International Journal of Innovation and Research in Educational Sciences
Volume 3, Issue 5, ISSN (Online): 2349–5219

Perpetuation of Concurrent Validity of Intelligence Quotient as Found by Standardized Cognitive Ability Test

Shruti Marwaha
Department of Research & Development
Centre for Research in Applied Cognitive Sciences, Maxpro Intellithon Ltd. India

Geetika Seth
Department of Research & Development
Centre for Research in Applied Cognitive Sciences, Maxpro Intellithon Ltd. India

Astha Thakur
Department of Research & Development
Centre for Research in Applied Cognitive Sciences, Maxpro Intellithon Ltd. India

***Abstract* – The in hand research was conducted to re-confirm and re-establish the concurrent validity of the numerical value of Intelligence Quotient as assessed through the standardized Cognitive Ability Test. The research was conducted in and around Chandigarh. The sample consisted of 240 school going students between 7-16 years of age from different schools. Random sampling was followed. The sample was divided into 4 groups according to their age. The Intelligence Quotient of all the subjects were found in two different stages, using two varied tests, both of which are developed and standardized scientifically. It was established through results that the Cognitive Ability Test is valid measure to find out the Intelligence Quotient of the subjects. Eventually, the concurrent validity of the numerical value of Intelligence Quotient as assessed through the standardized Cognitive Ability Test was re-established.**

***Keywords* – Intelligence Quotient (IQ), Concurrent Validity, Standardized.**

I. INTRODUCTION

Validation studies are a lucid and useful tool for comparing the relationship between the cognitive abilities of intelligence tests. Inferences can be made from the results as to the degree broad factors from each testy are similar or different in the abilities they measure. Within the realm of the scientific world, the field of psychology has commonly been referred to as a soft science. Outside of Skinnerian behaviorism, psychology generally falls under the criticisms of being overly subjective in its definitions, interpretations and diagnoses. A single concept may be viewed in various ways, using many theoretical viewpoints, and finding a variety of results. No where is this more evident than in the understanding of intelligence. Although intelligence, and the ability to assess it, is considered an important concept in relation to academic settings, a great deal of controversy has surrounded both the ways and means used to define and measure intelligence. With the advent of federal regulations such as the Individuals with Disabilities Education Act (IDEA: 1991, 1997), the need for suitable intelligence tests has never been more important. Measures of a child's intellectual abilities are considered one part of what is referred to as the 'Fours Pillars of Assessment' (Sattler, 1992). Along with behavioral observations, interviews, and informal assessment, intelligence testing provides an investigator with information into a child's overall level of functioning, as well as specific abilities. However, intelligence tests provide information about a child's abilities in two main ways that the other methods do not. First, it provides a standardized or norm- referenced framework (Anastasi & Urbina, 1997). Accordingly, comparisons between individuals, as well as intra-individual performances can be made for the purpose of placement or identifying special education needs using these tests. Secondly, aptitude has been found to be highly correlated with success in both school and work environments (Sattler, 1992). Being that tests of aptitude have long been considered acceptable ways of predicting future outcomes, they maintain their important place in the educational and psychological landscape. Much of the difficulty in developing an adequate intelligence assessment tool is the lack of a consensus definition of what the concept actually represents. Before tasks can be chosen to represent and assess cognitive abilities, those abilities must be operationally defined. Francois (1995) states that in order to make use of what intelligence tests show us, we must first understand what intelligence is. Through the years, the nature of the types of abilities believed to represent intelligence has taken numerous routes. Even the term intelligence itself has recently taken a back seat to a more broad viewpoint involving various cognitive abilities. Theories of intelligence date back to the origins of psychology (Anastasi & Urbina,1997). It is believed that ancient Greeks and Chinese used tests as measures of both physical and mental abilities. A heightened focus on defining and assessing intelligence began in the 1800' s as part of attempts to classify between various levels of mental retardation and mental illness using psychological tests (Anastasi & Urbina, 1997). From Francis Galton's work on sensory perception, to the hierarchical theories of Charles Spearman's "g" and Hom-Cattell's multi-factor approach, theories of intelligence have evolved as a science (Drummond, 1996). As these theories have developed over time, tests which measure intelligence have been developed as well. For the past half century, the assessment of intelligence has been conducted using a small number of tests covering a limited number of abilities. The most recent and commonly heard criticism of the use of these tests, is their lack of being tied to a specific definition or theory of intelligence (Naglieri, 1999). Subsequently, there has been a move away from these traditional measures of intelligence, toward new assessment tools more firmly based upon existing theories of intelligence. Raven's Progressive Matrices (often referred to simply as Raven's Matrices) or RPM is a nonverbal group test typically used in educational settings. It is a 60-item test used in measuring abstract reasoning and regarded as a non-verbal estimate of fluid intelligence. It is the most common and popular test administered to groups ranging from 5-year-olds to the elderly. It is made

