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Development, Item Analysis, Standardization, Review and Expansion of the Cognitive Ability Test for a Wider Age Range (7-16 Years) on a Single Test

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Abstract

The present research study was primarily designed to develop & standardize the Cognitive Ability Test for children between 7-16 years of age making it available for late childhood and early adolescents. The subjects were further categorized into specific 5 age groups for the best results. The purpose for such investigation and amelioration was considered necessarily owing to standardize the test for 7-16 years of age, the test items were developed through Bloom's taxonomy and Leslie Wilson theory, determining the Difficulty, Discrimination Index & Reliability. The purpose of this research project is the revision and expansion of age-range of the test already developed for the identification, measurement and analysis of core cognitive ability factors that determine success in education and occupation. The study was significant because it shall provide standardized ways of assessing cognitive abilities of children between 7-16 years of age.

Keywords: Cognitive Ability, Development and Standardization, Bloom's taxonomy, Leslie Wilson theory.

Introduction

This research project aims to expand and review the cognitive ability test for children, which was earlier developed and standardized for the children between 9-11 years of age. In this revision, the authors intend to review the same, and more than that to expand the test by standardizing it for the higher range i.e. for the children falling under 7-16 years of age. It will provide a base for measurement & identification of cognitive abilities of children. Psychological test refers to a standardized method of comparing the behavior and ability of two or more persons at the same time and/or comparing the behavior of the same person in different periods of time. A standard is the unit of measurement which further means to attribute a number. A child's cognitive ability is defined through both overt and covert behavior, observed and expressed verbally and/or measured. Standardization is a process of exactly fixing the stimulus variables, the exact situation of administration and of observing the behavior, in terms of units of measurement and the exact method of interpretation, in the light of relevant norms, having high reliability and validity. Objectivity refers to freedom from subjective factors in administration, measurement and interpretation. Reliability means consistency of scores over a period of time and consistency in administrative methods, administration by self or by others, the method used by scorers as well as the test's internal consistency. It ensures the authenticity of the test in a sense that it would fetch similar results if administered over same subjects in similar situations. Reliability can be of the total score, of various parts of the test or of every individual item. It is mostly measured in terms of coefficients of correlation, but can also be estimated in terms of percentage of agreement or disagreement. Validity of a test shows whether a test measures what it purports to measure. A test is a valid measure of cognitive ability; if at least, it provides the measure of cognitive ability of the subjects for whom it is specifically meant. The validities are also of different kinds: face validity, content validity, and concurrent validity, construct validity, factorial validity and predictive validity. A test is said to be valid for something with which it correlates. Validity depends upon the reliability of the test. In fact, validity cannot exceed the under root of its reliability. Norms have to be used for interpretation. Population, reliabilities and validities are defined by the standardization process and must be given in the test manuals. A test has to be revised after sometime, in order to remain a valid and reliable measure over time. The test items were developed through Bloom's taxonomy and Leslie Wilson theory, determining the Difficulty, Discrimination Index & Reliability. The three domains of learning according to Bloom's Taxonomy are **Cognitive:** mental skills (*knowledge*), **Affective:** growth in

feelings or emotional areas (*attitude or self*) and **Psychomotor**: manual or physical skills (*skills*) this taxonomy of learning behaviors may be thought of as “the goals of the learning process.” That is, after a learning episode, the learner should have acquired a new skill, knowledge, and/or attitude. The Bloom's taxonomy is easily understood and is probably the most widely applied one in use today. Wilson discusses methods that have been used to unite the sciences, and might be able to unite the sciences with the humanities. Wilson prefers and uses the term "consilience" to describe the synthesis of knowledge from different specialized fields of human endeavor. He defines nature as a collection of epigenetic rules, the genetic patterns of mental development. He argues that culture and rituals are products, not parts, of human nature. He says art is not part of human nature, but our appreciation of art is. He argues that concepts such as art appreciation, fear of snakes, or the incest taboo (Westermarck effect) can be studied by scientific methods of the natural sciences. Previously, these phenomena were only part of psychological, sociological, or anthropological studies. Wilson proposes that they can be part of interdisciplinary research. This test will help us in developing a universal scale or matrix to numerically measure cognitive ability factors like Focus, Decision Making Ability, Creativity, and Dynamic IQ termed as natural ingredients for success in life in general. The numerical measurement of these factors will also help us in identifying the gaps between current level of cognitive development & desired level of cognitive development, on a prescribed scale. It will also help in designing educational solutions that can elevate the cognitive ability of children to desired levels to drastically increase their learning process. It is witnessed that factors like focus, decision making ability & creativity have a direct impact on an individual's life & common belief put these factors under the category of wisdom or general intelligence. It was found that no convincing test or comprehensive analysis was available to measure these factors in numerical values. This Research is meaningful, goal oriented and unidirectional. From hypothetical theories it will move to scientific evidence based research which will lead future researchers to carry on the work where previous generations stop. An exhaustive item pool development process was put into practice that can be used across a vast age group of 7 to 16 years. Item pool selection was the key to develop and standardize this test. A test has to be revised after sometime, in order to remain a valid and reliable measure over time. In this article, an attempt is made to describe the test construction and the standardization procedures along with the process of expansion and revision of the test.

2. Review of Literature

Alfred Binet invented the first practical intelligence test, the Binet-Simon scale to identify students who needed special help in coping with the school curriculum. **Sherman Kent** "the father of intelligence analysis" pioneered many of the methods of intelligence analysis. Spearman (1904) first popularized the observation that individuals who do well on one type of mental task also tend to do well on many others. Thurstone (1935), who popularized the notion that people had a number of independent primary mental abilities rather than a single general mental ability. Both Spearman and Thurstone made contributions to the development of factor analysis as a way to identify the presence of unobserved variables/abilities that affect a number of observable variables. There has been exhaustive studies on the IQ and Cognition. The Harvard

Educational Review published Arthur Jensen's lengthy article, "How Much Can We Boost IQ and School Achievement?" Jensen concluded that (a) IQ tests measure socially relevant general ability; (b) individual differences in IQ have a high heritability, at least for the White populations of the United States and Europe; (c) compensatory educational programs have proved generally ineffective in raising the IQs or school achievement of individuals or groups. Jensen (1969) has published prolifically on all of the issues, and increasing numbers of psychometricians and behavioral geneticists. The A meta-analytic review by Roth, Bevier, Bobko, Switzer, and Tyler (2001) showed it also holds for college and university application tests such as the Scholastic Aptitude Test (SAT; N 2.4 million) and the Graduate Record Examination (GRE; N 2.3 million), as well as for tests for job applicants in corporate settings (N 0.5 million) and in the military (N 0.4 million). Because test scores are the best predictor of economic success in Western society (Schmidt & Hunter, 1998), these group differences have important societal outcomes (R. A. Gordon, 1997; Gottfredson, 1997). The question that still remains is whether the cause of group differences in average IQ is purely social, economic, and cultural or whether genetic factors are also involved.

3. Methodology

The children of age group 7-16 years comprised of the population of the study. Random sampling procedure was followed while selecting the sample. In total, there were 507 subjects, both males and females sampled from different schools. All the subjects were given the Cognitive Ability Test which was re administered on the same subjects after a period of 45 days for Test-retest reliability to find out the degree to which the results are consistent over time.

