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PROBLEM SOLVING ABILITIES AND PSYCHOMOTOR SKILLS OF THREE ETHNIC GROUPS IN TWO JUNIOR HIGH SCHOOLS OF USA

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The problem solving abilities and psychomotor skills of three ethnic group children belonging to the Navajo Indians, Spanish Americans and the White Caucasians studying in two junior high schools in Albuquerque (New Mexico), U. S. A. was assessed at intra and inter ethnic levels. The three performance sub tests such as the Block Design, Object Assembly and Coding of the Wechsler Intelligence Scale for children (representing typical problem solving situations) and certain selected psychomotor skills such as the perception, visual set, emotional set, physical set and fine motor acts were used as criterion measures and predictor variables respectively.

Inter alia, the results indicate, that there is significant relationship between problem solving abilities and psychomotor skills for all the subjects involved in this study.

INTRODUCTION

Review of literature pertaining to cross cultural education in USA indicates several problems (1, 2, 3, 8, 14 & 16). Many of the internal problems of the American nation are due to its not being a monolith; it may not have as many languages and religions as India, but it has five heritages—Black, Puerto Ricans, Spanish Americans (Mexicans), American Indians (Red Indian) and Asians—besides the main European (White Caucasians) which again has its roots in all the countries of Europe. Thc attempt to fuse them into one American type has not succeeded, as the minority problem has reached huge proportions. There is therefore a growing consciousness among American educators today that revolutionary action needs to be taken to make school experience meaningful for students whose racial, social, religious and cultural backgrounds differ from those of so-called mainstream students. It would seem obvious that to force non-Anglo pupils into the Anglo (white caucasian) mould is not the best way to integrate them, still less to educate them in any true sense. Statistics show that the school dropout rates are notoriously high for American Indian, urban Negroes, Mexican Americans and Puerto Ricans. Mere special programs to compensate for an inadequate home environment have not proved enough.

The very test used to measure intelligence or aptitude may not be reliable if they are culturally biased in favor of the majority or are unduly verbal or are not correctly motivated. Amidst these academic clamour frequently the voices of curriculum specialists—in line with the democratic principles of equality of opportunity—favouring a separate curriculum for each minority group are also heard.

Another common criticism levelled at the high school curriculum is that it suffers much from imbalance. Experts (3, 6, 7, 13 & 14) believe that a balanced curriculum must have in its organisation cognitive, affective and psychomotor domains where cognition represents knowledge, affection for feeling and psychomotion for neuro muscular coordination. Currently much stress is laid, as part of the curriculum innovation, for instituting many problem solving situations in all learning and teaching areas. Educational psychologists believe that problem solving or inquiry or discovery or creativity approaches in education, involve the students to exercise their memory, ability to synthesize, analyse, and to use their inductive and deductive abilities.

Needless to state that apart from the above process much affective and psychomotor activities are also involved in creative problem solving situation.

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This study was designed to investigate the relationships between problem solving abilities and psychomotor skills of three ethic group children hailing from Spanish American, Navajo Indian and Anglo communities in two junior high schools of the city of Albuquerque, located in the state of New Mexico in USA at inter and intra ethnic levels. The conclusions of this study helped us directly and indirectly to assess some of the cross cultural educational problems discussed earlier.

SELECTION OF SUBJECTS

A primary criteria for the selection of junior high school level students was indicated by the test instrument used. One of the conditions stipulated by the Wechsler Intelligence Scale for Children (15) is that the mean age level of the subjects should be within their 15th birthday. Hence the junior high school was considered as the proper level for this investigation since in the junior high school, the ages of the pupil range from 9 to 15. Pupils totalling 89 were involved in this study, hailing from two junior high schools described earlier. The students belonged to lower socio economic level, which was kept as a constant variable.

The following is the breakdown figure of the sample by racial group:

Anglos 29, Spanish Americans 30 and Navajo Indians 30.

SELECTION OF TEST INSTRUMENTS

The following three performance sub tests belonging to Wechsler Intelligence Scale for Children were selected by the investigator to represent typical problem solving situations:

(1) Block Design
(2) Object Assembly
(3) Coding

WHY WISC WAS SELECTED?

WISC is one of the tests having high validity and reliability (10). Among other things, utilization of the performance test by and large eliminates the oft expressed criticism that an unduly verbal test introduces cultural biases. All the three performance tests are also expected to measure creativity and intelligence. The study was designed in such a way that while the subject was tackling the three performance sub tests, their psychomotor skills have to be rated by the investigator, on certain criteria evolved by the investigator himself. The WISC performance sub tests lent themselves easily towards rating the psychomotor skills.

