C H A P T E R VI

SOME CORRELATES OF CREATIVITY

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6.0 INTRODUCTION

The preceding two chapters have been devoted to discussing the main problem of investigation, viz., study of creative thinking and some personality traits of intellectually gifted children. Often, a distinction is not made between creative thinking and intelligence as measured by conventional intelligence tests; it is many times assumed that those with high I.Q. are usually creative. This has been a problem of much controversy nowadays, and has been subjected to the scientific study by recent research. Besides those of others, particularly in the preceding fourth chapter one more attempt has been made by the present investigator to examine how far high level of intelligence contributes to creative thinking. In addition, the problem is examined again from a slightly different approach in this chapter to study not directly the role of intelligence, but to study the extent of

relation of intelligence to creativity, to understand how far one can predict that a highly, intellectually gifted child can also be creative. Besides, the attempt is also made here to examine other correlates of creativity, if to any extent, viz. achievement and also personality traits, when data were already available on all these aspects. In other words, the earlier data on creativity scores, intelligence scores, achievement marks and scores on personality traits, as obtained with the help of tools used, were treated statistically in a different way subjected to statistical technique of correlation (product-moment correlation by scatterogram analysis), in order to examine the relation between creativity on one hand and intelligence, achievement and personality traits on the other. This chapter is devoted to the discussion of these three correlates of creativity, giving additional information to that in the main study.

6.1 CREATIVITY - INTELLIGENCE CORRELATION

The concept of intelligence and the consequent intelligence measure have been used to define individual differences in cognition as if the concept and the measure emcompasses the totality of the human mind and imagination. In schools and more recently in other areas requiring

intellectual accomplishment - the I.Q. has become the critical metric on which individuals are evaluated and classified, given preference or denied it. Individual differences in potential for productive thinking have been made synonymous with individual differences in performance on one or another of the numerous intelligence tests. It is not the intention to deprecate the substantial contribution of the concept of intelligence and intelligence measures to our understanding of mental functioning. Yet from the very beginning it has been apparent that many significant intellectual processes were inadequately sampled by these tests. Indeed a number of the early test-makers themselves argued that certain types of cognition-notably creativity-might be independent of, or at least only moderately related to, the measures of intelligence they were constructing. And whereas common observation insists on distinguishing between knowing and discovering, between the ability to remember and the ability to invent, between being intelligent and being creative, it is this distinction that seems largely to have been lost sight of in the rush to apply the intelligence test or some derivative of it to everything from grouping children in the kindergarten to selecting students for graduate work, from choosing executives in business to assigning

scientists to research positions.

Once we accept the notion, however provisionally, that creativity and intelligence as measured by the I.Q. are not necessarily synonymous, that the number of words an individual can define or his ability to memorize digits backwards may tell us very little about his ability to produce new forms and to restructure stereotyped situations, an almost limitless number of exciting problems present themselves for systematic study. Some notable questions may arise; can we indentify individuals who are outstanding in one of these functions but not in the other ? Specifically, can we identify children who are very high in intelligence but not accompanying high in creativity, and children who are very high in creativity but not concomitantly high in intelligence ? If this can be done, we may raise all manner of relevent issues regarding the behaviour of these children, the answers to which may yield significant insights not only into the children themselves but into the character of specific cognitive processes. Such issues would include; what is the relative performance of these children in school ? What is the nature of their fantasies and imaginative productions ? Their family background ? Their values and aspirations ? The reactions of others to them ?

In emphasising that individual differences could be measured by tests of judging and reasoning Binet performed a work of unquestioned importance. The I.Q. seems to be a thing or quantity which sums up all that needs to be known about an individual's intellect, rather than a numerical device useful in expressing the extent to which a person has responded to certain tests in a certain way. Further, the I.Q. score is seen as merely a measure of the extent to which a person is capable of thinking in a certain way, a way characterised by its emphasis on logic and correctness and usually aimed at finding a single best answer to any problem. The kinds of thinking which lead to high I.Q. scores tend to be closely related to successful children in our schools, and also correspond fairly well with the tendency to do well in adult life, so that intelligemce tests of the conventional kind are very useful indeed. The point is that the usefulness of these kinds of tests sometimes leads us to forget that they do, in fact, concentrate on one particular kind of thinking. On the other hand, some authors have recently focussed their attention on a different kind of thinking which involves chiefly the production of many and varied responses rather than the finding of the single correct solutions and have labelled it 'divergent thinking'. The more commonly used tests, which concentrate on logic and correctness are said to measuæe

mainly 'convergent thinking'. Thus, it is increasingly being suggested that intellect may manifest itself in at least two (and quite possibly more) different modes, one of which corresponds fairly well with what conventional I.Q. tests measures (convergent thinking), the other (divergent thinking) being largely ignored.

