boys and 3,249 girls of secondary schools of Gujarat State. Stratified cluster samples were drawn for the purpose. The test was also administered to the students of pre-degree commerce, pre-degree science, first year degree engineering, ITI's and polytechnics.

Percentile grade norms were computed for boys and girls, opting elementary mathematics, as well as for those opting algebra and geometry at their respective grade levels. Percentile norms for technical groups were also computed. The test-retest reliability coefficients ranged from .523 to .880 with a median value of .661 and split-half reliability coefficient ranged from .755 to .934 with a median value of .835 for the students of grades VIII, IX, X and XI. The analysis of variance of the scores of 300 answersheets of grade X boys, by Hoyt method, gave $rtt=.79$. The Ferguson coefficient of discrimination was .97. The numerical ability test, alongwith the tests of Verbal Ability, Mechanical Comprehension and Minnesota Paper Form Board Test (MPFB) were administered to eighty-six students of grade X. A (30 x 30) intercorrelation matrix was computed for the test scores and marks at the annual examination of the students. The coefficient of correlation of the numerical ability test with marks in mathematics was higher ($r=.48$) than those of the other tests and other school subjects. The validity coefficient was found to be as high as .75 and as low as .33. A (30 x 30) correlation matrix from the standardisation sample of 300 boys of grade X was processed for the principle axis factor analysis, using Hotelling iterative procedure. The total variance shared by different factors was found to be 42.54 percent by Numerical Concepts—Lower, 20.12 percent by Numerical Facility, 16.05 percent by Number Series — Inductive Reasoning, 12.19 percent by Numerical Reasoning—Verbal Form and 9.14 percent by Numerical Concepts — Higher.

294. *SHARMA, A., Mechanical Aptitude Test Battery, Ph.D. Psy., Agra U., 1963.*

Major aim of this investigation was to prepare and standardise a mechanical aptitude test battery.

The battery included five subtests, viz., (i) Mechanical Knowledge Test (Yantrik Yogyata); (ii) Mechanical Comprehension Test (Yantrik Sambodha); (iii) Spatial Relations Test (Sthan Sambandha); (iv) Form Relations Test (Akriti Sambandha); and (v) Mechanical Adaptability Test (Yantrik Anukulan). The sample included all the students who applied for admission to class IX (technical stream) of the ten government multipurpose higher secondary schools of Uttar Pradesh, students who had been admitted to the first year class in the government junior technical schools of Madhya Pradesh and Uttar Pradesh and the students admitted to the first year class of Delhi Technical Higher Secondary School in 1972, for establishing norms. In all, the sample comprised 640 students. Split-half method was used to calculate reliability. The external criteria were employed for establishing the concurrent validity of the test battery. The final form of test included thirty items in each subtest. The total working time for the battery was seventyfive minutes.

The reliability coefficients for test I ranged between .80 and .94; for test II between .80 and .92; for test III between .87 and .96; for test IV between .85 and .96; and for test V between .80 and .91. The reliability coefficient for the battery ranged between .90 and .98. The three criteria employed in validating the battery were — summary evaluation; school marks; and standard psychological tests. The product-moment correlations between the battery and the aggregate of marks in technical subjects ranged from .64 to .72 for the different classes. The correlations between the different subjects and the five tests of the battery were also worked out for the different classes. Further, the battery had a high relationship with $g + k : m$ tests and a low relationship with $g + v : ed$ tests. Percentile and standard score norms were calculated. Two factorial analyses were carried out by Thurstone's centroid method with orthogonal axes. The first analysis was carried out on the scores of the 'normative group' which indicated the presence of two factors — a general factor called 'Mechanical Mindedness' and a complex factor of 'Perceptual-Spatial-Practical-Abilities'. The second analysis was carried out on the scores of 'validation group' which indicated that the battery gives the evaluation of three factors — 'm', Knack for Mechanical Work; $p : m$, Perceptual-Mechanical Ability; $s : m$, Spatial-Mechanical Ability. The main findings of the study revealed the

bearing of results on (1) psychological theory, (2) educational practice and (3) mental testing.

