

RESEARCH ARTICLE

INDEXING OF SUBTESTS OF CHILDREN'S INTELLIGENCE SCALE AND THEIR CLINICAL SIGNIFICANCE

Dwarka Pershad and Neha Jain

Department of Psychiatry Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana.

Manuscript Info

Abstract

Manuscript History Received: 20 June 2020 Final Accepted: 24 July 2020 Published: August 2020

Key words:-

Children's Intelligence Scale, IQ, Abstract Index, Concrete Index, Numerical Index, Parenting, Fluid Crystallized Intelligence

To keep pace with recent uptrend in the field of intelligence testing, Children's Intelligence Scale comprising of six subtests [two performance & four verbal subtests] was developed. Its validity with MISIC was demonstrated earlier. Based on review three meaningful, transparent and clinically useful indexes were derived from these six subtests. These indexes were [1] 'Abstract Index', akin to fluid intelligence, [2] 'Concrete Index', akin to crystallized intelligence, and [3] 'Numerical Index', akin to working memory. It was rationalized that differences amongst indexes would provide significant information leading to parenting style and would help the psychologist to adopt a suitable treatment strategy to bridge the differences. The present study, thus examined the difference between children of 'working & nonworking mothers', 'precious and not so precious children' and 'male and female children' on these indexes. To fulfil the objectives of the study the Children's Intelligence Scale [CIS] was administered on 70 children attending or referred to the psychology section of MMIMSR, Mullana. Only those children were included who had IQ of 65 or more adjudged clinically. It was observed that children of working mother, precious and male children obtained consistently, significantly higher score on abstract compared to concrete index, where as numerical index had no consistent pattern. This indicated that the available potential of these children was not fully optimized because of scarcity of time to parents or out of parental attitude towards precious child. This discrepancy could be handled through counselling geared to improve parenting by training the parents to spent available time in meaningful way to fulfil the need of each child for maximization of potential, and amelioration of their emotional and behavioural problems.

.....

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

The implication of intelligence testing has increased tremendously in the present era. It is not only the numerical value attached to a child like biological parameter of height, weight, blood grouping etc. This numerical value and differences in index scores are of more important to understand parenting and holistic development of cognitive components of children. The role of psychologist has become multidimensional and multidisciplinary rather pivoting around psychiatry department alone. All comprehensive intelligence tests are time consuming and the man power is limited to handle such a gigantic work load with available resources in the country. Therefore, there was a

Corresponding Author: Neha Jain Address: Department of Psychiatry Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana. E-mail ID: nehajain06@outlook.com

need for brief but sensitive intelligence test battery. Several attempts had been done in past to shorten the intelligence scale for clinical purposes. These attempts include Bhatia's Short Battery of Intelligence Test [Murthy 1966] Verbal Adult Intelligence Scale [Pershad and Verma, 2020, 2009, 1990], Binet Kamat Test of Intelligence [Kamat, 1967] etc. Nevertheless, Wechsler's Intelligence Scales continued to dominate the armoury of intelligence test world over. The first test of Wechsler series was developed in the year 1939 by the name of Wechsler's Bellevue Intelligence Scale which was revised in 1942. From this revision, WISC was developed in 1949 for the children in the age range of 5 to 15 years (kezer & Arik, 2012). The current revision of this test is known as WISC-V that consists of 21 different scales and requires more than three hours to administer, score and interpret the score.

To fight against the manpower crunch, a new test battery for children in the age range of 6 year to 15 year 11 month, consisting of Picture Completion, Block Design, Information, Comprehension, Arithmetic, and Digit-span was developed [Pershad and Jain 2020]. Three indexes were developed from these six subtests basing on amalgamation of various theories of intelligence [Cattell, 1976; Thorndike, 1927; Thurston, 1941; and Gardner, 1999]. New proposed procedure of regrouping of subtests basing them on theoretical model, however, was not a newer effort. In the past other scholars have also attempted regrouping of WISC subtests [Bannatyne, 1974, and Horn, 1985], separating various subtests on Cattell's theory of fluid and crystallized intelligence. The proposed grouping was considered to be more useful in diversified clinical population visiting hospitals, for counselling purposes for optimization of potential and maximization of functioning to inflict positive changes in schooling and overt behaviour.

The three indexes developed were:

- 1. Abstract Index, comprised 'Block Design' and 'Comprehension' subtests, one each from performance and verbal section.
- 2. Concrete Index, comprised 'Picture Completion' and 'Information' subtest, one each from performance and verbal section.
- 3. Numerical Index, consisted 'Arithmetic' and 'Digit Span' subtests, both from verbal section.

