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Development, item analysis and standardization of the of the cognitive ability test for subjects above 16 years of age: Passion Profession Test (PPT)

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Abstract
The in-hand research project was designed and undertaken to develop & standardize the cognitive ability test for subjects above 16 years of age -Passion Profession Test (PPT). Random sampling procedure was followed to select the subjects from different cities. Subjects consisted of males as well as females falling between 16 and 23 years of age. The test items were developed through Bloom's taxonomy and Leslie Wilson theory, determining the Difficulty, Discrimination Index, Validity & Reliability. Test results include current cognitive capacity measure, dynamic IQ, Focus Factor, Decision Making Ability, CQ, Skill Estimation Level, Natural Learning Style, Cognitive Gaps Measurement, Gifted Ability, and Suitable Career Path. Cognitive Science being the most comprehensive & effective analysis, measures entire thinking process and can reorder the outcomes, provide solution to fill gaps in cognitive development to ensure success in professional life in a composed way.

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

Introduction
Profession selection and its management ought to be handled in an adroit manner, which must be learnt before launching oneself into the dynamism of life. It is the combination of structured planning and choices. The outcome of a successful career should include personal fulfillment, work/life balance, goal achievement and financial assurance. Most of the time, individuals opt for a career based on academic performances & professional qualification. But owing to this rigid traditional system, in later years, it is realized that the subject was meant to do something else. This is because of guesswork done in early years due to unawareness of scientific technology that helps in decision making about careers. Research & analysis reveal that what works for one individual may not work for other in terms of success despite having same qualification and career choice. Guesswork in career choice may prove lethal to the future prospects. Though passion is the buzzword these days to select and pick a career, but passion alone cannot deliver the goods. Until an individual has a high degree cognitive skill sets, success will always remain elusive & by-chance. The trend in campus placements is also changing fast. Corporate hire those who have right blend of cognitive abilities and passion to work and they prefer candidates who are quick decision makers, focused, energetic and have a high cognitive value. In a nutshell, package performers are valued more than bare academic class. A big myth is that a high IQ level or academic intelligence shapes a successful career. On the contrary, the fact is that cognitive factors play more prominent role in shaping one's future. These are Focus, Decision making ability, Self estimation level, Passion and Creativity. These factors can be measured in numeric values so that these can be reorder to the desired levels. The gap between mental age and chronological age widens as a child matures. This ratio of mental age by chronological age was given the name "Intelligence Quotient". Intelligence is the knowledge tested against time at a given age. Focus factor reflects one's Focus every hour to make right decisions based on observation, knowledge & experience. DMA score is the response time/speed of decision making based on current level of knowledge & experience. CQ is the measurement of your creativity, innovation & expressiveness based on experience, observation & knowledge. In earlier times the old technology was a unidirectional process with ineffective outcomes. Aptitude is an index of ability to perform a certain task that cannot measure whole thinking process, learning style or gifted ability. It cannot measure the gaps in current & desired level of potential and thus provides no solution to enhance learning process early in childhood. It can only label you as a performer or non-performer on a Task but is not applicable in wonder

years where it matters the most. The next in-hand technology was the Psychometric analysis, which is effective but with gross limitations. Psychometrics is the measurement of IQ, Attitude, and Personality & is Subjective in nature but it cannot measure Focus, Decision Making Ability & CQ in numerical values. It cannot measure the cognitive gaps & hence provides no solution to fill these gaps. It only gauges already developed personality & its future outcomes. It cannot identify learning style & no customized solution is available. It is also not applicable for 3-11 years of age when it matters the most. The latest in education technologies is the Cognitive Science which is the most comprehensive & effective analysis. It measures entire thinking process and can reorder the outcomes, can gauge Focus, IQ, Decision Making, CQ, and Estimation in numeric values to Identify & provide solution to fill gaps in cognitive development. It is applicable from 3 years onwards when it matters the most and helps to design customized education solution by identifying learning style. It not only gauges future outcomes but can give shape to future outcomes

2. Methodology

The test consists of two parts Part A which contains 100 Objective Test questions, and time bound for 30 minutes that is to be taken by the student under Parent/Teacher Supervision. The Part B consists of Self-Assessment Paper which includes 8 forms to be filled in by the Student and is time bound for 60 minutes. Test results include current cognitive capacity measure, dynamic IQ, Focus Factor, Decision Making Ability, CQ, Skill Estimation Level, Natural Learning Style, Cognitive Gaps Measurement, Gifted Ability, and Suitable Career Path.

2.1. Sample

Random sampling procedure was followed to select the subjects from different cities. Subjects consisted of males as well as females falling between 16 and 23 years of age, as illustrated in Fig.1

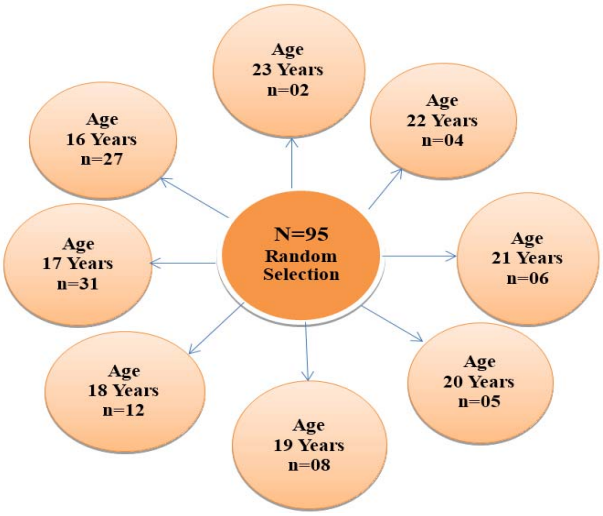


Fig 1: Sampling Procedure

2.2 Procedure and Administration of the test

The test (part-1) consisted of 100 items. Rapport building was followed by giving the in-length instructions to the subjects. The specific time in which children were required to complete the test was allotted and a stop watch was used for the purpose. The required material, i.e. Photocopies of test items, paper, pencil etc. was provided. 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 100 marks were assigned for each test. Standardization implies uniformity of procedures in administrating 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. To estimate and ensure validity, in both the cases, i.e. split half scores and the test retest scores, the validity was estimated. The reliability was estimated by calculating the reliability correlation coefficient. The split half method and the test-retest method were used to estimate the reliability of the test.