295. SHARMA, T. R., *Construction and Standardisation of a Non-verbal Intelligence Test (age group 11-16 years)*, Ph.D. Edu., Punjabi U., 1970.

In this study, an attempt was made to standardise a non-verbal, nonlinguistic, nonarithmetical and a fairly culture free test, wherein no use of the child's powers to manipulate abstract symbols such as words or numbers, was made. On the analogy of Goodenough's Draw-a-Man Test, the investigator employed the 'Bicycle' as a subject of drawing.

From a preliminary study of 417 drawings, the investigator prepared a thirtysix point scale which was twice revised and extended on samples of 417 and 673 drawings and finally a seventyfive point scale emerged out. In this scale, only such items were included, in which the percentage of children succeeding in each item showed an increase with increase in age. For purposes of standardisation, 2,863 children from thirty schools were selected at random. The test sheets were scored against a seventyfive point scale. The consistency of scoring had been previously determined ($r=.96$). Age norms for age groups (ten plus to sixteen plus), standard scores and T-scores were computed for the present test. One hundred and fifty drawings, twentyfive for each age group, out of a sample of 613 drawings collected for a second revision of the scoring scale, were scored thrice with an interval of six days between each scoring schedule.

The correlation between the first and the second, and between the second and the third scoring sets were found to be .94 and .95, respectively. The test-retest reliability coefficients and K-R formulae, 20 and 21 reliability coefficients ranged from .82 to .95. The test was validated against teachers' estimates of children's intelligence, children's scholastic achievements, 'Draw-a-Man' Test, (Pathak's adaptation for Indian conditions), and Jenkin's Non-verbal Intelligence Test (standardised by C.I.E., New Delhi); the validity coefficients were found to be ranging from .31 to .52, .43 to .47, .83 to .89 and .71 to .74 respectively for different age groups.

296. SHUKLA, S., *Development of Scholastic Aptitude Tests*, NCERT, New Delhi, 1970.

The study aimed at developing two tests of scholastic aptitude, one each for grades VIII, and X|XI whichever was the final for the high school. The tests were planned for using in the entire Hindi-speaking region covering four states and the Union Territory of Delhi.

Two criteria, viz., 'scores in the examinations' and 'scholarship' were selected and critically analysed, and suitable item types were selected in order to measure the abilities related to the criteria. Nine and ten subtests were tried out with each of the two grades VIII and XI, respectively. The total number of items which were administered at this stage were 670 for grade VIII and 768 for grade XI. The sample was selected from twelve schools of Uttar Pradesh, twelve schools of Bihar, ten schools of Rajasthan, nineteen schools of Madhya Pradesh and twelve schools of Delhi. On the basis of item analysis, two forms (V and N) of the tests were prepared. Item placement for different grades was done having 180 items for grade VIII and 176 items for grade XI. The time limit was also decided. It was two hours for Form V, and one hour and fortyfive minutes for Form N for grade XI, two hours for Form V and one hour and thirty minutes for Form N for grade VIII. Nine subtests, viz., synonyms, classification, analogy, reading comprehension, antonyms, similarities, sentence completion, problems in arithmetic|mathematics and number series were selected for grade VIII. For grade XI, instead of the subtest of similarities, data sufficiency test was incorporated. The standardisation sample was drawn from Delhi, Rajasthan, Uttar Pradesh, Madhya Pradesh and Bihar by using stratified random sampling technique, for Forms V and N separately. From the randomly selected samples of 200 cases from each state, reliability coefficients (by K-R formula 20) were obtained for each subtest separately. The range of these values was found to be from .71 to .92. By Mosier's formula, the reliability coefficients were found to vary from .90 to .97 and parallel form reliability coefficients ranged between .73 and .91. Coefficients of correlation of scores on scholastic aptitude test and marks achieved by the students in annual examination (grade VIII) were calculated and they were found to vary from .26 to .75. For grade XI, they varied from .23 to .60. With the help of factor analysis, two factors were identified, viz., Verbal Comprehension and Numerical Reasoning.

297. SINGH, I. B., *Preparation of a Standardised Group Test of General Mental Ability for school going Children in Punjab*, Ph.D. Psy., BHU, 1963.