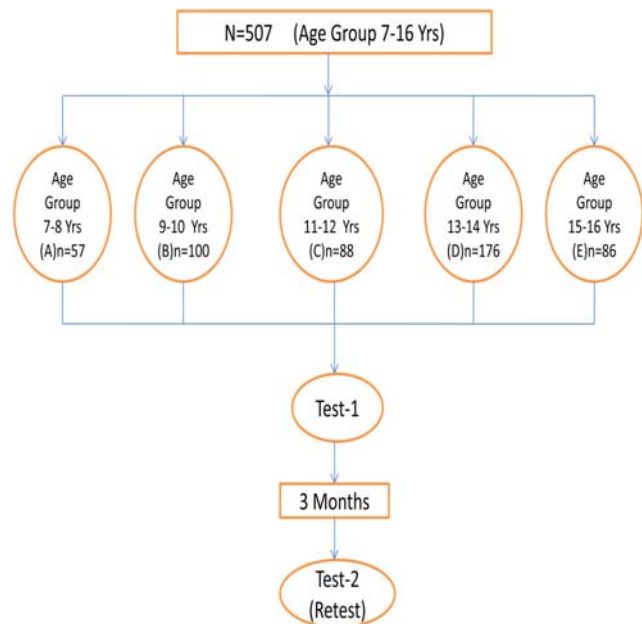


Fig1. Methodology

3.1. Sample

A sample of 507 children was selected from different schools. The sample consisted of students between 7 to 16 years of age including both males and females. The randomly selected subjects were further categorized into 5 different groups as per the age.

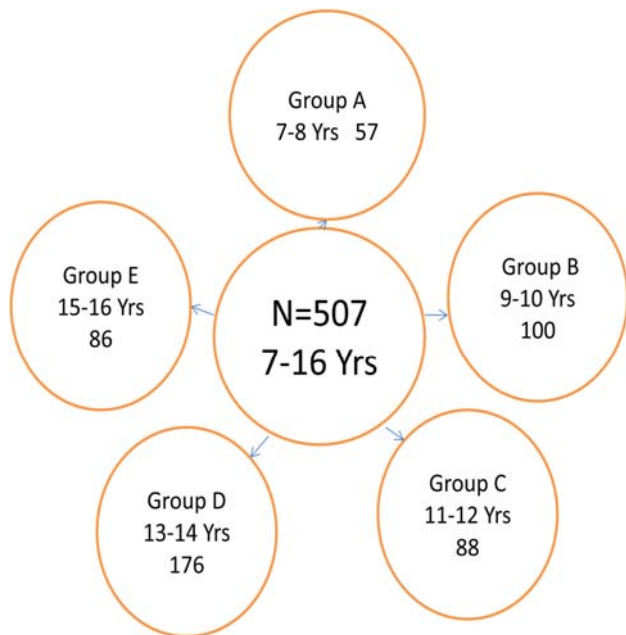


Fig 2. Sampling Procedure

3.2 Procedure and Administration of the test

Psychological test is a standardized measure. Standardization implies uniformity of procedures in administering and scoring the test. If the scores obtained by different persons are to be comparable, testing conditions must obviously be the same for all. The formulation of directions is a major part of the standardization of a new test. Such standardization extends

to the exact materials employed, time limits, oral instructions, preliminary demonstrations, way of handling queries from test takers and every other detail of the testing situation. Another important step in the standardization of a test is the establishment of norms. As its name implies, a norm is the normal or average performance. In the process of standardization a test, it is administrated to a large, representative sample of the type of persons for whom it is designed. This group known as the standardization sample serves to establish the norms, corresponding to the performance of typical or average persons

The randomly selected sample of 507 students was thereafter purposively categorized into 5 groups as under

- Group A (7-8 years) comprised of 57 students
- Group B (9-10 years) comprised of 100 students
- Group C (11-12 years) comprised of 88 students
- Group D (13-14 years) comprised of 176 students
- Group E (15-16 years) comprised of 86 students

This categorization was done specifically to ensure the reliability of the test for all these age groups as required for the expansion of the test.

The test consisted of 70 items. The instruction was given to the children for each part of a test. Each sub-test was assigned specific time in which children were required to complete the sub-test and a stop watch used for the purpose. To required the material photocopies, of test items, paper, pencil. Test administration procedure was similar for all the participants. Test were marked using standard procedure in which score +1 was given for each item passed. Thus total 70 marks were assigned for each test.

Table 1: Sampling and Categorization into Groups

Age	Group-A		Group-B		Group-C		Group-D		Group-E	
	7 Years	8 Years	9 Years	10 Years	11 Years	12 Years	13 Years	14 Years	15 Years	16 Years
No of Students	16	41	45	55	42	46	95	81	58	28
TOTAL	57		100		88		176		86	

4. Data analysis for the review and the expansion of the test

After collecting the data, it was arranged in tabular form and following mention statistical techniques used for items

analysis		
=>	Item analysis through Bloom’s Taxonomy	
=>	Item analysis through Leslie Wilson	
	LOTS	– Lower Order Thinking Skill
	MOTS	- Middle Order Thinking Skill
	HOTS	- High Order Thinking Skill
=>	Item difficulty level	
=>	Index of discrimination	
=>	Reliability (Test – Retest Method) Rulon & Flanagan	
formula		
=>	Time Analysis (with time, without time)	
=>	Split half method	

Correlation Coefficient – By Product moment correlation method

To find the item reflect the knowledge, comprehension, application, analysis, synthesis & evaluation.

To find the difficulty level and discrimination index the test score divided into three groups highest 27%, middle 46%, lowest 27% percentage.

The difficulty level was calculated with the help of formula

$$P = \frac{N_p}{N}$$

Where: NP indicates the number of test of test takers in the total group who pass the items, and N indicates the total number of test takers in the group.

The formula of the item – discrimination Index is:

$$D = \frac{U_p - L_p}{U}$$

Where: Up and Lp indicates the numbers of test takers in the upper and lower groups who pass the items, and U is the total numbers of the test takers in upper group.

The discrimination index was determined by the difference between the percentages of the students doing the item right in the high achieves and low achieves group discrimination index.

4.1. Presentation and Analysis of Data

Summary presentation in tabular form: - ITEM ANALYSIS.

Table 2: Summary of Bloom’s Taxonomy

Level of Learning Outcomes	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	TOTAL
Knowledge											
Recall			1	1				1		1	
Identify	1	1	1	1	1	1	1	1	1	1	
Comprehension											
Interpret					1	1	1	1	1		
Classify			1								
Comparing	1	1	1	1	1	1	1			1	
Application											
Solve							1	1	1		
Relate	1		1	1	1	1				1	
Analysis											
Analyse	1	1					1	1	1		
Discriminate		1	1	1	1	1				1	
Synthesis											
Devise		1			1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	5	6	7	6	7	7	7	7	6	7	
Level of Learning Outcomes	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20	TOTAL
Knowledge											
Recall		1	1								
Identify	1	1		1	1		1	1	1	1	
Comprehension											
Interpret	1		1	1	1	1		1	1	1	
Classify											
Comparing	1	1	1				1				
Application											
Solve			1								
Relate	1	1		1		1	1				
Analysis											
Analyse	1			1	1	1		1	1	1	
Discriminate		1	1		1			1	1	1	
Synthesis											
Devise			1	1	1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	6	6	7	6	6	5	5	6	6	6	