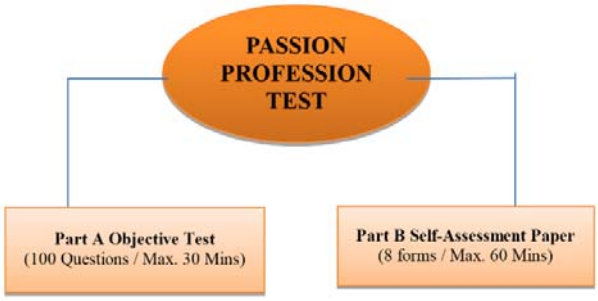


Fig 2: Test Format

3. 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

Table 1: Item Analysis Methods

1	Item analysis through Leslie Wilson
	LOTS - Lower Order Thinking Skill
	MOTS - Middle Order Thinking Skill
	HOTS - High Order Thinking Skill
2	Item analysis through Bloom's Taxonomy
3	Item difficulty level
4	Index of discrimination
5	Reliability (Test – Retest Method)
7	Split half method
8	Analysis of Validity by Linear Regression

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.

Presentation and Analysis of Data
Summary presentation in tabular form: - ITEM ANALYSIS.

Table 2: Summary of Leslie Owen Wilson

	Type of Questions 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				
71	1				
72				1	
73	1				
74					1
75	1				
76			1		
77			1		
78			1		
79					1
80					1
81			1		
82	1				
83					1
84			1		
85		1			
86		1			
87		1			
88		1			
89		1			
90		1			
91		1			
92		1			
93		1			
94		1			
95			1		
96			1		
97			1		
98			1		
99			1		
100	1		1		
Total	32	31	13	19	6

Table 3: Summary of Bloom's Taxonomy

	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	TOTAL
Level of Learning Outcomes	1	2	3	4	5	6	7	8	9	10	
Knowledge											
Recall			1		1	1	1	1			5
Identify	1	1	1	1		1	1	1		1	8
Comprehension											
Interpret	1		1		1				1	1	5
Classify						1	1		1		3
Comparing		1		1	1	1		1	1	1	7
Application											
Solve	1				1				1		3
Relate		1	1			1	1	1	1	1	7
Analysis											
Analyse	1	1	1	1							4
Discriminate			1	1		1	1	1		1	6
Synthesis											
Devise	1			1	1		1			1	5
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**6**	**5**	**7**	**6**	**6**	**7**	**7**	**6**	**6**	**7**	
	Item	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Total**
Level of Learning Outcomes	11	12	13	14	15	16	17	18	19	20	
Knowledge											
Recall	1			1				1			2
Identify		1	1	1		1	1	1		1	7
Comprehension											
Interpret	1	1	1	1	1	1			1	1	8
Classify											
Comparing	1	1	1					1		1	5
Application											
Solve	1		1	1		1	1		1		6
Relate		1			1		1	1	1	1	6
Analysis											
Analyse			1	1	1	1	1		1	1	6
Discriminate		1						1			2
Synthesis											
Devise	1	1	1	1	1	1	1	1	1		10
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**6**	**7**	**7**	**7**	**5**	**6**	**6**	**7**	**6**	**6**	
	Item	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Total**
Level of Learning Outcomes	21	22	23	24	25	26	27	28	29	30	
Knowledge											
Recall		1		1							2
Identify		1	1		1	1	1	1	1		7
Comprehension											
Interpret	1		1	1	1	1		1	1	1	8
Classify	1										1
Comparing		1		1							2
Application											
Solve	1			1			1				3
Relate	1	1				1	1			1	5
Analysis											
Analyse			1		1	1	1	1	1	1	7
Discriminate		1	1	1	1			1	1		6
Synthesis											
Devise			1	1	1	1	1	1	1	1	8
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**5**	**6**	**6**	**7**	**6**	**6**	**6**	**6**	**6**	**5**	
	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
Identify	1	1	1	1	1	1	1		1		8
Comprehension											
Interpret			1	1		1	1	1		1	6
Classify										1	1

Comparing		1							1	1	3
Application											
Solve	1				1			1		1	4
Relate	1	1			1			1	1	1	6
Analysis											
Analyse	1		1	1	1	1	1	1			7
Discriminate				1		1	1		1		5
Synthesis											
Devise	1	1			1	1	1			1	6
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**6**	**5**	**6**	**6**	**6**	**6**	**6**	**7**	**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		6
Identify	1	1	1		1	1	1		1	1	8
Comprehension											
Interpret	1	1	1	1	1				1		6
Classify				1				1			2
Comparing		1			1		1		1		4
Application											
Solve	1		1			1		1	1	1	6
Relate		1		1	1	1	1	1		1	7
Analysis											
Analyse	1		1		1	1	1	1		1	7
Discriminate			1					1	1	1	4
Synthesis											
Devise	1		1	1		1	1	1	1	1	8
Evaluation											
Justify	1	1	1	1		1	1	1		1	8
Total	**6**	**6**	**8**	**6**	**6**	**6**	**7**	**7**	**7**	**7**	
	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	3
Identify	1	1	1		1		1	1		1	7
Comprehension											
Interpret	1			1	1	1	1				5
Classify		1					1	1	1		4
Comparing	1		1	1	1		1		1	1	7
Application											
Solve		1	1		1	1		1		1	6
Relate	1			1			1		1	1	5
Analysis											
Analyse		1	1	1	1	1	1	1	1		8
Discriminate	1	1	1						1	1	5
Synthesis											
Devise	1	1	1	1	1	1		1	1		8
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**7**	**7**	**7**	**6**	**8**	**5**	**8**	**6**	**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			1		5
Identify			1	1	1		1	1		1	6
Comprehension											
Interpret	1		1	1	1		1	1	1		7
Classify	1	1		1		1					4
Comparing			1		1					1	3
Application											
Solve	1		1		1		1		1		5
Relate	1	1	1	1		1	1	1		1	8
Analysis											
Analyse	1	1		1	1		1	1	1	1	8
Discriminate						1	1			1	3
Synthesis											
Devise	1			1	1	1	1	1	1	1	8

Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**8**	**5**	**5**	**7**	**7**	**6**	**8**	**6**	**6**	**7**	
	Item	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**	**Total**
Level of Learning Outcomes	71	72	73	74	75	76	77	78	79	80	
Knowledge											
Recall	1			1	1	1	1			1	6
Identify		1	1			1	1	1	1		6
Comprehension											
Interpret		1	1			1		1	1		5
Classify	1										1
Comparing	1		1	1	1	1	1		1	1	8
Application											
Solve					1						1
Relate	1	1	1	1		1		1	1	1	8
Analysis											
Analyse	1	1		1	1	1	1	1	1		8
Discriminate			1	1					1	1	4
Synthesis											
Devise		1	1		1	1	1	1	1	1	8
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
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	81	82	83	84	85	86	87	88	89	90	
Knowledge											
Recall	1	1		1	1	1			1	1	7
Identify		1	1				1	1	1	1	6
Comprehension											
Interpret		1	1	1	1	1	1	1			7
Classify			1					1	1	1	4
Comparing	1	1	1			1	1		1	1	7
Application											
Solve		1	1			1	1	1			5
Relate	1	1	1	1	1						5
Analysis											
Analyse	1	1	1	1	1	1	1	1			8
Discriminate				1	1		1	1	1	1	6
Synthesis											
Devise	1			1	1			1	1	1	6
Evaluation											
Justify	1	1	1	1	1	1	1	1	1	1	10
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	91	92	93	94	95	96	97	98	99	100	
Knowledge											
Recall	1	1	1	1							4
Identify	1	1	1	1	1	1	1	1	1	1	10
Comprehension											
Interpret					1	1	1	1	1	1	6
Classify	1	1	1	1							4
Comparing	1	1	1	1	1	1	1	1	1	1	10
Application											
Solve					1	1	1	1	1	1	6
Relate											
Analysis											
Analyse					1	1	1	1	1	1	6
Discriminate	1	1	1	1	1	1	1	1	1	1	10
Synthesis											
Devise	1	1	1	1	1	1	1	1	1	1	10
Evaluation											10
Justify	1	1	1	1	1	1	1	1	1	1	10
Total	**7**	**7**	**7**	**7**	**8**	**8**	**8**	**8**	**8**	**8**	

Table 4: Summary of item analysis

Time (30mins)	**Easy**	**Moderate**	**Difficult**	**Total**
	70	19	11	Items
				100

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

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

Item: Discrimination Index is $$D = \frac{U_p - L_p}{U}$$

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

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

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:
- xi: the ith number of x
- yi: the ith number of y
- n: total numbers of x or y
- r: correlation coefficient, -1 <= r <= 1, 1 represents strongly positively correlated, -1 represents strongly negatively correlated, 0 represents no correlation.

Table 5: items with difficulty level < 16

Items	36,43,48,56,57,63,72,81,89,93,94,95,96,97,98,70,71,75,80, 99,100

Difficulty level <16 means these items are very difficult.

Table 6: of items with difficulty level > 84

Items	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23 ,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42, 44,45,46,47,49,50,51,52,53,54,55,58,59,60,61,62,64,65,66, 67,68,69,73,74,75,76,77,78,79,82,83,84,85,86,87,88,90,91, 92.

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

Items	24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42, 44,45,,48,56,57,63,64,65,66,67,68,69,72,81,89,93,94,95,96, 97,98,70,71,75,80, 90,91,99,100

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

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 Reliability:

Reliability	Value
Test – Retest method	0.9762
Split Half Method	0.6975

Table 10: Analysis of Reliability (Test-Retest Method)

t1	t2	$X - M_x$	$Y - M_y$	$(X - M_x)^2$	$(Y - M_y)^2$	$(X - M_x)(Y - M_y)$
37	42	-29.579	-25.653	874.914	658.058	758.778
64	63	-2.579	-4.653	6.651	21.647	11.999
64	58	-2.579	-9.653	6.651	93.173	24.894
70	71	3.421	3.347	11.704	11.205	11.452
53	57	-13.579	-10.653	184.388	113.479	144.652
49	49	-17.579	-18.653	309.019	347.921	327.894
61	60	-5.579	-7.653	31.125	58.563	42.694
70	72	3.421	4.347	11.704	18.9	14.873
74	75	7.421	7.347	55.072	53.984	54.525
56	58	-10.579	-9.653	111.914	93.173	102.115
56	60	-10.579	-7.653	111.914	58.563	80.957
66	66	-0.579	-1.653	0.335	2.731	0.957
61	60	-5.579	-7.653	31.125	58.563	42.694
64	65	-2.579	-2.653	6.651	7.036	6.841
80	79	13.421	11.347	180.125	128.763	152.294
39	43	-27.579	-24.653	760.598	607.752	679.894
55	58	-11.579	-9.653	134.072	93.173	111.767
69	70	2.421	2.347	5.861	5.51	5.683
60	62	-6.579	-5.653	43.283	31.952	37.188
57	55	-9.579	-12.653	91.756	160.089	121.199
56	59	-10.579	-8.653	111.914	74.868	91.536
71	78	4.421	10.347	19.546	107.068	45.746
46	47	-20.579	-20.653	423.493	426.531	425.009
63	63	-3.579	-4.653	12.809	21.647	16.652
85	85	18.421	17.347	339.335	300.931	319.557
83	84	16.421	16.347	269.651	267.236	268.441
46	45	-20.579	-22.653	423.493	513.142	466.167
50	55	-16.579	-12.653	274.861	160.089	209.767
50	52	-16.579	-15.653	274.861	245.005	259.504
53	57	-13.579	-10.653	184.388	113.479	144.652
53	50	-13.579	-17.653	184.388	311.615	239.704
59	58	-7.579	-9.653	57.44	93.173	73.157
59	59	-7.579	-8.653	57.44	74.868	65.578
59	60	-7.579	-7.653	57.44	58.563	57.999
61	61	-5.579	-6.653	31.125	44.258	37.115
61	62	-5.579	-5.653	31.125	31.952	31.536
64	65	-2.579	-2.653	6.651	7.036	6.841
64	64	-2.579	-3.653	6.651	13.342	9.42
64	64	-2.579	-3.653	6.651	13.342	9.42
64	67	-2.579	-0.653	6.651	0.426	1.683
66	70	-0.579	2.347	0.335	5.51	-1.359
67	65	0.421	-2.653	0.177	7.036	-1.117
67	68	0.421	0.347	0.177	0.121	0.146
69	71	2.421	3.347	5.861	11.205	8.104
70	72	3.421	4.347	11.704	18.9	14.873
74	71	7.421	3.347	55.072	11.205	24.841
76	70	9.421	2.347	88.756	5.51	22.115
77	79	10.421	11.347	108.598	128.763	118.252
66	66	-0.579	-1.653	0.335	2.731	0.957
73	75	6.421	7.347	41.23	53.984	47.178
77	72	10.421	4.347	108.598	18.9	45.304
77	78	10.421	10.347	108.598	107.068	107.83
77	77	10.421	9.347	108.598	87.373	97.409
91	89	24.421	21.347	596.388	455.71	521.325
63	65	-3.579	-2.653	12.809	7.036	9.494
70	71	3.421	3.347	11.704	11.205	11.452
77	77	10.421	9.347	108.598	87.373	97.409
72	74	5.421	6.347	29.388	40.289	34.409
36	45	-30.579	-22.653	935.072	513.142	692.694
41	43	-25.579	-24.653	654.283	607.752	630.588
50	50	-16.579	-17.653	274.861	311.615	292.662
57	59	-9.579	-8.653	91.756	74.868	82.883
65	66	-1.579	-1.653	2.493	2.731	2.609
67	68	0.421	0.347	0.177	0.121	0.146
71	78	4.421	10.347	19.546	107.068	45.746
75	72	8.421	4.347	70.914	18.9	36.609
82	82	15.421	14.347	237.809	205.847	221.252