Along with this emphasis on the one sidedness of conventionally used measures has come an increasing use of a kind of test which looks as though it measures something different from the skills sampled by I.Q. tests. These more recent tests are the so - called tests of creativity. As a matter of fact, no one is sure yet just what the defining properties of creativity are, and the ability of creativity tests to predict later levels of creativeness is unknown. One thing that is clear, however, is that human intellect can function in many ways other than those elicited by the usual kinds of tests and the other intellective modes can be elicited by different sorts of tests. Furthermore, the evidence is that people who do well on the conventional I.Q. tests do not always do well on the newer tests, while some very capable people do not do at all well on conventional measures. The work of Hudson[60] has demonstrated this point with particular force. Studying only school boys whose high capabilities had been demonstrated by superior school achievement, he showed

that distinctions could be made among the boys on the basis of their preference for a divergent kind of thinking on the one hand or a convergent kind on the other. If merely their I.Q. scores were taken into account, many of the superior students whom Hudson tested, among them some who went on to brilliant undergraduate careers, seemed unlikely candidates for success even at school certificate level.

The success of such boys in the academic sphere despite low scores on conventional I.Q. tests strongly supports the view that such tests neither isolate all capable individuals, nor describe fully the limits of intellectual functioning. For these reasons it seems desirable to look at some issues connected with creativity tests, particularly if their shortcomings are kept in mind as a safeguard against excessive enthusiasm. It is important that modern teachers should evaluate their students on as wide a basis as possible.

Hence, it is desirable to know the extent to which intelligence measured by conventional tests and divergent thinking or creativity as measured by new tests are related, how far one can be predicted from the other.

An important aspect of research on creativity has been the study of its relationship with intelligence. For layman and teacher alike intelligence has served as a blanket term

to cover all aspects of a child's intellectual abilities. Earlier researches on such aspects as inventiveness, imagination and originality, though pointing in the direction of a clear difference between intelligence and these other abilities, were of little more than theoretical interest. It was only when creativity became a matter of concern for them that educators started looking seriously at this problem. In a planned study of giftedness, Getzels and Jackson[36] tried for the first time to compare members of highly intelligent group who were in the top 20 per cent on I.Q. scores but not in measures of creativity and those in a highly creative group who were in the top 20 per cent on measures of creativity but not on I.Q. scores. They found that a large percentage of creative youngsters eluded indentification by teachers or by conventional I.Q. measures. Getzels and Jackson's study was replicated by Torrance[115]. He concluded that if we identified as gifted those scoring in the upper 20 per cent on an intelligence test, we would eliminate about 70 per cent of those who would score in the upper 20 per cent on a measure of creativity.

These findings suggest that it may be useful to keep traditional I.Q. and creativity concepts separate. But recently Simpson and Martinson[92] summarized some of the findings from the California studies to conclude that the use of intelligence

quotients as an identification criterion also locates individuals of great variety and virtuosity. They presented data which bring into question the view that use of intelligence tests in identification will produce a concentration of persons narrowly oriented towards conforming academic excellence. When data from Getzels and Jackson's study are more carefully analysed, it does become clear that the relationship between creativity and intelligence is not entirely linear; rather a curvilinear relationship seems to exist between the two. In this connection, John Anderson's[2] concept of ability gradient should be useful. According to this concept, ability level can be thought of in terms of threshold and we can ask questions as to the amount necessary to carry on a task and then consider the factors that determine function beyond this threshold. There are cut off points or levels above which the demonstration of ability in relation to environmental demands is determined by the presence of other factors.

Getzels and Jackson[38] and also Taylor[100] have indicated that some minimum level of intelligence is required for outstanding success of a creative nature. What this level is cannot be specified. But several estimates place the minimum level at 120, beyond which intelligence measures fail to discriminate between highly creative and less creative students.

Guilford's work supports this finding. In general terms, however, it may be safe to conclude with Getzels and Jackson that intelligence and creativity are by no means synonymous.

Guilford, Getzels and Jackson and Manemar had doubts about a high correlation between creativity and intelligence. Getzels and Jackson confirmed these doubts by their studies. They concluded that there is positive but low correlation ranging from .32 to .378 between the measures of creativity and intelligence. Dearborn[24] also reported low correlations between the measure of productive imagination and intelligence. Andrews[3] found the correlations of .15, .02 and .03 between intelligence and imagination. Likewise Phatak[83], Torrance[115], Cropley[19] had also found low correlations between the scores of creativity and intelligence.

Taylor[102], Vernon[120] and Yamamoto[130] were also of the opinion that creativity and intelligence became independent of each other only when some critical level of I.Q. has been exceeded. A specific minimum I.Q. was necessary for certain creative activities. Taylor and Holland[99] reported that positive but low correlations of .20 to .40 were found between creativity and intelligence and no correlation was found at higher ability level. Torrance[115] by summarizing all the available correlations between creativity and intelligence reported the median correlation of .20.

From the above information it is clear that there is a positive but low correlation between intelligence and creativity.

In brief, though there is agreement about possible correlation between creativity and intelligence upto a certain level, there is still a controversy about this relationship after the critical point. In view of this, the present investigator makes one more attempt to examine the correlation between creativity and intelligence, after the critical point, assumed and suggested by other authors to be at 120 I.Q.

To study this, the investigator has already the scores (converted into T-scores) on creative abilities measured by Torrance Tests of Creative Thinking, verbal test A and figural test B. The responses of the students to verbal form were evaluated along three different dimensions: fluency, flexibility and originality. Responses to figural form were also evaluated but along four different dimensions; fluency, flexibility, originality and elaboration, as described earlier.