The above said three performance sub tests are the criterion dependant variables and the following five psychomotor skills as identified by Elizabeth Simpson (12) are the predictor independant variables:

(1) Perception (2) Fine motor acts (3) visual set (4) physical set (5) Emotional set.

PSYCHOMOTOR SKILLS

Psychomotor skills (9, 11 & 12) are those which emphasize some muscular or motor skills, some manipulation of material and objects or some act which requires a neuromuscular coordination. These are stated in terms of abilities, skills, and set (a preparatory adjustment). Perception refers to essential first step in performing a motor act. It is the process of becoming aware of objects, qualities or relations by way of the sense organs. It is the central portion of the situation interpretation—action chain leading to purposeful motor activity. Visual set concerns with the mental pictures or images obtained through the eyes and eye movement. Physical set refers to readiness in the sense of having made the anatomical adjustments necessary for a motor act to be performed.

Readiness in the physical sense, involved receptor set, that is, sensory attending, or focussing the attention of the needed sensory organs and postural set, or positioning of the body. Readiness also implies the attitudes which are favourbale for the initiation of a particular motor act. In other words, it indicates the candidates willingness to respond to a particular stimuli or stimulus. Fine motor acts

are those that are performed by small muscles especially of the fingers, hand and forearm frequently involving eye-hand coordination.

RATING SCALE

The investigator assigned 1 to 5 rating for the selected psychomotor skills. Five specific criteria were selected by the investigator for rating each of the psychomotor skills. The criteria were used as an aid to obtaining a psychomotor index and to use it as a predictor of WISC sub test scores.

ORGANISATION OF THE PROBLEM

Five sub problems were designed and investigated in this study. The first sub problem was to determine the significant relationship between total problem solving abilities and psychomotor skills for all the subjects at intra ethnic level. The second, third or fourth sub problems were to investigate the relationship between Block Design, Object Assembly and Coding sub tests of Wechsler Intelligence Scale for Children (problem solving situations) and the five psychomotor skills of fine motor acts perception, emotional set, physical set, and visual set for all the subjects involved in this study. The fifth sub problem was to deter mine the exact relationship between ethnicity-psychomotor skills and problem solving abilities for all the subjects involved in this study.

SCORING AND TABULATION

The three performance sub tests of WISC yielded separate raw scores for each subject which were recorded by the investigator on the standardised WISC answer sheet. The psychomotor skills were rated by the investigator according to the criteria developed by the investigator himself and was recorded on a separate sheet of paper, while the subjects were tackling the three WISC performance sub tests. The measures thus obtained from the two testing instruments (WISC and Psychomotor skills) were summarized in a tabular form, with appropriate code number for each subject according to racial groups.

ANALYSIS AND INTERPRETATION OF THE DATA

In order to investigate the relationship of the total performance of all the subjects on the WISC sub test to total performance on psychomotor skills, Pearson Product Moment correlations were computed from the data collected. The results of the analysis are summarized in Table 1.

Total WISC, when correlated with total psychomotor skills, accounts for 36 percent of the shared variance indicating that all the five psychomotor skills did act as a good predictor for all the subjects, irrespective of racial stock. It is concluded from the above analysis that in all problem solving situations psychomotor skills play a vital role. The relationship between problem solving abilities and the psychomotor skills was significant at the .01 level.

The performance of all the subjects on the WISC Block design when correlated with the five independent variables (psychomotor skills) showed correlations ranging from .30 to .60 Among the psychomotor skills, perception correlated high with the Block Design, showing 36 percent overlap with the shared variance. It may be concluded that performance in a creative test, such as the Block Design depends on the subject's perception of the test, irrespective of ethnicity and the above relationship was significant at .01 level of confidence.

WISC object Assembly performance sub test was correlated with the five psychomoter skills and as the table indicates the correlations range from .28 to .56. Fine motor acts show an overlap of 25% with the shared variance, which is the highest in the order of correlation. It is concluded that irrespective of racial stock, fine motor acts are needed to perform efficiently in tasks such as Object Assembly.

When Pearson Product moment correlation was computed for the data accrued from the WISC Coding performance sub test and

TABLE 1

Correlations Between All Variables

	Perception	Emotional set	Physical set	Visual set	Fine Motor Acts	Block Design	Object Assembly	Coding	Total Pms
Perception									
Emotional	0.167								
Physical	0.157	0.108							
Visual	0.425**	0.302**	0.160						
Total Pms	0.650**	0.731**	0.440**	0.581**	0.739**				
Block Design	0.601**	0.340**	0.299**	0.429**	0.464**				
Object Assembly	0.479**	0.311**	0.282**	0.276**	0.555**	0.625**			
Coding	0.171	0.163	0.150	0.042	0.287**	0.299**	0.298**		
Total Wisc	0.521**	0.337**	0.302**	0.318**	0.516**	0.843**	0.695*	0.748**	0.601**

