CHAPTER III
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THE MEANING, CONCEPT AND THEORIES OF INTELLIGENCE

Having traced the history of intelligence testing, it is in the fitness of things to try to understand the nature of intelligence developed as a result of the first test constructed by Binet and Simon. There were attempts to define and measure intelligence before Binet. The Philosopher's interest in intelligence dates back to Aristotle and that of the Biologists to Darwin. Guilford reminds us that the modern notion of intelligence as a unitary entity was a gift to psychology from the biologist through the instrumentality of Herbert Spencer (Burt, P. 160.)

According to Spearman the concept of intelligence crossed the several stages. In Greek the term 'Nous' noesis means power that could be taken to provide the human mind with universal abstract ideas. In Latin it is intellect and 'intelligentia'. In English it is 'intellect' and 'intelligence' respectively. In Sanskrit the word (Buddi) equivalent of intelligence is derived from the root (Buddh) to know or to understand. The word budha means intellect. But (buddha) means one who posses great intellect or knowledge. Herbart
Spencer defines intelligence in 1983 as the mental adjustment of internal relations to external relations.

1. Definitions:

Binet defines Intelligence as "judgement of common sense, initiative, the ability to adapt one self," and again to judge well, understand well, reason well." His definition emphasized 3 phases of behaviour.

(i) The ability to take and maintain a given mental task

(ii) The capacity to make adaptations for the purpose of attaining a desirous end.

(iii) The power of auto-criticism.

Burt: It is the power of re-adjustment to relatively novel situations by organising new psycho-physical combinations.

Buckingham: Intelligence is the ability of acting effectively under given conditions. It is the ability to learn.

Colvin: Intelligence is a group of innate capacities by virtue of which the individual is capable of learning in a greater or lesser degree in terms of those innate capacities with which he is endowed.

Freeman, F.M.: It is the ability to learn actions or to perform new actions that are functionally useful.
Garret: The abilities demanded in the solution of problems which require the comprehension and use of symbols, i.e. words, numbers, diagrams, equations and formulae etc.

Piaget: Intelligence constitutes the state of equilibrium towards which tend all the successive adaptations of sensory motor and cognitive nature as well as all assimilatory and accommodatory interactions, between the organism and the environment.

Rex Knight: It is the capacity for relational, constructive thinking directed to the attainment of some end.

Spencer: It is the ability which each individual has of guiding or controlling his adjustment to an ever changing environment by combining his impressions and organising his reactions.

Stern: It is a general capacity of an individual consciously to adjust his thinking to new requirements.

Stoddard: Intelligence is the ability to undertake activities that are characterised by (a) difficulty - (b) complexity (c) abstractness (d) economy (e) adaptiveness (f) a good Social value and (g) the emergence of originals and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional force.

Terman: An individual is intelligent in proportion to the ability to carry on abstract thinking.
Thorndike: It is the power of good responses from the point of view of truth.

Thurstone: It can be judged by the degree of incompleteness of the alternatives in the trial and error life of the individual.

Walter B. Kolesnik: Intelligence comprises the following:
- the ability to profit by experience,
- the ability to adjust to one's own environment,
- the ability to solve problems,
- the ability to perceive relationships,
- the ability to think abstractly and
- the ability to learn.

Wechsler: Intelligence is the aggregate or global capacity of an individual to act purposefully to think rationally and to deal effectively with environment.

Wood Worth: To be intelligent, a test subject has to see the point of the problem now set to him and to adapt what he has learned to this novel situation.

A close study of the variety of definition reveals that they can be broadly classified into one of the following three groups.

1. One group of definitions places the emphasis upon adjustment or adaptation of the individual to his total environment. According to this Intelligence is general mental
adaptability to new problems and new situations of life. It is the capacity to recognise one's behavioural, patterns so as to act more effectively and more appropriately in novel situations. Thus the more intelligent person is one who can, more easily and more extensively vary his behaviour as changing conditions demand. Therefore, a more intelligent person can deal with a greater number and greater variety of situations than the less intelligent.

(2) A second type of definitions state that intelligence is the ability to learn. Accordingly, therefore, a person's intelligence is a matter of the extent to which he is educable. The more intelligent a person is the more readily and extensively is he able to learn.