The major aim of the study was to prepare a standardised group test of general mental ability in Punjabi.

Out of the seven elements in the test, five were incorporated from the standardised verbal group test of general mental ability in Hindi prepared by Jalota. The other two elements were of vocabulary synonyms and opposites prepared by the investigator. First tryout was conducted on 500 students of classes VIII, IX and X from ten schools of Amritsar. Here only two elements of vocabulary were used. Second tryout was carried out on a sample of 500 students of classes VIII, IX and X. Twenty minutes were allotted for the test consisting of 100 items. This revised form of test was administered to a large unselected sample of 2,985 students from twentyfive different schools of various cities, towns and villages of the Punjab. Item analysis was carried out. For the establishment of norms, the percentile scores and C-scores for various ages and classes were prepared.

The reliability coefficient found by split-half method was found to be 0.93. The validity coefficients for the test were found by correlating the scores with school marks which ranged from .41 to .50 for grades VIII to X. The validity coefficient of the test with a Hindi group test of intelligence was found to be .63. The 'g' saturation as found by Spearman's technique yielded figures ranging from + .332 to + .715. Further factor analysis yielded three factors.

298. SINGH, N. P., *Hindi Adaptation of Kuder Preference Record (Form C)*, Ph.D. Psy., Pat. U., 1965.

The present study aimed at developing a Hindi adaptation of the Kuder Preference Record (Form C) in order to serve the need for a standardised test of interests in Hindi.

In the first stage, individual items were selected by administering the test to a sample of 100 college undergraduates to find scores for ten areas of the test, each area being subjected to (i) response frequency and (ii) internal consistency analysis. Seventeen items out of 333 were found to be un-

satisfactory, leaving a total of 316 items. In the second stage, reliability was estimated by split-half method by administering the test in its final form on two separate samples of college undergraduates, one from Patna and another from Bhagalpur, each consisting of 100 students. The reliability coefficients of different subtests ranged between 0.68 and 0.84. The test-retest reliability, with a gap of one year in between, was also found. The coefficients of stability ranged from 0.57 to 0.71. In the third stage, validity was ascertained first by administering the Chatterji's Non-Language Preference Record and the Kuder Preference Record to a sample of 100 undergraduates. The product moment correlation coefficients found between the scores in the common areas of the two tests ranged between .43 and .55, each one being significant at .01 level. The other validity study covered nine different criterion groups, the results of which proved that all the ten separate areas of the test have distinct validity. In the final stage, percentile norms were developed for the ten areas of the test separately for the Preuniversity and Degree Part I students, drawing two random samples, each consisting of 250 students from T.N.B. College and Marwari College, Bhagalpur.

The findings of the study showed that : (i) the Hindi adaptation of the KPR (Form C) appeared to have come out as a reliable and valid test of the occupational interests of school leavers; (ii) the norms developed in this study, though tentative, could be safely trusted for ascertaining the interests of our young men and helping them in making a suitable decision regarding their post-school programme of work and education.

299. SINGH, R. P., *A Test for measuring Personality Adjustment of College Students*, Ph.D. Edu., Pat. U., 1967.

The study aimed at constructing an inventory for personality adjustment of college students.

The pilot inventory consisted of twelve areas. This draft was presented to twentyfive judges who were lecturers and psychologists. All the judges agreed on five areas — home, health, society, evaluation and education. One hundred and sixtysix items were selected by the experts, out of a pool of 201, for the inventory. The tryout was conducted on 100 randomly selected students of Patna University. Each item had 'Yes', 'No' response. After item

analysis, the inventory included 102 items related to home, health, society, evaluation and education dimensions of adjustment. The final administering of the test was done on a sample of 11,083 students, both men and women, of Patna University and from other various states to make a representative sample of the population of India. The chi-square test was applied to determine the normality of the distribution of scores of the subjects of both the sexes in respect of the total inventory, as also for the five separate areas.