For intelligence test data the investigator had scores of same subjects administered by Desai-Bhatt Group Test of Intelligence, as described earlier. The samples investigated were of two types, viz. (1) all intellectually gifted subjects (935 with I.Q. 120 and above) and (2) the functionally, manifest gifted subjects (325 with I.Q. 120 and above and achievement 60% and above marks), as described earlier.

To test statistically whether creativity and intelligence are independent of or related to each other in case of intellectually gifted high school students, the T-scores on different aspects of creativity test and I.Q. scores on intelligence test were subjected to the technique of Product-Moment Coefficient of Correlation (Scatter Analysis). The results of correlation between each of seven aspects of creativity (mentioned earlier) and intelligence have been summarized in the Table 6.1 for both the samples of 935 capably gifted and 325 functionally gifted subjects.

It would be seen from the Table 6.1 that both creativity and intelligence even beyond the assumed critical cut-off point of 120 I.Q. were correlated significantly beyond .01 level of confidence, in cases of both the capably gifted children (935) as well as functionally gifted children (325). In contrast to the studies quoted earlier, the correlations in the present study were found to be a significant positive correlation ranging from .12 to .18 in case of 935 subjects in Table 6.1 (Col.2) and from .104 to .201 in case of 325 subjects in Table 6.1(Col. 5). The absolute amount of correlation is almost the same as that reported by earlier quoted researchers. It is no doubt low, but significant in the present study. In the earlier studies quoted, it is doubtful whether the earlier authors tested its significance, depending

Table 6.1 : Showing Coefficients of Correlation between each of Seven aspects of Creativity and Intelligence

Creativity Aspect	Capably Gifted Group :935			Functionally Gifted Group : 325		
	r with intelligence	Std. Error $\sigma_r = 1/\sqrt{N}$	Variance explained (Coeff. of determination r^2	r with intelligence	Std. Error $\sigma_r = 1/\sqrt{N}$	Variance explained (Coeff. of determination) r^2
Fluency (verbal)	.14**	.0327	.0196	.15**	.0555	.0225
Flexibility (verbal)	.16**	.0327	.0256	.19**	.0555	.0361
Originality (verbal)	.12**	.0327	.0144	.16**	.0555	.0256
Fluency (Figural)	.18**	.0327	.0324	.18**	.0555	.0324
Flexibility (Figural)	.15**	.0327	.0225	.15**	.0555	.0225
Originality (Figural)	.13**	.0327	.0169	.104	.0555	.0108
Elaboration (Figural)	.16**	.0327	.0256	.201**	.0555	.0404

* Significant at .05

** Significant at .01

Significance of r is based on $t = r\sqrt{\frac{N-2}{1-r^2}}$

Quoted from Guilford's Table :

For 2 variables and df = 933 Sig. Coe. of Cor. at .05 = .065 and at .01 = .085
For 2 variables and df = 323 Sig. Coe. of Cor. at .05 = .109 and at .01 = .143

on the numbers of subjects tested.

This significant correlation between intelligence and creativity is also confirmed indirectly by the findings in Chapter IV about the significant role of giftedness (higher I.Q.) in contributing to different aspects of creativity in most cases. The earlier assumption was that beyond the minimum level of 120 I.Q., intelligence might not be discriminating between the creative and the non-creative, i.e., there might not be substantial relation between intelligence and creativity. However, in the present study investigating the subjects with I.Q. of 120 and above, it was found that there was positive, significant correlation between intelligence (beyond cut-off point of 120 I.Q.) and different creativity scores in case of both samples of 935 capably gifted children and 325 functionally gifted children, as shown in two columns of Table 6.1. In the latter case of 325 sample, the amount of coefficient of correlation is somewhat higher in most cases. Further, the two columns (3 and 6) along with r in Table 6.1 show respectively the estimated standard error - likely in the obtained correlation in two groups. As discussed by Quinn MacNemar [85] the formula for computing standard error of correlation is $\sigma = 1/\sqrt{N}$ when N is greater than 50, and the significance of correlation is obtained by dividing the obtained r by the standard error of r (to be significant, it must be greater than 2.58 in the case of such large sample); but when N is less than 50, significance of

r can be checked from the significance of $t = r\sqrt{(N-2)/(1 - r^2)}$ for df = N - 2. Guilford[44] gives ready-made tables of reference for significance of correlation for different number of variables. The coefficient of correlation values in the Table 6.1 are significant as shown, following both McNemar and also Guilford.

Finally, the two columns (4 and 7) in Table 6.1 give the proportion of variance explained by the obtained correlation in each case. In any statistical inference, the certainty (or error) in results depends on size of the sample. We can reduce uncertainty by increasing N in the same sample to study, say, correlation of Y with X. However, another approach to achieve similar results is to take other samples to study correlation of Y (say, creativity) not only with X (say, intelligence), but with other likely factors such as age, training, etc. and compare the variations in Y with these other factors (as in multiple correlation). However, inspite of these attempts to explain variation due to a number of factors, there will still remain some unexplained variation, and therefore, still some uncertainty. Croxton and Cowden[22] have illustrated the method of computing variation of independent variable explained by coefficient of correlating and as a ratio to one this is coefficient of determination which is equal to r^2. These values are given in the present case

in column 4 and 7 of Table 6.1. This means that the obtained correlation though significant explains only that much ratio or percent of the total variation. The results reveal that the correlation obtained between creativity and intelligence explains only about one percent (.0144 minimum) to three percent (.0324 maximum) variance in the total variation, in case of sample of 935 and similarly from one percent to about four percent in case of sample 325. It implies that though correlation of creativity with intelligence is significant, its relation with intelligence explains very little variance; other factors may be playing major role. And this consideration should always be kept in view while interpreting coefficient of correlation anywhere.

