

A Study of Distinction between Intelligence and Creativity  
and some of their correlates among a group of  
Pakistani Children

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A STUDY OF DISTINCTION BETWEEN INTELLIGENCE AND CREATIVITY  
AND SOME OF THEIR CORRELATES AMONG A  
GROUP OF PAKISTANI CHILDREN

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DISCUSSION OF RESULTS  
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Thesis submitted for the Degree of Ph. D.

by

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SUMMARY

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In Part II of this research Raven's Standard Progressive Matrices (1900)

and an abridged form of Wallach and Jager creativity test (1960) were given to a sample of 144 students of grade VII, taken from three English Medium Schools of Islamabad. The achievement scores obtained by these students in their school examination was correlated with Intelligence and Creativity scores on the aforesaid tests.

The following hypotheses were tested in the present work:

1. Raven's Standard Matrices (RSM) scores of the subjects will increase with their grades (Classes).
2. RSM scores of the subjects will increase with age.

## SUMMARY

The purpose of the present research is to distinguish conceptually and empirically between 'intelligence' and 'creativity' as independent cognitive variables, each contributing to scholastic achievement. While researches on the measurement of intelligence had their origin in the beginning<sup>n</sup> of the present century, creativity researches began only about three decades ago.

Several studies in other countries have shown that intelligence and creativity represent independent cognitive abilities. Such a distinction is necessary to establish in view of these recent researches in this area and because of its importance in personnel selection, admission to higher classes, teaching and examination practices.

The present work consists of two interrelated parts. In Part A, which comprised two studies, a non-verbal test of intelligence, namely, Raven's Standard Progressive Matrices, was administered to a sample of 1040 students to determine whether it was a reliable and valid measure of intelligence for our population. This was necessary because no valid measure of intelligence for Pakistan is available.

In Part B of this research Raven's Standard Progressive Matrices (1960) and an abridged form of Wallach and Kogan creativity test (1965) were given to a sample of 144 students of grade 8th, taken from three English Medium Schools of Peshawar. The achievement scores obtained by these students in their school examination were correlated with intelligence and creativity scores on the aforesaid tests.

The following hypotheses were tested in the present work:

1. Raven's Standard Matrices (RSPM) scores of the subjects will increase with their grades (Classes).
2. RSPM scores of the subjects will increase with age.

3. RSPM scores of the subjects will be significantly correlated with their achievement scores.
4. There will be a positive and significant correlation between test-retest scores of the subjects on RSPM.
5. Odd-even scores of subjects on RSPM will be significantly correlated.
6. All of the subtests of the creativity battery will be significantly correlated with each other.
7. The correlation between scores obtained by the subjects on RSPM and creativity test will not be significantly different from zero.
8. There will be a positive and significant correlation between the scores of the subjects on creativity test and their achievement scores in the examination.
9. Tests of creativity will add significantly to the prediction of achievement over and above that obtained by the intelligence test alone.

### Results

All of these hypotheses, except the second one, were confirmed.

INTRODUCTION AND HISTORICAL SURVEY

One of the main problems faced by psychologists, particularly in the study of intelligence, is the question of its nature and measurement. It is generally agreed that intelligence is a complex of various mental functions, including the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. In the past, tests of intelligence have been used for a variety of purposes, including the selection of students for advanced courses, the diagnosis of mental retardation, and the prediction of occupational success. More recently, a number of psychologists have realized the need for a more comprehensive theory of intelligence, one that would take into account the role of culture, environment, and individual differences in the development of intelligence. This has led to the development of new tests of intelligence, which are designed to measure a wider range of cognitive abilities than traditional tests. The present study is a contribution to this ongoing research.

Chapter I

INTRODUCTION AND HISTORICAL SURVEY

The purpose of this study is to investigate the relationship between intelligence and academic achievement. It is based on the assumption that intelligence is a key factor in the prediction of academic success. The study will examine the validity of this assumption by comparing the scores of students on a standardized intelligence test with their scores on a standardized academic achievement test. The study will also explore the role of other factors, such as motivation, effort, and social class, in the prediction of academic achievement. The results of the study will be discussed in terms of their implications for educational practice and policy.

INTRODUCTION

Measurement of Intelligence

Intelligence is a complex of various mental functions, including the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

## INTRODUCTION AND HISTORICAL BACKGROUND

One of the main problems faced by educationists, particularly in developing countries like Pakistan, is the selection of students for admission to various classes and prediction of their achievement. This is necessary for maximum utilization of national resources and development of individual talent. In many western countries, tests of intelligence have been used for this purpose. More recently, a number of psychologists have realized that tests of intelligence do not cover the whole area of cognitive abilities. Many such psychologists have proposed the use of tests of divergent thinking (or creativity) in addition to the tests of intelligence. The present study was mainly aimed at finding out whether addition of creativity tests to the tests of intelligence would result in better prediction of student's achievement than the prediction made on the basis of intelligence tests alone. Nevertheless, two problems had to be investigated before the main research could be initiated. One was finding a suitable test of intelligence and another was to determine whether measures of creativity were really different from those of intelligence. For the former, Raven's Standard Progressive Matrices were selected because this test has been frequently used in cross-cultural research. But its reliability and validity had to be first established on a Pakistani sample. In so far as creativity is concerned, <sup>an</sup> abridged form of Wallach and Kogan creativity Test was used. In the latter part of the research, relative contribution of intelligence and creativity to academic achievement was studied.

## INTELLIGENCE

### Cross-cultural testing of intelligence

Some degree of cultural bias is inherent in almost all tests.

This is so because cultures vary not only in the specific activities customs and traditions, which they encourage, stimulate and value but also along a number of other parameters e.g. language, reading ability, speed of performance and specific content. This adds to the methodological problems of adaption of a test in another social and cultural environment. To eliminate cultural bias, some tests have specially been devised for cross-cultural use. In these tests an attempt is made to rule out one or more of the above parameters. If the cultural groups to be tested speak different languages, the test to be used should require no language on the part of either examiner or examinee. Similarly, when different cultural groups differ widely in their educational backgrounds, reading must be ruled out. To eliminate the influence of speed, cross-cultural tests have often allowed sufficient time or are untimed. Above all, cultures may differ in respect of specific information called for by the tests even if they require neither language nor reading. It was mainly to control this type of cultural parameter that the classic 'culture-free' tests were first developed ( Anastasi, 1976 ).

Underlying all these problems, is the basic problem of the validity of culture-fair tests. A test, measuring characteristics equally familiar to many cultures, may possess little theoretical or practical validity in any of these cultures.

Keeping in view these theoretical and methodological problems, present in cross-cultural testing, three different approaches have been suggested ( Anastasi 1976 ). However, these approaches are not mutually exclusive.

The first approach involves the selection of items common to many cultures to form a test. Then such a test should be validated against local criteria in different cultures. This is the basic approach of the culture-fair tests, e.g., Leiter International Performance Scale and Cattell Culture Fair Intelligence Test ( Anastasi, 1976 ).

A second major approach is to devise a test in one culture and then administer it to individuals with different cultural backgrounds. Such an approach is followed when the individuals are tested to predict a local criterion within a particular culture. Such an approach can help measure the cultural distance between different groups as well as the individual's degree of acculturation and his readiness for educational and vocational activities that are culture-specific. Goodenough's Draw-a-Man Test and Porteus Maze Test followed this approach ( Anastasi, 1976 ).

As a third approach, a test may be devised in one culture and then adapted and validated against local criteria. This approach is exemplified by the various revisions of Binet test for use in different European, Asian and African cultures ( Anastasi, 1976 ; Menzel, 1961 ; Leiter 1948 ).

The first approach is mostly followed in the present study. The test used is Raven's Standard Progressive Matrices. An attempt has been made to find out whether this test is a valid measure of intelligence for our country or more specifically for the sub-population in which this study was conducted. A brief review of some well-known intelligence tests used in cross-cultural testing is presented below.

A brief review of some well-known intelligence tests used in cross-cultural testing is presented below.

The earliest test of intelligence used with different ethnic groups by different psychologists is Porteus Maze Test. It was devised in 1913 by Porteus for the differential diagnosis of feeble-minded people. It has been used in a variety of situations, e.g., in studies of psychosurgery, drugs, juvenile delinquency and crime, testing in industry as well as in numerous ethnic studies ( Porteus, 1965 ). Porteus claimed that this test proved useful in all the situations where it was applied, including studies of Australian aborigines and African pygmies and bushmen.

Another well-known intelligence test called Army Beta was devised in 1917. It was constructed for illiterates and foreign-born recruits who were unable to take a test in English in the United States. After World War I, this test was released for civilian use. It underwent many revisions, the latest of which is even now in use. It is called Revised Beta Examinations. The chief importance of this test lies in the fact that it served as a model for most group intelligence tests. The testing movement got a tremendous spurt of growth due to this test.

Goodenough's Draw-A-Man test is another psychological instrument used in comparative studies of children from various cultural sub-groups. It is in use since 1926 when it was first devised. In this test the examinee is instructed to make a picture of a man as best as he can. An extension and revision of this test was published under the title Goodenough-Harris Drawing test in 1963. In this revised scale, the examinee is asked to draw a picture of a man, a woman and of himself. In this revision, as in the original scale, emphasis is placed on the child's accuracy of observation and development of conceptual thinking. Retest and scorer reliabilities of this test are quite high. Scorer reliabilities are often reported near .95.

McCarthy (1944) in a carefully controlled study of the earlier form of Goodenough's Draw-A-Man test, administered to 386 third and fourth-grade school children, found that retest reliability after one-week interval was .68, whereas the split-half reliability was .89. Re-administration of the new form to groups of kindergartoon children on consecutive days revealed no significant difference in performance on different days (Dunn, 1967; Harris 1963). In these studies, examiner-effect was found to be negligible. The new and old scales correlate between .91 and .98 in homogeneous age groups. So, Harris recommends that the two scales may be regarded as alternate forms. The construct

validity of this test is provided by correlations mostly above .50 with other intelligence tests.

Rohrer (1942)\* administered Goodenough Draw-A-Man test and Otis intelligence test to 235, part or full blooded Osage Indians attending elementary schools in Oklahoma. He found no difference between this group and white student population in the same schools. Strumpfer and Mienie (1968) undertook a validity study of Goodenough-Harris Test and reported odd-even and retest reliabilities above .78 for both Man and Woman scales. Validity findings reported by these authors indicate statistically significant positive correlations between this test and father's occupation, examination marks and teacher's ratings.

Harris (1961)\* and Khatena (1964)\* found a correlation of .22 and .26 respectively between DAM and Raven's Matrices scores. These low correlations may be attributed to the fact that there is virtually no similarity in contents between the two types of tests.

Another test which is being increasingly used by psychologists is D-48 (Handel, 1973). Gough and Domino (1963), suggest that average scores of subjects of similar age and educational level in different countries will be about the same. Domino (1964)\* found that for a college sample in the United States the D-48 had a slightly more predictive validity as regards academic achievement than the Cattell's Culture-Fair or the Army Beta. The correlation of this test with Culture-Fair Test was found to be .51, with Army Beta .41, and with academic gradepoint average .22. He found similar results when he tested 108 foreign students from 21 countries attending California State College. Kagitchbasi (1972) Showed that the relative difficulty level of the test items was essentially the same for Turkish and American children.

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\* An asterik denotes that the reference is obtained from a secondary source.

Handel (1973) used this test in Israel. The result showed a progressive increase of mean scores from grades 7th to 11th. Concurrent validities of .46 to .59 against different criteria of seventh-grade scholastic achievements were reported. The D-48 and Raven's Matrices scores were also correlated. These correlations ranged between .64 and .68 in different samples. Bruni (1966) reported a correlation of .67 between these two tests for Italian subjects. Rafi (1967) reported a correlation of .58 between D48 and Raven's Matrices for candidates for admission to a technical college in Lebanon.

The Progressive Matrices were developed in Great Britain by Raven to assess the intellectual capacity, particularly in clinical settings (Raven, 1960). It gradually became popular as a screening device in group form. Raven's Matrices test is one of the most widely used intelligence tests in cross-cultural research (Brilson *et al* 1973). Its lack of verbal items, relative ease of administration, and widespread use vested it with what Irvine (1969) calls "Culture-free potential".

Mac Arthur and Elley (1963) showed that in sample from various Canadian cultural groups it has less association with socioeconomic status and higher 'g' loading than verbal reasoning tests.

Irvine (1969) applied Raven's Progressive Matrices extensively in two major surveys of educational aptitude to representative samples of 8th and 10th grade African students. The results have shown that environmental factors such as father's occupation and family size have no effect on test performance.

Vernon (1969) used Raven's Progressive Matrices in several studies on different ethnic groups in Britain, Hebrides, Jamaica, East Africa and Uganda. He found this test a valid and reliable measure of general intelligence.

Klingelhofer (1971) studied 7th grade children in two Tanzanian schools, using Raven's Standard Progressive Matrices. He found that examiner-effects and the language of administration had little or no effect on the performance of these children on the Progressive Matrices. It was also found that school location or quality probably had less relationship to performance on tasks like the Progressive Matrices than it may have on other types of test, e.g., achievement tests.

Bingham, Burke and Murray (1966) determined the concurrent validity of Raven's Progressive Matrices. The subjects were patients admitted in the Veterans Administration Hospital of East Orange. The results indicated that scores on Raven's Progressive Matrices correlated as well with scores on the WAIS verbal ( $r=.80$ ), and WAIS performance ( $r=.79$ ), as these did with one another ( $r=.77$ ), thus establishing the concurrent validity of Raven's Progressive Matrices.

In another study by Burke and Bingham (1969), the untimed Raven's Matrices showed a split-half corrected reliability coefficient of .96 ( $N=96$ , Age  $M=35.1$ ,  $SD=8.7$ ).

Burke (1972) in a further investigation of the reliability of Raven's Matrices, rescored 567 answer sheets of American (black and white) veterans who took this test when referred for vocational counselling. The odd-even reliability was found to be .93. Application of the Spearman-Brown formula for predicting the reliability of a test of double-length yielded a reliability coefficient of .96. The data showed a negative correlation with age ( $r=-.27$ ).

In Pakistan, Zaki and Beg (1967) determined the concurrent validity of Raven's Progressive Matrices by correlating scores of various groups of students on this test with scores on the scholastic Aptitude Test developed at the Institute of Education and Research, Lahore. The correlation coefficients between these two test scores were significant beyond .01 level ( $r=.68$  and  $.66$ ,  $N=40$ ). These authors also computed the split-half reliability of Raven's

Progressive Matrices by odd-even technique. For a sample of 80 children used in this study, the reliability coefficient reported was .72.

Raven's Progressive Matrices have been used quite extensively by psychologists for determining the validity of the new tests devised for measuring general intelligence in cross-cultural testing (e.g. Handel 1973; Cattell 1973). This shows that Raven's Matrices Test is accepted as a cross-cultural test of general ability by numerous psychologists.

#### Intelligence testing in Pakistan

At present, there is no test of intelligence available which can be used at a national level. The National Education Commission (1960) realised the need for such tests and recommended that measures of aptitude and intelligence for use in guidance and counselling may be devised in Pakistan.

In spite of this recognition of the value of intelligence tests, developments in this area have been very slow, due to the practical problems confronting any expert in the field interested in constructing an intelligence test for Pakistani population. One of the basic problems relates to literacy. The percentage of literate people in Pakistan is far lower than that of illiterates. The inadequate linguistic stimulation by illiterate parents acts continuously on children's mental growth from about six months to adulthood. So, when the test has to be prepared for school children, the differences in scores on such a test will not only reflect actual differences in intelligence but also differences in home background, parent's education, occupation and socioeconomic status. These differences are present more or less in all societies. But the extent of these variations is probably much more in developing countries like Pakistan.

Another problem relates to multilingualism. In different regions of our country, various languages (e.g., Urdu, Pashto, Panjabi, Hindko, Sindi,

Balauchi and their variants) are spoken. The question of the language of the test is very crucial. There can be different solutions to this problem, but each one has certain difficulties.

First, the test may be constructed in the national language, i.e., Urdu. The two extremes of our population, as regards the usefulness of Urdu, are represented by those who have a command over this language, Urdu being their mother tongue, and on the other extreme, are individuals who can neither understand nor speak Urdu. Hence a test in Urdu will not be applicable for the whole population of Pakistan.

However, if we limit ourselves to school going children, who read Urdu as a compulsory language and are much exposed to mass media: magazines, newspapers, TV etc., which are in Urdu, we can probably have a test which is applicable more or less at a national level, although it may be useful only for school going population.

Second the test may be devised in Urdu with its translations available in regional languages. But, it may generate a number of other problems. For example, there are certain concepts in one language not present in other languages. 'Cousin' for instance has no equivalent word in our regional language. Another problem can be that elements in the test material may stimulate different associations in different linguistic groups. A certain word or phrase may carry unintentional meanings.