Chi-square values showed that the distribution did not deviate from normality. The coefficients of reliability found by split-half method, test-retest method, Hoyt's analysis of variance method, K-R formula 20 were .94, .93, .94 and .92, respectively. The validity of the test was estimated by correlating the test scores with the scores obtained on the Asthana's Adjustment Inventory. The validity coefficient was .62. Percentile norms, for both men and women, with respect to the inventory as a whole and its five areas were obtained, so also T-score norms.

300. SINGH, R. P., *Interest Record*, Ph.D. Psy., Luc. U., 1968.

Interest record was designed as a counselling instrument to be used in situation in which the client counsellor relationship is such that straight forward and honest expression of choices of activities can be expected.

The seven interest factors set out by Guilford, viz., mechanical, business, scientific, aesthetic, social, clerical and outdoor were employed with some modifications. Items in the inventory were presented in the form of pairs and thus, forced choice technique was employed. In all, 462 items in 231 pages were put in the experimental draft. Seven interest categories had sixtysix items each. Pairs were formed on the basis of social desirability index and discriminative index. Each item got rated on a five point scale from a sample of 164 students of class X. The five point ratings of individual items were transformed with the application of the method of successive categories to give a numerical value. The numerical value thus obtained, indicated social desirability value of each item. The item analysis was performed on data obtained by administering this draft on 244 students of class X. The performances

of upper and lower twentyseven percent of the sample forming the two contrasting groups were compared separately on all the seven interest categories. It gave discriminative indices for all the 462 items.

Norms were developed for Uttar Pradesh using a sample of 1,436 students of class X studying in thirtyfive multipurpose higher secondary schools of Uttar Pradesh, excluding those in hilly areas. The schools offered atleast four out of six streams of higher secondary education and provided a sufficient choice to choose an educational course. Stanine grades and percentile ranks for three different streams, viz., scientific, constructive and aesthetic were calculated and tabulated. One hundred scripts were randomly picked up from 1,436 scripts, obtained by administering the draft. The split-half reliability coefficients corrected by Spearman-Brown formula were found to be .85., .70, .77, .84, .75, .77 and .72 for mechanical, business, scientific, aesthetic, social, clerical and outdoor interest factors, respectively. Interest record was found to have reasonably good construct and content validity.

301. *SOHONI, B. K., Testing of Temperament and Character of Children with Special reference to those attending High Schools in Cities, Ph.D. Edu., Bom. U., 1953.*

The objective was to standardise a method of studying temperament, including dispositions and character traits of children. The traits that were selected for testing were: (i) dispositions—(a) despondency, (b) inquisitiveness, (c) acquisitiveness, (d) dominance, (e) cautiousness and (f) sociability; (ii) temperaments — (a) emotional stability and (b) extraversion; (iii) temper persistence under character; and (iv) traits of character — (a) ambition, (b) maturity, (c) being puritanical, (d) self confidence, (e) conscientiousness, (f) persistence, (g) tact and (h) energy.

Two hundred and thirtyeight test items were constructed for the seventeen selected traits. These were administered to fortyeight boys, in the age-group of fourteen years to fifteen years eleven months, to enable rejection of tests with very small frequency on an average for one or more categories. The number of test items retained after this rejection were 169. Final testing was carried out on a sample of 2,129 subjects of the age group of fourteen to fifteen plus from high schools in cities. Tests were

tried out for their normality and those which deviated were manipulated till they gave a normal distribution. The tests were given to 110 boys again after two months for the calculation of coefficients of contingency and reliability. Inter-trait correlation was calculated. The measure of validity was obtained by comparing test scores and teachers.

The results revealed the following: (i) The batteries for the traits of despondency, inquisitiveness, sociability, ambition and energy could be considered to be fully standardised. The reliability coefficients for these were 0.54, 0.44, 0.48 and 0.45, respectively. The validity coefficients were 0.23, 0.45, 0.32, and 0.24, respectively. (ii) The other batteries yielded satisfactory results except for validity.

302. *TANDON, R. K., Revised Mental Testing (A Study of General Mental Ability with College Adults), Ph.D. Edu., BHU, 1957.*

The major aim of the study was to standardise a test of general mental ability.