84	87	17.421	19.347	303.493	374.321	337.052
76	79	9.421	11.347	88.756	128.763	106.904
77	79	10.421	11.347	108.598	128.763	118.252
82	79	15.421	11.347	237.809	128.763	174.988
82	87	15.421	19.347	237.809	374.321	298.357
65	61	-1.579	-6.653	2.493	44.258	10.504
77	76	10.421	8.347	108.598	69.679	86.988
87	88	20.421	20.347	417.019	414.015	415.515
87	90	20.421	22.347	417.019	499.405	456.357
88	83	21.421	15.347	458.861	235.542	328.757
64	60	-2.579	-7.653	6.651	58.563	19.736
65	68	-1.579	0.347	2.493	0.121	-0.548
81	83	14.421	15.347	207.967	235.542	221.325
87	85	20.421	17.347	417.019	300.931	354.252
91	89	24.421	21.347	596.388	455.71	521.325
41	45	-25.579	-22.653	654.283	513.142	579.43
61	64	-5.579	-3.653	31.125	13.342	20.378
74	74	7.421	6.347	55.072	40.289	47.104
79	80	12.421	12.347	154.283	152.458	153.367
85	83	18.421	15.347	339.335	235.542	282.715
92	90	25.421	22.347	646.23	499.405	568.094
74	78	7.421	10.347	55.072	107.068	76.788
76	83	9.421	15.347	88.756	235.542	144.588
76	78	9.421	10.347	88.756	107.068	97.483
81	89	14.421	21.347	207.967	455.71	307.852
34	40	-32.579	-27.653	1061.388	764.668	900.894
34	42	-32.579	-25.653	1061.388	658.058	835.736
56	56	-10.579	-11.653	111.914	135.784	123.273
67	67.652	Mx: 66.579	My: 67.653	Sum: 17599.158	Sum: 15771.537	Sum: 16264.105

N=95, t1-Scores in Test1, t2-Scores in Test1

Result Details & Calculation

X Values
∑ = 6427
Mean = 67.653
∑(Y - My)2 = SSy = 15771.537

Y Values
∑ = 6325
Mean = 66.579
∑(X - Mx)2 = SSx = 17599.158

X and Y Combined
N = 95
∑(X - Mx)(Y - My) = 16264.105
R Calculation
r = ∑((X - My)(Y - Mx)) / √((SSx)(SSy))
r = 16264.105 / √((17599.158)(15771.537)) = 0.9762
Meta Numerics (cross-check) r = 0.9762

Key

X: X Values
Y: Y Values
Mx: Mean of X Values
My: Mean of Y Values
X - Mx & Y - My: Deviation scores
(X - Mx)2 & (Y - My)2: Deviation Squared
(X - Mx)(Y - My): Product of Deviation Scores
The value of R is 0.9762. This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).
The value of R2, the coefficient of determination, is 0.953.

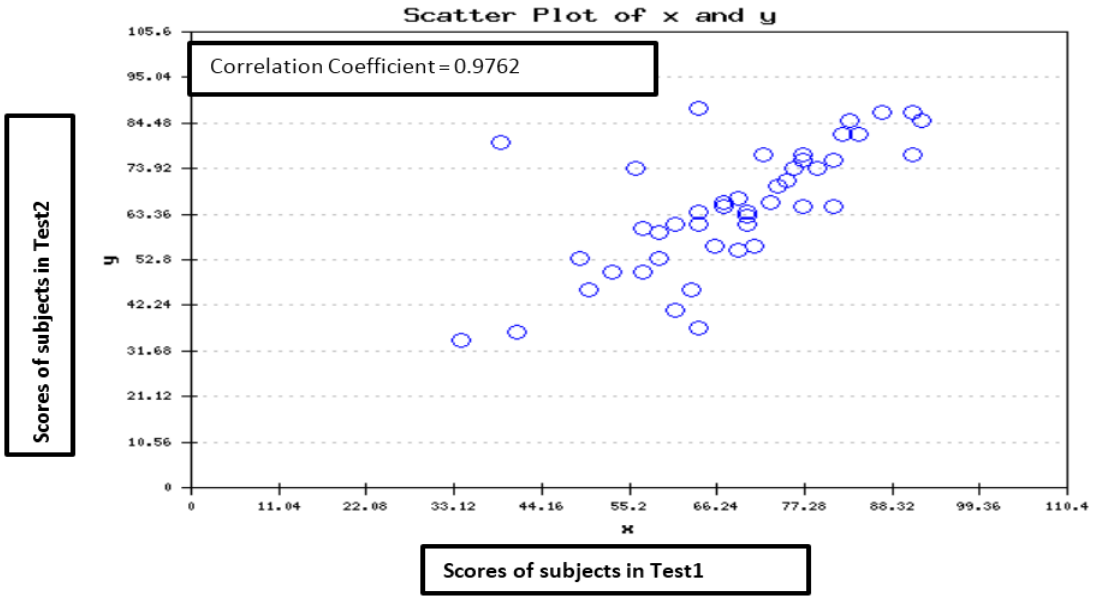


Fig 3: Correlation coefficient using Test-Retest Method

Table 11: Analysis of Reliability (Split-Half Method)