'Abstract Index' was akin to the concept of natural ability or a fluid intelligence that was relatively less influenced by education, training or exposure to stimulating environment. This index included both verbal and non-verbal material. Block design was considered to be the measurement of perceptual accuracy [analytic and synthetic ability] and mental manipulation to match the exposed design visually [matching colour and pattern both together]. The Comprehension subtest was manipulation of verbal thought and imagery and formation of sentences to fit the answer. These two tests were considered to be the measure of fluid intelligence [named here as abstract index]. It was presumed that the children with poor home training, inadequate parenting [Sanders and Morawaska, 2014], or living in joint family will score higher on this index compared to crystallized or Concrete Index. The reason being their innate abilities were not optimally encouraged/ reinforced for maximal functioning.

'Concrete Index' was related to social exposure and training in day to day existential activities and to cope with routine activity of daily living including schooling, without putting pressure on scratching mind and using logic. It is related with absolute learning rather than logical consequential learning. Some parents because of paucity of time [if both were working] or out of love and affection [if it was only child or a precious child] did not prefer to bother child's mind in a constructive manner with affective facial tone. Thus, they were unable to expose child to stimulating environment, providing them challenging situations and monitoring their behaviour regularly. Thus a child may get relatively low value on concrete index compared to value of abstract index. Similar views were expressed by some other researchers on the subject [Collins, Maccoby, Steinberg, Hetherington and Bornstein, 2000].

'Numerical Index' was thought to be related to sustenance of attention and numerical ability and it comprised of Arithmetic and Digit Span subtests. It was a part of overall development of intelligence included in the Thurston's [1941] Primary Mental Ability theory and in the Multiple Theory of Gardner [1999]. Working memory, in the Cambridge dictionary of Psychology [Matsumoto, 2009] referred "to the temporary storage of information that is currently being used in a cognitive task. The concept emerged from studies of a relied but simple concept, short term memory". It assesses children's ability to memorize new information, hold it in Short Term Memory, concentrate and manipulate that information to produce some result or reasoning processes. It was related with academic achievement. It is influenced by memorizing capacity, difficulty in attention concentration, induced fear of numbers by the parents, and by dyscalculia.



LOW on Abstract

Fig:- Hypothetical diagram showing relationship of parenting with indexing on intelligence test.

It was thought that working parents were generally unable to give personal care to their children because of scarcity of time and parents of precious children [only child, male child born after long conjugal relations, male child born after a number of females, adopted child, IVF child, etc.] would not be able to bother child's mind because of their attitude and irrational fears. Thus inborn potentials of these children are not optimized and sequel to this, such children may obtain higher on abstract compare to concrete index. On this assumption following hypotheses were developed for testing.

Objectives:-

- 1. Do children of working and non-working mothers differ on three indexes?
- 2. Do male and female subjects differ on three indexes as a sequel of differential parenting pattern in India?
- 3. Do precious children differ on three indexes?
- 4. What percentage of subjects obtains 'low on concrete and high on abstract indexes' amongst working mothers?
- 5. To suggest remedy to train the parents for wholesome intellectual development.

Methods:-

Sample:

Subjects numbering to 70 referred to psychology division of the Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana- Ambala having IQ of 70 and above and volunteered to the request of researcher to participate in the study, formed the sample. However those having brain pathology, severe psychiatric morbidity, depleted by physical illnesses were excluded from the sample.

Tools:

Each of the subject was administered Children's Intelligence Scale [Pershad & Jain, 2020], following standard procedure of administration and scoring of each of the six subtests. In addition to this accompanying parent of each child was also interviewed to explore age [date of birth of each child for accuracy of age], education [class completed successfully], number of siblings, birth order of the child, parental occupation especially if both were working.

Procedure:

Three Indexes and full scale IQ were computed as follows:

Abstract Index= Mean of TQs on Block Design and Comprehension subtests

Concrete Index = mean of TQs on Picture Completion and Information subtests

Numerical Index= mean of TQs on Arithmetic and Digit Span subtests

Full Scale IQ= Mean of performance and verbal IQs

Statistics:

Mean and standard deviations were calculated separately for the children of 'working and non working mothers' 'male and female' and for the precious children and t-test was applied to find significant of differences for first, second and third objectives. For the fourth objective, descriptive statics and chi square test was applied.