N === 89
* Significant at the .05 level
** Significant at the .01 level
Pms -Psychomotor skills

TABLE 2

Analysis of Variance
Ethnic Groups Vs the Five Variables (Psychomotor Skills)
Means, sd and F Value

VARIABLE	NAVAJO N=31		SPANISH N=30		ANGLO N=27		F
	Mean	SD	Mean	SD	Mean	SD	
Perception	4.22	0.84	4.12	0.92	4.37	0.68	0.61
Emotional	4.16	0.68	3.00	1.18	3.66	1.30	9.03**
Physical	4.45	0.67	4.258	0.68	4.70	0.46	3.71*
Visual	4.77	0.42	4.58	0.56	4.92	0.26	4.45*
Fine Motor Acts	4.58	0.56	3.83	0.82	4.40	0.50	10.99**

* Significant at the .05 level
** Significant at the .01 level

TABLE 3

Ethnic Groups vs the Three Dependent Variables (Wisc Performance Subtest)

VARIABLE	NAVAJO N=31		SPANISH N=30		ANGLO N=27		F
	Mean	SD	Mean	SD	Mean	SD	
Block Design	26.61	12.32	21.41	13.26	27.66	9.82	2.33
Object Assembly	24.16	3.06	21.90	4.86	24.85	2.53	5.25**
Coding	67.09	10.54	46.35	10.58	57.85	9.14	10.04**

* Significant at the .05 level
** Significant at the .01 level

the five psychomotor skills, the correlations ranged from .04 to .28 (Table-1). Among this only fine motor acts accounted for 4 per cent of the overlap of observed variance which was significant at .01 level of confidence. The rest of the independant variables such as Perception, physical set, visual set and emotional set had poor relationship with Coding performance sub test.

Comparison of the performance of the subjects in all the criteria and predictor variables at inter ethnic levels was done by subjecting the data to analysis of variance (Table 2 & 3) which provided statistical significance of the observed difference of means in the sample ethnic group. Further the data obtained through analysis of variance was subjected to Duncan's Multiple Range Comparison (5) to determine which of the differences between these means are significant and which are not.

Scrutiny of Table 4 reveals that perception, one of the psychomotor skills and Block Design, one of the WISC performance sub test were not significant for any of the ethnic groups involved in this study at any level of confidence. Emotional set was significantly higher for Navajos than Spanish Americans. Physical set was significantly higher for Anglos than Spanish Americans.

The Navajos were significantly higher in the visual set than Spanish Americans, while the Anglos were significantly higher than Navojos in the same.

In fine motor acts the Navajos performed significantly higher then Spanish Americans and Anglos. The Anglos' performance in fine motor acts were significantly higher than Spanish Americans. Anglos performed significantly higher in the WISC Object Assembly sub test than Spanish Americans. In the WISC Coding sub test thc Navajos performed significantly higher than Spanish Americans and Anglos.

CONCLUSIONS

Results discussed above have lot of implications for improving high school programs. This study has shown that emotional set plays a vital role in accomplishing simple problem solving tests among children which in turn is directly related to their self concept. Hence improving the self concept should be one of

TABLE 4

Duncan's Multiple Range Comparison For Three Ethnic Groups

			A	A	N
			3.00	3.66	4.16
Emotional	S	3.00		.66	1.16
=.01	A	3.66			.50
			S	N	A
			4.26	4.45	4.70
Physical	S	4.26		.19	.44
=.05	N	4.45			.25
			S	N	A
			4.58	4.77	4.92
Visual	S	4.58		.19	.34
=.05	N	4.77			.15
			S	A	N
			3.83	4.40	4.58
Fine Motor	S	3.83		.57	.75
=.01	A	4.40			.18
			S	A	N
			19.80	22.07	22.29
Total Psycho-	S	19.80		2.27	2.49
motor = .01	A	22.07			.22
			S	N	A
			21.90	24.16	24.85
Object Assem-	S	21.90		2.26	2.95
bly = .01	N	24.16			.59
			S	A	N
			56.35	57.85	67.00
CODING	S	56.35		1.50	10.65
= .01	A	57.85			9.15
			S	A	N
			99.74	110.37	117.87
Total Wisc	S	99.74		10.63	18.13
= .01	A	110.37			7.50

S= Spanish Americans N = Navajos A = Anglos

the vital goals of good pedagogy. Active inservice programs for teachers to familiarize them with various psychomotor skills should be initiated and attempts should be made to construct balanced curriculum with cognitive, affective and psychomotor skills. Such a curriculum will have a humanizing effect on the learner and will greatly aid in identifying, developing and creating productive citizens which the nations need sorely.

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