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Original Article

A Study on Assessment of Mental Abilities of Special School Children in Mongolia with Raven's Colored Progressive Matrices

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Abstract

This study is aimed to evaluate current state of mental abilities of children, enrolled in special schools for mentally retarded in Mongolia. As a result of administration of Raven's Colored Progressive Matrices (RCPM) and statistical data analysis for 707 children, age from 5 to 12 years in urban and rural areas normative scale for Mongolian children was presented. Satisfactory results were corroborated the findings presented in literature (e.g. Raven et al., 1990) and indicated that the RCPM was a culturally fair and a sensitive measuring tool of mental abilities. Further investigation was conducted to 200 children enrolled in special schools and significant statistical values of the test results were compared to the derived norm' s scale. The results demonstrated that the level of mental abilities of most special school children was lower than the norm results. However some results suggested that children who do not fit to the used categories as mentally retarded and mentally developmental delay according to current assessment in special schools in Mongolia enrolled too. Thus this research warrants further clarification of children's mental and learning abilities in special schools in Mongolia.

Key word: Raven's Colored Progressive Matrices, Mongolian children, mentally retarded, mentally developmental delay

1. Introduction

It is evident from an overview of special education in the countries with well-developed education system that psychological tests have been used as important technique for assessing the child's educational and psychological problems. And the profusion of psychological tests developed early in twentieth century helped to shape the character of contemporary tests (Gregory, 1996[4]). Against this background of test development for special education assessment, in Mongolia's regular and special education an intelligence test have not been used and was considered as a non-relevant method to get full information on child's intelligence. This is the result of the implication of defectology (study of abnormalities, Russian), since many Mongolian specialists in the field were trained at the universities in Russia. Famous Russian psychologist Vygotsky sharply criticized intelligence tests and was proving that education was actually the determining motive force in child's

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development (Petrovsky, 1990[7]).

In practice, the Medical–Pedagogical Commission (MPC) takes the responsibility for the assessment of a child at schools of the mentally retarded in Mongolia. Medical personal including a neuropsychologist diagnoses a child's health condition and special education teacher instruct different tasks to assess the state of cognitive functioning. To detect mental retardation specialist refers to theoretical basis of the Oligofrenopedagogy (Education of mentally retarded, Russian), which define characteristics of mental retardation as following: 1) the presence of organic brain damage; 2) general dysfunction of cognitive function with dominant symptom as deficiency of analyzing and abstracting skills; 3) the constancy of the intellectual processing disorders (Eremenko, 1985[3]).

Relatively there are three levels or states of deficiency so called debil or mild, imbecile or moderate and idiot or severe. According to the MPC documents, children identified as mildly mentally retarded and those with mentally developmental delay enrolled in special schools. In Soviet/Russian special education the term "zaderjka psihicheskogo razvitiya" (mentally developmental delay, Russian) refers to children with learning, behavioral and emotional problems, but little progress was made to classify into specific groups (Zavadenko & Uspenskaya, 1994[12]). The teachers of MPC recognize that by means of teaching experience children under the category of mentally development delay can be distinguished from children with more severe problem (Шиф, 1964[11]).

An overview of assessment procedure for special school in Mongolia disclosed that the main roles of assigning children in these schools were heavily based on special education teacher's individual judgment. Up to date there is no any data about the results MPC that could be compared to other investigations. There are no common rules and standardized measuring tool for identification of child's level of intellectual development or deterioration, thus this suggests the need for standardized tool in special and as well as in regular education. But there is a shortage of economic and professional resources to develop a test in Mongolia.

Therefore as an initial step towards a test development in Mongolia culture–reduced intelligence test (Raven Colored Progressive Matrices, hereinafter RCPM) was applied to Mongolian children. Relying on literature review (Raven, 1965[8]; 2000[10]; Raven et al., 1990[9]) RCPM have been selected for standardization for Mongolian children from 5 to 12 years. Thus RCPM test characteristics as an appropriate tool to measure general mental ability (Green & Kluever, 1991[6]) or fluid ("g") intelligence, it's culture fairness (De et al., 1971[2]; Gearhart, 1984[5]) cost effectiveness and ease of administration (Costenbader & Ngari, 2001[1]) have impacted for application in this study.

Purpose of the study

This study is aimed to evaluate current performance of mental abilities of children in the special schools in Mongolia with a reliable standardized measuring tool of general intelligence and consequently to clarify the constructs have been used in current Mongolia's special education assessment.

