

Personological Basis for Higher Education Preferences in University Students

Dr. Tarika Sandhu

Asst. Professor, Dept. of Psychology Punjabi University, Patiala, India

Abstract: Personality dynamics capture not only the interplay of traits in manifest behavior but also the influence of thinking styles and nature of intellectual functioning. It becomes interesting to note how inclination towards educational operationalization such as arts and science domains could indicate the aforesaid characteristics. The present study was designed to assess the personality types, Field Dependence/ Field Independence cognitive modes of functioning and Divergent/ convergent thinking styles of university students studying in science and arts streams. The sample comprised of 50 students each in the arts and science domain from the university, age ranging 20-23 years. The psychological tests administered on the two groups were Cattell's 16PF (1973), TTCT by Torrance (1974), Culture Fair Intelligence Test (Cattell's, 1973) and Embedded Figure Test (Witkins, 1971). The two groups presented a varied picture on the above mentioned indices of personality dynamics.

Keywords: Arts/Science domain, Personality, Field Dependence-Independence, Convergent-Divergent thinking.

I. INTRODUCTION

Contemporary notions of personality can be best understood in the words of Mc Adams and Pal (2006) who explain it as an individual's unique variation on the general evolutionary design for human nature, expressed in a developing pattern of dispositional traits (extraversion, friendliness, dominance) characteristic dispositions (goals, strategies, motives, values, schemas) and self-defining narratives (individuals life stories that unify and create meanings) differentially situated in culture and social context. A comprehensive definition such as this leaves enough room for thought about the enduring differences that educational and vocational choices signify in an individual's life specifically such as in those people opting for science and arts streams which are inherently diametrically opposite in nature.

Substantial classic research on this front has been conducted by stalwarts such as Roe (1953) and MacKinnon (1960) who concluded scientists to be more analytical, logical and high on convergent in thinking whereas writers were attributed qualities of emotional tender mindedness, ability to generate many solutions to single problem, engaging more in fantasy etc. Concentrated at one end of the pure sciences are domains that are more logical, objective, and formal and at the other end of Arts streams are domains that are more intuitive, subjective, and emotional. Analyzing the content of each stream the physical sciences emerge as rational, precise, collective, and constrained by a strong disciplinary consensus, whereas the arts disciplines promote expressiveness, ambiguity, individualism, and freedom from external constraints. The experiences associated with each end show marked differences because of not only the content but due to personality description of people aligned towards them also. The disciplinary differential makes perfect sense since objectivity, rationality and precision collectively ensure success in the science domains than would clustering of traits such as emotionality, subjectivity, ambiguity, and individualism characteristic of arts stream and vice versa. Research on the developmental differences between individuals opting for science and artistic endeavors brings to the fore interesting insights. Only a few studies have appeared in this context yet they indicate a similar pattern consistent with what is seen in the science-versus-art comparisons. Chambers (1964) suggested that creative psychologists tended to have a more rebellious relationship with their parents than did chemists. Post (1994) and Roe (1953) revealed tense family relationships persisting into adulthood among 64 eminent scientists, with 41% of the social scientists experiencing divorce, in comparison with only 15% of the biologists and only 5% of the physical scientists. Finally, when researchers

examined a different developmental condition, they found that scientists from distinct disciplines often displayed early hobbies consistent with their disciplinary choices. In Roe's (1953) study of 64 eminent scientists, the physicists often showed an early interest in mechanical and electronic gadgets, whereas the social scientists most commonly exhibited an early fascination with literature and the classics. The latter were also far more likely to have once had aspirations to pursue literary careers. A noteworthy distinction that had appeared in Roe's (1953) study was that the scientists and architects differed significantly on convergence and divergent thinking dimensions. The ability to think in divergent and convergent ways had been Guilford's focus of research. His work demonstrated that that divergent production involved the cognitive processes of fluency, flexibility, originality and elaboration. Following Guilford's (1967) line of thought there has been a tendency among psychologists to regard divergent thinking as analogous to creativity and convergent thinking as complementary to intelligence. Literature reveals that convergers and divergers have a tendency to differ in certain ways which can be regarded as a result of unique ways of each in handling and processing information. Rump and Dunn (1971) have reported that arts students score higher than science students on tests of divergent thinking. These indications of connection between specialization in Arts subject with divergent thinking and Sciences subjects with convergent thinking appears to be meaningful in terms of different processes required in both the disciplines.

