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RESEARCH ARTICLE

TRENDS IN DIVERGENT THINKING ABILITY OF SCHOOL CHILDREN (6-9 YEARS)

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ABSTRACT

The ability to think differently, also called divergent thinking, is the foundation stone of today's rapidly changing world. The present study was carried out to assess the divergent thinking ability of 1000 school children (6-9 years both boys and girls) representing academic grades I, II, III selected randomly from various schools from urban areas of Jammu Province (J&K), India. Standardized Divergent Production Ability Test devised by Sharma (2006) was administered to each child in order to assess his / her divergent thinking ability. The results of the study revealed that both boys and girls showed a declining trend in mean value scores of Associational Fluency, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration component with an increase in academic grades. It was also found that girls scored higher on the components of Word Fluency, Ideational Fluency, Spontaneous Flexibility, Associational Fluency and Elaboration as compared to boys across academic grades. Statistically, no difference was found on creativity scores of all the three academic grades. The study has implications for children, parents, teachers and professionals in the field of child development and can be used to provide inputs for enhancement of divergent thinking skills among children.

INTRODUCTION

The increasing complexity of problems in the world today seems to indicate a need for creative problem solving and flexible thinking. Flexible thinking involves the ability to shift cognitive functioning from common applications to the uncommon, namely breaking through cognitive blocks and restructuring thinking so that a problem is analyzed from multiple perspectives. The process of flexible thinking involves both divergent and convergent thinking. Convergent thinking provides that a problem solver works on multiple solutions as well as one single solution during the course of problem solving. On the other hand, divergent thinking refers to the ability to generate several ideas from a single input. Divergent thinking, the generation of many appropriate responses to a question, is a valuable tool in problem solving. The concept of divergent thinking was developed in the 1950s by psychologist J.P. Guilford, who ascribed it with four main characteristics. The characteristics were *Fluency* (ability to produce many ideas), *Flexibility* (producing a variety of ideas), *Originality* (producing novel ideas) and *EIaboration*, (adding value to existing ideas). Divergent thinking often results in variability in production (Cropley, 1999). Divergent thinking is believed to be characteristic of creative minds (Baer,1993; Wakefield,1992).Children are creative beings. During the tertiary circular reactions sub stage of sensori-motor stage of Piaget's theory of cognitive development, the child demonstrates ability to learn and practice novel actions remarkably. Every child is born with the potential to be a creative thinker, but somehow that part of a child's ability, is far more developed in some children than in others, for one reason or another (Shimm and Ballen, 1996). Children have many more ideas than we teach them (Kennedy and Stonehouse, 2004).They have a natural curiosity that leads them to constantly explore, investigate and experiment to gain an understanding of the possibilities in their environment. When encouraged to experiment and express themselves in their own way, children will often demonstrate greater creative ability than when they are expected to achieve a predetermined outcome or product. Evidence shows that, when children feel accepted and respected, they progressively develop the ability to express feelings, emotions, thoughts and feel confident to create and develop a free, flexible and open line of thought that leads to knowledge, experimentation and discovery (Collins and Amabile 1999; Cropley 1992; Hennessey, Amabile and Martinage 1989).

Trends in divergent thinking ability

Many studies reveal developmental curve of creativity growth and slumps that occur at different ages as inevitable and to be healthy phenomenon (Wilt,1959 ; Torrance,1966).It was also reported that not all children showed a decrease in creativity functioning during the fourth grade but 50% of the children showed serious slump at this particular stage of development. Although gender differences in creativity were assessed in