Level of Learning Outcomes	Item 21	Item 22	Item 23	Item 24	Item 25	Item 26	Item 27	Item 28	Item 29	Item 30	TOTAL
Knowledge											
Recall			1	1	1	1			1	1	
Identify	1	1	1	1	1	1	1	1	1	1	
Comprehension											
Interpret		1	1				1		1	1	
Classify										1	
Comparing	1			1	1	1	1	1	1	1	
Application											
Solve		1	1			1		1	1		
Relate	1			1	1		1			1	
Analysis											
Analyse		1	1	1	1			1	1	1	
Discriminate	1		1			1	1	1			
Synthesis											
Devise		1	1		1	1	1	1	1		
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	5	6	8	6	7	7	7	7	8	8	

	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	TOTAL
Level of Learning Outcomes	31	32	33	34	35	36	37	38	39	40	
Knowledge											
Recall		1	1			1			1		
Identify		1		1	1		1	1		1	
Comprehension											
Interpret				1	1		1	1	1		
Classify	1		1	1		1					
Comparing	1	1			1					1	
Application											
Solve		1			1		1		1		
Relate	1		1	1		1	1	1		1	
Analysis											
Analyse	1		1	1	1		1	1	1	1	
Discriminate	1	1				1	1			1	
Synthesis											
Devise	1	1		1	1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	7	7	5	7	7	6	8	6	6	7	

	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	TOTAL
Level of Learning Outcomes	41	42	43	44	45	46	47	48	49	50	
Knowledge											
Recall	1			1	1	1	1			1	
Identify		1	1			1	1	1	1		
Comprehension											
Interpret		1	1			1		1	1		
Classify	1										
Comparing	1		1	1	1	1	1		1	1	
Application											
Solve					1						
Relate	1	1	1	1		1		1	1	1	
Analysis											
Analyse	1	1		1	1	1	1	1	1	1	
Discriminate			1	1					1		
Synthesis											
Devise		1	1		1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	6	6	7	6	6	8	6	6	8	6	

	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	TOTAL
Level of Learning Outcomes	51	52	53	54	55	56	57	58	59	60	
Knowledge											
Recall	1	1							1	1	
Identify		1	1	1	1	1	1	1	1	1	
Comprehension											
Interpret		1	1	1	1	1	1	1			
Classify			1						1	1	
Comparing	1	1	1			1	1	1	1	1	
Application											
Solve						1	1	1			
Relate	1	1	1	1	1						
Analysis											
Analyse	1	1	1	1	1	1	1	1			
Discriminate				1	1				1	1	
Synthesis											
Devise	1	1	1	1	1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	6	8	8	7	7	7	7	7	7	7	

	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	TOTAL
Level of Learning Outcomes	61	62	63	64	65	66	67	68	69	70	
Knowledge											

Recall	1	1	1	1							
Identify	1	1	1	1	1	1	1	1	1	1	
Comprehension											
Interpret					1	1	1	1	1	1	
Classify	1	1	1	1							
Comparing	1	1	1	1	1	1	1	1	1	1	
Application											
Solve					1	1	1	1	1	1	
Relate											
Analysis											
Analyse					1	1	1	1	1	1	
Discriminate	1	1	1	1	1	1	1	1	1	1	
Synthesis											
Devise	1	1	1	1	1	1	1	1	1	1	
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	
TOTAL	7	7	7	7	8	8	8	8	8	8	

Table 3: Type of Questions

Type of Questions Age 7-16 Years Acc To Leslie Owen Wilson					
S.no	Factual	Convergent	Divergent	Evaluative	Combination
1	1				
2	1				
3	1				
4	1				
5		1			
6	1				
7		1			
8				1	
9		1			
10	1				
11	1				
12		1			
13				1	
14		1			
15					1
16				1	
17		1			
18				1	
19				1	
20				1	
21				1	
22		1			
23		1			
24	1				
25	1				
26					1
27		1			
28				1	
29				1	
30		1			
31			1		
32		1			
33	1				
34		1			
35			1		
36	1				
37		1			
38				1	
39		1			
40	1				
41	1				
42				1	
43	1				
44					1
45	1				
46			1		
47			1		

48			1		
49					1
50					1
51			1		
52	1				
53					1
54			1		
55		1			
56		1			
57		1			
58		1			
59		1			
60		1			
61		1			
62		1			
63		1			
64		1			
65			1		
66			1		
67			1		
68			1		
69			1		
70	1		1		
Total	17	24	14	11	6

Table 4: Summary of Time analysis with time item analysis and without analysis time of item (9-11 years)

Time (Independent)	Easy	Moderate	Difficult	Total
without time)	43	27	0	70
Controlled				
(With Time)	14	21	35	70

An Item with 50% difficulty, level is considered to be an ideal test item. However research shows that items with discriminations indices ranging from 16% to 84% could be included preferably. To this item analysis researches followed these criteria. However some expert of the field such as Ebel and Frisbie (1986, P. 324) also accept it as valid beyond this range. But in no case items with discrimination indices less than or equal to zero were accepted.

Total No. of Items in Test = 70

$$\text{Item difficulty index} = P = \frac{.N_p}{.N}$$

NP – Indicates the number of test takers in total group who passed the item = 18

N – Indicates the total number of test takers in the group = 40

$$P = \frac{.N_p}{.N} = \frac{17}{40}$$

P= .45

The item difficulty index (P) has a range of 0.00 to 1.00. If no one answers the item correctly, P value would be 0.00. An item that everyone answer correctly would have a P value of 1.00

$$D = \frac{U_p - L_p}{U}$$

Item: Discrimination Index is

UP - No. of test takers in upper group LP – No. of test takers in lower group

U – is the total number of test takers in upper group

Up – 18 Lp – 22 U – 18

$$D = \frac{17 - 23}{17}$$

D= 0.35

The optional level for an acceptable P value depends on the no. of options per item. In present test, have 4 options Then g = .25

P value = 1.0 G value = .25

Constant value = 2

$$\frac{1.0 + .25}{2}$$

Optional level = .63

As the number of options increases, the option P – value decreases, these test have more option to also be more difficult to answer.

The difficulty level increases.

After optional level of item: - we get lower Bond

$$\frac{[1 + 1.645 \sqrt{\frac{(k-1)}{n}}]}{k}$$

K= No. of multiple choice item K= 70

N – No. of examiners N = 40

Optional value .63 after computing formula:-0.049 The lower bond value

Furthermore, Coefficient (r) was used for measuring the linear dependence of two variables.

Pearson Correlation Coefficient Formula:

$$r = \frac{n \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \sum_{i=1}^n y_i}{\sqrt{(n \sum_{i=1}^n x_i^2 - (\sum_{i=1}^n x_i)^2)(n \sum_{i=1}^n y_i^2 - (\sum_{i=1}^n y_i)^2)}}$$

Where:

- x_i : the i th number of x
- y_i : the i th number of y
- n : total numbers of x or y
- r : correlation coefficient, $-1 \leq r \leq 1$, 1 represents strongly positively correlated, -1 represents strongly negatively correlated, 0 represents no correlation.

Table 5: items with difficulty level < 16

Group A (7-8 Years)	70, 69, 68, 66, 67, 65, 67, 34, 10, 54, 54, 28, 8, 56, 44, 43, 23, 28, 36, 56 29, 14 ,12, 15, 19, 46,
Group B (9-10 Years)	70, 69, 68, 66, 65, 67, 34, 10, 54, 54, 28
Group C (11-12 Years)	66, 65, 67,70, 69
Group D (13-14 Years)	66, 65, 6769
Group E (15-6 Years)	65, 67, 69

Difficulty level <16 means these items are very difficult.