(3) A third group of definitions intelligence is the ability to carry on abstract thinking. This means effective use of concepts and symbols in dealing with situations, especially those presenting a problem to be solved through the use of Verbal and numerical symbols. Binet's conception of intelligence belongs largely to this type, since he held that intelligence is the capacity to reason well, to judge well, and to be self-critical.

Analysis of mental ability: The various definitions of intelligence considered so far are functional in character that is, they state how intelligence operates through learning, adaption, and abstract thinking but, in addition,
Psychologists have been concerned to know the 'structure' of intelligence. They have made analysis in the effort to determine its underlying factors. The purpose of these analysis has been to discover, if possible, the elements or components of intelligence, not only for a better theoretical understanding of this complex process, but also to learn that might be the implications for the design and construction of mental tests.

Test makers are advised to solve the problem by saying that intelligence is what the intelligence tests measure. But that is equivalent to saying that time is what the clock measures. Looking into them one can say on a closer scrutiny of these and other definitions that it reveals a unity underlying the seeming diversity. They appear rather, to be different ways of saying the same thing.

Statistical techniques have lead psychologists to conclude that intelligence is not a single power or capacity or ability which operates equally well in all situations. It is rather, composite of several different abilities. Thurstone classifies them as (1) Spatial (S) (2) Perceptual (P) (3) Memory (M) (4) Number (N) (5) Verbal (v) (6) Word-fluency (W) (7) Reasoning (R).

Thorndike suggested three main types of intelligence (i) Social intelligence (ability to understand and deal with persons) (ii) Concrete intelligence (ability to understand and deal with things) (iii) Abstract intelligence (ability
to understand and deal with verbal and Mathematical symbols)

The Nature of Intelligence: The intellectual ability described so far is innate or a acquired or both and if both, to what extent, is a problem of considerable dispute among psychologists. The mental endowments of a human beings are too complex to be clearly viewed and experimentation under perfect conditions is not a possibility. Besides this, environment itself is a complex thing. It includes pre-natal as well as post-natal influence. In differential Psychology Anastasi comments "Environment is a very broad concept, ranging from the intracellular and intercellular environment with in the organism itself to the manifold external influence that impinge upon it from conception to death. An individual's environment includes all stimuli to which he responds. Hence the affective environment of two persons will differ even if both persons are placed in identical surroundings."

(Anastasi, P.83.)

Hence it is argued that the gift of the gifted is a social inheritance, not a biological one and that what parents bequeath to their off-spring are not their talents but their privilege. Hence the genius is made, not born (Burt, Pp 7-8). But Kohs recognises the inborn element in mental ability. "It seems evident that if one is born with good mental endowment his brain will synthesize to a degree and in a manner impossible to one whose mental endowment is poor" (Koh's quoted by C.L. Bhatt, p 11).
V.V. Kamath also favours the presence of native intelligence which is measured by intelligence tests. "Native intelligence always manifests itself through acquired knowledge or skill or action. Pure abstract intelligence does not exist. It always requires as it were a vehicle on which to ride" (Kamath P 17 quoted by C.L. Bhatt P. 23).

Those who maxin concluded the nature-nurture controversy and who are moderate in their emphasis, caution the test makers by saying "to ask how much of an intellectual or personality trait depends upon heridity and how much upon environment is a meaningless question. The question should be reformulated in terms not of how much but of how" (Anastasi, p. 83).

A clear understanding of the problem is also necessary for the test maker, in so far as he is expected to interpret the test scores and indicate the predictive value of his newly developed tests, for guidance of the users of the tests.

2. Some important theories of Intelligence:

Theoretical back-ground is indispensable for a test maker in order to have a correct concept of the nature and structure of intelligence.

Faculty theory:

Up to the nineteen-th century, it was generally believed that the mind is made up of a number of separate
and distinct 'faculties' such as memory, observation, discrimination, concentration, reasoning, imagination, perception, and will. It was thought that the mind is so compartmentalised that any one of them could be strengthened through an appropriate kind of exercise (Kolesnik 1970, p. 137). This theory has been replaced by better theories given by later psychologists.