Hypothesis:

- 1. Children of working parents will obtain higher score on Abstract Index compared to Concrete Index [directional hypothesis, one tail test].
- 2. Male children will have more score on Abstract than on Concrete Index [directional hypothesis, one tail test]
- 3. Precious children may influence home training thus may obtain higher score on Abstract Index than on Concrete Index [directional hypothesis, one tail test].

Results:-

Table 1 as given below provides the correlation values amongst variables of Children's Intelligence Scale. It indicated that each of the three indexes is highly correlated with full scale IQ but their correlation amongst indexes was low. The numerical index had relatively less correlation with abstract index and had better correlation with verbal IQ. Table 2, provides mean values on abstract, concrete and numerical indexes.

VARIABLES	AB	СО	NI	VQ	PQ	FIQ
AB [abstract]	1	$.48^{**}$.35**	.61**	.84**	.83**
CO [concrete]	.48**	1	.43**	$.78^{**}$.67**	.81**
NI [numerical]	.35**	.43**	1	.77**	.42**	.68**
VQ [verbal IQ]	.61**	$.78^{**}$.77**	1	.55**	.86**
PQ[performance IQ]	.84**	.67**	.42**	.55**	1	.89**
FIQ [full scale IQ]	.83**	.81**	.67**	.86**	.89**	1

Tabel 1:- Correlation Among Indexes & Full Scale Iq.

All correlations were significant at the 0.01 level

Table 2, suggested that in clinical sample, mean of abstract index value was significantly higher than concrete index value. Concrete and numerical values however, did not differ significantly.

TABLE- 2 Differences Antongs Abstract, Concrete & Numerical indexes in Foored Sample.						
INDEXES	Ν	MEAN	SD	SEM	T-TEST	
[A] ABSTRACT		85.75	9.07	1.09	4.49[AB]*	
[B] CONCRETE	70	80.57	8.12	0.98	1.12[BC] n.s.	
[C] NUMERICAL		81.13	10.95	1.31	3.9[AC]*	

TABLE- 2:- Differences Amongs Abstract, Concrete & Numerical Indexes In Pooled Sample.

* Significant at .01 level

Tables 3 and 4, shows results of hypotheses. It indicated that numerical index could not differentiate mean values consistently for any of the three groups of subjects. However there were significant differences between abstract and concrete indexes supporting hypotheses. A cross validity on an independent sample of 40 subjects as reported in table four also supported the empirical evidence of the authors.

Table 3:- Comparisons Of Means Of Abstract, Concrete & Numerical Indexes Across Different Variables

Variables	[A]Abstract	[B]Concrete	[C]Numerical	Paired t-value		
	Index	Index	Index	AB I	BC	CA
	Mean and SD	Mean and SD	Mean and SD			
Working Status of Parents						
Both working $[n=48]$	87.27 [8.58]	77.69 [5.28]	79.72 [11.51]	3.89*	0.71	2.39**
Single working [n= 22]	82.29 [9.40]	87.14 [9.66]	82.15[10.56]	3.57*	3.11*	0.99
t-test	2.16**	5.25*	0.907 n.s			
Position of Child						
Precious child [n=21]	86.00 [9.59]	79.05 [6.11]	79.05[10.30]	3.93*	0.00	2.84*
Not precious child [n=49]	85.65 [8.94]	81.18 [8.79]	81.98[11.20]	3.07*	0.47	2.25**

t-test	1.43 ns.	0.99 ns	1.08 ns			
Gender of Subject						
Male child [n=46]	84.87 [9.39]	79.76 [7.08]	80.37[11.06]	3.66*	1.37	3.12*
Female child [n=24]	87.52 [8.28]	82.17 [9.92]	82.65[10.80]	2.54**	0.14	2.17**
t-test	1.49 n.s.	1.67 n.s.	0.814 n.s.			

*p .01, **p .05

Table 4:- Cross Validity Of Indexes On Independent Sample.

(This data was supplied from a psycho-diagnostic centre, Chandigarh)

Characteristics	Abstract index	Concrete index 1 SD	Chi square
	1 SD Higher,	low,	
	N=22	N= 18	
Parents working status	83.33%	16.67%	5.61,
Both working [12]	42.86%	.57.14%	P=.05
Only father working [28]			
Birth position			
Only child [n=14]	78.6%	21.4%	4.83
Not only [n= 26]	42.3%	57.7%	P=.05
Gender			
Male [n=25]	60.00%	40.00%	0.72
Female [n=15]	46.66%	53.33%	N.S

Discussion:-

The present study was conducted with an objective to find out the difference in the score of Abstract, Concrete and Numerical indexes of children having working mother, precious child and gender differences.