2. Method

1) Subjects

707 children from 5 to 12 years age (362 boys, 345 girls) attending regular schools and kindergartens from urban and rural areas (Ulaanbaatar city, Dornot aimak (prefecture, Mongolian) Kherlen soum (name of district, Mongolian) were participated for standardization; 200 chil-

Table 1 Item analysis results on RCPM test for standardization group (n-707): item difficulty (P) and point biserial (r_{pbis}) correlation of items to total test score

Item	P	r_{pbis}	Item	P	r_{pbis}	Item	P	r_{pbis}
A1	1	0.00	Ab1	0.91	0.46	B1	0.98	0.34
A2	0.94	0.35	Ab2	0.82	0.45	B2	0.78	0.50
A3	0.93	0.35	Ab3	0.79	0.49	B3	0.74	0.57
A4	0.93	0.35	Ab4	0.57	0.61	B4	0.70	0.55
A5	0.77	0.39	Ab5	0.44	0.56	B5	0.53	0.62
A6	0.66	0.45	Ab6	0.39	0.69	B6	0.48	0.61
A7	0.46	0.57	Ab7	0.62	0.59	B7	0.47	0.57
A8	0.64	0.42	Ab8	0.47	0.66	B8	0.29	0.55
A9	0.48	0.55	Ab9	0.50	0.60	B9	0.38	0.58
A10	0.49	0.46	Ab10	0.62	0.50	B10	0.44	0.57
A11	0.28	0.46	Ab11	0.49	0.54	B11	0.24	0.52
A12	0.23	0.35	Ab12	0.18	0.35	B12	0.21	0.34

dren (113 boys and 87 girls) from 9 to 13 year from special schools in Ulaanbaatar were included for purpose to clarify the level of their intellectual ability.

2) Procedure

Classroom teachers in Ulaanbaatar city, Dornot aimak (prefecture, Mongolian), "Orgil" university students and methodologist at the preschool education center supported the administration of the test. Book form of the test was administered to subjects in regular school dividing them into 5-6 children in one group. At special schools and kindergarten children were tested individually. The data was computed for all 36 items on sets A, Ab, B. Item analysis, reliability studies and standardization procedures were applied. Results of significant statistical indices for special school children were compared to norm results, derived from representative samples of Mongolian children.

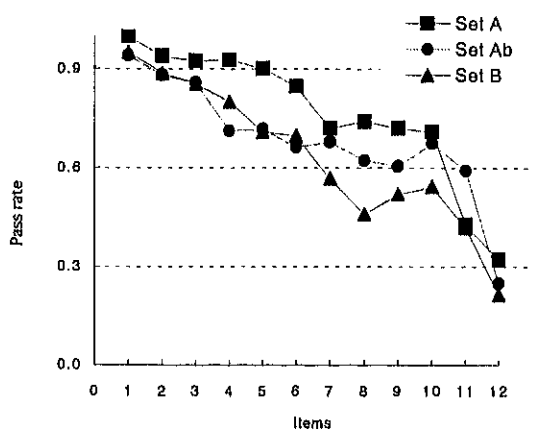


Figure 1 Item pass rate on set A, Ab, B for regular school children on RCPM test

3. Results

An item analysis of the responses for standardization group to all 36 problems constituting sets A, Ab, B indicate that item's difficulty increase in the sequencing order (Fig. 1) and items on set B appeared as a most difficult (Table 1).

Analysis of relationship of item to total test score shows a fair relationship (Table 1). There were no differences according to gender and location.

Test-retest reliability of the test was investigated and showed .86. The split-half and Cronbach alpha coefficients have been estimated at values ranging from .56 to .98.

Results of raw scores on RCPM for standardization group presented in Table 2. The mean

Table 2 Results of scores on RCPM test for standardization group

Age	Regular schools			Range
	N	M	SD	
5	90	20.94	5.25	6-33
6	90	22.18	7.77	4-36
7	90	22.86	5.70	12-36
8	90	24.42	7.57	7-34
9	99	27.82	5.64	10-36
10	110	28.29	6.02	11-36
11	73	30.33	4.57	18-36
12	65	31.85	4.74	15-36

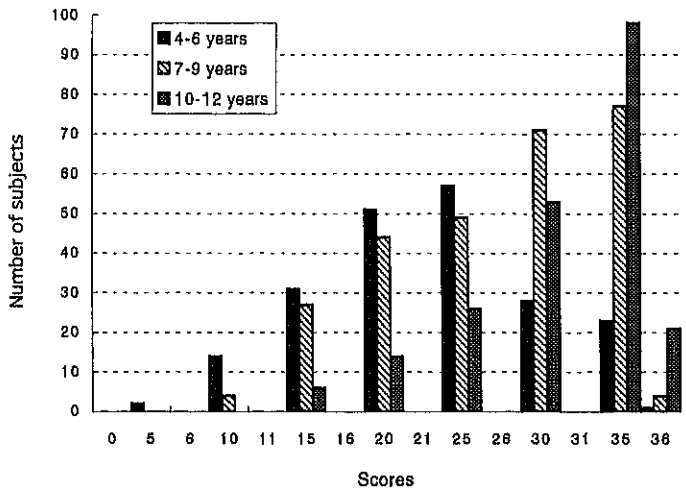


Figure 2 Frequencey distribution for scores on RCPM test for regular school children (n-707)

score for each age group increased with age.