S(O)	S(E)	$X - M_x$	$Y - M_y$	$(X - M_x)^2$	$(Y - M_y)^2$	$(X - M_x)(Y - M_y)$
37	64	-28.149	-4.234	792.363	17.927	119.184
64	70	-1.149	1.766	1.32	3.119	-2.029
53	49	-12.149	-19.234	147.597	369.948	233.673
61	70	-4.149	1.766	17.214	3.119	-7.327
74	56	8.851	-12.234	78.341	149.672	-108.284
56	66	-9.149	-2.234	83.703	4.991	20.439
61	64	-4.149	-4.234	17.214	17.927	17.567
80	39	14.851	-29.234	220.554	854.629	-434.157
55	69	-10.149	0.766	103.001	0.587	-7.774
60	57	-5.149	-11.234	26.512	126.204	57.843
56	71	-9.149	2.766	83.703	7.651	-25.306
46	63	-19.149	-5.234	366.682	27.395	100.226
85	83	19.851	14.766	394.065	218.033	293.12
46	50	-19.149	-18.234	366.682	332.48	349.163
50	53	-15.149	-15.234	229.49	232.076	230.78
53	59	-12.149	-9.234	147.597	85.268	112.184
59	59	-6.149	-9.234	37.809	85.268	56.78
61	61	-4.149	-7.234	17.214	52.331	30.014
64	64	-1.149	-4.234	1.32	17.927	4.865
64	64	-1.149	-4.234	1.32	17.927	4.865
66	67	0.851	-1.234	0.724	1.523	-1.05
67	69	1.851	0.766	3.426	0.587	1.418
70	74	4.851	5.766	23.533	33.246	27.971
76	77	10.851	8.766	117.746	76.842	95.12
66	73	0.851	4.766	0.724	22.714	4.056
77	77	11.851	8.766	140.448	76.842	103.886
77	91	11.851	22.766	140.448	518.289	269.801
63	70	-2.149	1.766	4.618	3.119	-3.795
77	72	11.851	3.766	140.448	14.182	44.631
36	41	-29.149	-27.234	849.66	741.693	793.843
50	57	-15.149	-11.234	229.49	126.204	170.184
65	67	-0.149	-1.234	0.022	1.523	0.184
71	75	5.851	6.766	34.235	45.778	39.588
82	84	16.851	15.766	283.958	248.565	265.673
76	77	10.851	8.766	117.746	76.842	95.12
82	82	16.851	13.766	283.958	189.502	231.971
65	77	-0.149	8.766	0.022	76.842	-1.306
87	87	21.851	18.766	477.469	352.161	410.056
88	64	22.851	-4.234	522.171	17.927	-96.752
65	81	-0.149	12.766	0.022	162.97	-1.901
87	91	21.851	22.766	477.469	518.289	497.46
41	61	-24.149	-7.234	583.171	52.331	174.694
74	79	8.851	10.766	78.341	115.906	95.29
85	92	19.851	23.766	394.065	564.821	471.78
74	76	8.851	7.766	78.341	60.31	68.737
76	81	10.851	12.766	117.746	162.97	138.524
34	34	-31.149	-34.234	970.256	1171.97	1066.354
65.14894	68.23404	Mx: 65.149	My: 68.234	Sum: 9203.957	Sum: 8058.426	Sum: 6007.362

N=95, S(O)-Scores in Odd Items, S(E)-Scores in Even Items

Result Details & Calculation

X Values

$\sum = 3062$

Mean = 65.149

$\sum(X - M_x)^2 = SS_x = 9203.957$

Y Values

$\sum = 3207$

Mean = 68.234

$\sum(Y - M_y)^2 = SS_y = 8058.426$

X and Y Combined

$N = 47$

$\sum(X - M_x)(Y - M_y) = 6007.362$

R Calculation

$r = \sum((X - M_y)(Y - M_x)) / \sqrt{((SS_x)(SS_y))}$

$r = 6007.362 / \sqrt{((9203.957)(8058.426))} = 0.6975$

Meta Numerics (cross-check)

r = 0.6975

Key

X: X Values

Y: Y Values

M_x: Mean of X Values

M_y: Mean of Y Values

$X - M_x$ & $Y - M_y$: Deviation scores

$(X - M_x)^2$ & $(Y - M_y)^2$: Deviation Squared

$(X - M_x)(Y - M_y)$: Product of Deviation Scores

The value of R is 0.6975. This is a moderate positive correlation, which means there is a tendency for high X variable scores go with high Y variable scores (and vice versa).