Third, independent tests may be devised in various regional languages, so that one could get rid of the problems encountered in translations of a psychological test. This approach necessitates the availability of experts in the technique of test construction having command over the language of the test. Even if a programme is launched at a national level, it will be difficult to get hold of such specialists in all the regional languages. Moreover, it will be very expensive to construct a number of tests rather than one test, apart

from the problem of comparability of tests.

Fourth, we may devise a test in English, but the same problem of mastery of language is present again. Those who are studying in Urdu medium schools will be at disadvantage. The test scores will not reflect true differences in intelligence. The scores will be faked by the differences in opportunities to gain a command over English. Such a test, of course, will not be applicable to the whole country because only school going children of advanced grades, and literate adults may be given this test.

Last, a non-verbal test may be devised. Such a test will be applicable to the whole population. A review of available non-verbal tests clearly indicates their value especially with children who have had limited educational opportunities or poor social backgrounds, with young children who have not yet learned to read, with older pupils who are handicapped in reading or have language difficulties, and with illiterate (or non-English-speaking) adults. Moreover, non-verbal group tests have been found useful in determining aptitude and promise in shop-work, mechanical drawing, architectural drafting, and occupations of a mechanical or quasi-mechanical nature. So, at present devising and using a non-verbal test is a good solution of the existing problems encountered in intelligence testing in Pakistan.

The use of intelligence tests in Pakistan has uptill now been rather limited. The Armed Forces and the Federal Public Service Commission are the major institutions where psychological tests are used in a systematic and organized manner as an aid to personnel selection. Both of these have their own batteries of intelligence tests: verbal and non-verbal. However, their use is restricted to a limited population. The subjects are educated persons. Moreover, neither these tests nor the obtained data are released for public use.

A brief description of the testing procedure used by Federal Public Service

Commission is available in Zaidi (1973), according to which Raven's Standard Progressive Matrices alongwith many other tests have been used by the Commission for a number of years, but they have not published any analysis of obtained data.

Much of the work on intelligence testing in Pakistan has been of the nature of adapting western tests by determining their validity, reliability and norms for our population. The earliest work in the subcontinent was an adaptation of Stanford-Binet Test by Rice (1929)\*. After independence in 1947, a number of investigators have shown that it is possible to use western tests of intelligence for the literate population. Some of these studies are summarized below.

Rouck (1966) undertook an adaptation of Differential Aptitude Test Battery (DAT) for use with students in degree colleges and universities in Pakistan. He adapted two parts of DAT, the Verbal Reasoning and Numerical Ability tests. This work was initiated in Dacca University (now in Bangladesh) in 1961, and was subsequently carried out at the Institute of Education and Research, Lahore. The proposed research included adaptation of all eight tests of the battery and translation of the adapted form in Urdu. The test-retest data revealed that despite the substantial mean gain in scores on the second administration of VR and NA tests, the coefficients of reliability were high. In all the three validation studies, the co-efficients of correlation between the DAT, VR and NA tests and the criterion measures were between .36 and .77 with a median near .60 (significant at the .01 level). Moreover, in these studies the combined scores of these tests (DAT, VR and NA) were predictive of academic achievement as measured by objective tests to the extent of .77 for original forms and .57 for adapted forms in English. The results of these investigations show that DAT, VR and NA tests have great potentiality for adaptation across different cultures.

Ahmad (1968) undertook an exploratory study to determine the validity of Otis Quick Scoring Mental Ability Test as a predictor of academic success in Pakistan. About 600 college graduates were tested all over Pakistan (then West Pakistan). The results demonstrated a significant positive correlation between the academic performance in B.A. Final Examination and Otis Quick Scoring Test. The investigator recommended this test as a useful predictor of academic performance in Pakistan.

Otis Quick Scoring Test was standardized for Intermediate students of Lahore in two phases during 1971-72 (Zaidi, 1973). In the first phase, this test was translated into Urdu and then a correlation between this new version and original test was determined. The correlation between the two was .76. In the second phase of its standardization, the test was modified and re-arranged on the basis of item analysis. The split-half reliability of this modified form was .98. The validity of this test was determined by correlating the test scores with marks of the High School Examination (10th grade). It was .38 for the male sample and .50 and .52 for the two female samples.

At a lower educational level, a similar study was undertaken by Zaki and Beg (1969) at the Institute of Education and Research, Lahore. They undertook to determine the concurrent validity of the Raven's Standard Progressive Matrices (1960) and Chicago Non-verbal Examination for Pakistani children by correlating these test scores with scores on the I.E.R. Scholastic Aptitude Test Scale I. The latter test is one of the first series of psychometric devices developed in Pakistan for use with children of Urdu medium schools. It consists of sixty multiple choice items of four types: verbal ability, numerical reasoning, logical reasoning and general knowledge. The validity coefficients of this test were .41 and .61 for boys and girls respectively when final examination marks were used as the validity criterion. The split-half reliability of

this scale was .89. Zaki and Beg administered these three tests on eighty subjects of classes 4th and 5th taken from four junior schools of Lahore. The validity coefficients between I.E.R. Scholastic Aptitude Test and Raven's Test ranged between .45 and .68 for the four samples. The validity coefficients between I.E.R. Scholastic Aptitude Test and Chicago Non-verbal Examination were low. The split-half reliability of Raven's Matrices, Chicago Test and I.E.R. SAT were .72, .93 and .78 respectively. The authors recommend that Raven's Matrices and I.E.R. SAT can be used as effective measures of intelligence for fifth grade Pakistani children.

Jamal (1965) undertook a validity study of Raven's coloured Progressive Matrices for 5th grade children. He reported significant reliability and validity coefficients for this test.

#### Use of RSPM in the present research

The above review highlights two important facts about Raven's progressive matrices:

- (a) That it has been quite extensively and effectively used in cross-cultural research;
- (b) that this test has proved reasonably valid for children of junior grades in Pakistan. It was therefore decided to use it as a test of intelligence in the present research.

### CREATIVITY

#### Definition

The earliest view about creativity was that it is something that is inaccessible to scientific measurement. So no systematic attempt was made for quite sometime to explore the creative potential or even to explain this talent in some objective and quantitative way. During the first quarter of the present

century, when Terman (1925) undertook his genetic studies of gifted children, the word 'gifted' was taken as synonymous with high I.Q. A child who might be superior to his peers in several respects other than his score on a test of intelligence was not considered gifted or 'genius'. Terman undertook to investigate and measure other physical, mental and personal qualities of his subjects who were exceptionally superior in intellectual capacity as measured by the tests of intelligence. Terman also studied the biographies of men of genius. He found exceptional gifts usually appear quite early in childhood. Terman (1917)\*, after studying Galton's biography and later career, estimates that his I.Q. must have been close to 200. The childhood histories of Goethe, John Stuart Mill, Francis Bacon, Descartes, Spinoza and many other eminent persons give early promise of later greatness, but it is not a rule in all geniuses. Charles Darwin was considered rather dull by his teacher; Napoleon stood 42nd in his class in military school; Edison was usually at the foot of his class in school (Garrett, 1930). Such data led the investigators to explore other expedients that offer opportunity for initiative and creative endeavour. A typical intelligence test requires the subject to recall, recognize and even to solve, but not necessarily invent or innovate. Restricting giftedness in children within the one concept of intelligence as represented by I.Q. metric led to only a partial understanding of giftedness during the first half of the present century.

Although creativity has been a topic of some interest throughout man's history, yet the scientific investigations of creativity were undertaken only during the third quarter of the present century. In the six or seven decades before 1950, only a few research articles on creativity appeared in the scientific literature.

The growing recognition of the limitations of multiple-choice tests which by their very nature exclude original thinking (Hoffman, 1967) led the psychologists to believe that originality and power of creating something new

are not likely to be detected in performance on this kind of test. It was realized that to get a more accurate statement of the worth of an individual, tests of general intelligence must be supplemented by creativity tests.

Now, what does the concept of creativity mean? Taylor (1956) has summarized different definitions, including the ones proposed by Ghiselin, Lacklen and Stein. Ghiselin considers the measure of a creative product as the extent to which it restructures our universe of understanding. To Lacklen, it is the extent of the area of science that the contribution underlies. The more creative the contribution, the wider the effects. Stein says that a process is creative when it results in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time.

Berlyne (1965) says that in order to be deemed creative, a product of a thought process must be initially improbable and hence unpredictable. According to Bruner (1962), an act is creative if it produces "effective surprise". Bartlett (1958) postulates a range of kinds of thinking, the extremes of which he calls 'thinking within closed systems' and 'adventurous thinking'. For research purposes creativity is usually defined in terms of end products (Taylor, 1964).

The common assumption among most psychological researchers is that all persons have some creative potential (Taylor 1964). Lowenfeld (1959) distinguished between actual creativity and potential creativity, the former being that potential which is already developed and functioning, the latter including the total creative potential (both developed and undeveloped) within an individual. Actual creativity is evaluated in terms of the degree of creativeness of a product or a performance. Creative potential of people, on the other hand, is usually estimated by means of test scores.

Creative product, however, is quite different from the creative

process. An early view about creative process was that it is a sort of divine madness, a seizure by the gods (Tyson, 1966). A number of creative persons from Homer and Socrates onward have stated their experiences. The most widely recognized analysis of creative process is that by Graham Wallas (1926), who suggested four stages, namely preparation, incubation, illumination and verification. Vinacke (1952) studying the reports by various creative writers and scientists found that the stages usually do occur but they are so interwoven that they can be taken as a dynamic process.

Various groups of psychologists have conceived creative process in their own way. According to Mednick (1962) creative thinking consists of forming new combinations of associate elements. These combinations, he says, should either meet specified requirements or be useful in some way. He describes three mechanisms by which one arrives at a creative solution, viz., serendipity, similarity and mediation.

The gestalt psychologists considered the process of creative or productive thinking as the 'structuring of gestalten'.

The psychoanalytic conceptions of creativity emphasize motivational rather than intellectual characteristics. For Freud, creative production is a form of substitute gratification. In his study of Leonardo da Vinci, Freud (1963) had attempted to relate the inhibitions of the artist's sexual life to his childhood experiences and to his artistic activities. Koestler (1964) suggests that in the creative act the mind gives itself up to the 'games of the underground'. It is a process of disintegration preceding the new synthesis. Later on, Koestler coined the term 'act of bisociation' for what to him is the essence of creation, i.e., bringing together two unconnected matrices of thought.

Empirical studies of creativity

Research studies of creativity steadily emphasize the need for systematic empirical investigation. Some psychologists have paid more attention to the special characteristics of creative persons and others to the processes involved. It is quite likely that creativity is a function both of special personal characteristics and of certain processes. The latter has mostly been studied by experimental techniques, and the former by means of biographical and case study methods. Besides these two traditional approaches, recently a number of creativity tests have been devised and used to measure and predict creativity. Some of the major results of these investigations are presented in the following sections.

The earlier experimental studies of creative thinking have followed an indirect approach to this problem. The investigators in these studies have discovered the effects of certain important variables like set and fixedness on thinking. They believe that such factors make productive thinking difficult. Luchin's experiments on the effects of 'Einstellung' (1942) and Duncker's experiments on functional fixedness (Ray, 1967) explain the blind and inhibitory effects of past experience and set on creative thinking. Wertheimer (1959) conducted many experimental studies on school children and concluded that it is possible to train the children to think productively and creatively.

Recent experimental studies of creativity deal with those factors that facilitate originality. Houston and Mednick (1963) demonstrated the reinforcing properties of associative novelty for creative individuals. Maltzman (1960) carried out some laboratory experiments on originality training. The experimental procedure used provided for inhibition of common responses as well as facilitation of uncommon responses. From these experiments he concluded that his originality training procedures proved successful

with tasks having no one correct solution, whereas performance on problems that had only one correct solution could not be facilitated.

Gordon (1961) claimed that synectics mechanisms effectively increase the probability of success when creativity is called for.

#### Biographical and case studies

A number of investigators have collected biographical information of known creative individuals to discover what personal qualities and background factors make a person creative. Both the idiographic and nomothetic methods have been applied in this endeavour.

One of the earliest investigations into personality and background of 64 eminent scientists was carried out by Roe (1952). She subjected them to long interviews covering their life history, family background, professional and recreational interests, ways of thinking, etc., as well as to intelligence and personality tests. While every scientist displayed his own individuality, and while differences emerged between the different professional groups, common patterns were also detected. Roe was most impressed by the independence of thought exhibited by these scientists while expressing their liking mostly for those teachers who let them alone in their attitude towards religion and personal relations. They decided about their careers on their own and were satisfied. They had very few recreations and they regarded work as their life. Scientific activity seemed to meet their inner need better than any other activity.

The most comprehensive and convincing findings on the personality of men and women who have creative achievements to their credit comes from the Institute of Personality Assessment and Research (IPAR), chiefly by Mackinnon (1962), Barran (1969), and Gough (1961). The subjects were creative architects,

writers and mathematicians. The assessment of these eminent persons revealed that creative workers as a group appeared outstandingly intelligent and imaginative. They showed a trait of individualism, self-centeredness and independence, alongwith a high level of aspiration.

A number of studies have shown that the more creative scientists are the less conforming (e.g. Gough, 1961; Mackinnon, 1964; Crutchfield, 1962).

Garrett (1930), reviewing the autobiographies of Sir Francis Galton, Voltaire, Sir Issac Newton and Macaulay, reported that exceptional gifts usually appear early in childhood.

Kris' principle of "regression in the service of ego" (1952) agrees well with the view of creativity as an interplay between intrinsic and extrinsic forces. Myden (1959) analysed Rorschach responses of recognized creative persons compared to a matched sample of non-creative ones and found a clear evidence for a greater use of primary process by the creative subjects and for its effective integration with secondary process thinking. Barron (1963) in his study of 15 creative Air Force officers concluded that the impulse or ego-control dimensions emerged most clearly as determinants of originality. In another study, Barron (1963) found his 66 creative writers as a class were significantly more independent, flexible, original, introvert and intuitive than most people. Barron and Welsh (1952) found the artists liked the complex asymmetrical figures, whereas the non-artists preferred the simple symmetrical ones. Eiseman and Robinson (1967) have also shown that creativity is associated with preference for complexity.

Drevdahl (1956) studied a group of graduate students selected on the basis of creativity shown by these students in essays, research and class discussion, as evaluated by professors familiar with them. He found statis-

tically significant differences between students of high and low creativity on the 16 PF test in so far as that the former were more schizothyme, self-sufficient, desurgent and radical. Another extensive study, specifically concerned with creativity in the scientific field, was undertaken by Cattell and Drevdahl (1955). The subjects were leading research physicists, biologists and psychologists. They were selected by committees in their particular fields and all completed both A and B forms of the 16 PF Questionnaire. It was found that the researchers were decidedly more schizothyme, intelligent, dominant, desurgent, emotionally sensitive and radical.

Chambers (1964)\*and Taylor and Ellison (1967) found self-initiated, task-oriented striving a distinguishing characteristic of creative scientists.

Pankove (1967) studied the relationship between creativity and risk-taking in a group of fifth-grade boys. She found a positive relationship between the two variables. Low defensiveness enhanced this relationship while high defensiveness attenuated it.

Creativity research with regard to similarity of personality traits of young creatives to those of recognized creative adults, as summarized by Dellas and Gaier (1970), shows that high creatives, as compared to low creatives, manifested greater independence, dominance, autonomy, unconventionality, broad interests, and openness to feelings. Emotional instability also seemed controlled in the young creatives. Data generally indicates that personality of young creatives bear similarities to those of creative adults. It seems that these traits develop fairly early.

#### Psychometric Investigations

These investigations apply some criterion, such as teacher ratings or scores on tests designed to assess the creativity of individuals.

There have been attempts to measure fluency and other aspects of creative behaviour ever since the end of the nineteenth century. Then the topic fell into relative neglect. The revival of interest in this area and what Hudson has called 'a boom in the American psychological industry' can be traced back to Guilford's 1950 paper on creativity. It exerted a considerable influence on a movement that has become known as "creativity research". Some of the tests employed in this type of research are described in the following section.

Guilford's creativity tests. Guilford and his associates at the University of Southern California undertook a factor analytic research on high school level personnel, which is now in its third decade. This research led to the structure of intellect model ( Guilford 1959 ). It consists of a three-way classification of intellectual factors already discovered or still to be identified. This classification is based on the kind of operations performed, content involved and the products. Guilford conceives of intellect as an information processing agency which deals with information of various kinds in a variety of ways. Guilford's theory of intellect has important implications for research. Various investigators in the field of creativity have derived and adapted their tests from ideas proposed by Guilford and his collaborators.