The sample consisted of students of faculties of education, arts, science and engineering of Banaras Hindu University. The university had a fair representation of students from all parts of the country. The first sample for revision had 1,099 unselected adults. The subtests with approved validity selected for the purpose included (a) number series having twelve items, (b) mathematical instruction, with six items, (c) following instructions, having twelve items, (d) vocabulary-similars, with nine items, (e) vocabulary-opposites, with nine items; (f) class identifications, having eighteen items and (g) comprehensive reasoning, having seven items. In the first and second revisions, the comprehensive reasoning was replaced by 'drawing inference' with ten items.

First revision was conducted on 328 students. The skewness of .19 was negligible and not significant and the kurtosis of $-.85$ made the curve platykurtic. Results of this revision revealed the presence of a general or a group factor in most of the subtests. Fairly high 'g' saturation both among arts and science students indicated the justification of the combination of these subtests for measuring general mental ability. The Spearman-Brown split-half and K-R reliability coefficients ranged between .79 and .93. For the second revision, the test was administered to 1,099 unselected college adults, Reliability

coefficients ranged between .84 and .99. The validity was ascertained by obtaining the 'g' saturation in the B.Ed. and the engineering groups. The validity coefficients ranged from .51 to .82 and from .30 to .87 in both groups, respectively. All the subtests were found to be highly saturated with 'g'. It was found that if the test was to be used for predictive purposes, the subtests having high correlations with academic marks for their respective sections should be taken into account. This test has great predictive value for the biology students of intermediate classes.

303. *TARACHAND, D. E., Construction and Standardisation of a Personality Test for Guidance, Ph.D. Edu., Bom. U., 1965.*

A test of temperament was proposed to be constructed and standardised.

Five temperamental traits included in the test were: (i) emotional stability-instability, (ii) self-sufficiency-dependence, (iii) aggression-submission, (iv) extraversion-introversion, and (v) sociability-unsociability. The test was designed to serve the English and Gujarati speaking pupils studying in classes X and XI. For item analysis, samples were taken from English as well as Gujarati speaking students. Separate percentile and stanine norms were computed for both the sexes.

The reliability coefficients by (i) test-retest method varied between 0.53 and 0.87, (ii) split-half method varied between 0.65 and 0.83 for whole and for parts between 0.66 and 0.76, and (iii) K-R formula 21 varied between 0.60 and 0.84. The validity coefficients by graphic scales varied between 0.34 and 0.74 and the same by normative technique varied between 0.10 and 0.67. Intercorrelations between the traits ranged from .07 to .73.

304. *TRIVEDI, O. D., Standardisation of Culture Free Test of Mental Ability for Assam, D. Phil. Edu., Gau. U., 1969.*

To meet the need for one common empirical device for the measurement of intelligence in a multi-lingual state, a culture free test of mental ability was planned. This was proposed to assess the general intelligence of students of grade X in Assam.

The preliminary draft having 186 items covered eight subtests, viz., figure arrangement test, simi-

larity location test, progressive matrices test, pattern perception test, analogy based matrices test, series construction test, series completion test and form board test. The test was administered to a sample of 370 students (252 Assamese speaking, seventyfour Bengali speaking, eleven Hindi speaking and thirty-three students speaking different tribal languages), providing adequate time of one and a half hours. The final test was prepared by selecting items having item-total score correlation of more than .20 and having the distribution of difficulty values as flat, approaching rectangular form. Final test contained 107 items in all, with the inclusion of five highly difficult items and eight subtests of the tryout draft. The investigator made a cluster sampling having stratification on the basis of mother tongue. A sample of 1,310 pupils of class X from different schools, chosen at random from eleven districts of the state, was drawn.

The reliability coefficient of the test on Gulliksen's formula '16' was found to be 0.911. The validity coefficients of the test were obtained by correlating it with N.I.I.P. 70/23 Nonverbal Group Test of Intelligence, London, and with the Group Test of Intelligence produced by the Department of Education, Gorakhpur University. Computed values of Pearson's product-moment correlation coefficients were found to be 0.86 and 0.62, respectively. Percentile and T score norms were developed.