The value of R^2, the coefficient of determination, is 0.4865

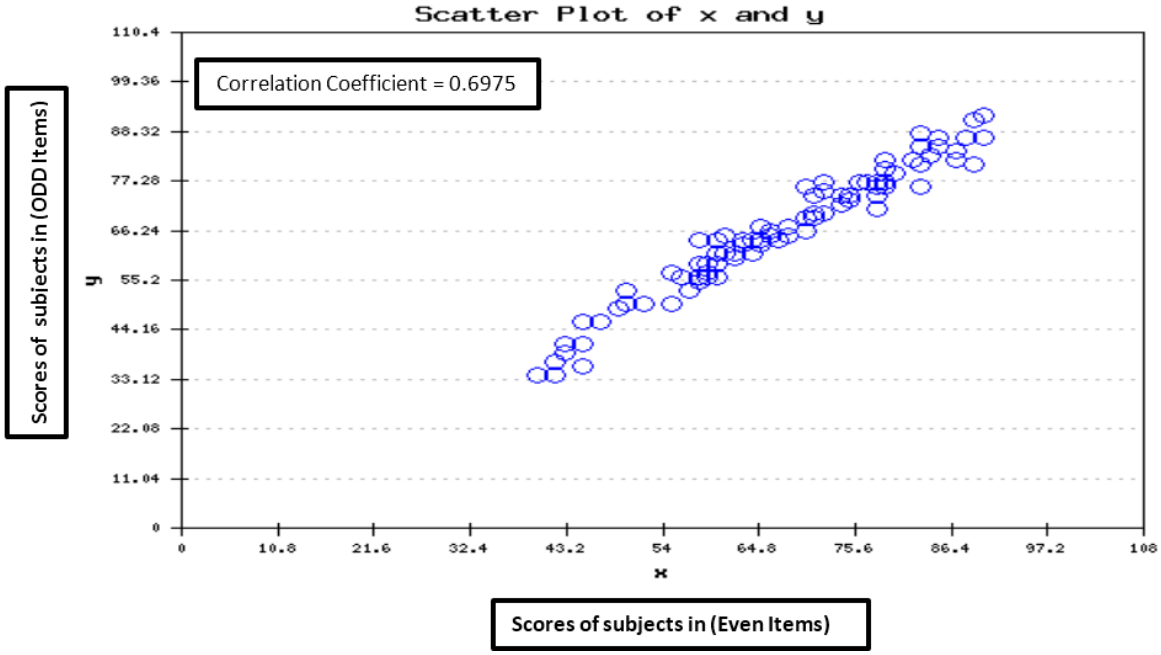


Fig 4: Correlation coefficient using Split-Half Method

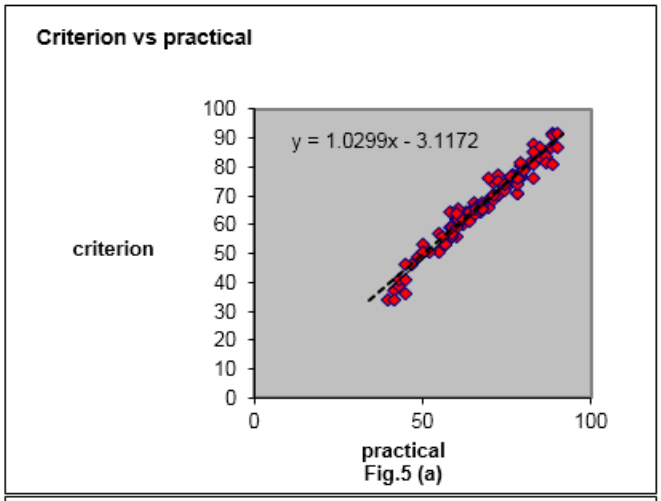
Table 12: Analysis of Validity by Linear Regression Method

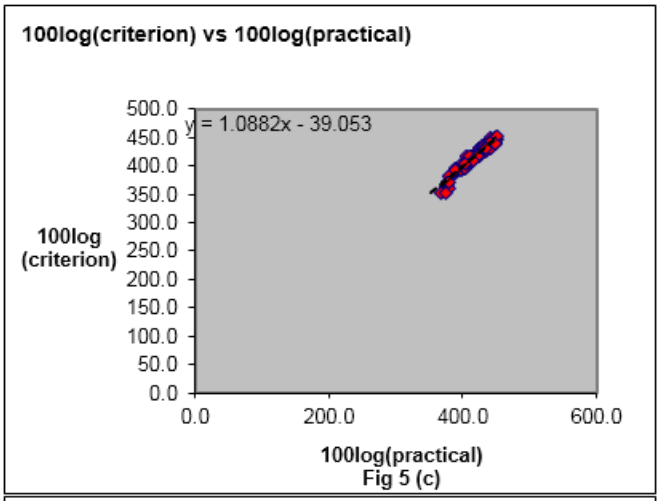
S. No	Y (criterion)	X (practical)	predicted	residual	prac-crit	S.no	100logY	100logX	predicted	residual	prac-crit
1.	37	42	40.14	-3.00	4.86	1.	361.5	373.8	367.69	-6.22	12.29
2.	64	63	61.77	2.52	-1.29	2.	416.3	414.3	411.82	4.52	-2.02
3.	64	58	56.62	7.67	-6.29	3.	416.3	406.0	402.82	13.51	-10.29
4.	70	71	70.01	-0.01	1.00	4.	424.8	426.3	424.83	0.02	1.42
5.	53	57	55.59	-2.73	4.14	5.	396.8	404.3	400.93	-4.17	7.55
6.	49	49	47.35	1.22	0.43	6.	388.3	389.2	384.47	3.83	0.88
7.	61	60	58.68	2.75	-1.43	7.	411.8	409.4	406.51	5.28	-2.35
8.	70	72	71.04	-1.04	2.00	8.	424.8	427.7	426.35	-1.50	2.82
9.	74	75	74.13	0.16	0.71	9.	430.8	431.7	430.79	0.00	0.96
10.	56	58	56.62	-0.90	2.29	10.	402.0	406.0	402.82	-0.80	4.02
11.	56	60	58.68	-2.96	4.29	11.	402.0	409.4	406.51	-4.49	7.41
12.	66	66	64.86	0.86	0.29	12.	418.5	419.0	416.88	1.65	0.43
13.	61	60	58.68	2.75	-1.43	13.	411.8	409.4	406.51	5.28	-2.35
14.	64	65	63.83	0.46	0.71	14.	416.3	417.4	415.22	1.11	1.10
15.	80	79	78.25	1.75	-1.00	15.	438.2	436.9	436.45	1.76	-1.26
16.	39	43	41.17	-2.17	4.00	16.	366.4	376.1	370.25	-3.90	9.76
17.	55	58	56.62	-1.62	3.00	17.	400.7	406.0	402.82	-2.09	5.31
18.	69	70	68.98	0.02	1.00	18.	423.4	424.8	423.28	0.13	1.44
19.	60	62	60.74	-0.74	2.00	19.	409.4	412.7	410.08	-0.64	3.28
20.	57	55	53.53	3.47	-2.00	20.	404.3	400.7	397.04	7.27	-3.57
21.	56	59	57.65	-1.65	3.00	21.	402.5	407.8	404.68	-2.14	5.22
22.	71	78	77.22	-6.22	7.00	22.	426.3	435.7	435.06	-8.79	9.40
23.	46	47	45.29	0.71	1.00	23.	382.9	385.0	379.93	2.93	2.15
24.	63	63	61.77	1.23	0.00	24.	414.3	414.3	411.82	2.50	0.00
25.	85	85	84.43	0.57	0.00	25.	444.3	444.3	444.41	-0.15	0.00
26.	83	84	83.40	-0.06	0.67	26.	442.3	443.1	443.13	-0.84	0.80
27.	46	45	43.23	2.49	-0.71	27.	382.2	380.7	375.20	7.04	-1.57
28.	50	55	53.53	-3.53	5.00	28.	391.2	400.7	397.04	-5.84	9.53
29.	50	52	50.44	-0.44	2.00	29.	391.2	395.1	390.94	0.27	3.92
30.	53	57	55.59	-2.73	4.14	30.	396.8	404.3	400.93	-4.17	7.55
31.	53	50	48.38	4.48	-2.86	31.	396.8	391.2	386.67	10.09	-5.56
32.	59	58	56.62	1.95	-0.57	32.	407.0	406.0	402.82	4.21	-0.98
33.	59	59	57.65	0.92	0.43	33.	407.0	407.8	404.68	2.34	0.73
34.	59	60	58.68	-0.11	1.43	34.	407.0	409.4	406.51	0.52	2.41
35.	61	61	59.71	1.72	-0.43	35.	411.8	411.1	408.31	3.48	-0.70
36.	61	62	60.74	0.69	0.57	36.	411.8	412.7	410.08	1.71	0.93
37.	64	65	63.83	0.46	0.71	37.	416.3	417.4	415.22	1.11	1.10
38.	64	64	62.80	1.49	-0.29	38.	416.3	415.9	413.53	2.80	-0.45