A number of Guilford's studies have shown that the divergent production factors and tests have relevance to the measurement of creative potential, but the latter is very complex, and at times, and in different ways, involves abilities outside the former. The relationship between divergent-production test scores and I.Q. scores are generally low, but it appears that although a high I.Q. is not sufficient for doing well in divergent production tests, being above average in I.Q. is usually necessary. Guilford (1967)

writes: "In divergent thinking operations we think in different directions, sometimes searching, sometimes seeking variety. In convergent thinking the information leads to one right answer or to a recognized best or conventional answer". The mode of interpretation adopted by the Guilford group in discussing their research suggests that the intellectual functions represented by the terms 'divergent thinking' form a relatively distinct group which stands apart from those denoted by the classical concept of general intelligence.

A number of tests have been devised by Guilford and his associates to measure divergent production. For most of these tests tentative norms are provided in terms of 'C' scores and percentiles for adults and ninth-grade students. These tests are generally applicable at the high school level or above. A battery of ten tests has also been prepared for children from fourth grade upward. Several of Guilford's tests have been used by other investigators.

A review of studies using Guilford's tests shows that the results are contradictory and sometimes inconclusive. Drevdahl (1956), for instance, studied arts and science students rated by independent judges on objective creativity rating scales. It was found that students who were rated highly creative demonstrated superior performance on Guilford's originality scores, and the correlation was .33. Similarly, Barron (1963) found a positive multiple correlation (.55) between rated originality and a composite divergent production score including Guilford's tests. Elliott (1964) also reached a similar conclusion. Semantic divergent production tests were given to public relations personnel nominated by their superiors as high or low creatives. The groups were significantly discriminated on the basis of each of five of the eight Guilford-type tests.

On the other hand, there are studies revealing low or negligible correlation between rated creativity and Guilford tests. For example,

Mackinnon (1961)\* found that Guilford's tests whether scored for quantity or quality of responses, neither correlated highly, nor predicted efficiently the degree of creativity demonstrated in the creative production of subjects. Gough (1961)\* demonstrated that for research scientists rated creativity correlated low or negligibly with various Guilford's tests.

One reason of these contradictory findings may be the inconsistency among the creativity ratings and the absence of an ultimate criterion for creativity. Another problem stems from the low reliability of creativity tests. Guilford (1967) recognized this problem when he observed that the low reliabilities of creativity measures probably reflect the general instability of functioning of individuals in creative ways. So, he suggested that high levels of predictive validity should not be expected. Nevertheless, on the basis of the available evidence, the probability of a positive relationship between creative performance and divergent thinking test measures cannot be ruled out. It is also possible that there are different types of creative talent, the creative scientist probably excelling in different abilities as compared with the creative artist.

Torrance tests of creative thinking. Torrance developed tests of creativity, as part of a long term research programme emphasizing class room experiences that foster and stimulate creativity. The Torrance Tests of creative thinking comprise a battery of four verbal, four pictorial and four auditory sub-tests. Two equivalent forms of each battery are available. The tests are described as suitable from kindergarten to graduate school.

Torrance and his associates followed two approaches (a) identify high and low groups on some test measure and then determine whether or not they can be differentiated in terms of behaviour which can be regarded as "creative"; (b) identify criterion groups on some behaviour regarded as

creative and then determine whether or not they can be differentiated by test scores. Using the first procedure at the elementary school level, they found that children who achieved high scores on tests of creative thinking, also initiated a larger number of ideas in small group problems involving creative problem-solving than did their less creative peers. When compared with control subjects, the most creative children were far more reputed for fantastical and wild ideas and for producing drawings and other products judged as unusual, and work characterized by humour, playfulness, relaxation and relative lack of rigidity (Taylor, 1964). Weisberg and Springer (1961), using Torrance Tests of creative thinking with fourth graders having high I.Q., compared the most creative with least creative. Through psychiatric interviews, the highly creative children were rated significantly higher on strength of self-image, ease of early recall, humour, availability of oedipal anxiety and uneven ego development. On the Rorschach they showed a tendency towards unconventional responses, unreal percepts, and fanciful and imaginative treatment of the blots. Their responses on Rorschach test described them as being more sensitive and more independent than their less creative peers.

Using the approach of identifying criterion groups regarded as highly creative or noncreative, Torrance and his associates (Taylor 1964) found that children nominated by their teachers on various criterion of creative thinking achieved higher scores on test of creative thinking than did their peers who were being nominated as low on this criterion. Wallace (1961) found that highly productive saleswomen in a large departmental store, scored significantly higher on a battery of creative thinking tasks than did their less productive peers in the same department.

Remote associates tests. Mednick (1962) proposed an associative theory of creative thinking. The basic task in the creative process,

Mednick argues, is to bring together, in some useful fashion, ideas which are usually remote from each other. He proposed that a test of 'Remote Associates' would prove useful as an indicator of creative ability. Mednick administered his Remote Associates Test (RAT) to a group of first year psychology students at the University of Michigan. Faculty research supervisors rated the eight highest and eight lowest RAT scorers either high or low in research creativity. Of the eight high RAT scorers, six were rated high on research creativity and two were rated low; of the seven low RAT scorers, only one was rated high, the other six being rated low. One student, a low RAT scorer, was not rated by his supervisor as the latter felt he had not enough contact with him.

Getzels and Jackson creativity tests. Getzels and Jackson (1962)

undertook to examine empirically the utility of other conceptions of giftedness as well as high I.Q. to the study of children, in contrast to Terman (1925) who defined giftedness in terms of high I.Q. They collected all the positive statements made about children suggesting that if a child had such a quality he would be called in some way 'gifted'. The long list of these statements was divided into thirteen categories. This helped them expand the conception of giftedness to include a number of cognitive and psychological qualities in addition to the I.Q. However, they limited their research to four groups of students representing creativity, intelligence, morality and psychological adjustments, as these groups seemed to be of more theoretical and practical significance, and of relevance to the issue they were exploring. But here only the findings about creativity and intelligence of the sample tested will be reviewed.

The subjects were students from sixth grade through senior year of high school, all belonging to a private school in Chicago. The mean I.Q. of this group was 132, with an SD of 15. Intelligence test data and scholastic

achievement data were supplied by the record office of the school. Defining creativity as a fairly specific type of cognitive ability Getzels & Jackson (1962) devised five tests to measure it. These were Word Association, uses for things; Hidden shapes; Fables; and make up problems. Some of these were taken from tests devised by Guilford and Cattell, while others were especially constructed by the authors. The Subject's score depended on the number, appropriateness, complexity and originality of the problems.

On the basis of I.Q. and creativity scores, two experimental groups were formed. Those students who were in the top 20 percent on the creativity measures when compared to students of the same age and sex, but below the top 20 percent in I.Q. (N=26 : 15 boys, 11 girls), formed the High Creativity Group. Those students, on the other hand, who were in the top 20 percent in I.Q. when compared to students of the same age and sex, but below the top 20 percent on the creativity measures (N=28 : 17 boys, 11 girls), formed the High Intelligence Group. The relationship between the five creativity measures and the I.Q. for the total school population were rather low, though statistically most of these were significant. The achievement test performance of the high I.Q. students was significantly above that of the population from which they were drawn. But the most striking finding of this study was that the high creativity group was also significantly superior to the school population, in spite of the fact that they were below the school average in I.Q. Despite the 23-point difference in mean I.Q. between the high creatives and high I.Q.'s, the achievement scores of the two groups were equally superior to the achievement scores of the school population as a whole. Moreover, the correlations between certain of creativity tests and school achievement for the whole sample were equal, or exceeded the correlation between I.Q. and school achievement. These findings led the investigators to assume that the cognitive abilities assessed by their creativity measures contributed significantly to school

achievement. So, these creativity measures could be used as predictors of scholastic achievement in the same way as intelligence tests are used. When the teachers were asked to rate all these students on a 5-point scale to indicate the degree to which they enjoyed having them in class, the data indicated that even though the scholastic achievement was the same, the teachers preferred the high I.Q. students over the average, but not the high creativity students. However, the difference in preference was not statistically significant. This study has been severely criticized as being ill-designed and inadequately reported, and the criticism is largely justified.

Hasan and Butcher (1966) carried out a replication of Getzels and Jackson's study with 175 Scottish children, representative of the entire population of secondary school children. They found an overlap between measures of intelligence and creativity. They reported a high correlation (.74) between the two constructs. Similarly, Ginsberg and Whittemore (1968) reported a correlation of .60 for an Australian sample.

Cline, Richards, and Abe (1962) studied 95 male and 66 female high school children. These children were given California-Mental Maturity Test to measure their I.Q. Seven 'creativity' tests ranging across the same level of diversity as those used by Getzels and Jackson were also given to this group. The data indicated that all of the seven creativity measures were significantly correlated with I.Q. for the boys, and five of the seven were significantly correlated with I.Q. for the girls. This study again demonstrated the existence of a good degree of relationship between general intelligence and creativity measures. Using the same tests of creativity and intelligence with 79 male and 40 female high school students, Cline, Richards, and Needham (1963) reached similar conclusions. For the boys, all seven of the creativity measures were significantly correlated with I.Q.; for the girls, five out of

the seven tests were correlated with I.Q. Again, a sizeable degree of relationship between the creativity measures and intelligence was found.

McNemar (1964) criticising Getzels and Jackson's study (1962) argued that intelligence and creativity tests used in this study have far more common variance than the investigators believed. He believed that the authors did not bother to report the correlation of creativity, so defined, with I.Q. From their published report he ascertained that creativity and I.Q. correlate to the extent of .40 for the total of 533 cases. This correlation is significant as well as substantial. So the independence of creativity and intelligence tests, in this study, seems questionable. McNemar further questioned the validity of Getzels and Jackson's finding that the creativity tests tended to correlate higher than did I.Q. with verbal-content of school achievement. He said, the I.Qs of the sample were a mixture from the Stanford Binet, Hemmon-Nelson and Wechsler Intelligence Scale for children. The use of regression-estimated Binet I.Qs from the other two scales aggravated rather than improved the mixture. Moreover, the subjects were highly selective on I.Q. (mean of 132). This was an explicit selective curtailment on the I.Q. variable and only incidental selection on the creativity variable. Discussing the achievement means of the two experimental groups that were unexpectedly superior to the school population mean, McNemar says, it is a three-variate problem and had they given the three basic correlations among the three variables (I.Q., creativity, school achievement) for the entire group, this finding would have been expected. This study, he says, involves faulty design and false logic, and its replications lead to the same false conclusions.

Thorndike's (1963) study of Getzels and Jackson data leads him to conclude "no warrant exists in these data for designating a psychological

attribute of creativity distinct from general intelligence", as the comparison of factor loadings of several tests shows that they are all fairly modest and the loading for conventional intelligence test falls about midway among the creativity tests. Marsh (1964) reached the same conclusion from the factor analysis of Getzels and Jackson's study. Wallach and Kogan (1965) criticizing Getzels and Jackson's study, argued that high correlations between creativity test scores and I.Q. for the entire sample lead one to question the degree to which the tests of creativity are independent of general intelligence. Moreover, the five creativity measures used in this study, were virtually no more strongly related with one another than they were with intelligence, and that was true for both sexes. So it is quite illegitimate for Getzels and Jackson, Wallach and Kogan argued, to sum up the five creativity measures into a combined score for particular individuals, as if these measures possessed something in common that was distinct from what they also shared in common with general intelligence. Moreover, the instruments for assessing creativity were printed in the form of examination-type booklets, and were administered to a class of students in the same manner as they were used to take their academic examinations. An atmosphere of time pressure was prevalent. A student, when finds himself taking longer time than majority of his peers, tries to finish up along with feelings of inadequacy. Time limit, either explicit or implicit, was nevertheless present. For example in their description of one procedure, they write: "For each paragraph the student is to use the information given to make up as many mathematical problems as he can within the time limit" (Getzels and Jackson, 1962, P. 205).

Flescher Creativity Tests: Flescher (1963) devised a group of seven creativity measures. These tests along with California Test of Mental Maturity were given to 110 sixth-graders with the two sexes combined. The average correlation of seven creativity measures used with I.Q. scores was .04. So,

here the creativity instruments are in fact independent of an intelligence measure. This data suggested the general independence of the creativity indices from intelligence. However, the average correlation among the seven creativity measures is .11 which is statistically insignificant. So the data does not indicate any single dimension unifying these 'creativity' measures comparable to and independent of the 'g' concept of general intelligence.

Wallach and Kogan Creativity Tests. Wallach and Kogan (1965) reviewed earlier researches about the variously defined psychological ability called creativity. They held that these investigations failed to establish creativity as a single domain apart from general intelligence due to methodological pitfalls, namely, the time pressure and administration of group tests in an evaluative and competitive situation. Wallach and Kogan held an associative conception of creativity. They are of the view that where appropriateness of responses is assured, two variables may reflect individual differences in creativity, i.e., the total number of associational responses that a person could generate under various circumstances, and the uniqueness of these responses. So they devised and adapted procedures that would assess generation and uniqueness of associates. The procedures utilized were five in all, three verbal and two visual. The verbal tests were Instances, Alternate Uses, and Similarities. The other two creativity assessment techniques involve visual stimulus material and are called Pattern Meanings and Line Meanings.

The subjects were 151 fifth-graders, all belonging to middle class families. All the creativity tests were administered individually, in a relaxed, permissive and gamelike atmosphere. Those tests which could not be given under such conditions were reserved for the end of the sequence of work with a given class. These included three subtests from Wechsler Intelligence Scale for children and a story completion test. There were seventeen procedures and all,

except one, were administered individually. The instruments utilized for exploring creativity concerned the generation of five types of associates. In each case two related variables were studied, that is, the number of unique responses produced by the child, and the total number of responses produced by the child. The results were very striking. The average correlation amongst the creativity tests was .4, among intelligence and attainment measures .5, and between intelligence and creativity .1. Thus, Wallach and Kogan established a creativity dimension as distinct from intelligence.

The reliability of these creativity tests was determined by split-half technique as well as item-analysis. The results have shown that all these measures possess a high degree of internal consistency. These findings strengthen the conclusion that creativity as a psychological ability is both pervasive and distinct from general intelligence.

#### FURTHER STUDIES OF INTELLIGENCE-CREATIVITY DISTINCTION

The Wallach and Kogan study was extended downwards in age by Ward (1968) to 7 and 8 years, and to kindergartoon children. For the former group, the measures of intelligence and creativity emerged, as independent of each other; for the latter group, independence of the two measures was obtained only in case of creativity tasks with semantic content.

Cropley and Maslany (1969) studied University students in Canada using Wallach and Kogan creativity tests but adopting different experimental and scoring procedures. Whereas, the latter authors relied exclusively on individual administration of tasks, the former made use of a group administration. Wallach and Kogan treated fluency and uniqueness as separate components of creativity whereas Cropley and Maslany developed a single index of creativity by combining the two components. Finally, these authors used tests of Primary

Mental Abilities (PMA) for the assessment of intelligence, whereas Wallach and Kogan used SCAT, STEP and three subtests of WISC. Despite these differences in tests and procedures across studies, the reliabilities and intercorrelations yielded a pattern corresponding quite closely to that found in original Wallach and Kogan research, that is, a strong trend towards significant positive correlations between tests within the "creativity" and "intelligence" domains, and non-significant correlation across the two domains. It appears that Wallach and Kogan conclusions regarding the creativity-intelligence distinction are valid across a developmental span extending from kindergarten to university students.

Wallach and Wing (1969) selected secondary school students, aged 17-18 years as subjects, and administered them Wallach and Kogan creativity tests and Scholastic Aptitude Test (SAT). They found that verbal and mathematical scores of SAT were unrelated to the fluency and uniqueness scores derived from the Wallach and Kogan creativity tests. They have put forth the concept of "non-academic talented accomplishments". They argued that talent may manifest itself in a variety of ways that are not emphasized in the classroom, but which are clearly relevant to real life. These non-academic talented achievements are related to creativity test scores. They concluded that creativity tests measure a domain of talent that is not adequately sampled by conventional intelligence tests.