Fig. 2 shows the frequency distribution of scores on RCPM test for children in regular schools and indicates that the frequency of scores increasing with age growth.

Standardization : Standard scores were computed for all raw scores. Using Standard Normal Z table corresponding z scores were derived. These Z scores were transferred to normalized percentile rank (Fig.3). At 50th percentile point it is observed a clear distinction and score's growth age by age, however at upper level for 6 and 7 years it is viewed overlapping

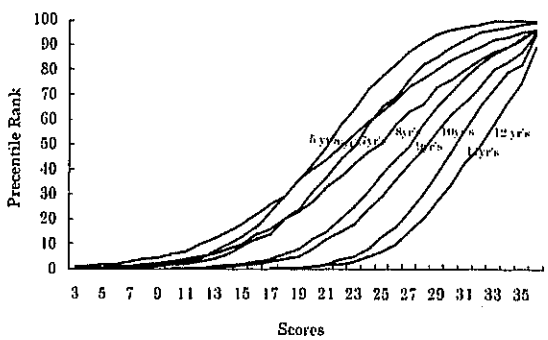


Figure 3 Normalized percentile ranks for standardization group on RCPM test

Table 3 Norm results of Mongolian children on RCPM in 2001 in the context of 1982 UK norms: Table CPM IX in the CPM Manual by Ravan et al.'s 1990 edition

Percentile Points	5 yrs		6 yrs		7 yrs		8 yrs		9 yrs		10 yrs		11yrs		12 yrs	
	UK	Mon	UK	Mon	UK	Mon	UK	Mon	UK	Mon	UK	Mon	UK	Mon	UK	Mon
95	22	29	24	35	28	32	32	36	34	36	35	36	35	36	35	36
90	20	27	21	32	25	30	30	34	33	35	33	36	35	36	35	36
75	18	24	19	27	21	26	25	29	29	30	32	32	33	33	34	35
50	15	21	16	22	18	23	22	25	26	27	30	28	31	30	32	32
25	12	17	13	16	16	19	18	19	22	23	25	24	28	27	30	28
10	10	14	11	12	13	15	15	15	17	19	21	20	23	24	25	26
5	8	12	9	9	12	13	14	12	15	17	17	19	20	23	22	24

Table 4 Results of scores on RCPM test for special school subjects

Age	Special schools			Range
	N	M	S.D	
9	16	17	7.1	2-28
10	56	18.8	6.06	8-31
11	65	20.8	7.24	5-36
12	51	21.1	6.92	11-35
13	12	20.9	7.58	12-32

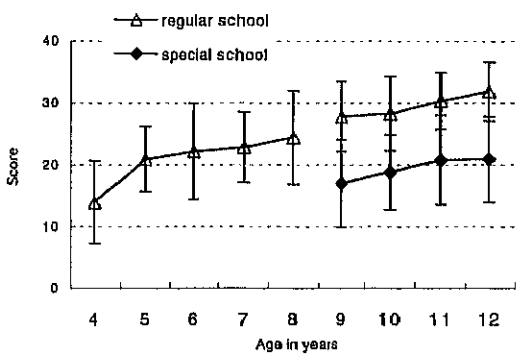
positions, which might be reflected by results of this particular samples who enrolled in kindergartens.

Table 3 is presents norm results for Mongolian children in the context of UK norm in 1982. In generally yielded results were close to results of UK norms; however small differences observed at earlier ages: score's points of children in this study were higher and for stages at 10 and 11 years' results were slightly lower.

In order to evaluate current performance of children enrolled in special schools the RCPM was administered to children (n=200) in special schools by their classroom teachers. Results of scores for special school children are reported in Table 4.

Compared results of means and range of standard deviations of raw scores for regular and special school children presented in Fig. 4

The original RCPM test score interpretations were considered in terms of the percentage frequency to the same aged children in the norm group. Consequently, in accordance with Raven's classification Table 5 presents the results of scores for special school children. Corresponding to these grade characteristics: no children in special schools in Mongolia were in rank that



Figue 4 Means and standard deviations of scores for regular and special school results on RCPM test

Table 5 Results on RCPM for special school children in Mongolia according to the Raven's classification (CPM Manual by Ravan et al.'s 1990 edition)