Multi-factor theory:

According to E.L. Thorndike, intelligence is constructed of a multitude of separate factors, each one of them being a minute element of ability. "There are no such things as general intelligence or general mental ability, there are specific stimuli and specific mental responses" (Kolesnik, 1970: p.137). So every mental act involves a number of these minute elements operating together. But Thorndike himself admit that in constructing a mental test his "Atomistic" theory is of less practical significance than the conception that many of the specifics operate together in any situation demanding intelligence. This is illustrated by his scale, known as (C.A.V.D. Test)

Thorndike divides intelligence into 4 classes:

(i) C i.e. verbal completion
(ii) A i.e. intelligence in arithmetical situation.
(iii) V i.e. intelligence with respect of vocabulary.
(iv) D i.e. intelligence with respect to verbal direction.
Two-Factor theory:

According to this theory, Speaman states "all branches of intellectual activities have in common one fundamental function (or group of functions) whereas the remaining or the specific element of the activity seem in every case to be wholly different from that of others" (Verson, 2 p.12)

The general factor 'g' is a kind of mental energy common to every mental act. Essentially it is an ability to pursue relationships. The amount of 'g' varies from person to person. Specific factors 'S' are abilities to do particular things. These are numerous but indefinite in number and vary from individual to individual.

Spearman's theory enables a test maker to devise satisfactory tests of 'g'. Spearman derived this theory through the use of factor analysis which is essentially an extension of the co-efficient of correlation. When three tests, say reading, arithmetic and understanding symbols, correlate positively, the assumption is that they are measuring the same mental ability or general factor of intelligence to a certain extent.

Fig. 1 Spearman's Two factor Model.
The fact that a person performs better in one of these than in the other is explained by specific factors which are necessary for reading but not for symbols and arithmetic or vice-versa. Spearman has pointed out in his book on "Abilities of Man" that 'g' is a constituent which is common to all abilities interconnected by tetrad equation \( r_{ap} \cdot r_{aq} + r_{aq} \cdot r_{bp} = 0 \) where \( r \) stands for any correlation while sub-scripts bq, aq, ap, bp represent the two abilities. Spearman regarded 'g' as general mental energy of the individual. Spearman's "Principles of Neogenesis" is an ever lasting contribution to psychology. Wechsler puts it "Spearman's demonstration of the existence of at least one pervasive factor in all performances requiring intellectual ability remains one of the great discoveries of psychology."

Criticism of the two factor theory:

The theory has been subjected to much criticism both on psychological and on statistical grounds. Statisticians pointed out that although the analysis of two factors general 'g' and specific factors 's' is legitimate when the tetrad difference criterion is satisfied, yet this is not the only possible mode of analysis, that if mental abilities consisted of larger number of overlapping group factors, the same criterion would still be satisfied.

Spearman's theory has been vehemently criticised by Thompson Hull, Kelly, Garret, and Wilson. Thompson has given
the sampling theory of intelligence while Kelly put forward on the basis of his own analysis a multiple factor hypothesis rather than that of a single 'g' factor. They call it weighed group factor theory.

**Group Factors:** Studies on factor analysis and refinement of techniques compelled psychologists to differ with Spearman with regard to the existence of group factors over and above the 'g' and the specifics. Thurstone concludes that intelligence is composed of a number of groups or families of closely related abilities. They are called primary mental abilities (PMA). He has identified six such group factors such as V-Verbal factor (the ability to understand ideas expressed in words) N-Number; S-Spatial, W-Word Fluency, R-Reasoning, M-Memory. These abilities constitute general intelligence. They are considered to be relatively independent so that a person proficient in one is not necessarily so in another. But correlations among them are almost always found to be positive, which means that those who are average (or above or below) in one are usually found to be average (or above or below) in the other. The findings suggest that the various types of mental activities have something in common and that they may all be governed, to some extent, by a general power or ability, but the difference in an individual's performance in these six areas seems to indicate that each depends upon the operation of a separate ability or factor. Spearman was also convinced of the
existence of broad factors, but he held that very few specific factors cover broad ground and so the existence of broad factors was an exception rather than a rule.