of 60 multiple choice questions, listed in order of difficulty. This format is designed to measure the test-taker's reasoning ability. In each test item, the subject is asked to identify the missing element that completes a pattern.

Intelligence Quotient is an artificial dynamic cognitive factor. It is a measurement of knowledge tested against time & age. It is a ratio of mental age vs chronological age vs time. IQ cannot be a constant factor & varies in either direction as we grow older. A big neuro myth is that having a high IQ leads us to a successful career. (dIQ 90-110 is avg, 120 optimum) A very high DiQ is not a guarantee to success. Its not constant rather highly variable, volatile at times. (IQ=100XMA/CA)

Table 1. Intelligence Quotient Range and Interpretation

IQ	
ABOVE 220	GENIUS
180-220	EXTRAORDINARY
150-180	EXCELLENT
120-150	HIGH
111-120	ABOVE AVERAGE
89-111	AVERAGE
70-89	BELOW AVERAGE
BELOW 70	BELOW PAR

II. METHOD

Random sampling was undertaken to select subjects both males as well as females from different schools aging between 7-16 years. The sample was divided into four groups

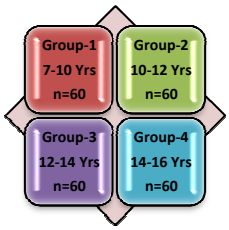


Fig.1 Sampling

Group 1: Subject aging between 07-10 Years
Group 2: Subject aging between 10-12 Years
Group 3: Subject aging between 12-14 Years
Group 4: Subject aging between 14-16 Years

STAGES OF STUDY –
The Groups were compared in two stages.

Table 2. Stages of study

	STAGES OF STUDY			
Groups	Group-1	Group-2	Group-3	Group-4
Age Range	7-10 Yrs	10-12 Yrs	12-14 Yrs	14-16 Yrs
Day-1	Rapport Building			
Stage-1 Day-2	IQ tested by Test-1	IQ tested by Test-2	IQ tested by Test-1	IQ tested by Test-2
Day-3 & 4	Halt			
Stage-2 Day-5	IQ tested by Test-2	IQ tested by Test-1	IQ tested by Test-2	IQ tested by Test-1

Test-1 used is the Raven's Progressive Matrices (often referred to simply as Raven's Matrices) or RPM is a nonverbal group test typically used in educational settings. It is a 60-item test used in measuring Intelligence Quotient of the respondents. The Test-2 is the developed and standardised Cognitive Ability Test in question. On the first day, rapport was built with the subjects. On the second day, Intelligence Quotient of Group-1 (subjects aging between 7-10 years of age) and Group-3 (subjects aging between 12-14 years of age) was initially found using the Test-1. In contrast, those from Group-2 and Group-4 were given Test-2 to test their Intelligence Quotient. A halt was given for next two days, following which, the subjects of Groups 1 and 3 were tested for Intelligence Quotient through Test-2, while those from Group 2 and 4 were tested for Intelligence Quotient using Test-1.