Grade	Raven's classification according to the obtained score	%	All (%)
I	"Intellectually superior" - score lies at or above 95th percentile for people of that age group	-	-
II	"definitely above the average in intellectual capacity"		
	II+ If score at or above the 90th percentile	0.50%	1%
	II- If score lies at or above 75th percentile	0.50%	
III	"intellectually average"		
	III+ if score is greater than the median or 50th percentile	4.50%	20%
	III- If score is less than the median	15.50%	
IV	"definitely below average in intellectual capacity"		
	IV+ If score lies at or below the 25th percentile	13%	19.50%
	IV- If score lies at or below the 10th percentile	6.50%	
V	"intellectually impaired"- if score lies at or below 5th percentile	59.50%	59.50%

classified children as "intellectually superior", nevertheless those who laid under the category "above the average" were 1 % and "intellectually average" were 20%. Those children's results falling within the rank as categorized "definitely below average in intellectual capacity" constitutes 19.5% and those falling under the category as "intellectually impaired" is 59.5%

Analysis of the RCPM test–retest and internal consistency reliability suggest that this test is a reliable measuring tool and no revision or modification is needed, thus pursued positive results on cross–cultural validity. Item analysis documented satisfactory results with respect to item difficulty ; relationships of items to total test score. The increase in raw scores with age growth corroborates other studies (Gearhart, 1984) findings that the test is sensitive developmental indicator of at least certain forms of intellect (Green and Kluever, 1991). Yielded results on RCPM for Mongolian children are higher at earlier age from 5 to 8 years level, which might be caused by the condition of samples in engaged this study were kindergarten children. Those who have more chance to comprehend to information, rather then those who are not attending kindergarten. Therefore samples result of 5 to 8 years can be considered as norm for kindergarten children, and results for 9 years up to 12 years as norm's indices representing these certain population.

Discussion

In regards to the test results there are 59% of subjects' score in special schools stand of approximately two standard deviations below or referring to Raven's classification, if score lies at or below 5th percentile these children can be identified as "intellectually impaired". Consequently classifying more than half proportion of children presently enrolled in special schools in reliance to consensus in diagnosis of the mental retardation category might be reasonable. However derived results suggest that except children with lower performance those within normal range on their intelligence enrolled in special schools too. Proportion for children falling in normal range or whose results stand within the range of above two standard deviations and one standard deviation and above RCPM test yield-

ed 41% of score results. These data we might assume were resulted by children with "mentally developmental delay" as identified by MPC teachers. Nevertheless for those children whose score results lie on normal intelligence range consisted 21%. For children whose results lay on this range current classification category is not appropriate and should be revised.

Furthermore, RCPM test results reveals that most of children with more severe mental retardation are deprived from school system, and indicate the fact that today's special school in Mongolia have mainly been emphasized on teaching children with mild mental developmental problems.

Collectively, results from this initial study provide a baseline index against which to measure related cognitive abilities of Mongolian children. Further research on validation of special school children classification according to RCPM should be tested. It is suggested to collect data on other variables, specifically verbal abilities of children in both regular and special schools. The emphasis on more inclusion of children with special needs has implication for providing teachers with knowledge how to access children's mental and learning abilities. Thus further investigation of teachers' knowledge concerning children's characteristics and expectations for support system should be investigated.

References

1) Costenbader, V & Ngari S.M. (2001) A Kenya Standardization of the Raven's Colored Progressive Matrices. School Psychology International, 22 (3), 258–268.
2) De, B., Kala, Ch. & Patha, U., (1971) Development of local norms for the Colored Progressive Matrices. Journal of Vocational and Educational Guidance, 14 (1), 1–10.
3) Eremenko, I.G. (1985) Oligophrenopedagogika. Visha Shkola, Kiev.
4) Gregory, R. J. (1996) Psychological testing, history, principles and applications, 2nd Edition. Allyn and Bacon, Boston.
5) Gearhart, K.J. (1984) An analysis of the performance of Navajo children on Raven's Colored Progressive Matrices. Dissertation Abstracts International, 45 (4), 1073–A.
6) Green, K.E. & Kluever, R.C. (1991) Structural properties of Raven's Colored Progressive Matrices for a sample of gifted children. Perceptual and Motor Skills, 72, 59–64.
7) Petrovsky, A. (1990) Psychology in the Soviet Union, A historical outline. Progress Publishers, Moscow.
8) Raven, J. C. (1965) Guide to using the Colored Progressive Matrices, Set A, Ab, B. Dumfries, Scotland : Grieve.
9) Raven, J., Raven, J.C & Court, J.H. (1990) Manual for Raven's Progressive Matrices and Vocabulary scales, Section 2 : Colored Progressive Matrices. Oxford Psychologists Press, Oxford, England, TX : The Psychological Corporation.
10) Raven, J. (2000) The Raven's Progressive Matrices : Change and Stability over Culture and Time. Cognitive Psychology 41, 1–48.
11) Шиф,Ж. (1964) Опыт отбора учащихся во вспомог ательные школы,Просвещение,Москва.
12) Zavadenko, N.N. & Uspenskaya, T.L. (1994) Attention Deficit Disorder and Maladaptive behavior in schools. Shkola Zdorovya, 1, 91–104.