Leith (1971) undertook an investigation designed to obtain evidence of the existence of a unitary trait which may be assessed by means of creativity tests and of its independence from general intelligence. At the same time, a hypothesis about the optimal conditions for assessing 'creativity' was tested. His data confirmed the Wallach and Kogan's hypothesis that individual administration of creativity instruments in a gamelike situation, without any time limit, is necessary for emergence of creative behavior. In a further study by the same author (1972), a modified procedure was adopted in which group testing was

used under conditions of moderate stress and in stress-reduced situations. The creativity tests were similar to three verbal instruments of Wallach and Kogan's scales, whereas intelligence was measured by Raven's Standard Progressive Matrices. The creativity measures were significantly correlated under moderate stress as well as reduced stress conditions. Under moderate stress, the inter-correlations between six measures of creativity were .63, .77 and .83 for 9, 11 and 13 years respectively. In stress reduced condition, these correlations were .49, .61, and .47 for the three age levels. Thus stress tended to induce higher scores at all age levels than relaxed conditions. All of these correlations were significant (P less than .01). The creativity measures were not significantly related to intelligence at any age level. Under conditions of moderate stress, the correlations between intelligence and creativity range between .326 to .303, whereas in stress-reduced condition the range of these correlations is between .119 to .329. All of these correlations are statistically insignificant. The author concluded that the two variables are independent irrespective of individual or group administration.

It appears from the aforesaid studies that although research on the measurement of creativity is still in its infancy, there is substantial evidence to indicate that under non-evaluative test conditions creative ability can be measured as a dimension of human performance which is independent of intelligence.

#### INTELLIGENCE, CREATIVITY, AND ACHIEVEMENT

A vast amount of research is available on the relationship between intelligence and achievement. On the other hand, the relationship between creativity and achievement is still a controversial issue.

#### Intelligence and Achievement

The first test of intelligence Binet Simon Scale (1905), was devised

in an effort to screen out those pupils who were attending Paris Schools without getting any benefit of teaching. This was in a way a recognition of the important contribution of intelligence to success in academic work. Noll and Scannell (1972) agree that a positive and significant relationship exists between intelligence and creativity, at least, insofar as the schools are concerned.

Sometimes, intelligence tests are referred to as tests of "scholastic aptitude". This is because a number of intelligence tests have been validated against academic achievement as one of the criteria, e.g., Stanford-Binet test (Anastasi, 1976).

Various studies aimed at investigating the relationship between intelligence and academic achievement lead one to conclude that the correlation between these two variables does not remain consistent at all levels of education. There is a general agreement that intelligence tests provide a very useful tool for prediction and selection at lower educational levels but their efficiency is reduced at higher levels.

Egeland (1966), Thorndike and Hagen (1969) Kenny and Campbell (1972), Barton, Dielman and Cattell (1972), etc., have reached the conclusion that a significantly positive correlation exists between these two variables at lower grades.

Thorndike and Hagen (1969) reviewed hundreds of investigations of intelligence tests scores in relation to academic success, and reached the conclusion that this relationship is higher in elementary schools than high schools, and in high schools than the colleges. They have reported a drop in correlation from approximately .70 in elementary school to .60 in high school, and .50 in college. This drop goes further in the universities (Ansari, 1971). Lavin (1965)\* reported that in British Universities the correlation between AHS test and University Examination marks in Psychology is found to be around .27 and .40.

Vernon (1966) says that in primary school age-groups, the correlation between intelligence and achievement approximates .85, and at graduate level it is between .20 and .35.

These findings lead us to the conclusion that the relationship between intelligence and achievement is higher at lower levels of education, and lower at higher levels. This decline in correlation with advancing levels of education is partly due to selection effect and partly due to threshold effect (Lavin, 1965)\* Moreover, the correlation between these two variables depends upon the nature of intelligence tests. There is a higher correlation between verbal intelligence tests and achievement, and a relatively lower correlation between non-verbal and performance tests and achievement. For example, Thorndike and Hagen (1969), when administered tests of Academic Progress (TAP) alongwith Lorge-Thorndike Test of intelligence to students in grades 9-12, correlations for the verbal battery averaged about .88 with the total score on TAP, whereas the correlations for the nonverbal battery averaged around .71.

The preceding discussion leads us to conclude that inspite of the correlation intelligence tests do not provide a perfect prediction of academic achievement. This prediction, it appears, can be improved if other measures besides intelligence are used. Creativity is one such measure that can help in prediction, and a combination of intelligence and creativity tests can improve the prediction.

#### Creativity and Achievement

A number of investigators have studied the relationship between creativity and scholastic achievement. Getzels and Jackson (1962), for example, found that high intelligence and high creativity were both related to scholastic achievement in the high school that they studied.

Torrance (1962) in six out of eight studies found that intelligence and creativity were each related to academic achievement, but were relatively independent of each other. Yamamoto (1964, b) studied the role of creative thinking and intelligence in high school achievement, and reported a similar conclusion.

On the other hand, Flescher (1963) found no significant relationship between creativity and achievement scores of a sample of school children. In a replication of Getzels and Jackson's study, Edward and Tyler (1965) found that when children, in a junior school that they selected, were classified as 'highly intelligent' and 'highly creative', the former group was better in grade point average and scores on Sequential Test of Educational Promise. Circirelli (1965) in a sample of sixth graders found that while the relationship of creativity and achievement was a weak one, the form of this relationship was such that I.Q. and creativity were additive and linear in their effects on academic achievement. Hassan and Butcher (1966) found that the total creativity score predicted achievement in English and arithmetic almost as much as did the I.Q. However, their 'high intelligence' group had significantly higher achievement scores than the 'high creativity' group.

A review of these studies shows that those investigators who found a positive correlation between creativity and achievement are mainly the ones who have not been able to separate intelligence and creativity as independent variables, e.g., Getzels and Jackson (1962), Cline, Richards and Needham (1963), and Yamamoto (1964). On the other hand, Flescher (1963) and Edwards and Tyler (1965) who did not find a correlation between intelligence and creativity, also did not find any relationship between achievement and creativity.

The earlier investigators have used achievement tests which are mainly of multiple-choice type. These tests have been found to correlate highly with intelligence tests at school level. So, the use of these tests might be one

of the factors contributing to creativity-achievement as well as creativity-intelligence relationship. In other words, it is the type of achievement tests used that determines the presence or absence of a positive relationship between creativity and achievement. Bently (1966), for instance, found that creativity tests show low correlation with achievement test designed to measure cognition and memory, whereas intelligence tests have shown high correlation with them. On the other hand, creativity tests were found to have higher correlations with achievement tests devised to measure 'divergent production' and 'evaluation', while intelligence tests do not correlate so highly with them. The correlations between intelligence and creativity tests were not significant in this study.

In the present research, the nature of the achievement tests used in the above studies has not been analysed. However, the tests used in our schools are mainly of essay-type. There is evidence (Ansari, 1971) demonstrating a positive relationship of essay-type achievement tests and measures of creativity. So, it was hoped that creativity and achievement should show a positive and significant correlation in our case.

#### INTELLIGENCE, CREATIVITY AND SOME OTHER VARIABLES

A number of studies have shown that measured intelligence is positively correlated with socio-economic level. Variables relating to occupation, income, education, home type and structure, and neighbourhood have been used to calculate socio-economic status. The global index of socio-economic level has usually given greatest weight to the parent's occupation. A graded ranking of occupations, in terms of prestige, education and value to society yields quantification scales, such as those of Warner with the professional in the top category and the unskilled labour in the lowest (Warner, 1949). Major interest in these scales has been concerned with child's intellectual status as determined by the socio-economic status of his parents. Among the sub-variables studied are the educational

level of parents, family income, value of the home, and other home assessments.

Manster and Havinghart (1972) argue that socio-economic status can most easily and efficiently be measured using only two of these variables : occupation and education. They suggest that such an index is useful not only in the United States but also in cross-national studies where comparability on the other variables would be very difficult. They have devised two International Scales of Occupational Prestige, one for urban and another for rural occupations. These are generally six to seven point scales (Appendix C). Each point stands for a variety of jobs or job types or a level of attained education which is considered for the society in question to form a natural level of status.

Although occupation in itself is the single best indicator of an individual's status, adding educational level to the scale refines the measure considerably. This is particularly so when information about occupation is meagre. Since the occupational level is a stronger indicator of socio-economic status, it is reasonable to give greater weightage to occupation in the combined socio-economic status scale. A usual weighting method is occupational level times 3 plus educational level times 2 which equals socio-economic status.

The relation of a parent's I.Q. to his occupational level has been demonstrated by a number of investigators (Anastasi, 1958). The results generally show that the mean scores progressively increase as we go from unskilled labour groups to professional groups. The parent who furnishes the child with a favourable hereditary basis for development of intelligence also provides him with favourable environmental conditions.

According to Lytton (1971), an overall picture of families of those who are creative or at least divergers shows that they belong to middle-class with father having considerable autonomy in his profession or business. The parents exhibit enthusiasm for creative activities, encourage their children's

curiosity and exploratory urges and stimulate them to independent achievement.

In Getzels and Jackson study, highly creative children predominantly had fathers who were in business, whereas highly intelligent children had parents who were professionals and had a somewhat higher educational status than the parents of the high creativity group. Moreover, there is a striking finding that both the parents of the high I.Q. group have greater specialized training as compared to parents of high creativity group. McNemar's results (1942) are probably representative of I.Q.'s of children to occupational level of the father. He found a difference of 20 I.Q. points between the mean I.Q. of children of fathers in the professions and the children of fathers in unskilled occupations. Leahy (1935)\* found .40 correlation between I.Q. of children and the index of family status in terms of type of home lived in (Guilford, 1971).

Havinghurst and Breese (1947) gave six Primary Mental Ability Tests to thirteen-years-old children. The correlation of scores on these tests with Warner Scale of Socioeconomic Status was reported to the extent of .42 for verbal comprehension, .32 for Number, .30 for Word Fluency, .25 for Space, .23 for Reasoning, and .21 for Memory.

Generally, correlations between parental socioeconomic status and scores of children on academic-aptitude types of tests are higher, and for nonverbal abilities, are lower.

Jensen (1969) has offered a two-level theory of mental ability. The theory involves two types of mental abilities, level I and level II, and their interaction with population (socioeconomic status and race) differences. Level I ability consists of rote learning and primary memory. Level II ability, in contrast, is characterized by mental manipulations, conceptualization, reasoning, problem solving. It is essentially the general intelligence (g) factor common to most complex tests of mental ability and standard tests of intelligence.

Turner (1975) argues that differences in performance between various socioeconomic groups are accounted for by a hypothetically different distribution of Level II as a function of SES level. In other words, Level II and SES are positively correlated, since most intelligence and achievement tests, as well as most educational information, require Level II ability.

Another relevant finding in this area is that of Oran and Das (1972). They argue that subnormal children from low socioeconomic status often appear to be brighter than those from middle and high socioeconomic status. These authors cite Jensen's findings (1967) that I.Q. did not predict the associative learning ability of low socioeconomic status subjects nearly as well as it did of high socioeconomic status subjects. Jensen (1970) suggests that most high socioeconomic retardates are deficient both in associative learning and in reasoning. It can therefore be safely assumed that the high socioeconomic status retardate is a true retardate, whereas the low socioeconomic status retardates is merely a culturally deprived child, a victim of unstimulating early environment. A greater proportion of the high I.Q. fathers than of the high creativity fathers were found in academic or educational occupations. But, despite their greater professional training, a somewhat greater proportion of the mothers of the high I.Q. children than high creativity group, were exclusively housewives having more time to devote to their children.

Singh (1970) in a cross-cultural study of creative abilities, found that children of the higher socioeconomic groups tend to be more creative than those of the lower socioeconomic groups. The former, he argues, are brought up under more democratic child training methods, while the latter are far more likely to experience authoritarian training. Democratic environment fosters creativity by giving children more opportunities to express their individuality and pursue interests and activities of their own choice. Even more important, the environment of children of the higher socioeconomic groups provides better

opportunities for gaining the knowledge and experience necessary for creativity. The young children from deprived homes have very few creative materials to play with and little encouragement to experiment as compared with those from more favourable socioeconomic environments.

#### Chapter 11

#### STATISTICS OF THE WORLD

## STATEMENT OF THE PROBLEM

The present research is designed to study the distinction between

'intelligence' and 'creativity' as independent variables in classroom examinations.

The marks obtained in the school examinations have been used as an

index of achievement.

Instead of the wide use of Raven's Standard Progressive Matrices as a

psychological test of intelligence (Verma 1968, Datta et al. 1973), this has

been used as much in the present research as well, but after the determination of

the validity and reliability of a Pakistani sample.

Similarly, Wallach and Kogan's (1965) Creativity Scale, which has been

widely used to be interpreted as a measure of intelligence and

creativity, has been used here to an appropriate form (Appendix II).

## Chapter II

### STATEMENT OF THE PROBLEM

#### Aims and Objectives

The aims of the research are as follows:

1. To determine the reliability and validity of Raven's Standard Progressive Matrices, a cross-cultural test of intelligence, on a sample of Pakistani students.
2. To distinguish between intelligence and creativity as independent variables measured in classroom examinations.
3. To see if there is any relationship between the scores obtained in the school examinations.
4. To find out if the addition of creativity tests to tests of intelligence would result in a significant better prediction of achievement.

## STATEMENT OF THE PROBLEM

The present research is designed to study the distinction between 'intelligence' and 'creativity' as independent variables in academic achievement.

The marks obtained in the school examination have been used as an index of achievement.

Because of the wide use of Raven's Standard Progressive Matrices as a cross-cultural test of intelligence (Vernon 1969 ;Brilson et al 1973), this has been used as such in the present research as well, but after the determination of its validity and reliability on a Pakistani sample.

Similarly, Wallach and Kogan's creativity battery (1965), which has been usually found to be internally homogeneous and independent of intelligence test scores, has been used here in an abbreviated form ( Appendix A).

### Aims and Objects

The aims of the research are as follows:

1. To determine the reliability and validity of Raven's Standard Progressive Matrices, a cross-cultural test of intelligence, for a sample of Pakistani students.
2. To distinguish between intelligence and creativity as independent cognitive variables in scholastic achievement.
3. To see if tests of creativity can predict students' achievement in the school examination.
4. To find out if the addition of creativity tests to tests of intelligence would result in a significantly better prediction of achievement

than the one obtained from tests of intelligence alone.

### Hypotheses.

The following hypotheses were tested:

1. The scores of subjects on Standard Progressive Matrices (RSPM) are likely to increase progressively with their school grades<sup>I</sup>. In other words, subjects belonging to higher grades will obtain higher scores as compared with scores of subjects in the lower grades.
2. RSPM scores of subjects will increase with age, the older subjects obtaining higher scores than the younger ones.
3. RSPM scores of subjects will be significantly correlated with their achievement scores, i.e., the marks obtained by them in school examination.
4. Test-retest scores of subjects on RSPM will be significantly correlated.
5. Odd-even scores of subjects on RSPM will be significantly correlated.
6. All the subjects of the creativity battery will be significantly correlated with each other.
7. The correlation between scores obtained by the subjects on RSPM and creativity battery will not be significantly different from zero.
8. There will be a significant positive correlation between the scores of subjects on creativity tests and their achievement scores.
9. Tests of creativity will add significantly to the prediction of achievement over and above that obtained by the intelligence test alone.

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<sup>I</sup> In Pakistan the term 'grade' is known as 'class'. Nevertheless the term 'grade' will be used throughout the thesis.

## RESULTS AND DISCUSSION

The present work consists of two interrelated parts. In Part A, eleven Standard Progressive Matrices (SPM) were administered to a group of students to determine the reliability and validity of this test for our sample.

In Part B, another group of students was given the same test and their scores on which were correlated with each other. Besides, some variables of the students in their last school examination and their parents' ratings of their involvement in learning and interpersonal relationships, as well as their preferences for particular courses were obtained. The background variables, such as the level of parents, as well as the original position of the subjects in their families were also recorded.

### Chapter III

#### METHOD AND PROCEDURE

##### PART A

##### VALIDITY AND RELIABILITY OF SPMS IN STANDARD PROGRESSIVE MATRICES

As no valid test of intelligence is available in Pakistan for the 11th and 12th grade levels, the SPM were selected for this study. The students were administered in their own schools. As their schools were different, they were tested separately.

This study was conducted during October-December, 1977.

Subjects - The subjects were 110 female students of grades 11th and 12th,

belonging to three different schools of Dera Gokhri, District of Dera Gokhri.

## METHOD AND PROCEDURE

The present work consists of two interrelated parts. In Part A, Raven's Standard Progressive Matrices (RSPM) were administered to a group of students to determine the reliability and validity of this test for our sample.

In Part B, another group of students was given tests of creativity and RSPM, the scores on which were correlated with each other. Besides, marks obtained by these students in their last school examination and their teachers' ratings on their involvement in learning task and interpersonal relationship, as also their preferences for particular children were obtained. The socioeconomic status and education level of parents, as well as the ordinal position of the subjects in their families were also recorded through interviews with the latter. All these measures were then correlated.

### PART A

#### VALIDITY AND RELIABILITY OF RAVEN'S STANDARD PROGRESSIVE MATRICES

As no valid test of intelligence is available in Pakistan for use at a national level, the RSPM were selected for such a validation study. Two studies were conducted in this connection. As their samples were different, they are reported separately.