6.2 CREATIVITY - ACHIEVEMENT CORRELATION

Since, intelligence and academic achievement have been reported to be highly correlated, it is worth examining correlation between achievement and creativity, after examining that between intelligence and creativity, in case of individual who are gifted and also high achievers. The present section deals with this relationship between achievement and creativity. The purpose of education is to develop a child into a fully functioning individual. It is also true that education in a democracy should help all children towards the full development of their talents. The main function of

the schools is to help overachievers and also to influence underachievers to make better use of their intellectual resources to learn more. The recent findings concerning the role of creativity in educational achievement call for revision. Results of the studies have showed that creative thinking can contribute to the acquisition of information and educational skills. It is long known that it is natural for a child to learn creativity. But we have forgotten this principle and till now try to teach them in an authoritarian manner. Moore[73] and Ornstein[77] have drawn the attention by their experiments that many things can be learned more economically in a creative situation than in any authoritarian one and that some people who learn little by authority can learn much creatively.

Today important requirement is to learn how to design school experiences that will foster creative acquisition of information. It is also important to know which kinds of information can be learned more economically by authority and which by creative means. The tasks of intelligence tests require cognition, memory and convergent thinking. These tests work well in predicting school achievement. The children will require these abilities when they are taught by authority. Recent findings of studies suggest that even traditional subject matter and educational skills can be so taught that

creative thinking is important in their acquisition.

Getzels and Jackson[37] concentrated their attention on this relationship. For this they selected two groups of children, one of high I.Q. and other of high creativity. The first group consisted of children in the top 20 per cent on I.Q. but not on creativity. The second group consisted of children in the top 20 per cent on creativity but not on I.Q. Although the intelligent group had a mean I.Q. twenty three points above that of the creative group, there were no significant differences in academic achievement between the two. Consequently it was implied that creativity can compensate in some way for relative lack of skill in the areas sampled by more conventional intelligence tests. As the sample of children studied by those two authors was a particularly unrepresentative one, there is some doubt concerning the extent to which the findings can be taken to reflect the state of affairs in school children as a whole.

Torrance[108] has conducted nearly eight studies which avoided some of the Getzels-Jackson shortcomings. In six studies which were conducted in elementary schools, the mean I.Q. of the highly divergent thinkers ranged from 97.5 to 126.5. In four of these six studies Torrance found that there were no significant differences in overall academic achievement between the high I.Q. group and the high creative group, and he noted

similar findings in case of both samples of university students which he studied.

Yamamoto[129] also compared the academic performance of secondary school children selected in the way described by Getzels and Jackson. He obtained results which he described as clear cut. Despite I.Q. differences of twenty points, the divergent thinking group did as well on the Iowa Tests of Educational Development as did the High I.Q. group. This finding was true both for boys and girls separately, and also when both sexes combined. In a second study Yamamoto compared the achievement scores of a high creative group with those of a low creative group allowing for differences in I.Q. between the two groups. His results showed that the highly creative thinkers surpassed the low creative children and from this he concluded that there were differences in achievement between the highly divergent thinkers and the uncreative students which were not due to differences in I.Q. These differences led Yamamoto to the notion that there is a distinct relationship between performance on creativity tests and success in school learning.

Cropley[21] has investigated the extent to which creativity scores are related to school achievement. He studied 320 Canadian children in four groups on the following basis :

1. Children, those are in the top half on both creativity and I.Q. (The High - High Group).
2. Children, those are in the lower half on both the measures (The Low-Low Group).
3. Those children high on I.Q. but not on creativity (The High-Low group).
4. Those children low on I.Q. but high on creativity (The Low-High Group).

If creativity does add to academic success and creativity scores discriminate significantly between those likely to achieve highly and those likely to do less well, it should be possible to discriminate between high and low achievers, on the basis of creativity scores, even after I.Q. differences have been removed. Thus among the highly intelligent, those who are highly creative should surpass those who are low on creativity, while among the less intelligent, once again the highly creative should surpass those who are low on both quantities. Hence it would be expected that the High-High group would achieve significantly better than the High-Low group, despite the absence of I.Q. differences and similarly, that the Low-High group would surpass the Low-Low group, again despite the absence of differences in I.Q. both of these expectations were borne out: in fact the mean achievement scores formed an ordered sequence in descending order, with the High-Highs averaging 69.6 per cent, the High Lows 63.5 per cent, the Low-Highs 56.6 per cent and the Low-Lows 51.9

per cent. Thus, although the group high only on intelligence surpassed both low I.Q. groups as might be expected, the intellectual all rounders did best of all.