III. STATISTICAL ANALYSIS

Once the data was obtained, it was coded, tabulated and analyzed, keeping in mind the objectives of the study. Appropriate statistical tools were used to draw meaningful inferences. The statistical tools used in the present study are given in the table below;

Table 3. Statistical tools used for analysis of data

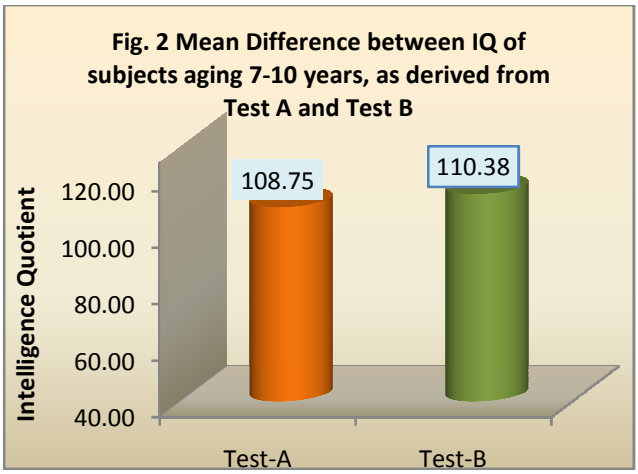
S.No.	Statistical tools	Formula	Purpose
1.	Mean (x)	$X = \Sigma X/N$ where, X = Variable N = No. of sample	To find out the average scores of variable used in the study.
2	Standard Deviation (S.D.)	$0 = \sqrt{\Sigma x / N}$ Where X = Deviation from actual mean X = mean. X = variable. N = number of samples.	To find out deviation from the mean scores of the variables.
3.	Standard error of mean (S.E)	S.E = 0/n Where 0 = S.D. n= number of observations	To find out the degree to which the mean is affected by the error of measurement and sampling.
4.	't' test	$t = (x1-x2) / S\sqrt{n1n2/n1 + n2}$ where x1 = mean of 1st sample x2 = mean of second sample S = combine S.D. n1 = number of observations in 1st sample. n2 = number of observations in 2nd sample	To compare the average score of any two groups or to find out whether the mean of the two samples vary significantly from each other.

International Journal of Innovation and Research in Educational Sciences
Volume 3, Issue 5, ISSN (Online): 2349–5219

IV. Results and Discussion

Table 4. Mean, Standard deviation, standard error and t-values of Test-A & Test-B of subjects aging between 7-10 years (n=60)

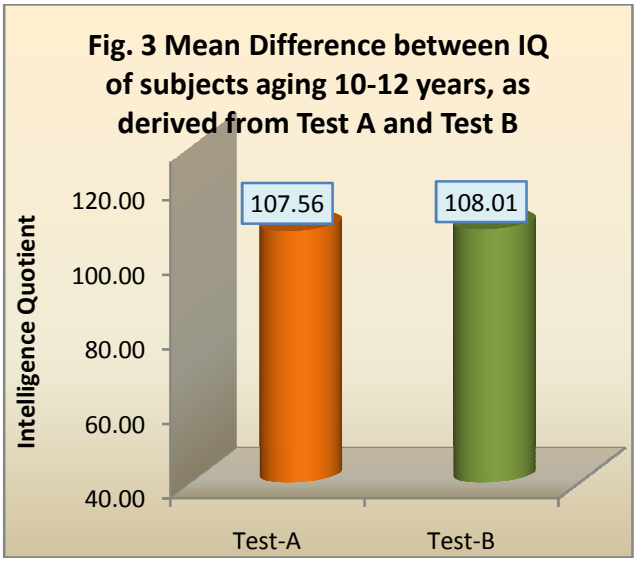
	Mean	SD	SEM	t-value	Lev of Sig.
Test-A	108.75	7.6	0.98	1.23	Not Statistically Significant
Test-B	110.38	6.86	0.88		



There was an insignificant difference in the Intelligence Quotient of the respondents aging between 7-10 years as assessed through the two tests.