##### Study I

This study was conducted during October-December 1972

Subjects: The subjects were 552 female students of grades 7th to 10th, belonging to three different schools of Peshawar (as detailed in Table I).

All the students in each grade and school present on the day of test administration were included in our sample.

Tests and measures: The subjects were given RSPM in groups of about 25 each with usual instructions (Raven, 1960). During the test no time limit was imposed. The total number of correct responses given by each student constituted his RSPM Intelligence score.

The age and grade of each student were recorded. The total marks obtained by the students in the preceding examination were also recorded from the school record.

Validity of RSPM: In order to find out the validity and reliability of RSPM, the following criteria were used:

1. Age differentiation.
2. Grade differentiation.
3. Correlation of RSPM with achievement tests.

Age and grade differentiation were used to find out the validity of RSPM. Both these measures have been used quite frequently to validate intelligence tests. Therefore, it was expected that students in higher grades will, on the whole, obtain higher RSPM scores as compared to students in the lower grades. Similarly, it was assumed that RSPM scores will differentiate between different age levels i.e., the scores of older students will be higher than those of students younger to them.

Achievement Tests: It was decided to use marks obtained in the last school examination as achievement scores of the students.

Using school marks in this manner creates a problem of item-sampling.

The achievement tests given to these students are usually of essay-type which have very low scorer-reliability. Moreover, students are usually given option to attempt questions of their choice. In spite of distortion in sampling caused by optional questions and low reliability of essay-type examination, the marks obtained in them are accepted as a measure of achievement for the purposes of promotion in grades, selection, and employment. So it is reasonable to accept school marks as a proper measure of achievement until better ones are available.

Another problem was regarding the comparability of achievement scores. This was due to the fact that the subjects belonged to three different schools; so the examination questions asked differed from school to school. Similarly, the teachers who evaluated the answers of the students were also different. Despite such a variation in questions the school marks were accepted as a measure of achievement for three reasons.

First, the prescribed syllabi and text books for the various grades were the same in these schools.

Second, the procedure of setting questions and evaluating answers by nearly equally trained and experienced teachers could be assumed to be almost uniform for all the subjects.

Third, the only other alternative to the above was to devise a new test of achievement. Apart from the practical problems of developing such tests, it was feared, that the students might not react to such a test as realistically as they would to the usual school examination.

After collection of all the aforementioned data, Mean and standard deviation (SD) of scores obtained on RSPM by all the subjects falling in each grade and age group were calculated (Tables 2,3). Moreover, modal age of each grade was computed. Mean and SD of the subjects of modal age groups were

calculated (Table 4), i.e., from each grade those students who were above or below the modal age were eliminated and the RSPM scores of the rest of the subjects only, were taken into account.

To determine the differentiatory power of RSPM in terms of grades and age levels, Duncan-Range Test of Significance between means was applied. Lastly, the scores obtained on RSPM by these subjects were correlated with their achievement scores (Table 5).

Reliability of RSPM. The reliability of RSPM was determined by retest method. The test was administered to various groups of students after a time interval of about six months. All the available subjects (N=244) were included in this study. The correlation between their scores obtained on the first and the second administrations of the test was calculated (Table 6).

## Study 2

This study was conducted during December 1973 and January 1974, in order to obtain further validity data, particularly on lower grades.

Subjects: The subjects were 518 students of grades 6th to 8th, from three English Medium Schools (boys and girls). Most of these subjects came from slightly higher socioeconomic levels as compared to subjects of Study I. The subjects were selected in the same manner as described in Study I, i.e., all students present on the day of test administration in the selected grade were included in the sample.

Tests and Measures: RSPM were administered in the same manner as described in Study I. The ages and grades of the subjects were noted down. A number of measures of achievement in the preceding examination were recorded. They consisted of percentage of total marks, marks in English, Urdu and Mathematics.

Validity of RSPM: While in Study I, only one measure of achievement, percentage of total marks in the last promotion examination was used, in study II, the validity criteria of RSPM were extended. Now the following measures of achievement were used:

- a. Percentage of total marks obtained by each student in all the subjects studied during the preceding academic session.
- b. Marks obtained by each student in English.
- c. Marks obtained by each student in Urdu.
- d. Marks obtained by each student in Mathematics.

Each of these measures was derived from the marks obtained by each student in the last examination.

The Mean and SD of each grade were computed (Table 9). Mean and SD were also calculated for boys and girls separately (Tables 10,11).

Duncan-Range test of significance was applied to these data, in order to determine whether the differentiation in terms of grades based on RSPM scores, is statistically significant or not.

The correlations between RSPM and our four achievement measures were calculated for this sample (Table 12). Besides, intercorrelations between intelligence and achievement measures were also calculated for the total sample of 8th grade students, as well as, for the two sexes separately (Tables 14-16), as these students were to be studied in detail as described in Part B of the present research.

Reliability of RSPM: The reliability of RSPM was determined by split-half method. Two sets of scores were obtained for each student by counting all the correct odd items and all the even items that were answered correctly. The odd-even

scores obtained in this way by all the subjects in a certain grade were correlated. In this way, we had nine correlations in all, representing different grades of all the schools included in the present study (Table 7). Spearman-Brown formula was applied to these correlations in order to predict the reliability of the whole test.

## PART B

### CORRELATIONS BETWEEN MEASURES OF INTELLIGENCE, CREATIVITY AND ACHIEVEMENT

This part of the research deals with the distinction between intelligence and creativity as independent cognitive variables and their relative contributions to academic achievement. Moreover, the relationship of intelligence and creativity with some other variables, including socioeconomic status, parents' educational level, age and ordinal position of the child in the family, and teacher's ratings was also explored.

Subjects: The subjects for this study were a part of our sample taken for Study II (Part A). All the 8th grade students of that sample (N=144) served as subjects in this part of research.

Tests and Measures: Twelve items of Wallach and Kogan (1965) creativity battery (Appendix A) were used in the present investigation. Wallach and Kogan presented their battery of creativity tests in a gamelike situation to each subject individually, without imposing any time limit. The subjects were taken from 5th grade, all belonging to middle class families. The average age of these children was 10 years and 7.6 months with an SD of 5.42 months. The subjects comprising our sample were a bit older (Table 13) as they were taken from grade 8. The average age of these children was 13.28 years with an SD of 11 months.

In the present work, three major changes of Wallach and Kogan's procedure

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were made, namely, use of an abbreviated version of the test, group administration of the creativity battery, and a relatively competitive atmosphere of testing.

One of the basic changes in procedure was the use of an abbreviated version of Wallach-Kogan Creativity battery. Some investigators have found that an abridged form, consisting of 12 items, can be used without any serious loss of validity (Ansari, 1971). So the abbreviated version of the test was used to find out whether it was a valid measure of creativity, which were successfully used for predictive purposes and would take lesser time than the original version.

Another basic change in the procedure was the group administration of the creativity tests. We had to resort to such a procedure partly to save time involved in individual administration, and partly due to the reluctance of school authorities to allow their students to be away from their classes for long hours. There is also evidence suggesting that these tests can be administered in groups without detriment to validity (Kogan and Morgan, 1969; Cropley and Maslany, 1969).

A still more important change in the usual procedure of the test was the emphasis on competition. This may appear a violation of the contextual conditions laid down by Wallach and Kogan (1965) who insist that the testing atmosphere should be evaluation free. However, since in the present research, the items of creativity battery were presented as a game, not as a test, one would expect that despite competition, it would not arouse test-anxiety which is the main obstacle in eliciting creative responses. Moreover, we conducted a number of exploratory studies of these creativity tests in the earlier phase of the study (not reported here). In these investigations we administered the creativity tests in groups as well as individually, with and without competition. It was found that when no element of competition was introduced, the subjects appeared to be extremely low in motivation, as seen from the small number of responses that they gave. It

was, therefore, decided to introduce some element of competition, not in a test-like situation but in a game-like situation. To achieve this end, before test administration, the present author was introduced to each group of students by their respective class teachers as a visitor interested in indoor games, who would like to have those students participate in the development of such games. After this introduction, the class teacher left the class room, and the present author (visitor) expressed her deep involvement and keenness in devising new indoor games which might require minimum equipment and yet prove interesting for persons of all age levels. To control cheating as well as to motivate the students to do their best, the visitor announced that like all other games, the winner in this game too, would be awarded a prize, provided his/her answers were more in number as well as different from those of the rest of the group.<sup>1</sup>

In line with Wallach and Kogan (1965), 'creativity' is defined here as the ability to generate many cognitive associates and many that are unique. Therefore, the procedure used for studying creativity required the generation of two types of associates. In each case, we obtained two related measures: total number of responses given by the subject and total number of unique responses produced by the subject.

Now, the three tests of creativity were given to the subjects in the order: Instances; Alternate uses; and Line Pattern Meanings. For each of these tests, almost the same instructions, as used by Wallach and Kogan, were given.

Instances: This was the first test in our creativity battery. The subjects were asked to generate possible instances of a class concept and record them on paper. This test was introduced with the following instructions:

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<sup>1</sup> Later on, one student in each of the three schools was awarded a photo album as a prize for winning the game.

"In this game, I am going to tell you something and it will be your job to name as many things as you can think of that are like what I tell you. For example, I might say, 'things that hurt'. Now you name all the things you can think of that hurt". (Here the author paused to allow the subjects to give responses). "Yes, those are fine, some other kinds of things might be falling down, slapping, fire or knife. (Here the examiner varied her suggestions so that they consist of ones which the subjects have not provided) "So we see that there are all kinds of different answers in this game. Do you see how we play?" (If the subjects already indicated understanding, the last sentence was replaced by "I can see that you already know how we play this game". "Now remember, I will name something and you are supposed to name as many things as you can think of that are like what I have said, O.K. Let us go".

The explanation of the sample answers was provided in such a way so as to convey the feeling of suggestion rather than of finality. The possible answers were given slowly and in a suggestive tone, so as to provide the impression that she was thinking of them at that time.

The four items in this test were administered in the following order, one by one:

1. "Name all the round things you can think of".
2. "Name all the things you can think of that will make a noise".
3. "Name all the square things you can think of".
4. "Name all the things you can think of that move on wheels".

There was no time limit and the subjects were allowed to work on each problem as long as they wished. The procedure was, when the subjects had

worked on a problem for about five minutes, a new problem used to be introduced with instructions to work on it. At the end of the last problem, the subjects were allowed to add further to their answers to the earlier problems, if they so desired.

Alternate Uses: In this second test of creativity battery, the subjects were asked to generate possible uses for a verbally specified object. The task was introduced in the following manner:

"Now in this game, I am going to name an object and your task is to give as many uses of the object as you can think of. For example, think about string". (Here the subjects were allowed to try and think aloud). "Yes, those are fine". Subjects' responses were supplemented by other examples suggested by the examiner, and then the following four items were given one by one:

1. "Tell me all the different ways you could use a newspaper".
2. "Tell me all the different ways you could use a knife".
3. "Tell me all the different ways you could use a shoe".
4. "Tell me all the different ways you could use a key-  
the kind that is used in doors".

The subjects recorded their responses on sheets of paper provided to them by the examiner. When the subjects finished with all these items, the next test was administered.

Line and Pattern Meanings: This test involved visual rather than verbal materials. It consisted of Lines and Patterns drawn with black ink on white cards measuring 4" X 6", with the following instructions:

"Here is a game where you really feel free to use your imaginations. In this game I am going to show you some drawings. After looking at

each one, I want you to tell me all the things you think each complete drawing could be. Here is an example card. (Showing the example card). You can turn it any way you would like. What could this be? (the child is encouraged to try some suggestions). Yes, those are fine". Then the examiner added some other kinds of things and said, "Probably there are lot of other things too. And yours were very good examples too. I can see that you already know how we play this game. So let us begin".

In this test, the subjects had to generate possible meanings and interpretations for each of the four abstract visual lines and patterns (Appendix A). Each drawing appears on a separate 4" X 6" card. Each of the four cards (other than the example card) in this procedure was presented with the instructions, "Here is another drawing. Tell me all the things you can think this could be".

When the subjects indicated that they have stopped working further on these problems, they were asked to write their name, father's name, grade, school, and date of birth on the paper on which they recorded their responses and then hand it over to the author.

Scoring: Two measures of creativity were obtained:

- I. Fluency: Total number of responses in each of these tests constituted its Fluency score and total number of answers to all the 12 items were considered as total Fluency score.
2. Uniqueness: The number of unique or original responses was counted for each item as well as for the whole test. To obtain the uniqueness score, each of the 12 items were taken separately, and the responses given to it by all the

subjects were listed. A response that occurred just once in the whole sample was scored as a unique response. Total number of such unique responses constituted the uniqueness score of that subject.

Reliability of the Creativity Tests: The reliability of the creativity tests was determined by three methods. The first approach followed was to calculate the split-half reliability of each test according to Spearman-Brown prophecy formula. With the sample size of 144 children, the results of these calculations are shown in Table 17.

Another indication of the reliability of the creativity tests was obtained by finding out the intercorrelations among various measures of creativity (Table 18-21).

The third approach was to carry out, for each test, an item analysis that would tell us the extent to which every item is contributing to the score provided by the sum of all the items. The results of these item-sum correlations, for each of the tests, are given in Tables 22-24.

#### Assessment of Intelligence.

The RSPM test was used to assess the intelligence of subjects used in Part B of the present research, as this test has proved reliable and valid (as described in Part A ). In this part too, RSPM was correlated with achievement scores of all the subjects (Tables 13-16).

#### Individual Interview.

After completion of testing sessions, each subject was interviewed individually for about half an hour to collect information about his interests,

ordinal position in the family, socioeconomic status and academic accomplishments. A questionnaire was used for this purpose (given in Appendix B) to make scoring as objective as possible.

To classify these subjects into different socioeconomic levels, an International Scale of Socioeconomic Status (Manster & Havinghurs, 1972) was used (Appendix C).

#### Teachers' Ratings.

After the above tests and interviews, each one of the class teachers of grade 8th was given three questionnaires alongwith three lists of students in his/her class. They were requested to rate each one of their students on a five-point scale in three respects : one dealing with teacher preferences, the other with child's social behavior, and the third with child's ability to become involved in the learning tasks. (Detailed instructions provided to these teachers are given in Appendix D. These are taken from Getzels and Jackson, 1962).

The results, thus obtained were subjected to statistical analysis. Correlations between measures of creativity and various achievement scores, as also between creativity and intelligence scores were computed. Multiple correlations between scores of intelligence, creativity and achievement were also calculated. The intelligence and creativity scores were also correlated with teacher's ratings, socioeconomic status of the subjects, their ordinal position in the family and academic accomplishments.

## INTRODUCTION

Tables 1-10 present the results of reliability and validity studies of the Standard Progressive Matrices. The validity studies were conducted in two studies. The results of Study I are presented in Tables 1-4, and those of Study II are presented in Tables 5-10. Tables 11-13 show the reliability data of 1938.

## Chapter IV

### ANALYSES OF RESULTS

INTELLIGENCE TESTS

Tables I-16 present the results of reliability and validity findings of Raven's Standard Progressive Matrices. Two validity studies were conducted; the results of study I are presented in Tables I-5, and those of study II are presented in Tables 8-16. Tables 6,7 show the reliability data of RSPM.