The results cited above are particularly interesting if they are considered in the light of the notions of over and under achievement. Presumably, the High-Low group, whose mean I.Q. was 124, would be described by their teachers as under achieving, since despite the possession of equally high I.Q. they failed to do as well on their school examinations as did the High-High group (mean I.Q. 128). Similarly, the Low-High group would probably be regarded as over-achievers, since, despite relatively low I.Q. (mean I.Q. for this group was 105) they achieved at a significantly higher level than did the Low-Lows who were of similar I.Q. (mean I.Q. 101). The data presented here suggest that I.Q. alone is an inadequate predictor of academic success; at the very least, further discrimination between those who achieve at high levels and those who do less well can be affected by the use of creativity scores.

Correlations in the above study were also calculated between six divergent thinking tests employed and the academic achievement scores. The correlation coefficients obtained ranged from .163 to .420 when all children were considered,

regardless of their grouping on the joint I.Q. - Creative basis. Torrance[108] reported similar findings with a sample of seventy five children ranging from grade 4 to grade 6 in their educational level. The correlation coefficients he obtained ranged from .37 to .53 and, even when the effect of I.Q. was removed, the subsequent partial correlations were still as large as .23 to .48. Finally, Cline, Richards and Needham[18] demonstrated that scores on creativity tests correlated significantly with high school science marks. Hence, correlation studies too indicate that there is significant relationship between divergent thinking and classroom achievement.

In the above section, examination of relationship between creativity and achievement was largely confined to consideration of global achievement scores based on a range of school subjects. For example the achievement scores employed in the research was based on what the canadians called core courses and included marks for English, Science, Mathematics and Social Studies. Nowadays it is believed that the mental abilities sampled by various tests of the convergent kind (I.Q. tests) are of differing importance in different kinds of achievement. Thus, a verbal I.Q. test is more useful in predicting success in verbal tasks than in performance tasks, and so on. In a similar way it seems likely that the

skills sampled by divergent tests should be more important in some kinds of classroom achievement than others.

Torrance[108] studied this point in details and has reported the results of students in five U.S. elementary schools in which the mean achievement of high I.Q. and high creative groups of school children was compared in four subject areas. On the basis of his data he concluded that highly creative students tend to do better in reading and language skills, despite I.Q. differences which were as large, in some cases as 26. In the case of students at university level, the highly creative students tended to surpass the high I.Q. groups on measures like creative applications and self-initiated bearing, again despite large intelligence differences in favour of the high I.Q. groups.

Correlational data too suggest that high levels of creativity are differently related to success in different subjects areas. Thus, for example, Torrance reports partial correlations (with the effect of I.Q. removed) of .48 between creativity and reading skill and only .22 between creativity and arithmetic skill. Hence, the conclusions may be drawn that creativity scores are particularly related to achievement in language tests and least related to achievement in arithmetical tests. This is not altogether

unexpected, if one keeps in mind the differences between the kinds of questions usually comprising the two sorts of tests. Arithmetic tests in particular, often emphasise the finding of single correct solutions through the application of previously learned techniques and may, therefore, be heavily convergent in nature.

Hudson's research[59] adds strong support to the idea that preference for a divergent mode of thinking is reflected in a particular pattern of school achievement.

Flescher[31] has however tried to clarify it in a recent study in which the validity of implications concerning the comparative influence of unusual creative thinking and exceptional intelligence in the learning process has been thoroughly studied. In an elaborately designed study in which the two groups left out by the earlier researchers, one characterized by non-extraordinary intelligence and creativity and the other by creativity and high intelligence, were also used. Flescher found, as he should have found, that while there existed a significant relationship between intelligence and scholastic performance, creativity was not related to academic success. As will be easily seen, to speak of high correlation between creativity and school achievement of the formalized kind is in itself a negation of what we know about the relationship between creativity and

intelligence. That Getzels and Jackson and Torrance did find a substantial relationship can be easily explained by the fact that they were concerned with those pupils in the creativity groups, who possesses sufficiently high intelligence, considerably above 120 I.Q. Once the intelligence of high creatives fell below this level, the mean achievement scores of the high creative group fell significantly below those of the high I.Q. group. As pointed out by Flescher, when we talk of creative talent and divergent thinking abilities, we must also think of divergent achievement indices. It is proposed that just as I.Q. is related to convergent achievement, an analogous relationship exists between creativity and divergent achievement.

The following section of this chapter deals with the study of the relation of creativity and achievement of the intellectually gifted high school students on total (functionally gifted pupils) as well as subjectwise (capably gifted pupils) performance. The different creativity scores (T-scores) already available were correlated with the achievement in school subjects.

For the achievement of the pupils, the marks of the last annual examination were taken into account in the subjects : Gujarati, Hindi, English, Mathematics, Science,

Physical Education and Drawing.

To test statistically whether creativity and achievement in school subjects are independent of or related to each other in case of intellectually gifted high school students, the scores on different aspects of creativity and achievement in school subjects were subjected to the correlational technique viz. Product-Moment Method of Coefficient of Correlation (by scatter analysis). The results have been summarized in Table 6.2 for different school subjects.