Another psychological construct namely field dependence/independence captures the nature of cognitive styles in individuals and which are inherently bipolar in nature. Zhang and Sternberg (2006) describe cognitive styles as related to how people interpret and analyze the world. According to Messick (1987) cognitive style is a 'bridge' between personality and cognition and in this sense it serves as a platform for future career choices. Field-dependent persons have difficulty separating more important from less important element of a problem with the result that parts of the field are experienced as fused. The second is the field-independent mode in which there is a clear differentiation between figure and ground. Individuals with high field independence have the ability to analyze the environment, breaking up the total field and attending to the relevant features while withholding attention from the less salient features. Kalgo (2001), Morgan (1997) and Koruluk (1987) highlighted that field dependent people are attracted by professional and academic fields that involve social content and interpersonal skills but do not demand analytical and restructuring abilities. Field independent persons have an affinity toward theoretical and scientific domains especially in the formal and pure sciences.

The present study aimed to search for differences on personality, convergent and divergent thinking and field independence-dependence dimension in students from arts and science faculties.

Hypotheses:

1. Subjects in arts specialization would be more affectothymic, low on ego strength, desurgent, tender minded, and imaginative while those in science specialization would be more sizothymic, emotionally stable, assertive, happy go lucky, relatively tough minded and practical.
2. Subjects opting for arts specialization would be divergers and subjects opting for science specialization would be convergers.
3. Subjects opting for arts specialization would be more field dependent as compared to subjects from science streams.

II. METHOD

Sample:

Sample (N=100) for the present investigation was drawn from different departments of faculty of Sciences (n=50) and faculty of social science and languages (n=50) from Punjabi University, Patiala age ranging (20-23) years. Sampling could be described as incidental because only those departments were covered where access to students was possible and only those subjects (both male and female) were taken who reported that the basis of their choice of subjects (Arts/Science) for specialization was their own. Care was taken to include equal number of boys and girls to rule out any possibility of sex domination in the findings. Students who showed lack of interest in giving information or those having relatively different socio-economic and cultural background were eliminated from the sample. Faculty and department-wise split of the total sample is given in table I (a) (Science faculty) and table 1 (b) (Arts faculty).

As indicated in the tables, 50% of the total sample belonged to the faculty of natural science and the remaining to the faculty of social science and languages.

TABLE-I (a): DEPARTMENT-WISE DISTRIBUTION OF SUBJECTS IN GROUP-I (SCIENCE)

Sr. No.	Department	No. of Subjects
1	Bio-technology	4
2	Botany	10
3	Chemistry	16
4	Forensic Science	3
5	Mathematics	3
6	Physics	8
7	Zoology	6
Total:		50

TABLE-I (b): DEPARTMENT-WISE DISTRIBUTION OF SUBJECTS IN GROUP-2 (ARTS)

Sr. No.	Department	No. of Subjects
1	Defense Studies	1
2	Economics	12
3	Education	5
4	English	3
5	Hindi	3
6	History	3
7	Law	7
8	Philosophy	3
9	Pol. Science	3
10	Psychology	2
11	Public Administration	6
12	Punjabi	2
Total		50

1. 16 Personality Factory Inventory (Cattell, R.B., 1973):

Cattell's 16 Personality Factor is the most extensively used inventory for the assessment of personality in psychological research. The 16 dimensions of personality measured in this test are not just unique to the test but instead rest within the context of a general theory of personality. These sixteen dimensions are essentially independent. Any item in the test contributes to the score on one and only one factory so that no dependencies were introduced at the level of scale construction. The scale consists of 187 test items measuring the following sixteen primary factory of personality.

Factor A: Outgoing, warmhearted, easygoing, participating, Vs reserved, detached, critical, aloof and stiff.

Factor B: Bright Vs Dull.

Factor C: Emotionally stable, mature, faces reality, calm Vs Affected by Feelings, emotionally less stable, easily upset, and changeable.

Factor E: Assertive, aggressive, competitive, stubborn Vs Humble, mild, easily led, docile, accommodating.

Factor F: Happy-go-lucky, enthusiastic Vs Sober, taciturn, serious.

Factor G: Conscientious, persistent, moralistic, staid Vs Expedient, disregard rules.

Factor H: Venturesome, uninhibited, socially bold Vs Shy, timid, threat sensitive.