**Sampling theory:**

Sir Godfrey Thompson levels his criticism against the Two-Factor theory from a different angle. He holds that the hierarchical order and the zero tetrad difference can be explained by his sampling theory, according to which "any activity such as a mental test calls upon a sample of bonds which the mind can form, and that some of these bonds are common to two tests and cause their correlation." (Thompson quoted by Desai P.28) According to the sampling theory, the hierarchical order or zero tetrad difference is the most probable connection to be found among the correlation coefficients. If the tetrad differences in actual practice were always exactly zero or within limits of sampling error, the theory of one general factor would have to be accepted, for it gives exact zero tetrad-difference, while the sampling theory only asserts a tendency in that direction "some are richly endowed by heredity, some by opportunities in environment and education, some by both, some by neither" (Thomson 5, p. 54). "The sampling theory neither denies nor asserts - general ability. Nor does it deny specific factors" (Brown & Thomson, p. 189).
The Multiple Factor theory:

The factor analysis techniques lead to a number of investigations of the factors of human ability. In 1938, Thurstone published an analysis of fifty-six tests given to 240 college students. This investigation seemed to cause a complete break with Spearman, for it revealed no 'g' at all but a series of distinct multiple factors such as, V-Verbal, P-Perceptual speed, I-Inductive reasoning, N-Number, M-Rote Memory, D-Deductive reasoning, W-Word Fluency and S-Space or Visualisation. Spearman quickly re-worked Thurstone's work and showed that they could equally well be analysed to yield a large general factor and smaller group factors. Both the solutions are equally valid mathematically. Thurstone, Kelley, and many other American psychologists have divided up 'g' among multiple primary factors. Thurstone, however, has lately discovered super-factors, different from primary factors and called them second order general factors (of which 'g' may be one). He describe primary factors as facilities in the mind or media of expression, and regards second order factors as more central (Vernon quoted by Desai, p.29).

Hierarchical Group-Factor theory:

This theory has been championed by Vernon. He has attempted to provide contents to the hierarchical classification proposed by Burt. As the newly discovered factors increased, the need for putting them into some kind of logical interrelationship became the necessity and hence the
emergence of this theory. It is not an established fact rather a hypothesis. As such it would be accepted with certain reservations. The theories and definitions of intelligence have suggested that the mental operations which depend most markedly upon intelligence operations which involve (a) discerning relations between things or ideas, (b) education of correlates (c) a combination of (a) and (b).

Every intellectual activity depends to some extent upon the general factor, but its proportionate influence is preponderant in the learning of languages, mathematics etc. (These activities are supposed to be highly saturated with 'g') but specific factors are of more importance in activities like drawing, music etc.

(a) The Burt's Model:

Cyril Burt has conceived a hierarchical type of model, which is like an inverted tree, as seen in Fig.2. The model applied to the whole of human mind with the first major dichotomy between intellectual characteristics or 'g' and 'practical' or behavioural characteristics. Among the practical abilities he placed priority for psychomotor abilities and abilities for dealing with space and mechanical affairs.

![Fig. 2 Burt's Hierarchical Model](image-url)
Burt expressed his views that 'g' is developed from or consists of a number of factors, and these factors are related to 'g' in Hierarchy.

(b) The Vernon's Model:

According to Vernon, all human abilities could be structured hierarchically, under 'g' with major group factors, minor group factors, and specific factors. Under 'g' are two major factors V;ed for Verbal-educational, on one hand and K;m for knowledge and memory on the other. The latter is called "Practical", as in the Burt's model. The former V;ed, subdivides into verbal and numerical, while the latter, K;m subdivides into three ways, space-ability, manual ability and mechanical information.

General (g)

Fig. 3 Vernon's Hierarchial Model.

He claims that if the diagram could be worked out completely to cover all the human abilities, the 'g' variance might amount to about 40% the major and minor group factors to some 10% each and the remaining 40% would consist of very narrow group factors. (Vernon 1950 p.28).
Jean Piaget's theory of Intelligence:

The scope of intelligence Piaget holds is that intelligence is always active and makes an active contribution towards any situation with which an individual is in contact. Intelligence is present in action, in perceptions, in images, in language and it could be applied to any content areas of interest. According to Piaget, intelligence is constructive, in fact, development of intelligence is but gradual creation of new mechanism of thinking. It is creative because it is not the discovery or copy of anything that has any physical existence.

His view is that the way how individuals acquire knowledge constitutes the key to understanding intelligence. About the operations of the human mind Piaget is of the opinion that the development of an individual's intellectual functioning goes on increasingly in the direction of formal logic and some individuals going much farther than the others.