	7th	8th	9th	10th	11th
State Public High					
Girls	20	25	35	45	55
State Normal School					
Girls	25	30	40	50	60
State Normal School					
Girls	20	25	35	45	55
Total	137	140	145	155	165

TABLE I

THE SAMPLE OF STUDENTS USED AS SUBJECTS IN STUDY-1, PART A

( N=552 : ALL FEMALES )

SCHOOL:	GRADE 7th	GRADE 8th	GRADE 9th	GRADE 10th	Total.
Cantt:Public High School for Girls	20	25	15	12	72
Cantt:Board School for Girls	67	80	56	50	253
Govt:High School for Girls	20	35	91	81	227
TOTAL :	107	140	162	143	552

TABLE 2

MEAN &amp; SD OF RSPM AT DIFFERENT GRADES

TABLE 2

MEAN &amp; SD OF RSPM AT DIFFERENT GRADES

STUDY I, PART A

( N=552, ALL FEMALES )

GRADE	<u>n</u>	<u>M</u>	<u>SD</u>
7th	107	31.23	11.58
8th	140	35.23	10.54
9th	162	35.83	10.98
10th	143	36.46	11.33

TABLE 3

## MEAN RSPM SCORES IN TERMS OF AGE LEVELS

## STUDY I PART A

Age in Years	<u>n</u>	<u>M</u>
11	14	32.64
12	51	33.05
13	101	34.27
14	106	36.08
15	123	35.06
16	79	35.05
17	42	32.16
18	24	34.07
19	6	32.05
20	6	36.00

TABLE 4

MEAN RSPM SCORES OF MODAL  
AGE GROUPS IN VARIOUS GRADES  
STUDY I-PART A

GRADE	MODAL AGE	<u>n</u>	<u>M</u>	<u>SD</u>
7th	12 Years 6 Months	33	28.00	13.40
8th	13 Years 6 Months	41	35.63	12.13
9th	14 Years 3 Months	32	39.30	9.60
10th	15 Years 3 Months	43	37.14	10.30

TABLE 5

## CORRELATIONS BETWEEN RSPM AND AVERAGE

## ACHIEVEMENT SCORES

## STUDY I PART A

(Number of subjects is shown in parenthesis)

SCHOOL	GRADE 7	GRADE 8	GRADE 9	GRADE 10
Cantt: Public High School	.57** (17)	.39* (24)	.06 (13)	.22 (11)
Cantt: Board High School	.57** (63)	.32** (68)	.04 (53)	.09 (52)
Government High School	.69** (17)	.47** (38)	.23* (71)	.40** (74)

\* P less than .05

\*\* P less than .01

TABLE 6  
 TEST-RETEST RELIABILITY COEFFICIENTS OF  
 RSPM WITH A TIME INTERVAL OF SIX MONTHS

(Number of Subjects is shown in Parenthesis)

SCHOOL	GRADE 8	GRADE 9	GRADE 10
Cantt: Public High School for Girls	.39 (N=14)	.88** (N=19)	.77** (N=11)
Cantt: Board High School for Girls	.76** (N=42)	.66** (N=47)	.70** (N=35)
Govt: High School for Girls	.91** (N= 9)	.85** (N=11)	.62** (N=56)

\*\* P less than .01

TABLE 7

## ODD-EVEN RELIABILITY COEFFICIENTS OF RSPM

(Number of subjects is shown in Parenthesis)

SCHOOL	GRADE 6	GRADE 7	GRADE 8
Cantt: Public High School for Girls	.89** (58)	.94** (67)	.85** (76)
St. Mary's High School for boys	.92** (73)	.94** (78)	.86** (57)
P.A.F. Intermediate College	.85** (58)	.91** (67)	.82** (76)

\*\* P less than .01

TABLE 8

THE SAMPLE OF STUDENTS USED AS SUBJECTS  
IN STUDY II PART A

SCHOOL	Grade 6		Grade 7		Grade 8		Total
	M	F	M	F	M	F	
P.A.F. Inter College	40	16	36	22	42	22	178
Saint Mary's High School	76	-	76	-	55	-	207
Cantt; Public High School for Girls	-	58	-	50	-	25	133
Total	116	74	112	72	97	47	518

TABLE 9

RSPM SCORES FOR VARIOUS GRADES

STUDY II PART A

(N=488)

GRADE	<u>n</u>	<u>M</u>	<u>SD</u>
6th	174	34.50	9.21
7th	170	39.00	10.32
8th	144	42.05	7.43



TABLE 10

RSPM SCORES FOR VARIOUS GRADES: MALE SAMPLE

STUDY II PART A

(N=333)

GRADE	<u>n</u>	<u>M</u>	<u>SD</u>
6th	116	33.85	10.62
7th	120	37.55	9.55
8th	97	42.69	7.16

TABLE II

RSPM SCORES FOR VARIOUS GRADES: FEMALE SAMPLE

STUDY II PART A

(N=155)

---

GRADE	<u>n</u>	<u>M</u>	<u>SD</u>
6th	58	33.98	9.18
7th	50	37.84	11.40
8th	47	42.11	7.95

---

TABLE 12  
 CORRELATIONS BETWEEN RSPM AND ACHIEVEMENT SCORES  
 STUDY II PART A

GRADE	English	Urdu	Maths.	Total Percentage
6th	.37**	.11	.31**	.32**
7th	.25**	.26**	.23**	.23**
8th	.28**	.09	.30**	.28**

\*\* P less than .01

TABLE 13

INTERCORRELATIONS BETWEEN TEST AND AGE RATINGS OF

ACHIEVEMENT MEAN AGES OF SUBJECTS

USED IN PART B

	Mean Ages (in years)	<u>SD</u>
Boys	13.29	.92
Girls	13.25	.92
Both	13.28	.92

TABLE 14

INTERCORRELATIONS BETWEEN RSPM AND FOUR MEASURES OF  
ACHIEVEMENT FOR THE WHOLE SAMPLE: PART B

(N=144)

	2	3	4	5
RSPM	.284**	.091	.302**	.279**
English		.460**	.496**	.797**
Urdu			.343**	.607**
Maths.				.678**
Total Percentage				

\*\* P less than .01

TABLE 15

INTERCORRELATIONS AMONG RSPM AND FOUR MEASURES  
OF ACHIEVEMENT FOR THE MALE SAMPLE: PART B

(N=97)

	2	3	4	5
I- RSPM	.369**	.193	.338**	.377**
2- English		.509**	.433**	.770**
3-Urdu			.254**	.603**
4-Maths.				.677**
5-Total Percentage				

\*\* P less than .01

TABLE 16  
 INTERCORRELATIONS AMONG RSPM AND FOUR ACHIEVEMENT  
 MEASURES FOR THE FEMALE SAMPLE: PART B

(N=47)

	2	3	4	5
1- RSPM	.173	.054	.276	.181
2- English		.494**	.577**	.826**
3- Urdu			.509**	.706**
4- Maths,				.652**
5- Total Achievement				

\*\* P less than .05

Tables 17-24 present the reliability data of Wallach and Kogan creativity tests ( abbreviated form ) used in the present study.

RELIABILITY DATA FOR THE SIX CREATIVITY TESTS ( 1955 )

---

Wallach's Fluency	.82**
Wallach's Number	.82**
Wallach's Uses : Uniqueness	.80**
Wallach's Uses : Number	.80**
Wallach's Pattern Meaning : Uniqueness	.80**
Wallach's Pattern Meaning : Number	.80**

---

\* p < .05

TABLE 17  
 SPEARMAN BROWN SPLIT-HALF RELIABILITY COEFFICIENTS  
 FOR THE SIX CREATIVITY MEASURES ( N=144 )

	<u>n</u>
Instances : Uniqueness	.382**
Instances : Number	.722**
Alternate Uses : Uniqueness	.066
Alternate Uses : Number	.699**
Line & Pattern Meaning : Uniqueness	.527**
Line & Pattern Meaning : Number	.835**

\*\* P less than . 01

TABLE 18

INTERCORRELATIONS AMONG SIX CREATIVITY MEASURES  
FOR THE TOTAL SAMPLE ( N=144 )

	2	3	4	5	6
1- Instances: Uniqueness	.770**	.464**	.411**	.352**	.305**
2- Instances: Number		.456**	.463**	.406**	.412**
3- Alternate Uses: Uniqueness			.259**	.282**	.169**
4- Alternate Uses: Number				.351**	.435**
5- Line & Pattern Meanings: Uniqueness					.757**
6- Line & Pattern Meanings: Number					

\*\* P less than .01

TABLE 19

INTERCORRELATIONS AMONG THE SIX CREATIVITY  
MEASURES FOR BOYS ( N=97 )

	2	3	4	5	6
1- Instances: Uniqueness	.696**	.645**	.381**	.357**	.381**
2- Instances: Number		.385**	.463**	.355**	.412**
3- Alternate Uses: Uniqueness			.244**	.311**	.130
4- Alternate Uses: Number				.357**	.474**
5- Line & Pattern Meanings: Uniqueness					.737**
6- Line & Pattern Meanings: Number					

\*\* P less than .01

TABLE 20  
 INTERCORRELATIONS AMONG THE SIX CREATIVITY MEASURES  
 FOR THE GIRLS ( N=47 )

	2	3	4	5	6
1- Instances-Uniqueness	.860**	.530**	.575**	.349**	.414**
2- Instances-Number		.562**	.627**	.498**	.499**
3- Alternate Uses-Uniqueness			.435**	.245	.238
4- Alternate Uses-Number				.308*	.399**
5- Line & Pattern Meanings-Uniqueness					.792**
6- Line & Pattern Meanings-Number					

\*\* P less than .01

TABLE 21

INTERCORRELATION BETWEEN UNIQUENESS AND FLUENCY

	<u>N</u>	<u>r</u>
Total Sample	144	.77**
Boys	97	.68**
Girls	47	.90**

\*\* P less than .01

TABLE 22

## ITEM-SUM CORRELATIONS FOR THE INSTANCES PROCEDURE

( N=144 )

---

Item	Uniqueness	Number
1	.338**	.526**
2	.402**	.563**
3	.079	.441**
4	.249	.491**

---

\*\* P less than .01

ITEM-SUM CORRELATIONS TABLE 23

ITEM-SUM CORRELATIONS FOR THE ALTERNATE USES PROCEDURE

( N=144 )

Item	Uniqueness	Number
1	.053	.494**
2	.058	.591**
3	.022	.513**
4	.174	.485**

\*\* P less than .01

TABLE 24

ITEM-SUM CORRELATIONS FOR THE LINE & PATTERN MEANINGS  
 PROCEDURE  
 ( N=144 )

Item	Uniqueness	Number
1	.376**	.642**
2	.233**	.715**
3	.250**	.611**
4	.338**	.709**

\*\* P less than .01

Tables 25-27 present the intercorrelations between two creativity and four achievement scores. Tables 28 and 29 present the average of correlations among and between creativity, intelligence and achievement measures.

TABLE 25

CORRELATIONS BETWEEN CREATIVITY AND ACHIEVEMENTS SCORES  
 FOR THE TOTAL SAMPLE  
 ( N=144 )

	English	Urdu	Maths .	Total
Fluency	.220**	.394**	.175*	.313**
Uniqueness	.196*	.340**	.162*	.308**

\* P less than .05

\*\* P less than .01

TABLE 26  
 CORRELATION BETWEEN CREATIVITY AND ACHIEVEMENTS SCORES  
 FOR THE MALE SAMPLE  
 ( N=97 )

	English	Urdu	Maths.	Total
Fluency	.226*	.348**	.098	.283*
Uniqueness	.201*	.251*	.130	.341**

\* P less than .05

\*\* P less than .01

## CORRELATIONS BETWEEN ASPS AND CREATIVITY SCORES

TABLE 27

## CORRELATION BETWEEN CREATIVITY AND ACHIEVEMENTS SCORES

## FOR THE FEMALE SAMPLE

( N=47 )

	English	Urdu	Maths.	Total
Fluency	.279	.45**	.329*	.394**
Uniqueness	.251	.447**	.244	.325*

\* P less than .05

\*\* P less than .01

TABLE 28

## CORRELATIONS BETWEEN RSPM AND CREATIVITY SCORES

( N=144 )

	RSPM
	<u>r</u>
Instances-Uniqueness	.182*
Instances-Number	.159
Alternate uses-Uniqueness	.105
Alternate uses-Number	.056
Line and Pattern Meanings-Uniqueness	.001
Line and Pattern Meanings-Number	.021

\* P less than .05

TABLE 29  
 AVERAGE INTERCORRELATIONS AMONG CREATIVITY, ACHIEVEMENT,  
 AND BETWEEN CREATIVITY, ACHIEVEMENT  
 AND INTELLIGENCE MEASURES

	No. of correlations	Total sample ( N=144 )	Male sample ( N=97 )	Female sample (N=47)
Among creativity measures	15	.47**	.41**	.56**
Among achievement measures	6	.585**	.565**	.64**
Between creativity and achievement	32	.205**	.175	.295*
Between intelligence and achievement	4	.310**	.385**	.20
Between creativity and intelligence	8	.09	.12	.197

\*\* P less than .01

\* P less than .05

TABLE 30  
 MULTIPLE CORRELATIONS BETWEEN MEASURES OF INTELLIGENCE  
 CREATIVITY AND ACHIEVEMENT FOR THE TOTAL  
 SAMPLE

( N=144 )

Independent Variables	English	Urdu	Maths.	Total Percentage
RSPM	.25	.10	.22	.26
Fluency	.22	.32	.18	.31
Uniqueness	.22	.22	.27	.30
Fluency, Uniqueness	.27	.33	.27	.33
RSPM, Fluency	.31	.33	.26	.38
RSPM, Uniqueness	.36	.23	.33	.39
RSPM, Fluency, Uniqueness	.36	.33	.34	.40

TABLE 31

MULTIPLE CORRELATIONS BETWEEN MEASURES OF INTELLIGENCE,  
 CREATIVITY AND ACHIEVEMENT, MALE SAMPLE  
 ( N=97 )

Dependent Variables	English	Urdu	Maths.	Total Percentage
RSPM	.25	.09	.22	.26
Fluency	.22	.32	.18	.31
Uniqueness	.22	.22	.27	.30
Fluency, Uniqueness	.57	.46	.31	.56
RSPM, Fluency	.31	.33	.26	.38
RSPM, Uniqueness	.36	.23	.33	.39
RSPM, Fluency, Uniqueness	.36	.33	.34	.40

TABLE 32  
 MULTIPLE CORRELATIONS BETWEEN MEASURES OF INTELLIGENCE  
 CREATIVITY AND ACHIEVEMENT SCORES, FEMALE SAMPLE  
 ( N=47 )

Independent Variables	English	Urdu	Maths.	Total Percentage
RSPM	.17	.05	.28	.16
Fluency	.28	.45	.33	.39
Uniqueness	.25	.45	.24	.33
Fluency, Uniqueness	.24	.29	.27	.28
RSPM, Fluency	.35	.30	.23	.42
RSPM, Uniqueness	.41	.18	.33	.43
RSPM, Fluency, Uniqueness	.37	.37	.37	.39

TABLE 33

AVERAGE CORRELATIONS OF MEASURES OF INTELLIGENCE  
AND CREATIVITY WITH TEACHERS' RATINGS

( N=144 )

	Teacher's Preference	Interpersonal Behaviour	Work Involve- ment
Intelligence	.193*	.166	.161*
Creativity	.185*	.140	.125

\* P less than .05

TABLE 34

MEAN SCORES OF INTELLIGENCE AND CREATIVITY  
TESTS FOR VARIOUS SOCIOECONOMIC GROUPS

---

	Socioeconomic Groups		
	Low N=12	Middle N=69	High N=63
Intelligence	39.60	42.24	42.36
Creativity: Uniqueness	8.20	9.30	10.58
Fluency	96.80	98.46	105.72

---

TABLE 35

CORRELATIONS BETWEEN INTELLIGENCE, CREATIVITY  
AND FAMILY INCOME

	F		
	M (N=97)	F (N=47)	Both (N=144)
Intelligence	-.109	.019	-.074
Creativity: Uniqueness	.166	.558**	.183*
Fluency	.116	.459**	.182*

\*\* P less than .01

\* P less than .05

TABLE 36

MEAN INTELLIGENCE AND CREATIVITY SCORES OF CHILDREN  
IN TERMS OF PARENTAL EDUCATION

	Non Graduates ( N=54 )	Graduates ( N=76 )	t	P
<u>Father's education:</u>				
Intelligence	42.67	42.67		
Creativity: Uniqueness	7.33	10.64	.252	n.s
Fluency	90.18	108.97	3.201	.01
<u>Mother's education:</u>				
Intelligence	42.27	44.52		n.s
Creativity: Uniqueness	9.32	9.38		n.s
Fluency	100.76	102.87		n.s

TABLE 37

CORRELATIONS BETWEEN INTELLIGENCE, CREATIVITY AND  
SOME OTHER RELATED VARIABLES

( N=144 )

	RSPM	Fluency	Uniqueness
Hobbies	.02	.15*	.25*
Prizes	-.04	.23*	.20*
Family size	.03	.16*	.185*

\* P less than .05

TABLE 38

MEAN INTELLIGENCE AND CREATIVITY SCORES  
OF FIRSTBORN VS. LATER-BORN CHILDREN

	Firstborn	Later Born	t	P
<u>Male Sample:</u>	( N=34 )	( N=60 )		
Intelligence	43.03	43.35	.211	n.s
Creativity: Uniqueness	9.18	10.55	.83	n.s
Fluency	99.71	101.82	.303	n.s
<u>Female Sample:</u>	( N=13 )	( N=31 )	t	P
Intelligence	40.0	43.0	1.107	n.s
Creativity: Uniqueness	7.23	9.68	.857	n.s
Fluency	88.15	101.1	1.028	n.s

VALIDITY OF BAIN'S STANDARD PROGRESSIVE MATRICES

To determine the validity of BSM, three hypotheses, springing from the study of BSM with different validity criteria, were formulated.