Factor I: Tender-minded, sensitive, clinging over protected Vs Tough-minded, self-reliant, realistic.

Factor L: Suspicious, hard to fool vs Trusting, accepting conditions.

Factor M: Imaginative, bohemian, absent-minded Vs Practical, 'down-to earth' concerns.

Factor N: Astute, polished, socially aware Vs Forthright, unpretentious, genuine but socially clumsy.

Factor O: Apprehensive, self-reproaching, insecure, worrying, troubled Vs self-assured, placid, secure complacent, serene.

Factor O1: Experimenting, liberal, free thinking Vs conservative, respecting traditional ideas.

Factor O2: Self-sufficient, resourceful, prefers own decision Vs Group dependent, a "Joiner" and sound follower.

Factor O3: Controlled, exacting will power, socially precise, compulsive, following self-image Vs undisciplined self-conflict, lax, follows own urges, Careless of social rules.

Factor O4: Tense, frustrated, driven, over wrought Vs relaxed, tranquil, torpid, unfrustrated, composed.

In 16 PF, each answer score 0, 1 and 2 points except for factor B (Intelligence) where answer score 0 for incorrect and 1 for correct. The test can be either hand-scored with a stencil key or machine scored.

2. Group Embedded Figure's test (Witkins et al. 1971):

It is a perceptual test requiring the subject to locate a previously seen simple figure which has been so organized as to obscure or embed the sought after sample picture. The EFT consists of three sections (a, b, c and a set of 7 simple figures). Group Embedded figures test is an adaptation of the embedded figure's test in order to make the group testing possible. The test has a fairly high reliability between parallel forms i.e., 0.82 for both male and female samples.

3. Culture Fair Intelligence Test (Cattell, R.B., 1973):

This test was considered as a tool for convergent thinking. It has been widely used as a measure of Intelligence in a manner designed to reduce as much as possible, the influence of verbal fluency, cultural climate and educational level. The attributes which have been considered as an integral part of intelligence are measured by the test viz. ability to reach at correct solution, i.e., finding exact synonyms, solving arithmetical problems and recognizing analogies. The scale 2 of culture fair test consists of the following four subtests:

a. Series: In this subtest the subject has to complete the series selecting the correct alternative from a given set of choices.

b. Classifications: In this the subject has to identify that item which does not belong to the other items in that series, i.e., the 'odd man out' sort of problems.

c. Matrices: In this category the subject has to mark that item out of a given set that correctly completes the given matrices or pattern.

d. Conditions: Require the individual to select from the five choices provided the one which duplicates the condition given in the far left box.

The reliability and validity coefficients as given in the manual are quite high and have been evaluated across largely diverse populations.

4. Torrance test of Creative Thinking (Figural forms, Torrance, E.P., 1974):

Torrance's method of assessment of creative potential especially figural forms emphasize the ability to generate many new ideas (fluency) that are unusual (originality) and represent a variety of categories (flexibility) as well as ability to embellish the ideas (elaborations). Test battery comprised of three figural activities:-

Figural tasks	Time allotted
1. Picture construction	10 min
2. Picture completion	10 min
3. Lines	10 min

In the Picture construction task something clever and unusual is expected to be drawn using an egg shaped piece of paper. In the Picture completion task abstract lines are to be completed as objects. In the Parallel lines task the parallel lines are to be completed as objects.

Administration and scoring:

All the tests were administered in two different sessions in a group setting, each group comprised of 5-8 subjects each. A relaxation break of 20 minutes was given to the participants in between the two sessions. Efforts were made to establish rapport with the students so that authentic and reliable information could be elicited from them. For this purpose they were apprised of the purpose of investigation as being purely scientific and were assured that the information collected from them would be kept confidential.

Analysis:

Means and t-ratio were calculated for the two groups belonging to Arts and Science stream on the indices of the 16PF, CF, TTCT and GEFT.