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several studies (Kogan,1974; Tegano and Moran ,1989; Flaherty,1992; Boling and Boling 1993;Dudek and Strobel ,1993) the results have been inconsistent. In an extensive review of the literature covering more than 80 studies, Baer compared divergent thinking scores of males and females. Over half of these studies reported no differences, with about two thirds of the remaining studies favouring girls and one third favouring boys (Baer , 1993). Review of literature in the related areas revealed a paucity of research studies in the area of divergent thinking among children in Indian Context. Not many studies to date on divergent thinking ability among school children have been conducted in India. Further, no such study has been undertaken so far in Jammu province of Jammu and Kashmir State of India. The study has implication for children, parents, teachers and professionals in the field of Child Development and will be used to provide inputs for enhancement of divergent thinking skills among children. The data will provide new insights about this important aspect of thinking. Keeping this as background, the present study was designed to assess divergent thinking ability of school children (6 - 9 years) from different educational institutions of urban areas of Jammu province (Jammu and Kashmir). Further, it aimed at comparing the divergent thinking ability of school children across gender and academic grades.

Objectives

The study was undertaken with the following specific objectives

1. Assess divergent thinking ability of school children (6 - 9 year) from different educational institutions of urban areas of Jammu province (Jammu and Kashmir State).
2. Compare divergent thinking ability of sample school children across gender and academic grades.

RESEARCH METHODOLOGY

The sample for the present study comprised 1000 school children (both boys and girls) in the age group of 6-9 years. The sample children were selected from different educational institutions from urban areas of Jammu (J&K), India. The sample children were enrolled in grade I-III in the institution at the time of study. Random sampling technique was used in order to select the desired sample. From 20 randomly selected schools, 1000 children enrolled in grade I-III were selected randomly from various sections of these grades. Standardized Divergent Production Ability Test devised by KN. Sharma in 2006, was used to assess the divergent thinking ability of children who were in the age group of 6-9 years. The battery of Divergent Production Abilities contains six tests for measurement of the eight abilities which are Word Production Test (Word Fluency), Uses of Things Test (Ideational Fluency as well as spontaneous Flexibility), Similarities Test (Associational Fluency), and Sentence Construction Test (Expressional Fluency), Titles Test (Adaptive Flexibility as well as Originality), Sentence Completion Test (Elaboration).The test has been developed and standardized for Indian children. For data Collection**,** permission was obtained from the Heads of various schools of urban areas of Jammu. The purpose of the study was explained to the school authorities to obtain consent. Divergent Production Ability Test (DPAT) was administered to each child individually after establishing rapport with him/her. The administration of tool was usually done in a separate room (common room /vacant classroom) where a seating arrangement could be possible. It took on average about two and half hour to administer the entire battery on a child 5-6 visits were made in each school to gather the desired data. Hindi language was used for giving instruction and interacting with children during the administration of tool. The entire data collection was completed within a period of one year. The data obtained were subjected to both qualitative and quantitative analysis. For qualitative analysis, the data was coded and organized in tables. Percentages, Mean, Standard deviation, Chi square test, F test and t test were used to evaluate the results.

RESULTS AND DISCUSSION

Profile of Sample Children

A total of 1000 children aged 6 - 9 years were selected as sample for the study. Out of this, there were 550 boys (55%of the entire sample) and the rest 450 (45%) were girls.

Distribution of Respondents according to Age

Figure 1 shows age distribution of respondents. It was seen that almost half of the respondents (46%) were in the age group 8-9 years.33.6% were in the age group 7-8 years while 20.40% belonged to 6-7 years , group.

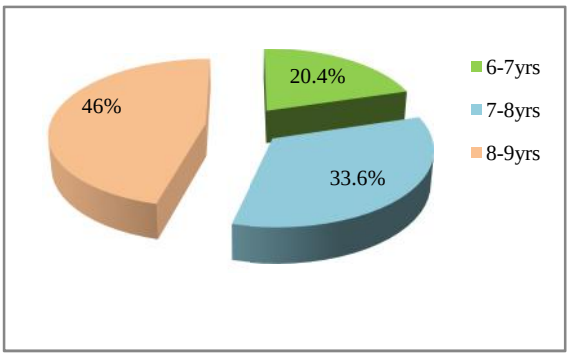

Fig 1 Age Distribution of Respondents

Distribution of Respondents according to Grades

Boys were higher in number in all the grades viz Ist , IInd and IIIrd as compared to girls (Table1). Almost half of the respondents (46%) belonged to IIIrd grade followed by II grade respondents (33.6 %) ,while rest of the respondents (20.4%) were in the Ist grade.