The result of the study reflected significant relation among parent working status and position of the child in the family. Abstract Index is a measure of fluid intelligence whereas; concrete index is a measure of crystallized. According to Cattell, Crystallized Intelligence has heavy loading with culturally acquired judgmental skills, while the Fluid Intelligence was found to have loading with insightful performances in which individual differences in learning experience play little role [Raymond B. Cattell, 1967]. Fluid intelligence is believed to have biological limit, set by the nature and raising it functional level is nurture [Rindermann, Flores-Mendoza and Mansur-Alves, 2010]. Abstract refers to the abilities needed for reasoning and speeded performance (Cattell, 1971). Some researchers [Papalia, Fitzgerald, Hooper, 1071 and Schonfeld, 1986] had linked the theory of fluid and crystallized abilities to Piglet's theory of cognitive development. Cattell's fluid and Piaget's operative intelligence both concern logical thinking. Cattell's crystallized and Piaget's treatment of everyday learning reflects the impress of experience [quoted from Wikipedia, 2020]. Kline [1998] noted that there should be a correlation of .6 between fluid and crystallized intelligences but remarked, will depend upon the type of deductive – in-deductive logic included there in.

The present study was conducted on the children who were brought to hospital thought to have some problem within family or schooling, resulting in one or other form of behavioral problem as a sequel of parenting style. This parenting style restricted unfolding of in born potential of the children.

Therefore it was imperative to discuss about relationship between abstract and concrete factors of intelligence. Greater the difference between abstract and concrete [abstract > concrete] greater would be the problem of children in relation to schooling, interaction with authority, peer groups and handling own impulsive behavior. Amongst those who scored high on abstract and low on concrete, many of them had inadequate parenting; parents were unable to spend quality time with children, high expectancy from the child, purchasing every comfort for the child but no emotional affinity and emotional involvement with their offspring. Work stress has been found to function differently for mothers and fathers. Galambos and colleagues (1995) found feelings of work overload to be

associated with parental stress and, in turn, poorer parent-child relationships and negative adolescent behavior. Mothers brought work-related emotions home, whereas fathers left work at the workplace (Schneider & Waite, 2005). Thus, mothers were more likely to transfer their work-related emotions to their children, whereas fathers were more likely to shield them from negative work experiences. This result perhaps explains why studies have found more effects associated with maternal employment but not paternal employment on child outcomes. Research has shown that children are more likely to engage in problem behaviors if they spend time unsupervised, either on their own or with peers (Mahoney et al., 2006; Smolensky & Gootman, 2003). Unsupervised time with peers was especially problematic when the peers engaged in negative behaviors, when parental monitoring was low, or when the parent-child relationship was poor (Osgood, Wilson, O'Malley, Bachman, & Johnson, 1996).

Authors viewed that a subject should obtain almost equal scores both on abstract and concrete intelligences if the subject had wholesome development of his innate/inborn cognitive potentials. This wholesome development will depend upon stimulating environment provided by the parents who were considered as preschool teachers. The younger child was more 'field dependent' than 'field independent' [Witkin and others 1954 and 1962] thus stimulating environment in early years of life would help to optimization of logic and finding newer ways of combining rational thinking to excel in the world.

However if Child was encouraged only for schooling and memorizing to excel in school grade then his concrete [crystallized] score would be higher than abstract [fluid] score [basic potential]. In modern era, schooling / competition is usually much preferred than over all wholesome development of the child [Maurya, 2015]. Parental involvement in day to day physical, cognitive, fluency, critical observations were denied that otherwise could be a part of effective parenting. This lack of interactive routine of parents might cause only partial unlocking of potential, reflected through abstract >concrete pattern. These children parent duo could be handled by the counselor adopting any therapeutic strategy involving rescheduling technique in inter active process.