Piaget distinguishes three aspects of intelligence, content, function, and structure. The content involves the observable aspects of behaviour, whereas the function pertains to broad principles of intellectual ability. Principles that apply quite generally regardless the age or state of development of the individual. The structure is essentially equivalent to knowledge. This aspect changes with age and with experience.
According to Piaget the unit of intellectual development is a schema. Schema means a unitary behaviour pattern which is elicited by a stimulus in a predictable manner and can be coordinated with other patterns of behaviour. There are three stages according to Piaget which are essential for intellectual development. They are the sensory motor stage, the stage of concrete operations and the stage of logical and abstract thinking. There are six sub-stages in the first stage of sensory-motor intelligence: Viz (1) exercising the inherited schema (reflexes) (ii) primary circular reactions (iii) secondary circular reactions (iv) coordination of learning schema (means and behaviour) (v) Tertiary circular reactions (inventions of new means by experimentation) and (vi) representation of schema. Internationalisation of sensory motor schemata and detour behaviour). This stage lasts for the first two years of a child.

In the second stage, the period from two to eleven years is characterised as one of the developments of concrete operations looking forward to formal operations later. Within this period are recognised six major stages, each with sub-stages. After this, comes the last stage of formal operations or logic or abstract thinking. This period of development is assigned to years from eleven to fifteen during which the child's thinking acts in terms of formal logic. He thinks, at this stage, in terms of representation of things, freed from space-time existence, much of his information being put into
proportional forms as needed in logic. This is the average adult level, in which many individuals do not achieve anything more intellectually. (Guilford 1967 p. 427). In these stages it is the sequence and not the exact age limit that is important. There are a number of well controlled studies under-way to see to what extent Piaget's formulations and observations about sequence are corroborated.

John P. Dececco accepts the concept of Piaget with regard to functional invariants including assimilation and accommodation of the schemes. He states "The alleged limitations result from ingrained prejudices which have little supporting evidence. The practical limitations result from the need to develop our notion of intellectual processes. As our understanding of new areas of cognitive entering behaviours and our skill in designing instructional procedure improves, we will have the means for supplementing IQ scores as predictors of school achievement." He classifies 'g' factors into two.

High 'g' factor: (1) Definition of abstract words (2) Arithmetical reasoning (3) Difference among abstract words, (4) Essential differences (5) Proverbs (6) Sentence building (7) Verbal absurdities (8) Vocabulary.

Low 'g' factor: (1) Enclosed box problem (2) Memory for Stories (3) Paper cutting (Visual imagery) (4) Plan of search (5) Problems of fact (6) Repeating digits (Forward
order) (7) Repeating digits (reverse order) (8) Reproducing a beaded chain from memory.

According to Dececco Tests of General intelligence are called scholastic aptitude tests, in the sense that they predict future educational or training achievement. To many educators, however, aptitude is merely a ephemism for intelligence. A deficiency in scholastic aptitude does not carry the same stigma as does a deficiency in intelligence. A deficiency in scholastic aptitude may condemn the student to academic hardship but not necessarily to failure in his post graduation life. Also to many educators and psychologist, scholastic or general aptitude describes only one type of aptitude. They have postulated many others that is, abilities which are independent of one another on general intelligence. A deficiency in general aptitude or intelligence then describes only one area of the individual’s capacities. Common sense, however, prompts many of us to believe that intelligence is a necessary but not a sufficient ingredient for success or, atleast, that the possession of intelligence, scholastic aptitude or whatever, is not a proven handicap in carving out one's destiny in or out of school. He concludes "having a high IQ is not a guarantee of success and happiness, but it is certainly not a handicap for occupational and social success (for women no less than for men) and also for creative achievement in the liberal and scientific discipline." (J.P. Dececco p. 121).
Guilford's "Structure of Intellect" Model:

'Structure of Intellect' is a significant outcome of the research work carried out by Guilford and his associates in factor analysis of mental abilities. This model classifies intellectual traits along three cubic dimensions.

Operations - What the respondent does. These include cognition, memory, divergent production (Prominent in creative activity), convergent production, and evaluation.

Contents - the nature of the materials or information on which operations are performed. These include figural, symbolic (e.g. letters, numbers), semantic (e.g. words), and behavioural (information about other persons' behaviour, attitudes, needs, etc.)

Products - the form in which information is processed by the respondent. Products are classified into units, classes, relations, systems, transformations, and implications.