Table 5. Mean, Standard deviation, standard error and t-values of Test-A & Test-B of subjects aging between 10-12 years (n=60)

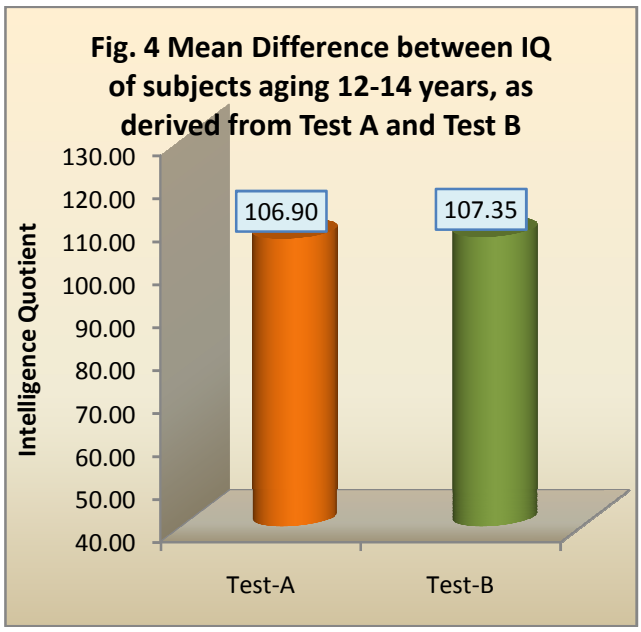
	Mean	SD	SEM	t-value	Lev of Sig.
Test-A	107.36	5.5	0.71	0.70	Not Statistically Significant
Test-B	108.01	4.58	0.59		



There was found no significant difference in the Intelligence Quotient of the respondents aging between 10-12 years as assessed through the two tests

Table 6. Mean, Standard deviation, standard error and t-values of Test-A & Test-B of subjects aging between 12-14 years (n=60)

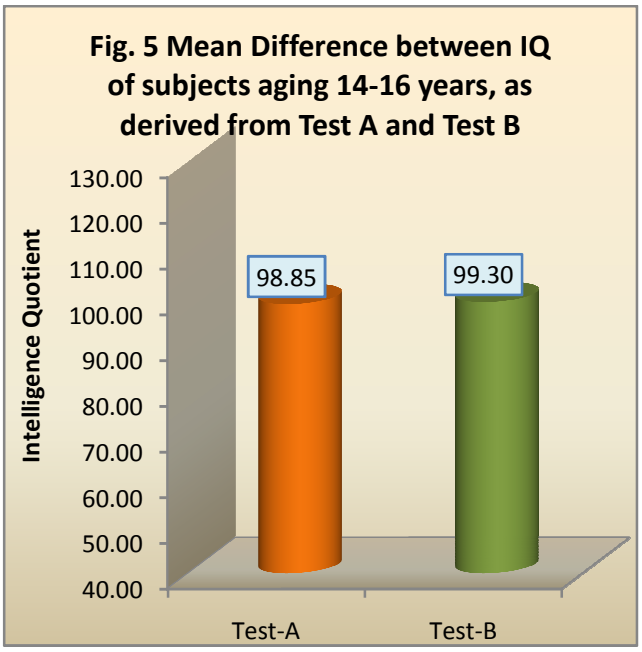
	Mean	SD	SEM	t-value	Lev of Sig.
Test-A	106.90	6.8	0.87	0.322	Not Statistically Significant
Test-B	107.35	8.4	1.08		



There was statistically insignificant difference traced in the Intelligence Quotient of the respondents aging between 12-14 years as assessed through the two tests.

Table 7. Mean, Standard deviation, standard error and t-values of Test-A & Test-B of subjects aging between 14-16 years (n=60)

	Mean	SD	SEM	t-value	Lev of Sig.
Test-A	98.85	3.5	0.45	0.794	Not Statistically Significant
Test-B	99.30	2.65	0.34		



No significant difference was noticed in the Intelligence Quotient of the respondents aging between 14-16 years as assessed through the two tests.

V. Conclusion

The Intelligence Quotient of all the subjects were found using two different tests, both of which are developed and standardized scientifically. It was established through results that the Cognitive Ability Test is valid measure to find out the Intelligence Quotient of the subjects. Eventually, the concurrent validity of the numerical value of Intelligence Quotient as assessed through the standardized Cognitive Ability Test was re-established.

VI. Acknowledgment

Authors express indebtedness to the Almighty, who is the apostle of strength. Authors are inevitably grateful to the subjects and all those directly as well as indirectly involved in the auspicious research work. Genuine thanks are expressed to all the authors/researches whose work is referred for making the present study a real success.