It will be observed from results in Table 6.2 that almost all correlations of creativity with achievement in school subjects are positive and significant except in case of achievement in English and total achievement. To examine in detail, all creativity scores correlated significantly and positively with achievement in mother-tongue Gujarati, coefficients of correlation ranging from .098 to .17, with standard error of .0327, and with variance explained from one per cent upto about three per cent, as described in earlier section. Similarly, all creativity scores correlated positively and significantly with Hindi, coefficient of correlation ranging from .086 to .17, with standard error .0327 and with variance explained from half per cent upto about three per cent only. No creativity scores correlated

Table 6.2 : Showing Coefficient of Correlation between each of Seven Aspects of Creativity and Achievement in School Subjects

Creativity aspects	Gujarati (S=935)	Hindi (S=935)	English (S=935)	Mathematics (S=935)	Science (S=935)	Phy. Educ. (S=828)	Drawing (S=444)	Total achievement in Gujarati, Hindi, English Mathematics and Science. (Sample : 325)
Fluency (Verbal)	.17**	.16**	.062	.061	.17**	.15**	.031	.0138
Flexibility (Verbal)	.16**	.14**	.055	.107**	.18**	.18**	.031	.0392
Originality (Verbal)	.14**	.16**	.0504	.077*	.17**	.14**	.069	.0097
Fluency (Figural)	.16**	.064	.038	.0503	.12**	.19**	.13**	.0594
Flexibility (Figural)	.14**	.17**	.049	.027	.11**	.062	.081	.0455
Originality (Figural)	.12**	.086**	.028	.047	.12**	.102**	.003	.0813
Elaboration (Figural)	.098**	.093**	.019	.094**	.19**	.15**	.24**	.1019
Standard Error $\sigma_r = 1/\sqrt{N}$	.0327	.0327	.0327	.0327	.0327	.0347	.0474	.0555
Variance explained (Coeff. of Determination) r^2								
(Minimum r)^2	.0096	.0041	.0004	.0007	.0038	.0038	.0000091	.000094
(Maximum r)^2	.0289	.0289	.0038	.0115	.0361	.0361	.056	.010383

S = Sample
* Significant at .05
** Significant at .01

Significance of r based on $t = r\sqrt{\frac{N-2}{1-r^2}}$ Quoted from Guilford's Table

For 2 variables and df = 933 Sig. Coe. of Cor. at .05 = .065 & at .01=.085
" " " " df = 826 " " " " " .05 = .0711" at .01=.0929
" " " " df = 442 " " " " " .05 = .094 " at .01=.1216
" " " " df = 323 " " " " " .05 = .109 " at .01=.143

significantly with achievement in English, though there was a positive trend. This may be the case, because students are expected to express their creativity through their mother tongue rather than foreign tongue. Achievement in Mathematics correlated positively and significant with verbal flexibility, verbal originality and figural elaboration only, though there was a trend of positive correlation with other creativity scores. Again, achievement in science correlated positively and significantly with all creativity scores, with standard error of .0327 and with variance explained upto three and half per cent. Physical education correlated significantly and positively with all creativity scores except figural flexibility, with standard error of .0347 and explained variance upto about three and half per cent. Drawing correlated significantly and positively only with figural fluency and figural elaboration. Total achievement of all main subjects together of functionally gifted children was not found to be related significantly with any creativity score, though the trend was in the positive direction. All correlations are no doubt low though significant, and explain very little amount of variation.

6.3 CREATIVITY-PERSONALITY CORRELATION

Finally, with the data available on creativity as well as personality traits, an attempt is made to study correlation between the two, in case of gifted children.

Those who have creative abilities can manage, control and organize new materials and experiences and must be given opportunity to develop their powers. There is a great need to identify and educate these children for their social usefulness. The carelessness towards these students now cannot be tolerated any more. Now the time has come to increase our efforts to develop new and better instruments to measure creative abilities. This is really the urgent duty of the educators and psychologists.

Since so many years, great efforts have been made to study more scientifically the nature of creativity, its measurement and its possible development. As a result of these studies many important aspects of creativity have come out. The main contributors to this field are Guilford and his associates at the University of California. Getzels and Jackson at Chicago, Torrance at Minnesota and Taylor at Utah. There are also others who have studied this field.

Till now when any one needs to measure intellectual potential of a child, he uses conventional intelligence tests and calculation of an I.Q. scores. Now there is greatest dissatisfaction with the I.Q. concept in its present form because these tests ignore important aspects of intellect. More surprising thing is that these neglected aspects are related to the performance in the classroom. Therefore these

neglected aspects are very important and or interest. The study of Guilford showed that creativity is a function of the intellect. As a result of different studies in the field of creativity many other questions arose such as whether creativity has any relation with intelligence, personality traits, achievement and environment and socio-economic condition of the family. In this section the investigator has tried to study the relationship between Creativity and Personality.

Differences in style of thinking between those who prefer the divergent mode and those who prefer the convergent appear to be related to differences between such individuals in the area of personality. Students whose thinking is of the divergent mode display a consistent set of personality traits which include characteristics like impulsiveness, non-conformity, willingness to ' have a go ' and so on, while convergent thinkers are more likely to be impulse-suppressing, conformist and unwilling to let themselves go.

In defining personality as well as other concepts preparatory to an investigation, definition of an operational type are much to be prefered. Guilford[47] has defined personality as unique pattern of traits of an individual. The trait is any relatively enduring way in which persons differ

from one another. The psychologists are particularly interested in those traits that are manifested in performance, in other words in behaviour traits. Behaviour traits come under the broad categories of aptitudes, interests, attitudes and temperamental qualities. By aptitude one means a person's readiness to learn to do certain types of things. There is no necessary implication in this statement as to the source of the degree of readiness. It could be brought about through hereditary determination or through environmental determination, usually if not always, by interaction of the two. By interest - one means the inclination or urge to engage in some type of activity of the persons. By attitude one means the person's tendency to favour or not to favour some type of object or situation. Temperamental qualities describe general emotional disposition of a person : for example person's optimism, moodiness, self confidence or nervousness.