References:-

- 1. Atkinson, A. P., Dittrich, W. H., Gemmell, A. J., and Young, A. W. (2004). Emotion perception from dynamic and static body expressions in point-light and full-light displays. Perception, 33, 717–746. doi: 10.1068/p5096
- 2. Bannatyne, A. [1974]. Diagnosis: A note on categorization of the WISC scaled scores. Journal of Learning Disabilities, 272-273.
- 3. Bateson, C.; Jackson, D.D.; Haley, J. and Weakland, J.H. [1956]. Toward a theory of schizophrenia. Behavioural Science, 1: 251-264.
- 4. Bhatia C.M [1955]. Bhatia battery of performance tests of intelligence. Vaman D. Purohit and Co. Pune.
- 5. Cattell, R. B. [1976]. Theory of fluid crystallized intelligence: a critical experiment. Journal of Educational Psychology, 54: 1-22.
- Conway, A. R., Cowan, N., Bunting, M. F., Therriault, D. J., and Minkoff, S. R. (2002). A latent variable analysis of working memory capacity, short-term memory capacity, processing speed, and general fluid intelligence. Intelligence 30, 163–183. doi: 10.1016/s0160-2896(01)00096-4
- 7. Collins W.A., Maccoby E.E., Steinberg L., Hetherington E.M., Bornstein M.H. [2000]. Contemporary research on parenting: the case of nature and nurturer. American Psychologist, 55 [2], 218-232.
- 8. Gardener, H. [1999]. Intelligence Reframed: Multiple Intelligences for the 21st Century. Basic Books, N.Y.
- 9. Horn, J.L. [1985]. Remodelling old models of intelligence. In B.Wolman [Ed.] . Hand book of Intelligence, Wiley, NY
- Hollingworth, A., Richard, A. M., and Luck, S. J. (2008). Understanding the function of visual short-term memory: transsaccadic memory, object correspondence, and gaze correction. Journal of Experimental Psychoogy. 137, 163–181. doi: 10.1037/0096-3445.137.1.163
- 11. Jain Neha and Pershad D. [2019]. Brief Battery of Intelligence Tests derived from MISIC, Presented at the Nation Conference of Indian Association of Clinical Psychology, Dehradun, May, 2019.
- 12. Kamat V.V [1967] Measuring intelligence of Indian children. London: Oxford.
- 13. Kezer F. & Arik, R.S. [2012]. An examination & comparison of the revisions of the Wechsler intelligence scale for children. Procedia- social & behavioural science. 46 (2012) 2104-2110.
- 14. Malin A. J. [1969]. Malin's Intelligence Scale for Indian Children. Indian Psychological Corporation, Lucknow.
- 15. Matsumoto D. [2009]. The Cambridge Dictionary of Psychology, Cambridge University Press.
- 16. Murthy H.N. [1966]. Short scale of the bhatia's performance tests. Indian Psychological Review, 2, 133-134.
- 17. Pershad D and Jain N [2020]. Children's Intelligence Scale. National Psychological Corporation, Agra.

- 18. Pershad D and Verma S K [2020] Verbal Adult Intelligence Scale. National Psychological Corporation, Agra. \
- 19. Pershad D and Verma S K [1990 and 2009] A Handbook of PGI Battery of Brain Dysfunction. National Psychological Corporation, Agra.
- Sanders M.R., Morawska A. [2014]. Can changing parental knowledge, dysfunctional expectations and attributions, and emotional regulation improve outcomes for children? In Trembay R.E.; Boivin M; Peters R. Dev; Tremblay R.E. [Eds]. Encyclopedia on Early Childhood Development [online] r
- 21. Sandler, lauren. (2010, July 8). The Only Child: Debunking the Myths. Time.
- 22. Tremblay R.E., Boivin M., Peters R Dev, Tremblay R.E. [Eds] Encyclopedia on Early Childhood Development.
- 23. Thorndike, E.L. [1927]. The measurement of intelligence. Bureau of Publication, Teachers' College, Colombia University, NY.
- 24. Thurston, L.L. [1941]. Factorial studies of intelligence. Psychometric Monograph 2, University of Chicago Press, Chicago.
- Unsworth, N., Fukuda, K., Awh, E., and Vogel, E. K. (2014). Working memory and fluid intelligence: capacity, attention control, and secondary memory retrieval. Cogn. Psychol. 71, 1–26. doi: 10.1016/j.cogpsych.2014.01.003
- 26. Wechsler, D [1939].Wechsler-Bellevue Intelligence Scale. Psychological Corporation, N.Y.
- 27. Wechsler, D [1994]. Wechsler Intelligence Scale for Children. The Psychological Corporation, N.Y.
- 28. Wechsler D [2003] Wechsler's Intelligence Scale for Children- fourth edition, London, Person.
- 29. Wechsler D [2014] Wechsler's Intelligence Scale for Children- Fifth edition, Bloomington, MN: Person.
- 30. Woodman, G. F., Luck, S. J., and Schall, J. D. (2007). The role of working memory representations in the control of attention. Cereb. Cortex 17, 118–124.