Table1 Distribution of Respondents according to Grades

Academic Grades	BOYS (%)	GIRLS (%)	TOTAL (%)
Ist (6 -7 yrs)	103 (50.4)	101 (49.5)	204 (20.4)
IInd (7-8 yrs)	198 (58.9)	138 (41.0)	336 (33.6)
IIIrd (8-9 yrs)	249 (54.1)	211 (45.8)	460 (46)
TOTAL	550 (55.0)	450 (45.0))	1000 (100)

Mean and Standard Deviation Scores on Subtests of Divergent Production Ability Test (DPAT)

Analysis of obtained data revealed several trends. The mean value score of Associational Fluency, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration component of boys and girls indicated a declining trend with an increase in academic grades whereas the mean value scores of word fluency among girls showed a progressive increase with advancing academic grades. It was also observed that standard deviation score in all the indicators of divergent production ability test of boys showed a declining trend with increase in academic grades whereas the standard deviation scores of Expressional fluency, Adaptive Flexibility among girls also decrease with advancement in academic grades. In all the three grades, girls children scored higher on Word Fluency, Ideational Fluency, Spontaneous Flexibility, Associational Fluency and Elaboration as compared to boys. Similar results were found in the study conducted by Stephens, Karnesa and Whortan (2001) which shows that girls obtained higher scores than boys across all the subtests with significant differences in originality scores (Table 2).

Table 2 Mean and Standard Deviation Scores on Subtests of Divergent Production Ability Test(DPAT)

Indicators	Grade I		Grade II		Grade III	
	Boys (n=103)	Girls (n=101)	Boys (n=198)	Girls (n=138)	Boys (n=249)	Girls (n=211)
Word Fluency	6.39±3.28	6.05±3.08	6.66±3.01	7.69±3.20	5.55±2.92	6.77±3.15
Ideational Fluency	7.10±3.47	7.51±2.92	8.38±3.10	8.88±3.22	6.18±3.11	7.31±3.19
Spontaneous Flexibility	10.40±3.51	10.71±2.56	11.04±3.00	11.62±3.20	8.62±2.87	9.64±3.07
Associational Fluency	6.48±3.18	6.66±3.25	5.56±2.83	6.54±3.06	4.72±2.95	5.72±3.10
Expressional Fluency	22.19±4.17	22.18±3.53	11.98±3.33	11.93±2.92	8.97±3.10	9.74±3.30
Adaptive Flexibility	14.26±3.54	14.52±3.61	12.49±2.85	12.32±2.76	9.11±2.73	9.39±2.94
Originality	25.51±3.50	25.54±2.74	21.11±2.79	20.89±2.91	14.4±2.50	14.9±3.7
Elaboration	20.87±3.35	21.47±2.58	19.80±3.12	19.89±3.23	12.8±2.80	14.0±2.61

Analysis of Variance Academic Grade wise) on Factors of Divergent Production Ability Tests

It was found that scores on indicators of Associational Fluency, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration decreases with the advancement of academic grades. Scores on the Ideational Fluency, Spontaneous Flexibility, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration were higher in Class I and II while a sudden fall was noticed in the scores of grade III.

Table 3ANOVA (Academic Grade wise) on Factors of Divergent Production Ability Tests