Creative personality is a matter of those patterns of traits that are characteristics of creative persons. A creative pattern is manifest in creative behaviour, which includes such activities as inventing, designing, contriving, composing and planning. Students who exhibit these types of behaviour to a marked degree are recognized as being creative.

There is some evidence that the creative persons are more autonomous, more self-sufficient, more independent in

judgment, more open to the irrational in themselves, more stable, more feminine in interests and characteristics, more dominant and self assertive, more complex, more self-accepting, more resourceful and adventurous, more radical, more self-controlled and possibly more emotionally sensitive and more introverted but bold than others. Creative scientists rate themselves high in professional self-confidence, self-sufficiency, independence, and emotional restraint and low in aggressiveness, assertion, social desirability, sociability and masculine vigour.

Creative people in different fields may have different personal characteristics. For example, it is commonly believed that the artist struck by sudden inspiration must get to his canvas quickly before his feeling vanishes. Different styles of creating within science have been studied with some success by Gough[41] suggesting similar possibilities in other areas of creativity.

Attempts to understand the personality correlates of divergent thinking abilities have been made by Getzels and Jackson[36], Mackinnon[67] and Torrance[110]. Torrance has summarized his researches on personality variables of highly creative person. In personality studies of highly creative children, Torrance found that three personality characteristics stand out, differentiating the highly creative children from

less creative but equally intelligent children. First, the highly creative children have a reputation for having wild and silly ideas, especially the boys. Second, their work is characterized by the production of ideas 'off the beaten track', outside this world'. Third, this work is characterized by 'humor, playfulness, relative lack of rigidity and relaxation'. Weisberg and Springer studies[122] show that the highly creative children were significantly higher on: strength of self-image, case of early recall, humour and uneven ego development.

MacKinnon[67] describes a syndrome of creativity including such aspects as (1) the creative person's self image as one who should be respected; (2) his sense of destiny about self; (3) his openness to experience; (4) his struggling towards reconciliation of opposites; (5) his seeking to tolerate increasing tension while striving for creative solutions to even more difficult problems, and (6) his high orientation to aesthetic and theoretical interests and values.

On the basis of elaborate psychological studies Hammer[52] found that the 'truly creatives' differed from the 'merely faciles' in that they exhibited deeper feelings, greater original responsiveness, preference for the observer role over the participant role, stronger determination and ambition, integration of feminine and masculine components, greater independence, rebelliousness and self-awareness, stronger needs for self-

expression, greater tolerance for discomfort and a fuller range of emotional expression.

A good picture of the highly creative person as contrasted with the highly intelligent emerges out of a study by Getzels and Jackson[36]. In their bid to discover significant variables differentiating the highly creative from the highly intelligent person, Getzels and Jackson examined the achievement motives, fantasy production, school performance and teacher preference of two types of adolescents. They found that the creative group rated aspects of personal aspiration, such as marks, I.Q., character and goal directedness lower than the high I.Q. group. The creative group rated a wide range of interests, emotional stability and sense of humour higher than the high I.Q. group. The high I.Q. group wanted to possess those qualities that would lead to success, whereas the creative child did not express ambitions in terms of that goal. Personal aspirations of the high I.Q. group were those which they thought teachers would approve; the creative children were unmindful of teachers' approval and showed a slightly negative correlation. Differences between the groups also appeared both in quality and quantity of occupational goals. The quantity of possibilities mentioned was significantly greater for the highly creatives. Also, the highly creative group mentioned a significantly greater proportion of

unconventional occupations than the highly intelligent group.

Taylor[100] has also given a picture of the creative individual as unconventional and as resisting the drives towards conformity and the conventional thinking often found in the schools. Barron[5] in his studies of highly creative people found them more original, less suggestible and more tolerant of structural disorderliness.

Reid, King and Wickwire[87] investigated the differences in cognitive and other personality attributes between twenty-four creative and twenty-four non-creative seventh-graders as nominated by peer ratings. The creative children were more sociable, more warm-hearted and less anxious. Students from upper class socio-economic backgrounds appeared more stable emotionally. Creative lower class boys were more confident and self-sufficient than non-creative lower class boys, but no differences were found among upper class boys. Creative lower class girls, however, were less confident and secure than non-creative lower class girls.

It is well to remember at this point that research on personality variables of creative children has not yet reached the point where we can safely formulate generalizations. Most of the studies cited above, including the

present are described in Chapter V, are quite limited in their scope both with regard to the population with which they are concerned and the controls they employ. Also the results have to be interpreted in the light of the techniques that have been employed in the identification of the creative group. The area of activity in which we discover creative talent may have much to do with the kind of personality qualities we discover. A creative writer might differ significantly in respect of personality characteristics from a creative scientist or a creative artist.

The following section of this chapter deals with the study of the relation of creativity and personality traits of the intellectually gifted high school students.

The T-scores on different aspects of creativity as well as personality traits were already available, as described earlier.