Table 6: of items with difficulty level > 84

Group A (7-8 Years)	1, 2, 3, 4, 5, 20
Group B (9-10 Years)	1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 18,22, 23, 24, 25
Group C (11-12Years)	1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 18,22, 23, 24, 25, 43, 44, 45, 46, 47, 48, 49
Group D (13-14 Years)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 19, 22, 43, 44, 45, 46, 47, 48, 49, 31, 32, 20, 21, 22, 23, 24
Group E (15-16 Years)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 19, 22, 41, 42, 43, 44, 45, 46, 47, 48, 49, 31, 32, 20, 21, 22, 23, 24, 25, 26, 29, 20

Difficulty level >84 means that items are very easy because the %age of both high achieve and low achieve is high in these items.

Table 7: Numbers of items with index of discriminations

Group A (7-8Years)	70, 69, 68, 66, 67, 65, 67, 34, 10, 54, 54, 28, 14 ,12, 15, 19, 46,
Group B (9-10Years)	70, 69, 68, 66, 65, 67, 34, 10, 54, 54, 28
Group C (11-12Years)	69, 70, 45, 52, 53
Group D (13-14Years)	66, 65, 67,70, 69
Group E (15-16Years)	66, 65,70, 69

Table 8: Shows the value D and their corresponding interpretation

D	Quality	Recommendation
> 0.39	Excellent	Retain
0.30 – 0.39	Good	Possibilities for improvement
0.20 – 0.29	Mediocre	Need to check/review
0.00 – 0.20	Poor	Discard or reviewing depth
< –0.01	Worst	Definitely Discard

Table 9: Summary for correlation and & Reliability

Other Statistical each of test	Reliability
Test – Retest method	0.97
Split Half Method	0.74
Correlation by Product measurement method	0.59

Ebel & Frisbie (1986) gives us the following rule of thumb for determining the quality of the items in terms of the discrimination index

Table10: Performance of subjects in Test-1 (n=507)

Groups	Age	No. of subjects obtaining marks between					
		0-30 (low range)		31-50 (Average range)		51-70 (High range)	
		No. of subjects	%	No. of subjects	%	No. of subjects	%
Group A	7-8 Years	10	17.5	40	70.1	7	12.2
Group B	9-10 Years	39	39	41	41	20	20
Group C	11-12 Years	19	21.5	49	46.5	20	22.7
Group D	13-14 Years	29	16.4	104	59.0	43	24.4
Group E	15-16 Years	18	20.9	51	59.3	17	19.7

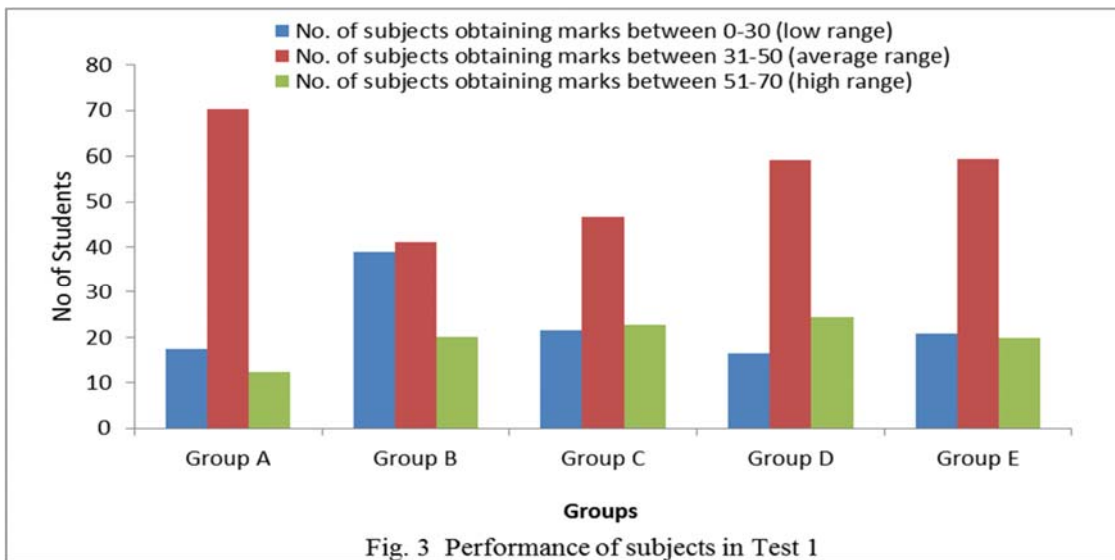


Table 11: Performance of subjects in Test-2(n=507)

Groups	Age	No. of subjects obtaining marks between					
		0-30 (low range)		31-50 (average range)		51-70 (high range)	
		No. of subjects	%	No. of subjects	%	No. of subjects	%
Group A	7-8 Years	9	15.7	35	61.4	13	22.8
Group B	9-10 Years	29	29	48	48	23	23
Group C	11-12 Years	18	20.4	40	45.4	30	34.0
Group D	13-14 Years	29	16.4	94	53.4	53	30.1
Group E	15-16 Years	18	20.9	46	53.4	25	29.0

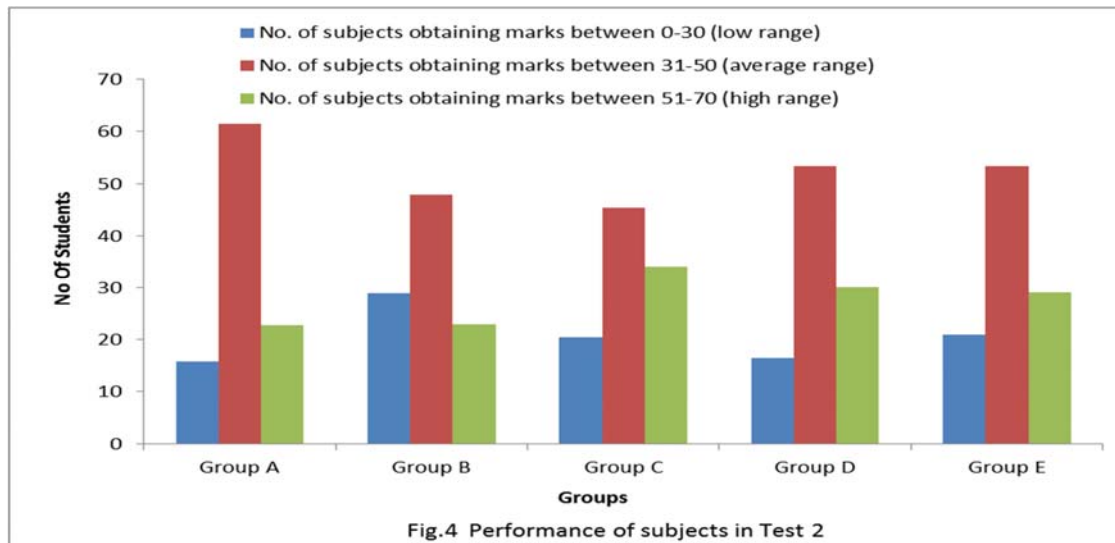


Table 12: Performance of Group-A in Test1 and Test2 (n=57)

Age	Duration (30 Mins)	No. of subjects obtaining marks between		
		0-30 (low range)	31-50 (Average range)	51-70 (High range)
7 YEARS	TEST-1	2	11	3
	TEST-2	2	9	5
8 YEARS	TEST-1	8	29	4
	TEST-2	7	26	8