Hypothesis I

The first hypothesis, regarding the validity of the intelligence test, assumed that BSM scores will significantly differ between different grades. Two groups were selected to test this hypothesis. A sample of 312 male students belonging to grades 7th to 9th was selected during October - December, 1973. In Study II, another group of 100 male and female students from grades 6th to 8th, was studied.

Chapter V

DISCUSSION OF RESULTS

(37-57). The results of Study I

Under the test of Significance (Mc Giegan, 1949) was applied to the data obtained. The results of Study I show that BSM significantly differ between grades 7th and 8th, but not between 7th and 9th. The results of Study II show that BSM significantly differ between grades 6th and 7th, as well as between 7th and 8th (Table 2). The results of Study II also show that BSM significantly differ between 6th and 7th, but not between 7th and 8th.

A further analysis of the data obtained in Study II, based on the test of Significance (Mc Giegan, 1949) is presented in Table 3. It is observed that BSM significantly differ between 6th and 7th, but not between 7th and 8th.

## VALIDITY OF RAVEN'S STANDARD PROGRESSIVE MATRICES

To determine the validity of RSPM, three hypotheses, stating the relationship of RSPM with different validity criteria, were formulated.

### RSPM and grade differentiation : Hypothesis I

The first hypothesis, regarding the validity of the intelligence test used in the present work, assumed that RSPM scores will significantly differentiate between different grades. Two studies were conducted to test this hypothesis. In Study I, a sample of 552 female students belonging to grades 7th to 10th were given this test during October - December 1972. In Study II, another mixed sample of 488 male and female students taken from grades 6th to 8th, was studied. The results of Study I are shown in Tables 1-6 (pp 62-67). The results of Study II are presented in Tables 7-12 (pp 68-73).

Duncan-Range Test of Significance ( Mc Guigan, 1968) was applied to both of these sets of data. The results of Study I show that RSPM significantly differentiates between grades 7th and 8th, but not beyond that ( Table 3, P 64). The analysis of data obtained in Study II shows that RSPM significantly differentiates between grades 6th and 7th, as well as between 7th and 8th (Table 9, p70). On the basis of these results one can say that RSPM significantly differentiates between students belonging to grades 6th to 8th, but not beyond that.

In a further analysis of the data, obtained in Study I, modal age for each grade was calculated (Table 4, p 65). An inspection of this table shows

that mean scores of the various modal age groups representing different grades indicate a progressive increase from grades 7th to 9th. The mean scores of these modal age groups significantly differentiate between grades 7th and 8th, and 8th and 9th, but not between 9th and 10th (Table 4, P 65).

The above findings demonstrate, in terms of grade-differentiation, the validity of the RSPM as an intelligence test for grades 6th to 8th.

#### RSPM and age differentiation : Hypothesis 2

The second hypothesis assumed a differentiating power of RSPM for various age levels. According to Raven (1960) scores on the Matrices test reach their maximum somewhere about the age of 14, remain relatively constant for about ten years, and then begin to decline slowly, but with remarkable uniformity.

In both, Study I and Study II, mean scores of the subjects, falling in different age levels, were computed ( Tables 3, 10 ). An inspection of Table 3 ( P 64 ) shows that mean scores of the sample progressively increase from age 11 to 14 years, and then show a decline. However, neither increase nor the decrease in mean scores, is statistically significant.

The failure of RSPM to differentiate significantly between different age-levels may be attributed to the non-availability of an accurate record of the age of these subjects. Parents, in this part of the country, are not at all careful about exact entry of date of birth of their children at the time of admission in schools. Either they do not fill the column meant for the date of birth, or if they do, it is usually, if not always, an approximation. This view is based on the following observations:

First, the present author interviewed about twenty teachers of elementary schools who reported that parents of children usually asked the teacher to write

the approximate age of the child.

Second, the writer administered RSPM to about 1350 students, but when the school authorities were contacted to collect information about the age of these subjects, she could get it only in respect of 1040 subjects. There was no age recorded of 210 subjects.

Klingelhofer ( 1967 ) encountered a similar problem in Tanzania, i.e., of age differentiation. He found RSPM scores level off and remain fairly constant over the age of 14 to 20 years or more. He attributed this to the presence of older children in a given grade. He argued that those who are 'average age in grade' might be either the late starters or the slower learners, and either or perhaps both conditions might be reflected in their performance on RSPM.

In Study I, the age-range of the sample was 11-20 years. An average student, when in grade 10th, is expected to be not more than 15 years. In the present sample, 157 students were above this expected age level. It shows that older students were present in each grade being studied. These were students who had either failed in different grades or were late starters. The average RSPM scores of students, on the other hand, bear high correlations with most of our achievement scores.

Keeping in view all the results, one can say that the data strongly support the first and third hypotheses whereas our second hypotheses is neither confirmed, nor rejected.

These findings, however, clearly suggest that the RSPM can be safely used as a valid test of intelligence.

#### RSPM and Achievement Scores: Hypothesis 3

The third hypothesis was that RSPM scores would be highly correlated

with academic achievement. The correlations between RSPM and achievement scores are presented in Tables 5 and 12 (pp 66-73).

Table 5 shows that all the correlations between RSPM and achievement scores of grade 7th and 8th are statistically significant ( P less than .01 ). In case of grade 9th and 10th, these correlations are significant only in one out of three subsamples. Table 12 shows that 10 correlations out of 12 are statistically significant. Table 29 shows that average correlation between RSPM and achievement scores is .31.

Tests of intelligence have often shown significant correlations with scholastic achievement. Some tests of intelligence have been validated against scholastic achievement. That is why some psychologists (e.g. Anastasi, 1976 ) suggest that tests of intelligence might be called scholastic aptitude tests.

The RSPM test has been used by investigators in carrying out psychometric research on the African continent ( e.g., Irvine 1965;1966). It has been administered under somewhat varying conditions in South Africa, West Africa, Congo, Zambia, Southern Rhodesia and Uganda. It has been shown to be a relatively pure measure of Spearman's general factor, and has proved useful as a predictor of scholastic achievement.

Irvine (1965)\* in an investigation in Rhodesia, correlated school leaving examination marks in Form I of the secondary school with RSPM, and found a correlation of .23. Vernon (1969) in an investigation in Jamaica found that RSPM test yielded an average correlation of .59 with the school achievement in English and arithmetic. In Pakistan, Zaki and Beg (1969) in their studies found significant correlations between RSPM and I.E.R. scholastic Aptitude Test, which is almost a measure of scholastic achievement.

These findings clearly indicate that a significant correlation exists between RSPM and achievement scores. Table 29 shows that there is an average correlation of .310 ( P less than .01 ) between RSPM and achievement scores for the whole sample ( N=144 ). An inspection of Table 12 shows that marks in English language, Mathematics and percentage of total marks are all significantly correlated with RSPM ( P less than .01 ); whereas marks in Urdu language seem to bear hardly any relationship with this test. Table 29 reveals the same picture, that is, in case of our male group ( N=97 ) too, the average correlation between intelligence and achievement scores is significant ( P less than .01 ). But when we compare the correlation between RSPM and individual achievement measures, i.e., English language, Urdu language, Mathematics and total percentage of marks, we find the correlations between all these measures, except Urdu language and RSPM, are significant ( P less than .01, Table 15 ).

On the other hand, marks in Urdu as compared to other achievement scores, are highly correlated with both of our creativity measures ( Tables 25-27 ), which necessarily call for divergent thinking. An analysis of data reveals that low correlations between RSPM scores and marks in Urdu may be due to differences in the types of tests used to obtain different achievement scores. The test in Urdu seems to be more divergent ( as shown by its high correlations with Fluency and Uniqueness scores ), whereas tests in English and Mathematics seem to be more convergent ( as they bear relatively low correlations with Fluency and Uniqueness, and higher correlations with RSPM ).

In the case of our female sample ( n=47 ), the correlations between RSPM scores and various measures of achievement are quite low. But, since the correlations between intelligence and achievement scores are quite high for the whole sample as well as for the male sample, so low correlations in the case of female sample may be due to the fact that it was a rather small group.

Summary: The validity of RSPM

To summarize all these findings, it can be said that in the present work, data about the validity of RSPM were obtained in terms of the efficiency of this test to differentiate between different school grades, age groups, and its correlation with various achievement scores. It has been clearly established that the RSPM can successfully differentiate between students belonging to grades 6th, 7th and 8th. This test, however, has not been able to differentiate significantly between different age levels. As pointed out earlier, it may be due to the practical problem of getting correct record of age.

RELIABILITY OF RAVENS STANDARD PROGRESSIVE MATRICES

To determine the reliability of RSPM, two hypotheses were formulated.

Retest Reliability : Hypothesis 4

On establishing the validity of RSPM, the second problem was to determine the reliability of this test. The fourth hypothesis predicted a significantly positive correlation between test-retest scores on RSPM. The results are presented in Table 6 ( p 67 ).

The results of the present research indicate that RSPM test can be used as a reliable measure of intelligence for Pakistani children. Table 6 shows reliability of RSPM calculated by retest technique. Out of a total of nine reliability correlations calculated for the subsamples in each of grades 8th to 10th, eight are significant ( P less than .01 ). The average reliability coefficient for grades 8th-10th are .75, .81 and .70 respectively. All of these correlations are statistically significant ( P less than .01 ). So we can conclude that the RSPM is a reliable measure of intelligence of Pakistani children.

Odd-Even Reliability : Hypothesis 5

Our fifth hypothesis predicted a significantly positive correlation between odd-even scores on RSPM. The results obtained by this split-half technique of reliability assessment are presented in Table 7 (p 68). The correlation range between .70 and .90. When the Spearman Brown formula is applied for the reliability of the whole test, it yielded reliability coefficients ranging between, .82 and .94.

An inspection of Table 7 shows that all the nine correlations are substantial. So it can be safely concluded that RSPM is a reliable measure of intelligence for Pakistani children.

Summary : The reliability of RSPM

To summarize all these findings, it can be said that in the present research the reliability data of RSPM were obtained by two methods, i.e., test-retest technique and split-half method. The data clearly establishes that RSPM can be used as a reliable measure of intelligence of our school children, at least upto grade 8th.

CREATIVITY TESTCreativity : A unified dimension of cognitive behaviour : Hypothesis 6

Our sixth hypothesis was that the creativity tests used in the present work, would be significantly correlated with each other, thus representing a unified dimension of individual differences that discriminates creative behaviour. We expected that something like Spearman's 'g' exists within the area of creativity. Tables 18, 19, 20 (pp 80,81,82) show the intercorrelations among the six creativity test scores. The average correlation between creativity tests is shown in Table 29 (p 92). Table 21 shows the correlation between overall fluency

and uniqueness scores for the total sample as well as for male and female samples.

Getzels and Jackson (1962) found their five creativity tests to be no more strongly correlated with each other as with intelligence tests, and this was true for both sexes. So this study provided no evidence for conceiving of a psychological dimension of creativity as existing apart from general intelligence. Thorndike's study of Getzels and Jackson's data (1963) also led him to the aforesaid conclusion. Cline, Richards, and Needham (1963) used seven 'Creativity' measures covering almost the same order of diversity as those used by Getzels and Jackson. Their results also indicated a good degree of relationship between general intelligence and the creativity measures.

Wallach and Kogan (1965) argued that the procedures used in earlier researches, to measure creativity, were too varied to define a unified dimension that would be substantially independent of general intelligence. Consequently, they developed procedures to assess generation and uniqueness of associates in accordance with the associational conception of creativity. Within each of these procedures, productivity and uniqueness were significantly correlated in terms of both measures. They reported substantial correlation among creativity measures, that is, .41 for total sample and .34 and .50 for male and female sample respectively. They reported similar correlations among the ten intelligence measures, they used. They found very low correlations between intelligence and creativity measures. These correlations were .09, .05 and .13 for total, male and female sample respectively. In this way, they succeeded in demonstrating independence of creativity and intelligence. Ward (1968) also reported positive significant correlation among the creativity tests. Cropley and Maslany (1969) found the intercorrelations among the Wallach and Kogan creativity tests that they used, to range between .267 to .742, the average being .486.

In the present study, the correlations among various measures of creativity are significant as well as in the same pattern as reported by Wallach and Kogan, that is, lowest in case of boys, but highest in case of girls.

Table 18 ( p 80 ) presents the correlations among the creativity measures for the total sample of 144 children. We find that all of the six creativity measures are strongly correlated. All of the 15 correlations are significant beyond .01 level. Moreover, in all of the three creativity tests, the measures concerning uniqueness of responses and the measures concerning number or fluency of responses are significantly correlated ( P less than .01 ), supporting the general expectation that the chances for production of unique associates should increase as the total number of associates generated increases. Results also show that the four verbal measures of creativity derived from Instances and Alternate Uses are strongly correlated with the two visual indices of creativity derived from Line and Pattern Meaning test. So, we find no verbal versus visual distinction in creativity and instead have found a unified dimension.

The data were also analysed to see if similar findings are obtained for each sex taken separately. The results of male sample are presented in Table 19 and those of female sample in Table 20. These results are almost similar to those obtained for the total sample. However, in case of male group, only one correlation out of fifteen is not significant, as shown in Table 19, whereas 13 correlations are significant beyond .01 level and one correlation is significant beyond .05 level. Table 20 presents our findings for female group, showing that 13 correlations out of 15 are significant beyond .01 level. The remaining two correlations, although moderately high ( .245 and .238 ) are statistically insignificant. So, for each sex considered separately as well as for the total sample, our findings lead us to similar conclusion.

The results of our investigation strongly support our hypothesis that the six creativity measures are strongly correlated with each other.

Reliability of creativity tests: Two approaches were followed to determine the reliability of the short version of Wallach and Kogan creativity battery, used in the present investigation. The first was to calculate the split-half reliability of each test according to Spearman Brown prophecy formula. The results of these calculations are shown in Table 17, for the total sample of 144 children. The results show that for each of the two measures in case of all the three tests, except uniqueness measure of Alternate Uses, the split-half reliability coefficients are quite high ( P less than .01 ). This shows that five out of six measures possess a high degree of internal consistency. Only one measure of uniqueness in case of Alternate Uses shows low reliability.

Our second approach to the reliability of creativity tests was to carry out, for each, an item analysis that would tell us the extent to which every item in our creativity battery is contributing to the score provided by the sum of all the items. The results of these item-sum correlations for each of these tests, are shown in Tables 22-24. In case of fluency of associates, it is evident that all items are making significant contributions to the total score. However, in case of uniqueness of associates, all but one item in Instances as well as all the items in Line and Pattern Meanings are significantly correlated with the total score. However, in Alternate Uses test, we find that none of the uniqueness measure of associates is contributing to the total score. So this measure seems to be unrepresentative of what this test measures as a whole as the results of both of our approaches determining reliability of our creativity battery lead us to the same conclusion. The split-half reliability coefficient as well as item-sum correlation of Uniqueness score of Alternate Uses are low, hence providing evidence to the unreliability of this measure. All other measures proved reliable

by statistical analysis of the data.

As shown in the beginning of this section, as well as in the preceding paragraphs, the evidence points to a high degree of internal consistency possessed by five out of six measures. As all of these indices of creativity are strongly related to each other, so we can conclude that creativity is a unified dimension of cognitive behaviour.

#### INTELLIGENCE AND CREATIVITY

##### Relationship between Intelligence and Creativity: Hypothesis 7

Our seventh hypothesis says that the correlation between intelligence and creativity scores will not be significantly different from zero. Table 28 shows the intercorrelations between RSPM scores and various measures of creativity. The average correlation between these two variables is shown in Table 29 ( p92 ).

The range of correlations between intelligence and creativity measures is .001-.182 ( Table 28 ). There are six correlations in all, out of which five are insignificant. Only one correlation is significant ( P less than .05 ).

Wallach and Kogan ( 1965 ) criticized the earlier studies of intelligence and creativity, showing that in these investigations ( e.g. Getzels and Jackson, 1962; Cline, Richards and Needham, 1963), intelligence and creativity do not emerge as separate dimensions of ability. For their own investigations they reported an average correlation of .09 between various measures of intelligence and creativity. Other studies that have used Wallach and Kogan creativity tests have reported almost similar results. Ward ( 1968 ) used an adaptation of Wallach and Kogan tests for 7 and 8 years old children. The correlation, he reported, between creativity and I.Q. was insignificant. Wallach and Wing ( 1969 ) in a sample of secondary school students found that verbal and mathematical scores of the Scholastic Aptitude

Test were unrelated to fluency and uniqueness scores derived from the Wallach and Kogan creativity tests. Cropley and Maslany (1969) in a sample of Canadian undergraduates reported an average correlation .07 between Wallach and Kogan creativity tests and Thurstone Primary Mental Abilities Test.