305. *TRIVEDI, P. A., Construction and Standardisation of a Pictorial Test of Mechanical Comprehension for the Pupils of Std. VIII to XI, Ph.D. Edu., Guj. U., 1972.*

The purpose of the study was to develop a test to measure mechanical ability of students of standards VIII to XI.

Out of 107 items used for item analysis, seventy-six were retained in the final form. The time limit to be set for the final form was also determined. The final tryout of the test was done on a sample of 5,790 students, out of which 3,855 were boys and 1,935 were girls. The sample was representative of both urban and semiurban population. Since significant difference between the means of boys and girls of each grade was found, separate norms for boys and girls were prepared. Coefficients of test-retest reliability and split-half reliability were calculated. Predictive validity was found

out to establish the value of the test as a predictor of success in technical schools, diploma colleges and degree colleges of engineering, by using academic achievement of students as the criterion. Concurrent validity was established against two forms — AA and BB of the Test of Mechanical Comprehension (the constituent test of the DAT), the Desai-Bhatt's Group Test of Intelligence and the Bhavsar's Non-Verbal Group Test of Intelligence. Construct validity was determined by finding the factors underlying the test. Factor analysis was conducted by Hotelling principal component method. Factors found were confirmed by employing fresh samples and appropriate reference tests in three stages, viz., high school pupils of grade X, students of different grades in ITIs, and students of B.E. (Mech.) degree class.

It was found that the test included three factors, viz., (a) Mechanical Reasoning, (b) Spatial Visualisation and (c) Perceptual Speed which in Guilford terminology are NFT, CFT-K and EFU respectively. As the investigator claims, CFT-K (K indicates Kinetic) is a new factor discovered.

306. TRIVEDI, S., *Study in the Assessment of Interest of the Undergraduate students in relation to Environment, Ph.D. Psy., MSU, 1969.*

The purpose of the inquiry was two-fold: (i) evolving methods of studying interest of the undergraduate students and (ii) studying the relationship between the interest patterns and environmental factors, viz; areas of residence, father's occupation, course of studies, etc. The hypotheses were: (i) at the undergraduate level in India, interests are identifiable; (ii) there are some broad basic patterns of interest inspite of an overlap in some types of interest; and (iii) interests tend to be influenced by environmental factors like father's occupation, areas of residence, family tradition, etc.

An inventory, an information test, a situational test and a projective test were designed to measure interest from various angles and the rationale behind the construction of these tests were reported. A sample of 180 students was chosen from various institutes so as to form criterion groups and the tests were tried out. Item analysis was carried out for finding out the chi-square value for each item. Revision of the tests was made in the light of the findings of the pilot study. The tests were finally ad-

ministered to 300 undergraduate students, selected at random from fine arts, technical, commerce, agriculture, humanities and science faculties from various institutes, areas of residence and family backgrounds. The number belonging to each course of study was kept at fifty. Besides the tests already mentioned, a questionnaire was also constructed for collecting the environmental data with a view to relating them to interests. Range, central tendency and the standard deviation for each of the six areas were found out. In addition to the correlational techniques, centroid analysis was attempted for finding out the basic interest patterns and also the factor loadings of each subtest on the general factor of interest, in each of the six areas. With a view to finding out the effect of environmental factors on each type of interest, analysis of variance and other allied statistical techniques were employed.

The study revealed that (i) interests were identifiable at the undergraduate level, and ranges, means and standard deviations of the interest scores were found to vary from group to group, interest to interest; (ii) there were three basic patterns of interest inspite of considerable overlap between interest areas and the basic dimensions might be identified as (a) practical—scientific; (b) creative-aesthetic (c) manipulative-computational; and (iii) the main effect of environmental factors included under the scope of the present study on most types of interests, was significant and there also existed a significant interaction between a number of environmental variables.

307. TUTOO, D. N., *The Mirror-Tracing Test as a Measure of Social Maladaptation, Ph.D., Edu., Del. U., 1968.*

The present study aimed at verifying the three hypotheses, viz., (i) the quality of performance of the subjects on the Mirror-Tracing Test, is related to the social adjustment; (ii) the mirror-tracing performance tends to give an indication of subjects' dominant personality tendencies like persistence, logicity, impulsiveness, and aggressiveness; and (iii) for certain types of subjects, who undergo the Mirror-Tracing Test, the mirror-tracing experience induces a mental discernment which has a therapeutic value for these subjects.