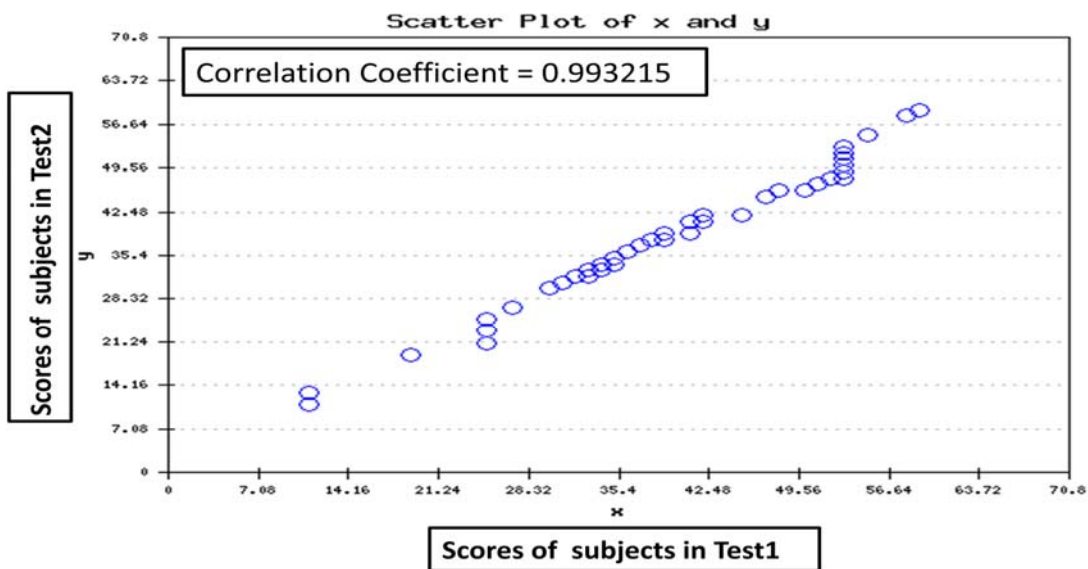
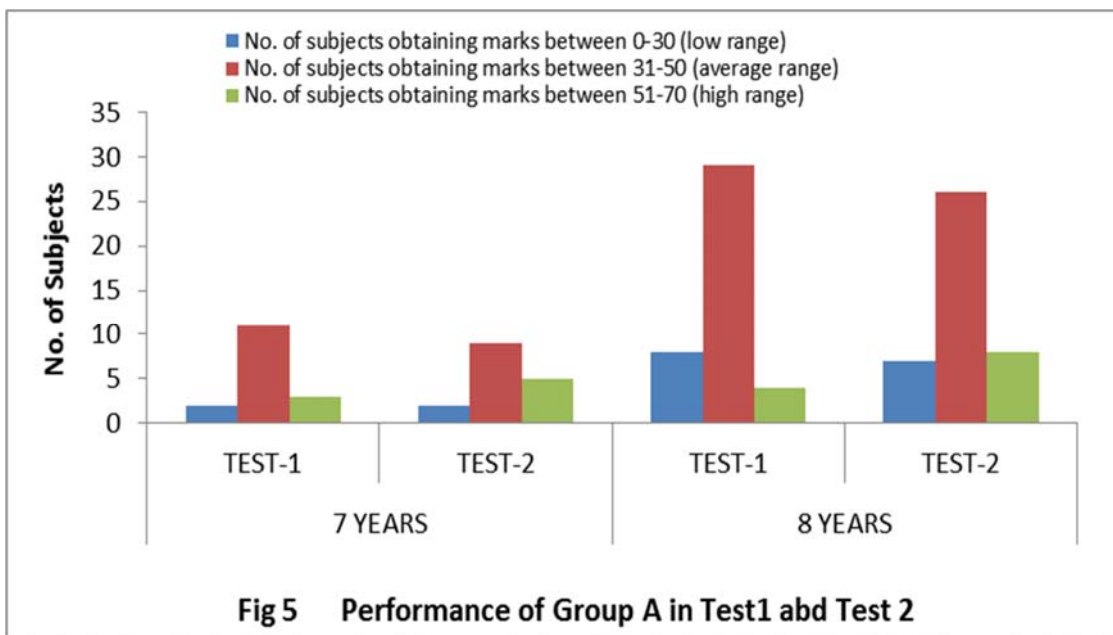


Fig. 6 Correlation coefficient of the scores of Test1 and Test2 (Group A n=57)

Table 13: Performance of Group-B in Test1 and Test2 (n=100)

Age	Duration (30 Mins)	No. of subjects obtaining marks between		
		0-30 (low range)	31-50 (Average range)	51-70 (High range)
9 YEARS	TEST-1	18	18	9
	TEST-2	13	22	10
10 YEARS	TEST-1	21	23	11
	TEST-2	16	26	13

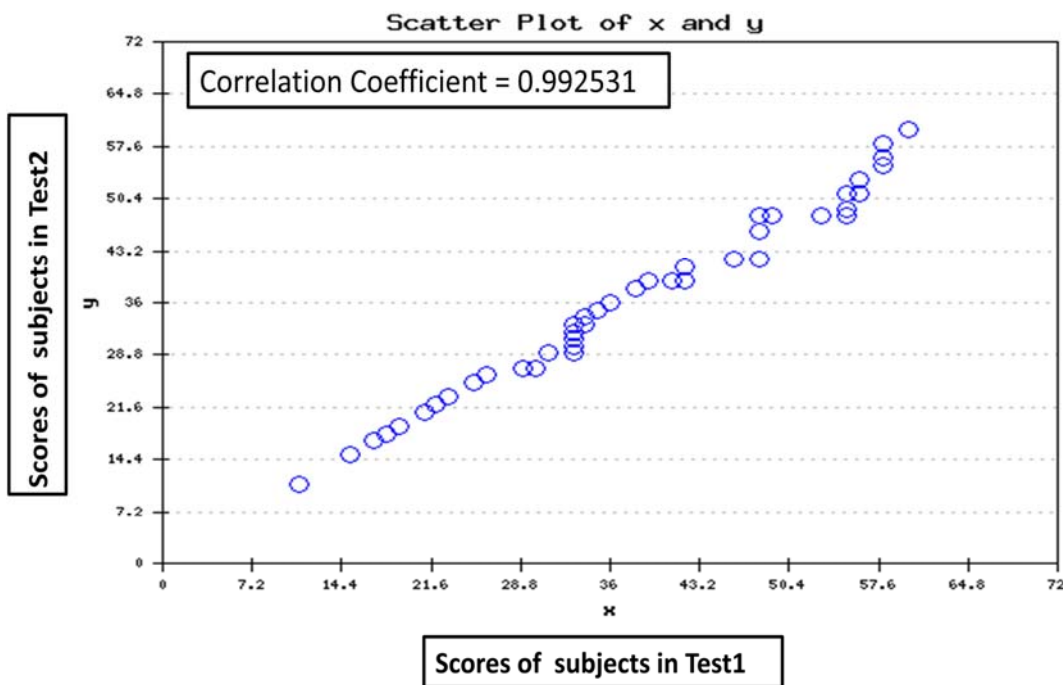
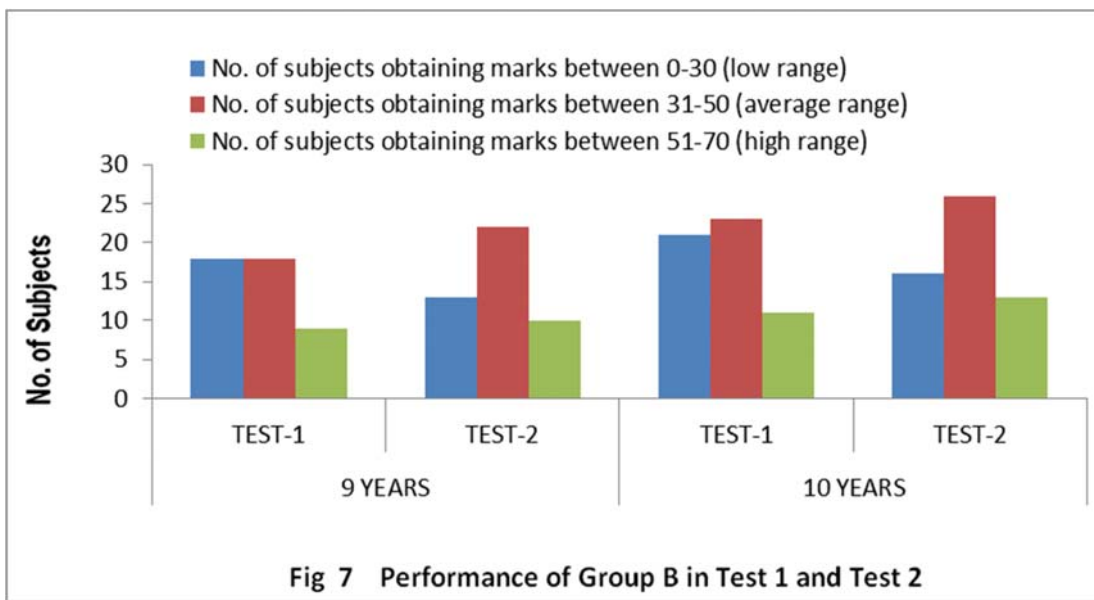