Table 29 shows that the average correlations between intelligence and creativity scores, in the present work, are .09, .120 and .197 for total sample, male group and female group respectively. All of these correlations are statistically insignificant. In the original study by Wallach and Kogan, too, the average correlations between intelligence and creativity for the total sample as well as for the two sexes separately, were insignificant. However, the average correlation between intelligence and creativity, in case of male subjects was lower as compared to female group. The same is true of our findings. Here the average correlation in case of boys is .120 as against .197 in case of girls. As all these average correlations between RSPM and creativity scores are insignificant, they reveal a substantial degree of independence of each other in the total sample as well as for each sex, when considered separately. Thus our seventh hypothesis is confirmed.

#### CREATIVITY AND ACHIEVEMENT

##### Relationship between creativity and achievement: Hypothesis 8

Our eighth hypothesis was that tests of creativity used in the present investigation, will significantly correlate with achievement scores. The correlation of our creativity measures with the achievement scores of the subjects, obtained in the last school examination, are presented in Tables 25, 26 and 27 ( pp 88-90 ). The average correlation among achievement measures is shown in Table 29.

The range of correlations between creativity and the four achievement

measures is between .162 and .394; the average being .265. All the eight correlations are statistically significant. Moreover, the four measures of achievement are also highly correlated with each other. The range of these inter-correlations is between .343 and .797, the average being .585. All of these six intercorrelations are statistically significant ( P less than .01 ).

Many investigators have studied the relationship between creativity and achievement. Most of these studies have been conducted on school children and have utilized standardized achievement tests. Getzels and Jackson ( 1962 ) found that their highly creative subjects were significantly superior to the school population in their scholastic performance, despite the fact that they were below the school average in I.Q.

Torrance ( 1962 ) in a replication of Getzels and Jackson's study, using eight different samples as a part of his studies of children's cognition, reached similar conclusion. He found a high correlation between creativity and achievement scores in six out of eight samples.

In the present work we found all the eight correlations between creativity and achievement are statistically significant (Table 25). With the sample size of 144 children, we found 5 out of 8 correlations between creativity and school achievement significant beyond .01 level and the remaining three beyond .05 level. So our results clearly demonstrate a positive and significant relationship between creativity and school achievement for the total sample.

In case of male sample, the range of correlations between creativity and achievement scores is between .098 upto .348 ( Table 26 ). Six out of eight correlations are significant. Similarly in case of female sample, five out of eight correlations are significant. The remaining three correlations, though statistically insignificant are moderately high ( Table 27 ). The range of creati-



vity-achievement correlations in our female sample is between .244-.447; the average being .34 ( P less than .01 ).

So the data clearly supports our hypothesis that the creativity scores are highly correlated with school achievement.

### INTELLIGENCE, CREATIVITY AND ACHIEVEMENT

#### Relationship between Intelligence, Creativity and Achievement: Hypothesis 9

Our ninth hypothesis was that tests of creativity will add significantly to prediction of achievement over and above that obtained by the intelligence tests. The correlations between intelligence and creativity scores are presented in Table 28 ( p 91 ), the correlations of creativity scores with achievement scores are shown in Tables 25, 26 and 27 ( pp 83, 89, 90 ). The multiple correlations between intelligence, creativity and achievement scores are presented in Tables 30, 31, 32 (pp 93-95 ).

Our findings show positive and significant correlations between intelligence and school achievement scores, as well as, between creativity and school achievement scores. Significance of difference between multiple correlations, when determined, clearly indicates that prediction of achievement scores in the next school examination based on two variables, intelligence and creativity, is significantly better than the prediction based on either of the two variables. On the basis of these results we can say that tests of creativity can be quite useful for the purpose of prediction of school achievement when used in addition to intelligence tests.

### INTELLIGENCE, CREATIVITY AND SOME OTHER VARIABLES

A large body of data indicates that a significantly positive relation exists between measured verbal intelligence and socioeconomic status of the indi-

viduals. However, this relationship does not hold true when intelligence is measured with non-verbal tests. On the other hand, it has also been demonstrated that children belonging to higher socioeconomic levels tend to be more creative than those of the lower groups (e.g., Singh, 1970).

The SES is usually measured by the variables relating to occupation education, family income, home type, neighbourhood etc. However, SES can be easily and efficiently measured using only two of these variables: Occupation and education. In the present study, besides these two variables, the relative role of family income and family size in determining the performance on intelligence and creativity tests, was also studied.

In the present study, the two International Scales of Occupational Prestige, devised by Manster and Havinghurst (1972) were used. These scales take into consideration only two variables; occupation and education. These authors give more weight to occupation than education in the combined socioeconomic status scale, believing that the former is a stronger indicator of the SES.

To investigate the relationship of SES with intelligence and creativity test scores, the whole group of children was classified into three SE levels: low, middle and high. Using the international Scales of Occupations, the highest possible rating was 30 points. It was decided to rate those individuals socioeconomically low, who scored upto 11 points; to rate high who scored between 22-30 points, and the remaining ones as middle class, who scored between 12-21. Mean and SD for each group were calculated (Table 34). An inspection of this table reveals that mean scores on RSPM are not at all affected by the different socioeconomic levels. This findings is in accordance with our assumption that performance on a non-verbal test of intelligence shows no significant relation with SES. On the other hand, as we expected, both measures of creativity (fluency and uniqueness) differentiate the higher socioeconomic group from the low and middle SE

groups. Nevertheless, this difference falls just short of significance level.

The relationship between parental education and performance on intelligence and creativity tests was also studied. The parents were classified into two groups: graduates and non-graduates. Table 36 shows the mean scores of intelligence and creativity measures. An inspection of this table reveals that father's graduation plays no role in performance on RSPM, whereas it contributes significantly to performance on creativity tests. Children of fathers who are graduates are significantly more creative than children of non-graduate fathers. However, mother's education seems to play no significant role in performance of their children on either intelligence or creativity tests.

The correlations between family income and scores on intelligence and creativity tests were computed (Table 35). This table shows that in the whole sample, the correlation between parental income and RSPM scores are not significant. On the other hand, the correlations between parental income and creativity scores are significant at 5% level. In case of male sample, the correlation between parental income and RSPM scores as well as the correlations between parental income and creativity scores are not significant. In case of female sample, the correlations, between intelligence and parental income is again non significant. However, in this sample there appears to be a high correlation between parental income and creativity scores. Both of the correlations between parental income and measures of creativity are significant beyond 1% level. This difference in the patterns of correlation for the male and female sample may be due to the fact that the females come from homes which are middle class or above. None of the female students in our groups belongs to lower SE class, while the male sample includes children from lower, middle, and upper classes. In Pakistan female education is still quite restricted. Only those parents who are liberal and comparatively less authoritarian send their daughters to school. Thus the family atmosphere becomes a crucial

variable in determining the creativity level of female children but not the male children who are treated in a more democratic manner any way. Similar pattern has been found in another investigation (Ansari, 1975) when it was found that democratic family atmosphere is conducive to better academic achievement in case of females, but plays no role in case of male children in Pakistan.

Authoritarian child-training practices and less favourable socioeconomic conditions are more likely to prevail in large families. These conditions militate against the development of creativity. Consequently, it was expected that children from small families, other things being equal, would tend to be more creative than children from larger families. An attempt was made to analyze this relationship in the present study. The correlations between family size and scores on intelligence and creativity tests were computed (Table 36). The results indicate that relationship between family size and intelligence tests scores is not significantly different from zero. On the other hand, family size is negatively related with each of the two measures of creativity. The correlation between these three variables are significant at 5% level. These findings lead us to assume that there is a negative relationship between family size and creativity of the individual. The creative children mostly come from small families.

Another related finding obtained in the present study is the relationship of intelligence and creativity test scores with the number of hobbies and the prizes won by the children. It was expected that creative children would have broader interests and hence a larger number of hobbies. It was also assumed that creative children would be more interested in extracurricular activities than their intelligent peers. Number of prizes won by a child was taken as an index of his participation in the extracurricular activities. The correlations of intelligence and creativity test scores with number of hobbies and number of prizes won were worked out. These correlations are presented in Table 37. This table shows that the

correlations between number of hobbies and intelligence and creativity scores are significant at 5% level. On the other hand, no significant relationship between intelligence scores and number of hobbies was demonstrated, similarly number of prizes were found to be significantly related with creativity scores, but not with intelligence scores. So it can be assumed that creative children have significantly a wider range of hobbies and participation in extracurricular activities than the less creative and intelligent children.

In recent years, order of birth and its effects on child development have attracted widespread attention. A number of studies (e.g., Staffieri, 1970) have reported differences in creativity. The explanations stress environment rather than heredity. Middle, later-born and only children are likely to be more creative than the firstborn. Usually, the firstborn is subjected to greater pressures to conform to parental expectations than those born later. These pressures make the child a conformer rather than a creator. An only child is spared many of the parental pressures common in homes where there are siblings.

In the present work, it was tried to find out if there is any significant difference in the intelligence and creativity test performance of first born and later-born children. Table 38 shows that performance of later born children is better than those of the first born children on creativity tests. However, this difference, although positive, is not significant.



### SOME GENERAL CONCLUSIONS AND SUGGESTIONS

The main purpose of the present study was to find out if intelligence and creativity can be separated as distinct, independent variables, each contributing to scholastic achievement. The subjects were school children. Their intelligence and creativity scores were based on their performance on RSPM and an abridged form of Wallach and Kogan creativity tests respectively. Nevertheless, the validity and reliability of RSPM were determined for a sample of our school children, prior to its administration to our experimental group. The reliability of creativity tests was also determined by split-half and item-sum correlation technique.

The following are the main findings of the present research:

- (a) That intelligence and creativity contribute independently of each other to scholastic achievement, the correlation between the first two being insignificant.
- (b) That intelligence contributes significantly to scholastic achievement.
- (c) That creativity also contributes significantly to scholastic achievement.
- (d) That intelligence and creativity combined together contribute more to scholastic achievement than they do so independently.

On the strength of the above findings, the following suggestions are offered for improvement of our admission test, curricula and teaching methods.

- (a) Both intelligence and creativity tests should be introduced for admission to different classes.
- (b) Special educational and learning programmes, such as, brain-

storming, synectics, productive thinking need be introduced in both primary and secondary schools.

- (c) Highly creative children need be spotted out and given special learning projects calling for explanation, divergent thinking and self-initiating ability.
- (d) Flexibility in the curricula and educational practices seems essential to promote divergent thinking. The teacher, in particular, will have to have a more open mind on these rather than a rigid attitude. Nurturing creative talent would be a significant contribution to national development.
- (e) The secondary schools, professional colleges and universities offer a variety of courses of study. Here again, a decision about selection of different courses based on one's intelligence and creativity scores would be far more dependable than the one based on either of these or just on past academic achievement.
- (f) Numerous researches have shown that intelligence tests are not very effective predictors of academic achievement at higher levels of education. One possibility is try creativity tests and see if they are effective in predicting academic achievement at this level.
- (g) A knowledge of one's intellectual and creative abilities is also helpful in vocational selection. This is particularly important when we are selecting people for jobs requiring originality and innovation, e.g., scientific research, social planning, educational planning etc.
- (h) Nurturing creative talent is more important in developing societies because without innovation the gap between developed and developing

countries cannot be bridged. To develop its human resources, our country needs to identify, train, and recognize its creative talents, so as to achieve overall economic and social development.

APPENDIXES

A P P E N D I X " A "

The Abbreviated Version of Wallach-Kogan  
Creativity Test used in this Study

I. INSTANCES:

"Tell me all the different things that are like that!"

1. Things that are round;
2. Things that make noise;
3. Things that are square;
4. Things that move on wheels.

II. ALTERNATE USES:

1. Tell me the different ways you could use a newspaper;
2. Tell me the different ways you could use a knife;
3. Tell me the different ways you could use a shoe;
4. Tell me the different ways you could use a key - the kind that is used in doors.

III. LINE AND PATTERN MEANING:

Attached to the inside back cover.

A P P E N D I X " B "

INDIVIDUAL INTERVIEW

Name.....Class.....

Date and Place of Birth.....

Father's name.....Address.....

.....

1. Number of brothers and sisters.....

2. Ordinal Position in the family.....

3. What are your special hobbies and interests ?.....

4. Have you ever received special promotion or made significant accomplish-  
ments in academic or extracurricular activities ?.....

5. How many persons are living in your home ?.....

6. What is your father's education, occupation, income ?.....

7. What is your mother's education, occupation, income (if employed) ?..

.....

A P P E N D I X " C "

INTERNATIONAL SCALE OF OCCUPATIONS

Urban Occupations:

1. Medical doctor, lawyer, clergyman, university professor, engineer, owner of a large business or factory, manager of a large business or factory, high military official, high government official.
2. Manager or owner of a business or factory of medium size, accountant, secondary school teacher, primary school teacher, with university level of education, commissioned officer in military service from lieutenant to major, journalist, civil servant of executive status, insurance salesman.
3. Owner of small business or shop with employees, civil servant of middle level, primary school teacher, with secondary level education, travelling salesman, office or bank clerk, trained nurse, laboratory technician, non-commissioned officer in military service from sergeant to lieutenant.
4. Owner of a small fruit or vegetable stand without employees, clerk in a shop, farmer, mechanic, policeman, electrician, other skilled workers, restaurant cook, conductor or driver of a train.
5. Semiskilled worker, factory worker, truck driver, waiter, barber, soldier, sailor.
6. Unskilled worker, construction worker, street sweeper.

## RURAL OCCUPATIONS

1. Landowner with large land area and large numbers of employees for his particular area or state. Does not do manual work on his land. May have a second house in city.
2. Intermediate, but still rather large farmer.
3. Small but independent landowner. May do all of his own *farm* work with machinery or may have a small number of employees.
4. Small landowner who does his own work.
5. One who lives on the land.

A P P E N D I X " D "

TEACHER'S OBSERVATIONS

Item I. This is a student whom the teacher specially enjoys having in Class. When asked what kind of person you prefer as a member of your class, this is the student who comes most readily to mind. He/she may or may not be the one who gets along best in the classroom situation, he/she may or may not be the brightest child in the class, and he may or may not be the one who gets the best grades. But he/she is liked by you and is the sort of person about whom you are most likely to say, "Of all the children in my class, this is the one I most enjoy".

INSTRUCTIONS:

Please rate the students listed here according to the following scheme:

1. Mark H next to the \_\_\_\_\_ students whom you would rate higher than others on this list for the quality described in the above item.
2. Mark L next to \_\_\_\_\_ students whom you would rate lower than others on this list for the quality described in this item.
3. Mark M for all others \_\_\_\_\_ this is the middle group.
4. Now circle the H next to the \_\_\_\_\_ students who are especially high.
5. Circle the L next to the \_\_\_\_\_ students who are especially low.

TEACHER OBSERVATIONS

Item II. This is a student who gets along exceptionally well in interpersonal relationships. He/she may or may not be the brightest child, and he/she may or may not be the outstanding scholar. But he/she is outstanding in his/her ability to function harmoniously within the formal and informal social relationships of the class. He/she has high prestige among peers, and is likely to be sought out as a "Leader" and "Opinion maker" by the other students, although he/she may not necessarily hold student offices. The implication here is not of course that he is the "School politician", but that he/she is generally liked and respected by other children.

INSTRUCTIONS:

Please rate the students listed here according to the following scheme:

1. Mark H next to the \_\_\_\_\_ students whom you would rate higher than others on this list for the quality described in item II.
2. Mark L next to the \_\_\_\_\_ students whom you would rate lower than others on this list for the quality described in item II.
3. Mark M for all others \_\_\_\_\_. This is the middle group.
4. Now, circle the H next to the \_\_\_\_\_ students who are especially high.
5. Circle the L next to the \_\_\_\_\_ students who are especially low.

### TEACHER OBSERVATIONS

Item III. This is a student who is most involved in (excited about) the learning task. Given a problem to be solved, an issue to be investigated, a work to be appreciated, he seems to get genuine pleasure from the educational experience. Learning is fun for this child. This does not mean that he/she is necessarily the brightest student or brightest achiever, although he/she may be. He may not be best liked by his teachers or peers, although again he may well be. But there is no doubt that he is interested in the new, enjoys the pursuit of discovery, gets pleasure out of knowing, and is, of all the children in your classes most eager to learn.

#### INSTRUCTIONS:

Please rate the students listed here according to the following scheme:

1. Mark H next to the \_\_\_\_\_ students whom you would rate higher than the others on this list for the quality described in item III.
2. Mark L next to the \_\_\_\_\_ students whom you would rate lower than the others on this list for the quality described in this item.
3. Mark M for all others \_\_\_\_\_. This is the middle group.
4. Now circle the H next to the \_\_\_\_\_ students who are especially high.
5. Now circle the L next to the \_\_\_\_\_ students who are especially low.

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