Since this classification includes $5 \times 4 \times 6$ categories, there are 120 cells in the model. In each cell, at least one factor or ability is expected; some cells may contain more than one factor. Each factor is described in terms of all three dimensions. Figure 4 gives both the names and letter symbols for each dimension. The code used by Guilford and his associates in describing each factor specifies Operation, Content, and Product in that order. The well-known factor of verbal comprehension, for example, corresponds to cognition.
of semantic units (CSU) and is best measured by vocabulary tests. A memory span test utilizing series \( z \) of unrelated letters or numbers assesses memory for symbolic units (MSU).

In fact Guildford does not accept hierarchical factors of intelligence which demonstrates hierarchy of factors under 'g' instead he proposes many factors having parallel properties (Guildford, 1966, p. 62). According to Guildford, there are 120 abilities and each factor has more than one dimension, operations, contents, and products. Hence the component - factors of intelligence may be classified in three ways.

(a) Operation category : Among five major groups of abilities, Guilford distinguishes factors of cognition, memory, divergent production, convergent production, and evaluation on the basis of operation process. The factor of cognition refers to awareness, immediate discovery or re-discovery or recognition of information in various forms. The memory factor refers to, information regarding relation of storage, with some degree of availability, information in some form in which it was committed to storage and in connection with the same clues with which it was learned. Divergent production and convergent production—both involve the generation of information form the given information. The former leads to a variety of awareness or possible solutions whereas the latter leads to one right or best solution. Evaluation refers to a process of comparing and matching items of information according to different logical criteria and to making decisions with respect to satisfaction of these criteria.
(b) Content category: On the basis of content properties of factors of the kind of materials used, Guilford described four types of abilities: figural—a concrete content that is perceived through sense, symbolic—that composed of conventional signs, letters, numbers, and other ('code') elements. Semantic the form of meanings to which words commonly become attached; and behavioural—information essentially non-verbal, involved in human interactions, where awareness of attention, perception, thoughts, desires, feelings, moods, intentions, and actions of other persons and of ourselves are important.

(c) Product category: When any of the mental operations are applied to any of these contents; Guilford suggests that six kinds of products might result. The concept of "product" pertains to the way or form in which any information occurs. Guilford suggests the term 'Conception' as an appropriate synonym for the term product, which also pertains to the ways of knowing or understanding.

Guilford identifies six products namely, units, classes, relations, systems, transformations and implications. Information can be conceived on the form of units—things, segregated wholes, figures on grounds or gestalts. Class, as a kind of product of information is near the common meaning of the term. A class is a set of objectives with one or more common properties; but it is more than a set, for a class
idea is involved. A relation is some kind of connection between two things, a kind of bridge, or connecting link having its own character. Systems are complexes, patterns, or organisation of independent or interacting parts, such as verbally stated arithmetic problems, as outline, a mathematical equation, or a plan or programme. Transformations are, revision, redifinitions or modifications by which any product of information in one stage goes over into another stage. Finally, an implication is something expected, anticipated or predicted from the given information of all the six products. Guilford says, implication is closest to the ancient concept of association and he argues that something more is involved in the concept.

The placement of any intellectual factor within the model is determined by its three unique properties; its operation, its content, and its product. The factor might be a matter of cognition of symbolic transformation or evaluation of figural units, or of the convergent production of semantic systems, and so on. The factors and their corresponding mental operations may be summed up as (1) cognition of symbolic units rearranging to form words eg. YSPOHCOGLY (2) Memory of figural system recalling certain details of a map or diagram after having studied for a while (3) Evaluation of symbolic units. Judging whether two sets of numbers are identical (4) Divergent production of symbolic units naming as many words as possible that begin with or end with a certain combination of letters (5) Convergent production of
semantic implications making logical deductions from given information. Guilford concludes that his theory of "Structure of intellect model" is not an end in itself and may undergo many more modifications in future and even it might be replaced by more adequate models of human intelligence.

The Theory of Fluid And Crystallized General Intelligence:

Raymond B. Cattell gives a detailed account of the emergence of two factors with a technical psychometric presentation in his book "Abilities; their structure, growth and action." He claims that the general ability factor as measured by intelligence tests will not be one, but two. These two factors have marked cooperativeness of loading pattern, which make them difficult to separate. They have properties in vital ways for educational and clinical predictions. Cattell (1963) has identified more than one general ability factor in his experiment. Among these two are highly co-operative in the sense that they agree in loading positively with most of the general ability areas and have zero loading outside the intelligence field. He designated these two ability factors as fluid (f) and crystallised (c) General abilities 'gf' and 'gc' (Fluid intelligence and crystallized intelligence - respectively).