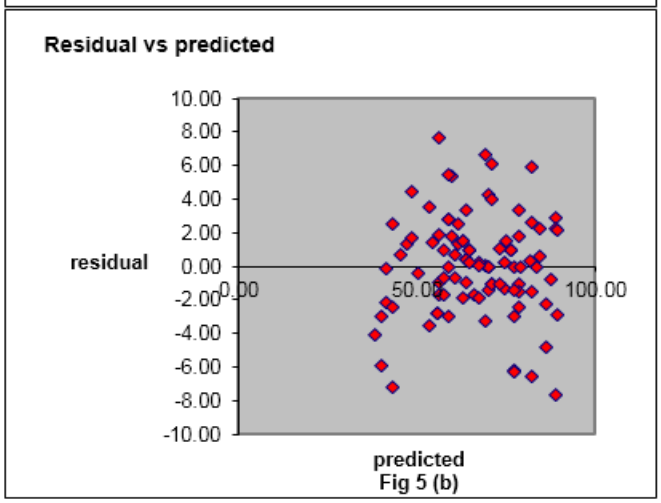
39.	64	64	62.80	1.49	-0.29	39.	416.3	415.9	413.53	2.80	-0.45
40.	64	67	65.89	-1.60	2.71	40.	416.3	420.5	418.52	-2.18	4.14
41.	66	70	68.98	-3.26	4.29	41.	418.5	424.8	423.28	-4.75	6.32
42.	67	65	63.83	3.32	-2.14	42.	420.7	417.4	415.22	5.46	-3.24
43.	67	68	66.92	0.23	0.86	43.	420.7	422.0	420.13	0.55	1.27
44.	69	71	70.01	-1.44	2.43	44.	422.8	426.3	424.83	-2.04	3.48
45.	70	72	71.04	-1.04	2.00	45.	424.8	427.7	426.35	-1.50	2.82
46.	74	71	70.01	4.28	-3.29	46.	430.8	426.3	424.83	5.96	-4.52
47.	76	70	68.98	6.74	-5.71	47.	432.7	424.8	423.28	9.41	-7.85
48.	77	79	78.25	-1.10	1.86	48.	434.6	436.9	436.45	-1.88	2.38
49.	66	66	64.86	0.86	0.29	49.	418.5	419.0	416.88	1.65	0.43
50.	73	75	74.13	-1.27	2.14	50.	428.9	431.7	430.79	-1.94	2.90
51.	77	72	71.04	6.11	-5.14	51.	434.6	427.7	426.35	8.22	-6.90
52.	77	78	77.22	-0.07	0.86	52.	434.6	435.7	435.06	-0.49	1.10
53.	77	77	76.19	0.96	-0.14	53.	434.6	434.4	433.66	0.91	-0.19
54.	91	89	88.55	2.88	-2.43	54.	451.6	448.9	449.42	2.14	-2.69
55.	63	65	63.83	-0.97	2.14	55.	414.1	417.4	415.22	-1.13	3.35
56.	70	71	70.01	-0.01	1.00	56.	424.8	426.3	424.83	0.02	1.42
57.	77	77	76.19	0.96	-0.14	57.	434.6	434.4	433.66	0.91	-0.19
58.	72	74	73.10	-1.10	2.00	58.	427.7	430.4	429.33	-1.66	2.74
59.	36	45	43.23	-7.23	9.00	59.	358.4	380.7	375.20	-16.85	22.31
60.	41	43	41.17	-0.17	2.00	60.	371.4	376.1	370.25	1.10	4.76
61.	50	50	48.38	1.62	0.00	61.	391.2	391.2	386.67	4.53	0.00
62.	57	59	57.65	-0.65	2.00	62.	404.3	407.8	404.68	-0.37	3.45
63.	65	66	64.86	0.14	1.00	63.	417.4	419.0	416.88	0.56	1.53
64.	67	68	66.92	0.08	1.00	64.	420.5	422.0	420.13	0.34	1.48
65.	71	78	77.22	-6.38	7.17	65.	426.0	435.7	435.06	-9.03	9.64
66.	75	72	71.04	3.96	-3.00	66.	431.7	427.7	426.35	5.40	-4.08
67.	82	82	81.34	0.33	0.33	67.	440.3	440.7	440.50	-0.24	0.41
68.	84	87	86.49	-2.32	2.83	68.	443.3	446.6	446.94	-3.66	3.31
69.	76	79	78.25	-2.41	3.17	69.	432.9	436.9	436.45	-3.59	4.09
70.	77	79	78.25	-1.58	2.33	70.	433.9	436.9	436.45	-2.50	3.00
71.	82	79	78.25	3.42	-2.67	71.	440.3	436.9	436.45	3.82	-3.32
72.	82	87	86.49	-4.82	5.33	72.	440.3	446.6	446.94	-6.68	6.33
73.	65	61	59.71	5.29	-4.00	73.	417.4	411.1	408.31	9.13	-6.35
74.	77	76	75.16	1.51	-0.67	74.	433.9	433.1	432.23	1.71	-0.87
75.	87	88	87.52	-0.85	1.33	75.	446.2	447.7	448.19	-1.98	1.53
76.	87	90	89.58	-2.91	3.33	76.	446.2	450.0	450.63	-4.43	3.77
77.	88	83	82.37	5.97	-5.33	77.	448.1	441.9	441.82	6.29	-6.23
78.	64	60	58.68	5.49	-4.17	78.	416.1	409.4	406.51	9.64	-6.71
79.	65	68	66.92	-1.92	3.00	79.	417.4	422.0	420.13	-2.69	4.51
80.	81	83	82.37	-1.53	2.17	80.	439.2	441.9	441.82	-2.58	2.65
81.	87	85	84.43	2.24	-1.67	81.	446.2	444.3	444.41	1.79	-1.94
82.	91	89	88.55	2.29	-1.83	82.	450.9	448.9	449.42	1.49	-2.04
83.	41	45	43.23	-2.40	4.17	83.	370.9	380.7	375.20	-4.25	9.72
84.	61	64	62.80	-1.96	3.17	84.	410.8	415.9	413.53	-2.72	5.07
85.	74	74	73.10	1.07	-0.17	85.	430.6	430.4	429.33	1.30	-0.22
86.	79	80	79.28	-0.11	0.83	86.	437.2	438.2	437.82	-0.66	1.05
87.	85	83	82.37	2.63	-2.00	87.	444.3	441.9	441.82	2.44	-2.38
88.	92	90	89.58	2.09	-1.67	88.	451.8	450.0	450.63	1.18	-1.83
89.	74	78	77.22	-3.05	3.83	89.	430.6	435.7	435.06	-4.43	5.04
90.	76	83	82.37	-6.53	7.17	90.	432.9	441.9	441.82	-8.97	9.03
91.	76	78	77.22	-1.38	2.17	91.	432.9	435.7	435.06	-2.21	2.82
92.	81	89	88.55	-7.71	8.17	92.	439.2	448.9	449.42	-10.18	9.62
93.	34	40	38.08	-4.08	6.00	93.	352.6	368.9	362.38	-9.75	16.25
94.	34	42	40.14	-5.97	7.83	94.	353.1	373.8	367.69	-14.57	20.64
95.	56	56	54.56	1.44	0.00	95.	402.5	402.5	399.00	3.53	0.00
Mean	66.6	67.7			1.09	Back-trans mean	65.0	66.3			2.1
SD	13.7	13.0			3.03	SD as a CV (%)	25.4	22.5			5.5
N	95	95				N	95	95			
ΣX^2		15772				ΣX^2		38623			