Fig. 8 Correlation coefficient of the scores of Test1 and Test2 (Group B n=100)

Table 14: Performance of Group-C in Test1 and Test2 (n=88)

Age	Duration (30 Mins)	No. of subjects obtaining marks between		
		0-30 (low range)	31-50 (Average range)	51-70 (High range)
11 YEARS	TEST-1	10	25	7
	TEST-2	10	21	11
12 YEARS	TEST-1	9	24	13
	TEST-2	8	19	19

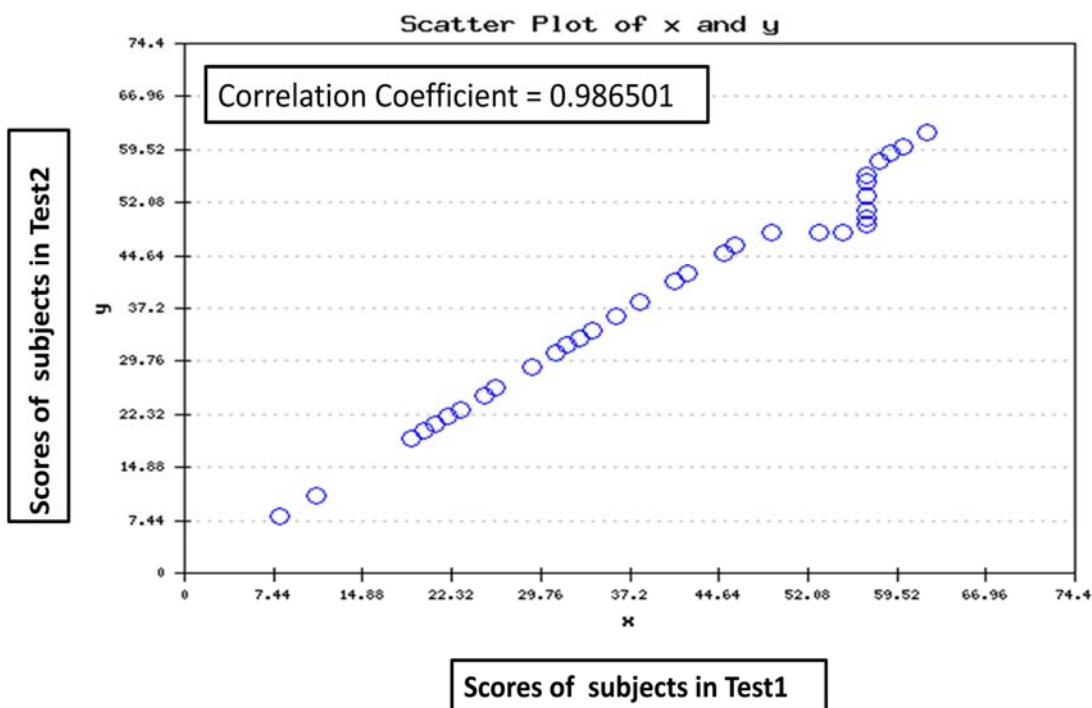
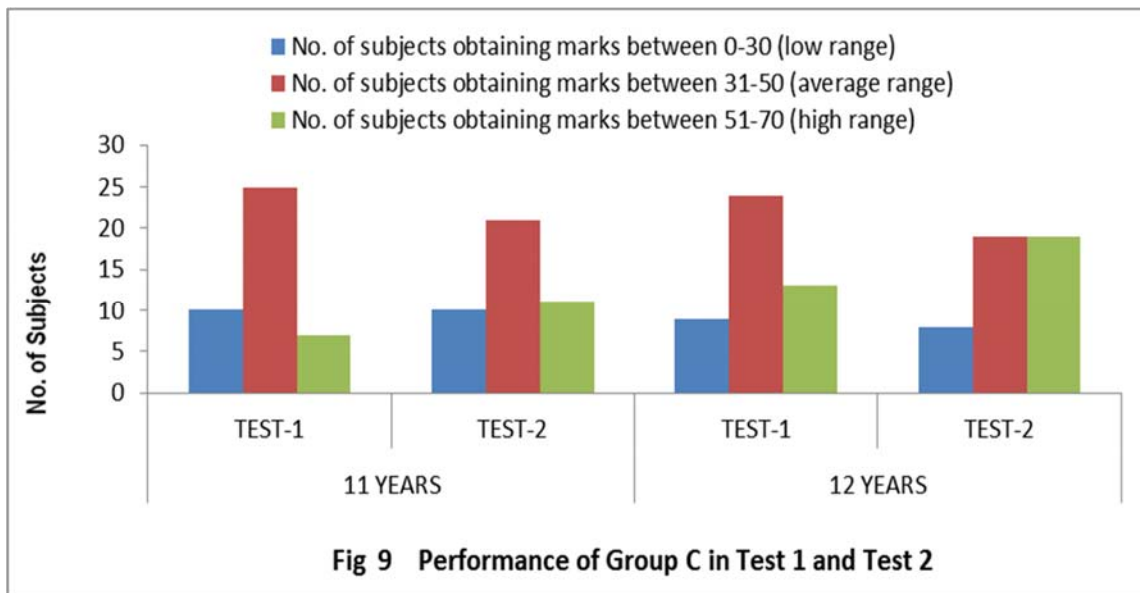


Fig. 10 Correlation coefficient of the scores of Test1 and Test2 (Group C n=88)

Table 15: Performance of Group-D in Test1 and Test2 (n=176)

Age	Duration (30 Mins)	No. of subjects obtaining marks between		
		0-30 (low range)	31-50 (Average range)	51-70 (High range)
13 YEARS	TEST-1	12	55	28
	TEST-2	13	49	32
14 YEARS	TEST-1	17	49	15
	TEST-2	16	45	21