TABLE-1: SHOWING MEANS FOR GROUP I (SCIENCE N=50) AND GROUP II (ARTS N=50) ALONG WITH T-RATIOS

Sr. No	Variable	Group I Mean	Group 2 Mean	t - ratio
1	A	8.62	9.88	2.45*
2	B	7.98	7.78	.464
3	C	13.62	15.1	2.189*
4	E	11.82	12.28	.659
5	F	10.36	10.46	.132
6	G	12.88	11.64	1.410
7	H	11.9	11.9	0
8	I	10.42	11.22	1.246
9	L	10.18	8.94	2.156*
10	M	11.4	11.64	.410
11	N	11.22	10.5	1.325
12	O	12.22	11.38	1.118
13	Q1	9.02	10.22	2.01*
14	Q2	12.22	10.76	2.260*
15	Q3	12.4	12.58	.350
16	Q4	13.0	12.02	1.31
17.	FD/I	7.86	6.36	1.698
18.	Con	31.78	29.42	1.815
19.	Div(total)	53.06	55.6	0.676
20	Flu	19.1	20.78	1.258
21	Flex	4.320	4.238	1.158
22.	Orig	19.98	19.88	.05
23.	Elab	54.9	50.54	.923

*showing significance at .05 level.

1. Personality traits and Arts/ Science specialization:

The overall picture which emerged regarding personality characteristics predominant in students opting for Arts/ Science specialization was as follows. Individuals in the field of science significantly differed from those in the arts stream on

Factor A i.e., they tended to be reserved (Sizothymic), conservative in temperament, mistrusting and usually deliberate in their actions. Students from science streams were also significantly higher on Factor L i.e., they were more suspicious, hard to fool in contrast to arts stream students who could be described as relatively more trusting, and accepting of conditions. Finally the domination of science students over arts students was observed on the Factor Q2 i.e., they were generally remaining unconcerned about other people and experienced self-sufficiency. These results paint a vivid picture of the typical scientifically oriented individual who while working relies heavily on his judgments, strong in conviction and very methodical in action. Contrarily in Arts, individuals tend to be affectothymic i.e., easy going and warm hearted and higher on Factor C i.e., stronger super ego strength which is indicative of involvement in one's own ego and higher maturity. Higher ego strength among arts students is in opposition to the formulated hypothesis which had attributed this quality to scientifically inclined students. The plausible reason behind this could be that at the beginnings of marked scientific pursuits the individual remains uneasy and doubtful in absence of supportive empirical evidence. Whereas the members of group 2 are steady in mind before they begin their creative exploits. The Arts group students were also found to be statistically higher on Factor Q1 i.e., they were more experimenting, liberal, free thinking than the science stream students pointing towards greater flexibility of thought. Feist (1998) provides partial empirical support when he concludes that in general, artistically creative people were more open to new experiences, less conventional and less conscientious, more self-confident, self-accepting, driven, ambitious, dominant, hostile, and impulsive. Using the BIG 5 framework the largest differences among scientists and artists were found on openness, conscientiousness, self-acceptance, hostility, and impulsivity. Further, there appeared to be temporal stability of these distinguishing personality dimensions especially in context of creative people. The dispositional impact on behavior transferred into social, cognitive, motivational, and affective dimensions of artistically oriented individuals. Recent research by Simonton (2014, 2012) lays great emphasis on how writers, composers, and artists differ from each other as well as from eminent scientific creators and its implications for socio cultural economic milieu of the nation.

2. Field Independence /Dependence and Arts/Science specializations:

No significant difference in the mean scores of two groups of arts and science specializations were found on the dimension of field independence and field dependence. Hence the hypothesis formulated in this concern has been disconfirmed. Mc Rae and Young (1990), Hansen (1995), Kelleher (1997) provide evidence of the science student to be field independent. A plausible reason that the result could not be ascertained in the present investigation was that opting for specializations in higher education in India was related to many socio cultural factors rather than the cognitive orientations of the individual.

3. Convergent/Divergent Thinking and Arts/Science specializations:

No significant difference in the mean scores of two groups of arts and science specializations were found on the dimension of Convergent/Divergent Thinking. Hence the hypothesis formulated in this concern has been disconfirmed also. A closer look at the mean score though indicates that the arts group was slightly higher on Divergent thinking as compared to the science group. None of the sub dimensions of fluency, flexibility and elaboration also displayed any significant variation in the two groups though elaboration scores were relatively higher in the science group. The science students scored higher on convergent thinking than the arts group but this too did not attain any level of significance. Studies by Runco (1986), Al Naeme (1991) provide evidence of students of science to be high on convergent thinking.