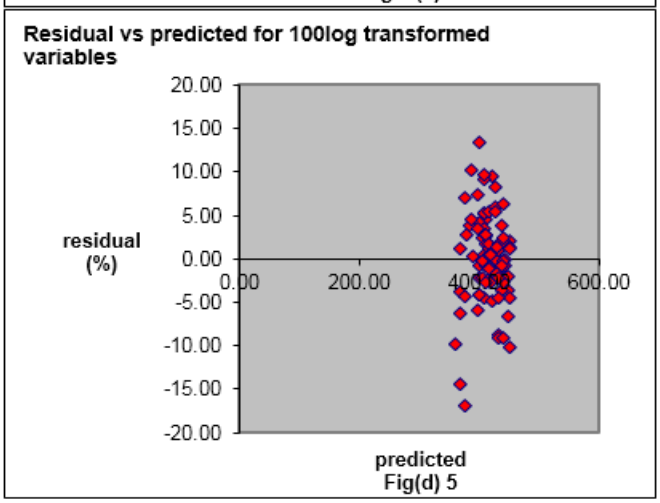
Table 13: Measures of Validity of Raw Variables and log Transformed Variables.

Calibration equation: Y = intercept + slope*X	Estimate	Lower CL	Upper CL	±CL	approx. ×/÷CL
intercept	-3.117	-6.413	0.178	3.296	
slope	1.030	0.982	1.078	0.048	
Enter an X value here:	50.00				
Predicted (estimated) Y at X	48.38	42.28	54.48	6.10	
Bias at X value					
in raw units	1.62	0.58	2.67	1.05	
standardized	0.12	0.04	0.20	0.08	
Overall bias					
Mean bias in raw units	1.09	0.47	1.71	0.62	
Mean bias standardized	0.08	0.03	0.13	0.05	
SD of bias in raw units	3.03	2.65	3.54		1.16
SD of bias standardized	0.22	0.19	0.26		1.16
Typical error of estimate	Estimate	Lower CL	Upper CL		
in raw units	3.03	2.65	3.53		1.16
standardized	0.22	0.19	0.26		1.16
PRRES error	3.06				
	Estimate	Lower CL	Upper CL	approx. ±CL	
Pearson correlation	0.98	0.96	0.98	0.01	
Bland-Altman	Estimate				
95% limits of agreement	5.95				
"Total" or "pure" error	3.03				
Calibration equation: Y = aX^b	Estimate	Lower CL	Upper CL	×/÷ CL	± CL
a	0.677	0.546	0.839	1.24	-
b	1.088	1.037	1.140	-	0.051
Enter an X value here:	400.00				
Predicted (estimated) Y at X	459.26	400.45	526.69	1.15	
Bias at X value					
as a %	-12.9	-20.6	-4.4	-	8.1
as a factor	0.871	0.794	0.956	1.097	-
standardized	-0.61	-1.02	-0.20	-	0.41
Overall bias					
Mean bias as a %	2.1	1.0	3.2	-	1.1
Mean bias as a factor	1.021	1.010	1.032	1.011	-
Mean bias standardized	0.09	0.04	0.14	-	0.05
SD of bias as a %	5.7	4.9	6.6	1.16	
SD of bias as a factor	1.057	1.049	1.066	1.008	
SD of bias standardized	0.24	0.21	0.28	1.16	
Typical error of estimate	Estimate	Lower CL	Upper CL	approx. ×/÷CL	
as a CV (%)	5.2	4.5	6.1	1.16	
as a ×/÷ factor	1.052	1.045	1.061	1.007	
standardized	0.22	0.20	0.26	1.16	
PRRES error (%)	5.3				
	Estimate	Lower CL	Upper CL		approx. ±CL
Pearson correlation	0.97	0.96	0.98		0.01
Bland-Altman	Estimate				
95% limits of agreement (%)	10.8				
"Total" or "pure" error (%)	5.5				









4. Conclusion

In recapitulation, the study came out with significant results as the correlation coefficient was found to be significantly high witnessing the high reliability and validity of the test. 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 Development, item analysis and standardization of the of the cognitive ability test for subjects above 16 years of age. The objective of the research was achieved as a product intended 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. The test would help in the identification, measurement and analysis of core cognitive ability factors that determine success in education and occupation. The validity was estimated via linear regression method. The value of reliability is 0.9762 through Test-Retest Method while in case of Split Half Method, the Reliability was found to be 0.6975. At an average, it was calculated to be 0.8276. The study came out with significant outputs as the correlation coefficient was found to be significantly high witnessing the high validity and reliability of the test.

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