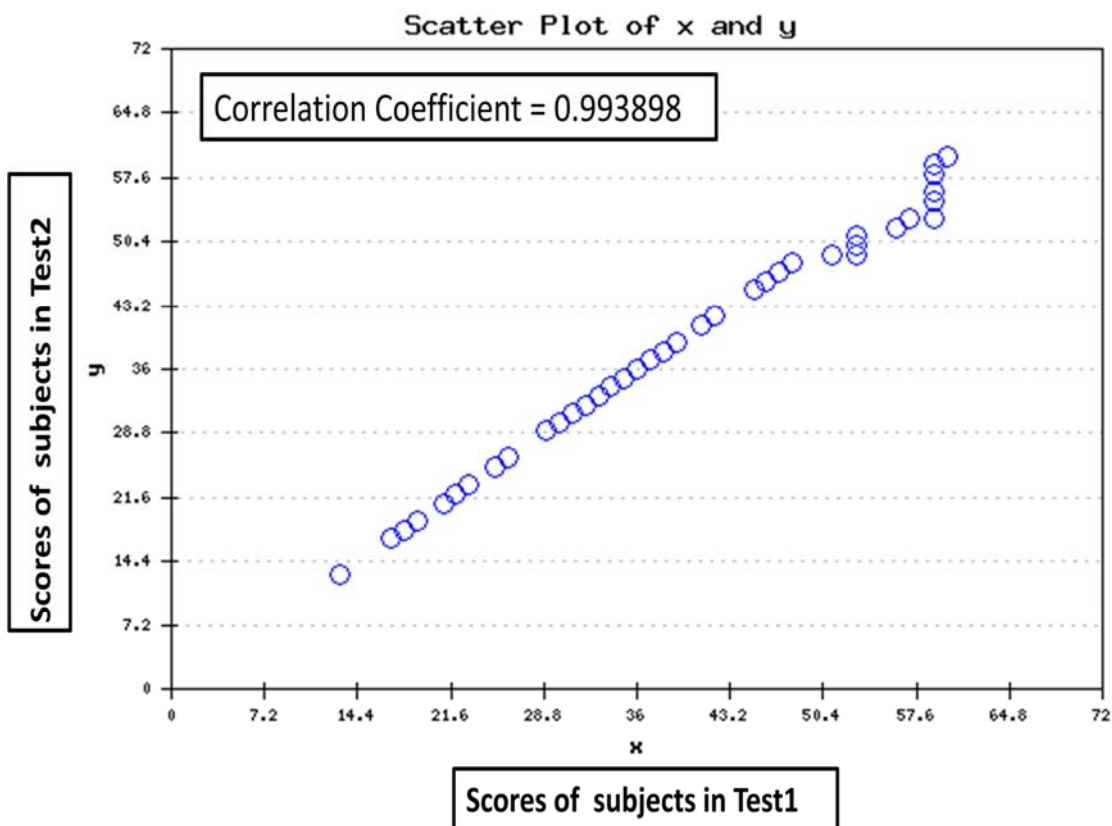
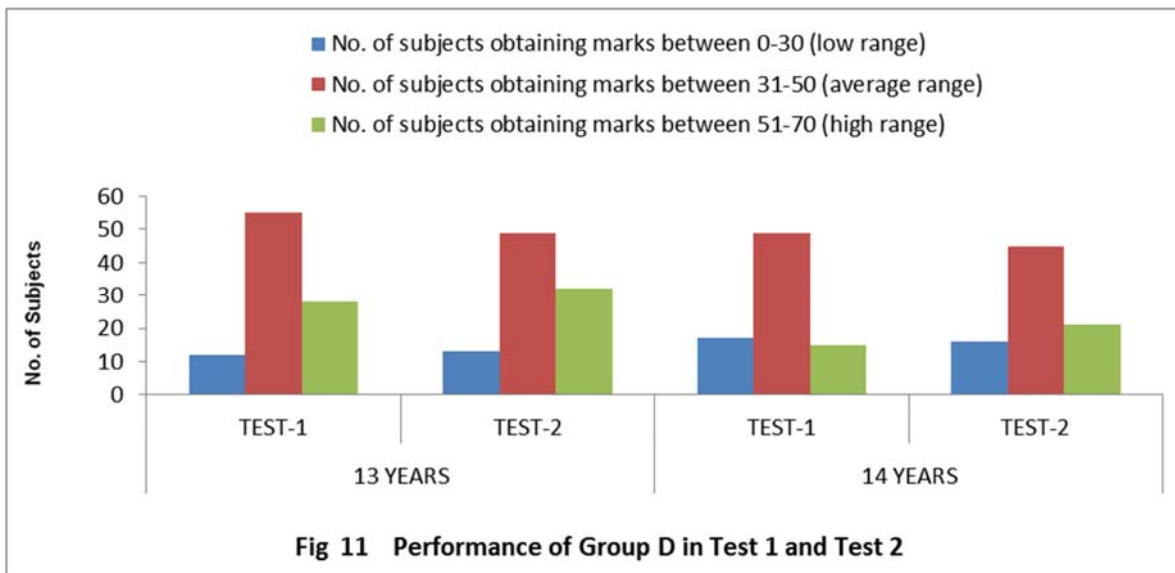


Fig. 12 Correlation coefficient of the scores of Test1 and Test2 (Group D n=176)

Table 16: Performance of Group-E in Test1 and Test 2 (n=86)

Age	Duration (30 Mins)	No. of subjects obtaining marks between		
		0-30 (low range)	31-50 (Average range)	51-70 (High range)
15 YEARS	TEST-1	15	30	13
	TEST-2	17	29	14
16 YEARS	TEST-1	3	21	4
	TEST-2	1	17	11