The sample of the study included 100 socially adjusted and 100 socially maladjusted subjects.

Of the 100 maladjusted subjects, fifty were identified as antisocial and fifty as neurotic. The socially adjusted group was selected from persons working in offices, institutions, etc., whereas maladjusted group was selected from jails and mental hospitals. The Mirror-Tracing Test was used as a basic tool of the study along with the Maudsley Personality Inventory, the Gibson Spiral Maze Test, and the Raven's Progressive Matrices. Besides these tests, scales for rating the four personality tendencies (persistence, logicity, impulsiveness and aggressiveness) and Personal Information Sheet were also used. To verify the first hypothesis, the performance of socially adjusted and socially maladjusted subjects on the Mirror-Tracing Test was analysed in terms of error and time scores. Means and standard deviations for error scores and time scores for both the groups were calculated. The scores of the two groups were also combined on each of the five trials as well as on the average of five trials and on the average of four trials for time scores and error scores. The *t* test was applied to find out the significance of difference between the mean scores of socially adjusted and socially maladjusted groups. For the second hypothesis, the set of two ratings rendered by the two raters on each of the four personality tendencies were submitted to chi-square test, to ascertain, whether there was any significant relationship between assessments of the two assessors. Regarding the third hypothesis, case histories of the subjects were reviewed.

The findings indicated the following: (i) There were qualitative and quantitative differences in the performances among subjects belonging to different clinical groups. (ii) With reference to the first hypothesis, it was seen that the quality of performance given by the subjects on the Mirror-Tracing Test was related to their social adjustment in society. The quality of performance of socially adjusted subjects was superior to socially maladjusted subjects as indicated by the low average error score and time score. The average error score and time score for socially adjusted subjects were 41.12 and 216.30 seconds, respectively, while the same for the socially maladjusted subjects were 63.35 and 261.60 seconds, respectively. The differences were statistically significant. (iii) With respect to the second hypothesis, ratings and case histories showed that the Mirror-Tracing Test could throw useful light on the four personality tendencies of subjects, viz., persistence,

logicity, impulsiveness, and aggressiveness. Analysis of the ratings showed an overall agreement between the ratings done by the investigator himself and by the jailor, warden or superior officer for the four tendencies. The case histories substantiated the ratings. And, (iv) results for the third hypothesis showed that the experimental group which was given therapy had displayed better understanding of their movements and had shown better performance on the Mirror-Tracing Test than the subjects on the controlled group. The subjects in the experimental group displayed a distinctive change in their behaviour which was not only better than their previous behaviour, but also better than the performance of the controlled group.

308. VARMA, M., *A Predictive Battery of Tests for Differential Scholastic Aptitude*, Ph.D. Edu., Nag. U., 1960. 7

The object of the present study was to produce a battery of ability tests for the southern districts of Madhya Pradesh, where Marathi is largely spoken. It was to cover mainly the mental ability factors useful in the predictive process.

The specifications of the battery were: (i) it should serve the urban areas of Madhya Pradesh where Marathi is largely spoken; (ii) its language should be Marathi—providing for a subsequent Hindi version; (iii) the battery as a screening device, should be possible to be applied at the commencement of the high school stage; (iv) the battery should initially be developed on boys' samples to avoid complexity and later on comparison of boys' group with girls' should be possible; (v) the total testing time should be less than three hours; (vi) tests of abilities likely to make contribution to the overall and differentiated achievement in the main subjects at the high school stage were to go into the battery; (vii) the number of abilities was to be held to a minimum to form a basic core of tests and these were to be relatively pure tests of familiar factors likely to be of interest as predictors of scholastic aptitude, and (viii) the setup of the battery should facilitate the use of tests in combinations with other predictors in differential prediction situations. The tests included in the battery were related to number, verbal, induction, deduction, space, perceptual speed, finger dexterity and rote memory factors. The first tryout was conducted on 370 students of classes IX and

X from the schools of Nagpur. The final draft was tried on three samples taken from Nagpur and out of Nagpur. Decile norms for these three groups were furnished. The use of the battery for guidance purposes was demonstrated by its application to four subjects, viz., language (Marathi), geography, science and mathematics offered by a random sample of 623 boys of the Nagpur group. Regression equations in raw score form for the prediction of achievement in these four subjects were developed. The matrix of intercorrelations among the eight tests was factorised by the centroid method.