References

[1] Anastasi, A & Urbina, S. (1997). Psychological Testing. Upper Saddle River, NJ: Prentice Hall.
[2] Byrd, P.B. & Buckhalt, IA (1991). A multitrait-multimethod construct validity study of the Differential Ability Scales. Journal of Psychoeducational Assessment, 9,121-129.
[3] Das, IP., Naglieri, lA, & Kirby, J.R. (1994). Assessment of Cognitive Processes: The PASS Theory of Intelligence. Boston, MA: Allyn & Bacon.
[4] Das, J.P. & Naglieri, IA (1997). Cognitive Assessment System. Itasca, IL: Riverside Publishing.
[5] Drummond, R.J. (1996). Appraisal Procedures for Counseling and Helping Professions-(4th ed.). Upper Saddle River, NJ.: Prentice Hall.
[6] Dumont, R., Cruse, C., Proce, L., & Whelley, P. (1996). The relationship between the Differential Ability Scales (DAS) and the Weschler Intelligence Scale for Children- Third Edition (WISC-III) for students with learning disabilities. Psychology in the Schools, 3, 18.
[7] Elliott, C. (1990). Differential Ability Scales: Introductory and Technical Handbook. San Antonio: The Psychological Corporation.
[8] Elliott, C. (1990a). The nature and structure of children's abilities: Evidence from the Differential Ability Scales. Journal of Psychoeducational Assessment, 8, 376-390. Elliott, C. (1997). The Differential Ability Scales. In Flanagan, D., Genshaft, 1., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.
[9] Elliott, C.D., Murray, D.I, & Peterson, L.S. (1979). British Ability Scales. Windsor, England: National Foundation for Educational Research.
[10] Francois, G.R (1995). Of Children: An Introduction to Child Development-(8th ed.) New York: Wadsworth Publishing Company. Glutting, 1.1.,McDermott, P.A, Konold, T.R, Snelbaker, A1., & Watkins, M.W. (1998).
[11] Harrison, P.L., Flanagan, D.P., & Genshaft, J.L. (1997). An integration of contemporary theories, tests, and issues in the field of intellectual assessment. In Flanagan, D., Genshaft, 1., and Harrison, P. (Eds.), Contemporary Intellectual Assessment: Theories, Tests, and Issues. New York: Guilford Press.
[12] Hergenhahn, B.R & Olson, M. H. (1997). An Introduction to Theories of Learning-(5th ed.). Upper Saddle River, NJ: Prentice Hall.
[13] More Ups and Downs of Subtest Analysis: Criterion Validity of the DAS with an Unselected Cohort. School Psychology Review, 27, 599-612.
[14] Nanda HK, Marwaha S, ChawlaP Development, Item Analysis, Standardization, Review and Expansion of the Cognitive Ability Test for a Wider Age Range (7-16 Years) on a Single Test. International Journal of Multidisciplinary Research and Development 2015, 334-350
[15] Nanda HK, Marwaha S, Suggestive case study on evidence of effectiveness of customized education training based on the outcomes of cognitive ability testing to develop high mental (cognitive) abilities & personality in students between 14-
[16] Nanda, HK.,Marwaha, Shruti., Chawla, Pawandeep., Kaur, Baljeet. Development and Standardization of Cognitive Ability Test for Children. International Journal of Applied Research, 2015, 1(4): 69-77.
[17] Raven, J., & Raven, J. (eds.) (2008) Uses and Abuses of Intelligence: Studies Advancing Spearman and Raven's Quest for Non-Arbitrary Metrics. Unionville, New York: Royal Fireworks Press.
[18] Raven, J., Raven, J.C., & Court, J.H. (2003, updated 2004) Manual for Raven's Progressive Matrices and Vocabulary Scales. San Antonio, TX: Harcourt Assessment.
[19] Thorndike, R.M. (1997). Measurement and Evaluation in Psychology and Education: Sixth Edition. Upper Saddle River, NJ: Prentice Hall.
[20] Weschler, D. (1991). Weschler Intelligence scale for Children-Third Edition. San Antonio, TX: Psychological Corporation.