III. CONCLUSION

Students from the Arts stream differed significantly from their counterparts in the science domains on indices of trust i.e. they were more accepting of conditions and trustworthy in nature. Arts students were relatively higher on ego strength than students from science domains. No other statistical difference was observed in any of the psychological dimensions. Contemporary research suggests that many disciplines in these two specializations inherently require similar personological patterns for successful understanding and application. Interestingly, Orton (1992) argues that subjects of biology, geography and economics necessarily do not require specific inclinations either towards convergent or divergent thinking. We may conclude that contemporary course curriculums require an amalgamation of both divergent and convergent thinking in both science and arts domains. Also the selection of specializations by students in higher education in India is mediated by personal, social and cultural factors instead of pure personality, ability, and cognitive style capacities.

REFERENCES

- [1] Barron, FX, and Harrington, DM (1981), Creativity, Intelligence and Personality, *Annual Review of Psychology*, 32, 439–476.
- [2] Cattell, HB (1989) *The 16PF: Personality in Depth*. Champaign, IL: Institute for Personality and Ability Testing.
- [3] Cattell, HE and Schuerger, JM (2003) *Essentials of the 16PF*, New York: John Wiley & Sons.
- [4] Cattell, RB (1973) *Personality and Mood by Questionnaire*, San Francisco: Jossey-Bass San Francisco.
- [5] Cattell, RB, Cattell, AK, and Cattell, H.E.P. (1993) *16PF Fifth Edition Questionnaire*, Champaign, IL: Institute for Personality and Ability Testing.
- [6] Chambers, JA (1964) Relating personality and biographical factors to scientific creativity, *Psychological Monographs*, 78.
- [7] Cynthia W. (1965) Creativity and Adaptive Regression, *Journal of Personality and Social Psychology* 2:161-169.
- [8] Feist, GJ (1998) A meta-analysis of personality in scientific and artistic creativity, *Personality and Social Psychology Review*, 2, 290–309.
- [9] Field, TW and Poole, ME (1970) Intellectual Style and Achievement of Arts and Science Undergraduates, *British Journal of Educational Psychology*, 40: 338–341.
- [10] Guilford, JP (1967) Creativity, Yesterday, Today and Tomorrow, *Journal of Creative Behavior*, 1, 3-13.
- [11] Guilford, JP (1967) *The nature of human intelligence*, New York: McGraw-Hill.
- [12] Hein, A and Diamond, RM (1971) Independence of Scotopic and Photopic systems in acquiring control of visually guided behavior, *Journal of Comparative and Physiological Psychology*, 76, 33-38.
- [13] Karson, M, Karson, S, and O'Dell, JW (1997) *16PF Interpretation in Clinical Practice: A guide to the Fifth Edition*, Champaign, IL: Institute for Personality and Ability Testing.
- [14] Mackinnon, DW (1960) The Highly Effective Individual, *Teachers' College Record*, 61, 367-378.
- [15] McAdams, DP, and Pals, JL (2006) A new big five: Fundamental principles for an integrative science of personality, *American Psychologist*, 61, 204–217.
- [16] Roe, A (1953) *The making of a scientist*, New York: Dodd, Mead.
- [17] Root-Bernstein, R, Allen, L, Beach, L, Bhadula, R, Fast, J, Hosey, C (2008) Arts foster scientific success: Comparison of Nobel prize winners, Royal Society, National Academy, and Sigma Xi members, *Journal of the Psychology of Science and Technology*, 1(2), 51–63.
- [18] Rump, EE, and Margaret D (1971) Extensions to the Study of Science Students' Divergent Thinking Ability, *Nature* 229, 349 – 350. doi:10.1038/229349b0
- [19] Runco, MA (1986) Divergent thinking and creative performance in gifted and non-gifted children, *Educational and Psychological Measurement*, 46, 375-384.
- [20] Simonton, DK (2012a) Creativity, problem solving, and solution set sightedness: Radically reformulating BVS, *Journal of Creative Behavior*, 46, 48–65.
- [21] Simonton, DK (2012b) Foresight, insight, oversight, and hindsight in scientific discovery: How sighted were Galileo's telescopic sightings, *Psychology of Aesthetics, Creativity, and the Arts*, Advance online publication, doi: 10.1037/a0027058.
- [22] Simonton, DK (2012c) Taking the US Patent Office creativity criteria seriously: A quantitative three-criterion definition and its implications. *Creativity Research Journal*, 24, 97-106.
- [23] Walker, EL (1980) *Psychological Complexity and preference: A hedging theory of behavior*, Monterey, California: Brooks-Cole.