The results revealed that the reliability coefficients of the individual tests ranged from .60 to .93, whereas the validity coefficients ranged from .45 to .66. The Horst's index of differential predictions and absolute prediction came to .144 (first approximation) and .997 (first approximation), respectively. The reliabilities of differences among tests were found to be satisfactory and the functional relationship among tests and criterion showed an orderly pattern.

309. VENKATARAMANA, C., *Construction and Standardisation of an Aptitude Test in Science, Ph.D. Edu., MSU, 1970.*

The study intended to develop an aptitude test battery in science for the pupils studying in class IX.

The investigation sought to develop an instrument which would cover the following seven scientific abilities, viz., numerical, spatial, reasoning, mechanical, interrelationship, cause and effect relationship and ability to infer from experimental data. A questionnaire was prepared and administered to the science teachers. The pilot form of the test consisted of 153 items in seven sections according to the various abilities listed above. A group of 220 class IX pupils were drawn from five high schools for the tryout. After the pilot form was administered and scrips scored, the test items were rearranged according to the difficulty level. The final form of the test consisted of 148 items and timed for 120 minutes. It was administered to 2,000 pupils studying in class IX in thirtynine schools of Andhra Pradesh. The selection of the schools was done on the basis of management, place of location (urban| rural) and sex variables.

The coefficients of reliability of the test found by split-half and K-R method were 0.88 and 0.90

respectively. The validity of the tool was established by correlating the scores of the test with the scores obtained by the pupils in annual science examination and also with the teachers' rating of the pupils. The coefficients of validity ranged from .72 to .76. The grade norms, the standard score norms, the percentile norms and the T score norms were established. Factorial analysis using Thurstone's centroid method yielded five factors. However, Fruchter's formula indicated the presence of four factors only. The instrument was found to be useful to measure scientific aptitude of the pupils and helpful to the counsellors in giving right type of service to the maladjusted children wherever possible.

310. YADAV, M. S., *Development of an Intelligence Scale for Children, Ph.D. Edu., SPU, 1970.*

In this study, an intelligence scale in Hindi for children in the age group eight to twelve was developed.

The constructed scale has the following five individual tests, viz., information, comprehension, arithmetical problems, similarities and vocabulary. Tryout was conducted on a stratified sample of 210 children selected from Delhi schools. Stratification was done on the basis of geographical location (rural—urban), sex, type of schools and parental occupation. For item analysis, the extreme groups were formed by taking upper and lower twentyseven percent children from each age group separately and then pooling them to get composite groups to ensure that children of high and low abilities from all age levels were included in the extreme groups. Scores on a nonverbal test of intelligence were used to provide additional evidence for discriminative power of items and also for the estimates of item validity. The difficulty indices for each item were computed separately for each age group. Usual scoring model of 0-1 was followed in the case of information, arithmetic problems and vocabulary tests, whereas for comprehension and similarity tests, scoring model of 0, 1 and 2 had been followed to give credit for partially correct answers. Reliability of comprehension and similarity tests was estimated by the Cronbach's general formula, whereas in the case of information, arithmetic problems and vocabulary tests, K-R formula 20 was used.

The reliability coefficients for the different subtests ranged from 0.80 to 0.93. An estimate of the reliability of the total scale was obtained by using Mosier's formula and it was found to be 0.96. The unifactor structure of the scale as a whole was evidenced by centroid method of factor analysis, where seventy percent of variance was accounted for by the first

factor. The norms in the form of standard scores were provided for all tests separately and also for the composite scale. Tests in the constructed scale were validated by construct validity approach and analysis of variance approach. The five tests as well as the total scale were also correlated with a nonverbal test as the criterion. The validity coefficients were highly significant ranging from .51 to .66.