Views expressed by Jensen have been summerised here as most of the intelligence tests measure both fluid and crystallized components of 'g'. Fluid intelligence is the capacity for new conceptual learning and problem solving;
a general brightness and adaptability, relatively indepen-
dent of education and experience, which can be invested in
the particular opportunities for learning encountered by
the individual in accordance with his motivations and
interests. Crystallized intelligence, in contrast, is a
precipitate out of experience, consisting of acquired
knowledge and developed intellectual skills. He has argued
that his "level II ability" identifies with Cattell's
"fluid intelligence."

According to Cattell (i) Crystallized general ability
exhibits Verbal factors (V) numerical ability (N) reasoning
(R) mechanical information and skills (M, K) and experimental
judgment (in social and other fields). Fluid ability, by
contrast, appears in series, classifications, analogies,
topology and other well-known intelligence tests (couched
in shapes which are neither verbal nor pictorial, but such
as would be equally accessible to a person of any back-ground).
In short, fluid intelligence 'g' is an expression of the
level of complexity of relationships which an individual can
perceive and act upon when he has re-course to answer to such
complex issues already stored in memory.

(ii) Individual difference of GF and GC will reflect
mainly differences in cultural opportunities and interests
before biological maturity around 15 years of age. Among
adults these differences will reflect the difference in age,
since the gap between GF and GC will tend to increase with
experience and the time lapse. Although the speed of an
intellectual performance is not a function of gf and gc alone. Performance speed, in any cognitive field will load gf more than 'ge' while tests without time limit such as power tests, will have relatively large loading of gc.

(iii) gc and gc will differ in their age trend plots for the general population, gf reaching an early maximum at 14-15 years, while gc increases till 18-28 years or beyond depending on cultural learning period for the given sub-culture. Thereafter gf will decline from the age of about 22 and continues till old age, whereas gc (abroad array of crystallized abilities) will show a later and lesser drop.

(iv) The standard deviation of the IQ calculated classically from mental ages, will be about 12-16 points for gc and 24-25 points for gf. The later will be more constant and biologically determined, whereas the former will hinge on culture habits.

(v) For any one group, the nature-nature variance ratio will be much higher for gf than for gc since gf is directly physiologically determined whereas gc is an environmentally varying, product and experimentally determined.

Crystallized ability is not only a function of fluid ability, but also of the personality factor. It is neither a special ability nor a practical ability, but a basic general intelligence. gc and gf both vary from general to complex intellectual relation perceiving performances.
Horn (1970) in support of this theory suggests the following tests as representative measures of fluid intelligence memory span, figural relations, associative memory, induction, letter series, matrices, paired, associates memory for non-sense syllables, and digit span. Measures of crystallized intelligence are: verbal comprehension, vocabulary and general information.

Implications for the present test:

In a review of group tests of intelligence, Freeman writes "Most group scales are based implicitly at least upon the general factor theory of intelligence for most of them undertake to sample a person's mental activities by means of several kinds of tasks and then to rate the individual by means of a single index. A few scales are based on the group factor theory." (Freeman F.S, p. 302). It appears that Freeman is Thurstonian.

K.G. Desai constructed his scale in the days when the controversies were very hot as he says, "every theory may still be regarded to be in the experimental stage", (Desai p. 31). It is very difficult for the present researcher to accept any one of them and then to construct tests to suit it. Construction of 'pure' test of 'g' as Bhatia observes "are hardly feasible if any impossible" (Bhatia p. 14). The investigator has to look to the practical side of the matter with the gained experience of reviewing the different theoretical
In framing the test items the three cognitive processes described in Spearman's neo-genetic Principles were taken into consideration. The present researcher has selected tests involving various mental activities; they are of the type known for their 'g' saturation, later on, in factorial analysis of these tests only one general factor (may be a group of general factors) and the remaining specific factors have been found. No group factor has been discovered. So, in a way the present research supports Spearman's Two factor theory, but it would be too much to align oneself to that school simply from the results of a comparatively small investigation like this.

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