Indicators	GRADE I (n=204)	GRADE II (n=336)	GRADE III (n=460)	f value	P value
Word Fluency	6.22±3.18	7.08±3.13	6.11±3.09	10.17**	0.00
Ideational Fluency	7.30± 3.21	8.59±3.16	6.70±3.20	34.28**	0.00
Spontaneous Flexibility	10.5 ± 3.07	11.28±3.10	9.09±3.01	52.23**	0.00
Associational Fluency	6.57 ± 3.21	5.96±2.96	5.17±3.06	16.14**	0.00
Expressional Fluency	22.18±3.86	11.96±3.16	9.32±3.21	1062.10**	0.00
Originality	14.39 ± 3.57	12.42±2.81	9.24±2.83	240.82**	0.00
Adaptive Flexibility	25.54 ± 3.14	21.02±2.84	14.63±278	1083.46**	0.00
Elaboration	21.17±3.00	19.83±3.16	13.36±2.77	703.22**	0.00

df =999;**Significant difference at 0.01

It could be due to the reason that when children entered in grade I, they showed more original, novel, unique ideas which might be due to their transformation from non formal to formal education system. It was also found that respondents of grade II scored higher on component of Word Fluency, Ideational Fluency and Spontaneous Flexibility. No consistent increasing trends were observed in scores grade wise. Declining trends were observed from grade I and grade III in all factors except Word Fluency, Ideational Fluency and Spontaneous Flexibility (Table 3).Statistically, significant difference across all academic grades was observed on all the factors of divergent production ability test. In the observation of Assouline and Lupkowski-Shoplik (2005) although young children often demonstrate interest in mathematical concepts, this interest is discouraged by the standardized rigid curriculum that requires them to accomplish certain predetermined tasks,such as counting from 1 to 100.The door to curiosity, exploration and individualization is immediately shut.

t value scores (Across gender) on Factors of Divergent Production Ability Test

Table 4 depicts t value scores of male and female respondents on factors of divergent production ability test.

Results indicated that although mean value scores of female children were higher in all the indicators of divergent production ability test as compared to boys, there was no significant difference between the scores of boys and girls. On all the dimensions of divergent production ability test, the difference was statistically insignificant at 0.05 level.

Table 4 t scores (Across gender) on Factors of Divergent Production Ability Test

Indicators	Boys(n=550)	Girls(n=450)	t - value
Word Fluency	6.2 ±3.07	6.8 ±3.14	0.12
Ideational Fluency	7.2 ± 3.22	7.9 ±3.11	0.44
Spontaneous Flexibility	10.02 ± 3.2	10.65 ± 2.94	0.42
Associational Fluency	5.5 ± 2.98	6.30 ± 3.13	0.86
Expressional Fluency	14.3 ± 3.53	14.6 ± 3.2	0.18
Adaptive Flexibility	11.9 ± 3.04	12.07 ± 3.12	0.1
Originality	20.3 ± 2.93	20.4 ± 2.90	0.06
Elaboration	17.8 ± 3.09	18.4 ± 2.80	0.4

Insignificant at 0.05; Table value =1.64; df=998

Creativity Scores of respondents according to academic Grade

Table 5 reveals that one fourth of the respondents (25.3%) were having percentile rank between 25th -50th ,while almost equal percent of respondents (25.2%) had percentile rank between 50th -75th. Sample children were found to be distributed equally among the other two equal rank categories.(Below 25th and above 75th).The difference in creativity scores of sample children grade wise was found to be insignificant statistically.

Table 5 Creativity Scores (Academic Grade wise)

Percentile ranks	*Grade I*	*Grade II*	*Grade III*	*Overall Total*	*χ 2*
	(n=204)(%)	(n=336)(%)	(n=460)(%)	(n=1000)(%)	
Below 25th	52(25.4)	83(24.7)	114(24.7)	249(24.9)	
25th -50th	51(25.0)	85(25.2)	117(25.4)	253(25.3)	0.144
50th – 75th	52(25.4)	86(25.5)	114(24.7)	252(25.2)	
Above 75th	49(24.0)	82(24.4)	115(25.0)	246(24.6)	
Total	204(20.4)	336(33.6)	460(46.0)	1000(100)	

Insignificant difference Calculated χ 2= 0.144; α = 0.05 ,df=6 χ 2 Tab=12.6

Creativity Scores of respondents according to academic Grade and Gender

Table 6 describes the percentile ranks of children on the basis of creativity scores on factors of divergent production ability test. In all the three academic grades almost equal number of male and female respondents were having percentile ranks between 25th-50th and 50th -75th percentile ranks. Statistically, no difference was found on creativity scores of sample children gender wise.