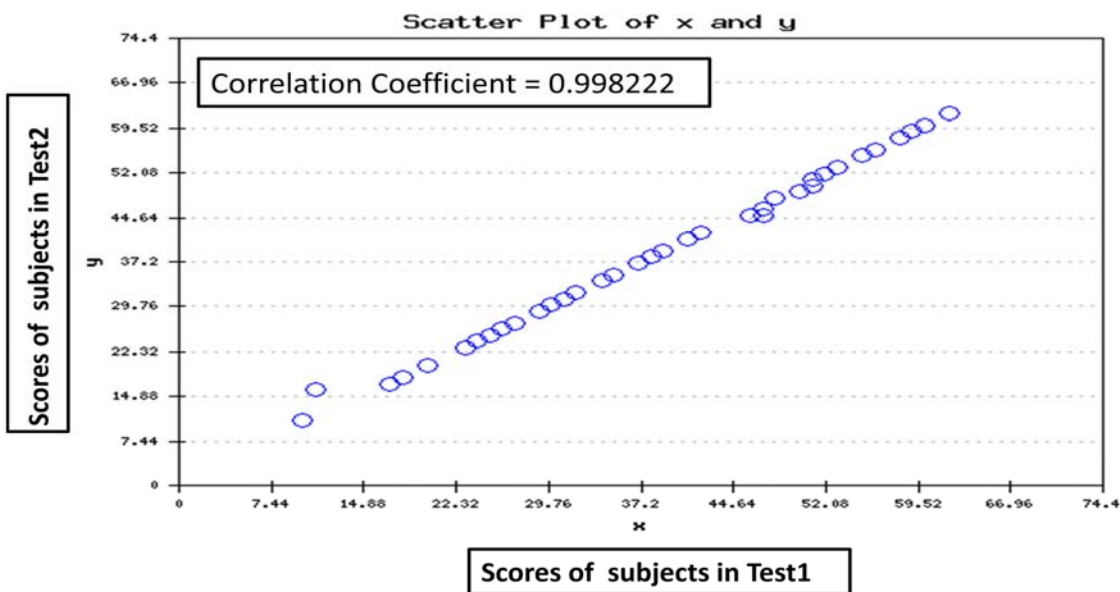
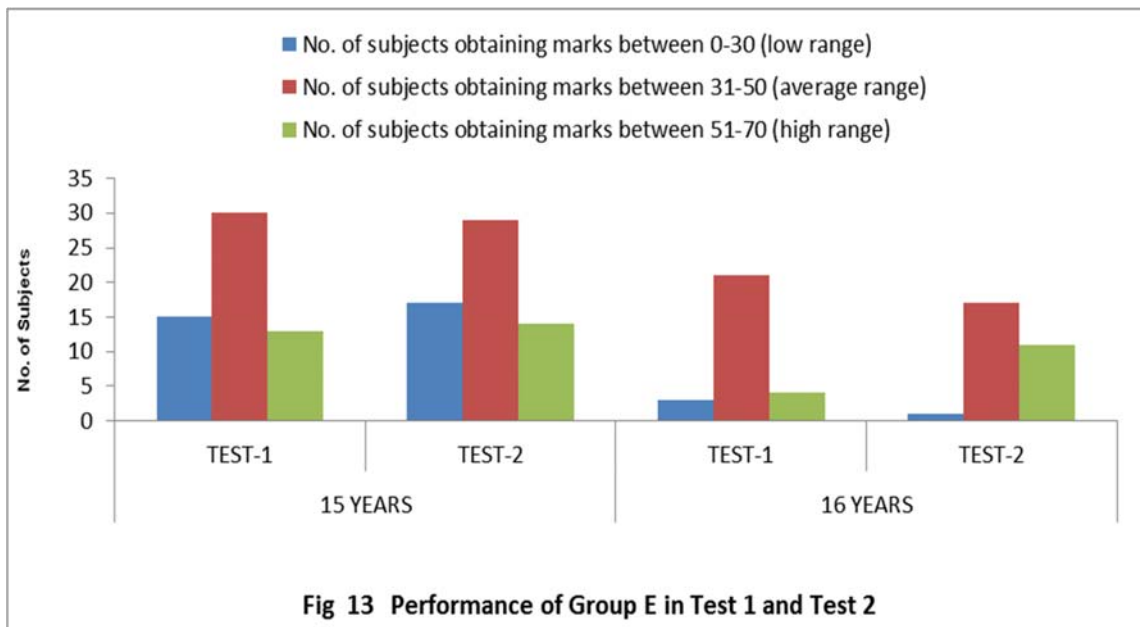
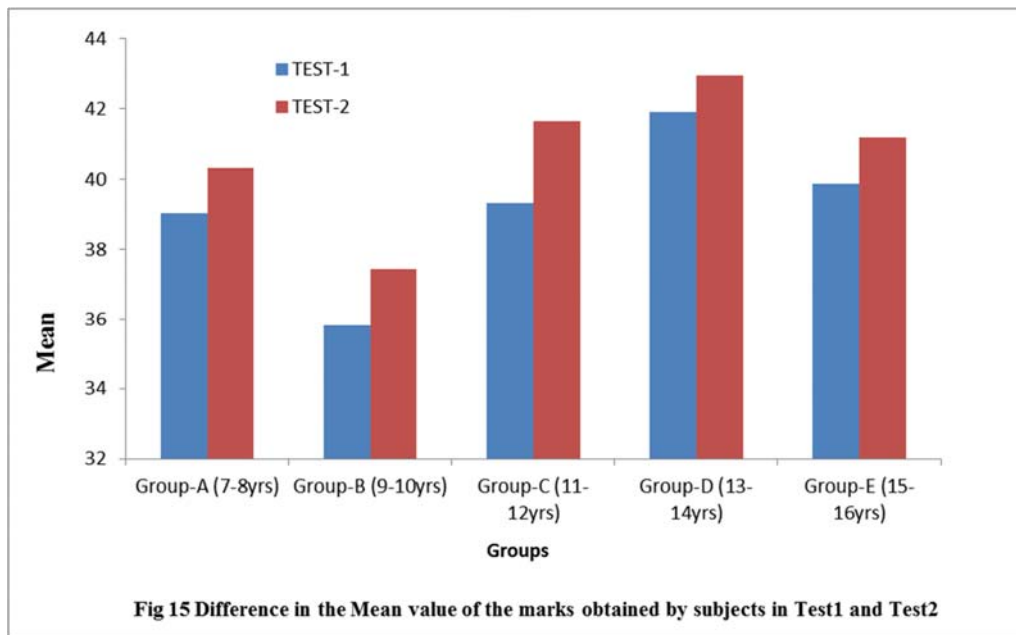


Table 17: Difference in the Mean value of the marks obtained by subjects in Test1 and Test 2

Age	Duration (30 Mins)	n	MEAN	SD	SEM	t-value	p-value	Level of Significance
7-8 Years	TEST-1	57	39.035	10.52	1.39	0.586461	0.558746	NS
	TEST-2	57	40.315	11.19	1.48			
9-10 Years	TEST-1	100	35.8	13.13	1.31	0.683087	0.49535	NS
	TEST-2	100	37.44	13.78	1.38			
11-12 Years	TEST-1	88	39.31	12.25	1.31	0.61719	0.537916	NS
	TEST-2	88	41.64	13.37	1.43			
13-14 Years	TEST-1	176	41.9	11.37	0.86	0.654065	0.513499	NS
	TEST-2	176	42.96	12.25	0.92			
15-16 Years	TEST-1	86	39.88	11.94	1.29	0.88319	0.929727	NS
	TEST-2	86	41.17	12.24	1.32			



5. Conclusion

The authors intended to check, review and expand the cognitive ability test, efforts were made to validate it for children between 7 to 16 years of age. It was notified that there are many factors along with IQ that have a great impact on the individual. These factors like Focus, Decision Making Ability, Creativity, Passion, Judgment, Estimation Level, Nature of Work & Professional Choice must be taken into consideration being more psychological nature than statistical. The study aided in the development & standardization of the the Cognitive Ability Test for children between 7-16 years of age making it available for late childhood and early adolescents. The investigation led to the amelioration to standardize the test for 7-16 years of age. The initial 16 years of a human being, where it is formidably easy to develop cognitive abilities and enhance learning process, have been the topic of research for decades. Numerous attempts were made all through human history to understand, diagnose & measure human intelligence so as to reorder it. But guesswork in imparting education is still prevalent in schooling & parenting. The goal of our research is to provide an insight into those scientific methodologies that can help us measure and reorder human intelligence to enhance learning process in children, to scientifically pick & select suitable career choice for a more meaningful & successful life, and to help hire right people for right jobs for maximum business efficiency This revision and expansion of the test already would help in the identification, measurement and analysis of core cognitive ability factors that determine success in education and occupation. The reliability and validity was proved ensuring the standardized ways of assessing cognitive abilities of children between 7-16 years of age. The study came out with significant outputs as the correlation coefficient was found to be significantly high in case of all the five groups as evident from Fig6, Fig8, Fig10, Fig12 and Fig14 witnessing the high reliability of the test.

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