To test statistically whether creativity and personality traits are independent of or related to each other in case of intellectually gifted high school students (sample size : 935) the scores on creativity and personality were subjected to the correlational technique, viz. Product-Moment Method of Coefficient of Correlation (Scatter analysis).

The results in Table 6.3 reveal that there is not any consistent trend to infer something definite about the relation between creativity aspects and personality traits; in some cases there is positive correlation, in other cases negative; sometimes significantly, sometimes not so. In all cases, the sample size being 935, the standard error is .0327. The variance explained by correlation is very low varying from almost negligible to about one or two per cent only. All this is just expected, since generally creative persons differ notably in their personality.

The details of results in Table 6.3, however, show that Factor B (General intelligence vs Mental defect) was significantly and positively correlated with verbal fluency, figural fluency, figural flexibility, and figural originality and figural elaboration; Factor E (Dominance or Ascendance vs Submission) with figural fluency; Factor G (Character or Super ego strength vs Lack of rigid internal standards) with verbal fluency; Factor I (Premsia vs Harria) with verbal fluency, verbal flexibility, verbal originality and figural flexibility; Factor L (Protension (paranoid tendency) vs Relaxed security) with verbal fluency, verbal originality and figural fluency; Factor Q_1 (Radicalism vs Conservatism of temperament) with almost all creativity scores except figural originality; Factor Q_2 (Self sufficiency vs Group dependency (with verbal flexibility ; Factor Q_3 (High self sentiment formation vs

Table 6.3: Showing Coefficient of Correlation between Seven aspects of Creativity and Sixteen Personality Factors (Sample : 935)

Personality Factors	Verbal			Figural				Std. Error $\sigma_r = \frac{1}{\sqrt{N}}$	Coeff. of Determination (Variance explained	
	Fluency	Flexibility	Originality	Fluency	Flexibility	Originality	Elebaration		(Minimum)^2	(Maximum)^2
A	+.0037	+.0366	-.0016	-.0144	-.0098	-.0503	-.0132	.0327	.000013	.002530
B	+.07002*	+.0483	+.0523	+.1004**	+.0808*	+.0836*	+.1438**	.0327	.001918	.20678
C	+.0331	+.0509	+.0328	+.0017	-.0281	-.0019	+.0041	.0327	.000003	.002591
E	+.0161	+.0571	+.0153	+.0846*	+.0428	+.0385	+.0646	.0327	.000234	.007157
F	-.0128	+.0215	-.0426	+.0261	+.0221	+.0328	+.0179	.0327	.000164	.001815
G	-.2415**	+.0113	+.0332	+.0038	-.0052	-.0279	-.0309	.0327	.000014	.058322
H	+.0588	+.0434	+.0565	+.0114	+.0072	+.0097	+.0479	.0327	.000052	.003457
I	+.1051**	+.0957**	+.0931**	-.0148	-.0107	.0351	-.0185	.0327	.000115	.011046
L	+.0810*	+.0547	+.1098**	+.0657*	+.0105	+.0445	+.0573	.0327	.000110	.012056
M	+.0126	+.0028	+.0021	-.0249	-.0443	-.0241	-.0194	.0327	.000004	.001962
N	+.0506	+.0349	+.0464	+.0489	+.0394	+.0429	-.0087	.0327	.000076	.002560
O	+.0339	+.0123	+.0383	+.0005	-.0103	+.0115	-.0224	.0327	.0000003	.001467
Q_1	+.1209**	+.1525**	+.0921**	+.1245**	+.0811*	+.0341	+.1135**	.0327	.001163	.023256
Q_2	+.0589	+.0765*	+.0420	+.0399	+.0282	-.0204	+.0253	.0327	.000416	.005852
Q_3	+.0808*	+.3185**	+.1037**	+.0592	+.0444	+.0216	-.0165	.0327	.000272	.101442
Q_4	+.1106**	+.1028**	+.0756*	-.0437	-.0475	-.0292	+.0060	.0327	.000036	.012232

* Sig. at .05
** Sig. at .01

σ_r (Standard Error) for 935 = .0327

From Guilford's statistical table -

For 2 variables and df = 933
Significant Coef. of Correlation at .05 =.065 and at .01=.085

Poor self sentiment formation) and Q_4(High ergic tension vs Low ergic tension), with all verbal creativity scores.

To sum up, as far as the sample of gifted children (with I.Q. 120 and above) was concerned,

(i) there was positive and significant (though of low value) correlation between intelligent and all creativity scores, in case of 935 capably gifted children as well as in case of a separate sample of 325 functionally gifted children ;

(ii) almost all creativity scores correlated positively and significantly (though of low value) with achievement in all school subjects except English language and total achievement of all main subjects ;

(iii) finally, there was not significant correlation between different creativity scores and different personality traits, except in a few cases, such as Factors B (General intelligence vs Mental defect) E (Dominance or Ascendance vs Submission), G(Character or Superego strength vs Lack of rigid internal standards), I (Premsia vs Harria), L (Protension (paranoid tendency) vs Relaxed security) Q_1(Radicalism vs Conservatism of temperament, Q_2 (Self sufficiency vs Group dependency), Q_3 (High self sentiment formation vs Poor self sentiment formation), and Q_4(High ergic tension vs Low ergic tension), where it is usually expected.