Spontaneous Flexibility, Associational Fluency and Elaboration as compared to boys across all the academic grades. It was seen that mean Scores on indicators of Ideational Fluency, Spontaneous Flexibility, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration were higher in grade I and II while a sudden fall was noticed in the scores of grade III. Similar results were found in the study conducted by Kim (2011) which showed that creative thinking scores of kindergarteners through third graders have significantly decreased. Declining trends were observed from grade I and grade III in all factors except Word Fluency, Ideational Fluency and Spontaneous Flexibility. Mixed results were found in the study by Sak and Maker (2005) who reported no peaks or slumps at the fourth grade. No consistency in creativity scores of males and females were found .Statistically, no difference was found on creativity scores of all the three academic grades. Similar results were found in the study conducted by Charyton and Snelbecker (2007) which showed insignificant differences in creativity scores.

Table 6 Overall Creativity Scores (Grade and Gender wise)

Percentile ranks	**Grade I**		**Grade II**		**Grade III**		**Overall Total**		
	Boys (n=103) (%)	**Girls (n=101) (%)**	**Boys (n=198) (%)**	**Girls (n=138) (%)**	**Boys (n=249) (%)**	**Girls (n=211) (%)**	**Boys (n=550) (%)**	**Girls (n=450) (%)**	**Total (n=1000) (%)**
Below 25th	26 (25.2)	26 (25.7)	49 (24.7	34 (24.6)	62 (24.8)	52 (24.6)	137 (24.9)	112 (24.8)	249 (24.9)
25th -50th	26 (25.2)	25 (24.7)	50 (25.2	35 (25.3)	63 (25.3)	54 (25.5)	139 (25.2)	114 (25.3)	253 (25.3)
50th - 75th	26 (25.2)	26 (25.7	50 (25.2	36 (26.0)	62 (24.8)	52 (24.6)	138 (25.0)	114 (25.3)	252 (25.2)
Above 75th	25 (24.2)	24 (23.7	49 (24.7	33 (23.9)	62 (24.8)	53 (25.1)	136 (24.7)	110 (24.4)	246 (24.6)

Insignificant difference Calculated χ 2=0.013 α = 0.05,df=3 χ 2Tab=7.81

Overall Creativity scores of Sample Children

Figure 2 shows overall creativity scores of sample children. It was seen that respondents were equally distributed among all the percentile ranks. It was also revealed from the figure that 50% sample children were having below 50th percentile rank and 50th sample children were having above 50th percentile rank.

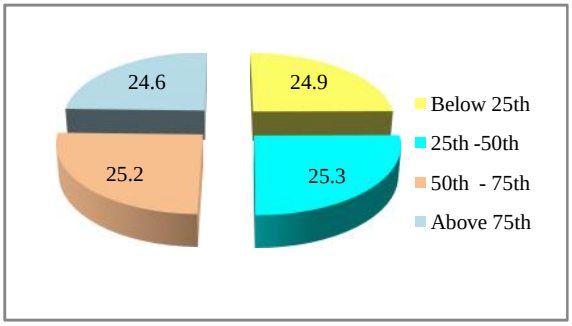

Fig 2 Overall Creativity scores of Sample Children

CONCLUSION

It has been concluded that both boys and girls showed a declining trend in mean value scores of Associational Fluency, Expressional Fluency, Adaptive Flexibility, Originality and Elaboration component of boys and girls with an increase in academic grades. It was also found that girls scored higher on the components of Word Fluency, Ideational Fluency,

Overall creativity scores of random sample of children aged 6-9 years reveals that the children, on the whole, were not performing well on divergent thinking tasks since almost 50% were falling in the group below 50th percentile rank. This explicitly means that there is less emphasis on these skills in the growing years of children. Based on the results of the study, it is recommended that educational institutions should make a balance between curricular and co-curricular activities and should also include those activities in the curriculum which enhance creative abilities of children.

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