



# Scanning the Factual Outcome of Intervention Program on Scholastic Achievement and Cognitive Abilities of 9 year old Students

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## ARTICLE DETAILS

### Article History:

Received Date:29/01/2019

Revised Date: 06/02/2019

Accepted Date:07/02/2019

Published Online:10/02/2019

### Keywords

Intelligence quotient, focus factor, decision making ability, creative quotient, academic achievement, intervention program

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## ABSTRACT

Cognitive thinking enables children to explore the world. As students are curious about the world around them and want to discover new things and new experiences. The study was conducted on a sample of 485 students including boys as well as girls aged 9 years of age. Respondents were further categorized on the basis of gender and eventually into experimental and control group. The study was carried to find out the variation and changes in the dependent variables precisely intelligence quotient, focus factor, decision making ability, creative quotient and academic achievement before, during and after the implementation of intervention program. The control group refers to the group under study which is refrained from the provision of any intervention during the course of study. There was significant rise in the intelligence quotient, focus factor, decision making ability, creative quotient and academic achievement of 9 years old respondents of experimental groups in Chandigarh and Punjab while insignificant changes could be found among respondents in control group after the consummation of intervention program.

## 1. Introduction

Learning is the core of education. Cognitive thinking is the process of obtaining knowledge through thought, experience, and the senses. Cognitive is another word for thinking and thoughts. Cognition is a group of mental processes that include attention, memory, producing and understanding language, learning, reasoning, problem solving, and decision making. The value of cognitive thinking lies in how people give logic about concepts and their observations. Cognitive thinking is the key to survive and to adapt to change. It is most useful to teachers as a tool through which they can teach students contextualize and articulate the knowledge that they gain in life. Cognitive thinking leads to learning. Cognitive skills separate the good learners from the regular learners. Jarial and Sharma (1980) investigated and evaluated the relationship between creativity and academic performance of students of Secondary schools of Indore city. Test of creative thinking and marks of annual examination of students were considered to measure their performance. Results indicated that academic performance was significantly and positively related to creativity. Gardner and Hatch (1989) mentioned important educational implications of the theory of multiple intelligences. In this concern, they opposed the traditional education practices which merely have a strong emphasis on the use of verbal and logical intelligences. They emphasized that educators and teachers should understand and teach through broad range of skills and talents. Deary and Johnson (2010), Kirby and Das (1977), Lin (2011), Perkins et. al (1991), Piaget (1964), Piaget (1977), Poon Teng Fatt (2000), Pour-Mohammadi et. al (2012), Pratiwi et. al (2018) and Pulaski (1971). Penick (1992) described creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements and disharmonies as well as identifying, searching for solutions, making guesses or formulation of hypotheses, and possibly modifying and restating them, and experimenting to find results and finally scoring high in academics. Christison (1996) through the research conducted, illustrated that the utilization of multiple intelligences theory strategies widens teacher's awareness regarding the knowledge and skills of students which would enable them to look at each student from the perspective of potential and strengths. The findings also added that the efficient use of multiple intelligences improves the academic achievement of students. Dare, Durand, Moeller and Washington (1997) conducted a research project to implement and examine the multiple intelligence program to enhance academic achievement. The results indicated that multiple intelligences can aid in

improvement of academics among students. Mills (2000) noticed that the use of multiple intelligences-based instructions enabled the students to perform better in academics and securing higher grades in the school. Weiner (2001) investigated commonalities among elementary schools that have implemented the theory of multiple intelligences. The commonalities led to the development of a set of guidelines that contain effective strategies for implementing the theory of multiple intelligences in an educational setting. Among the most prevalent guidelines found were that the monthly in-service days for teacher collaboration on multiple intelligences curricular ideas, usage of self-selected student projects, encouragement of students to recognize and identify their difference intelligences and incorporation of the eight Intelligences with understanding and depth. The results indicated that multiple intelligence-based teaching system enhances academic achievement. Nwazuoke, Olatoye and Oyundoyin (2002) carried a research study and had discussed educational implications of multiple intelligences in educational system. The finding suggested that although multiple intelligence theory lack empirical evidence but it still has great utility in education by helping teachers to watch beyond the narrow boundaries of curriculum. It was also found cognition and intelligence as related to self-confidence and academic achievement of school students. The results further reported that there was a significant relationship between cognition, intelligence and academic achievement among school students; there existed a significant difference between boys and girls in terms of cognitive abilities; proportionally, there existed significant difference between them in terms of academic achievement. Frederick (2005) studied the impact of schooling on cognitive process and decision-making ability. Results suggested that schooling is a socializing force for the development of children as well as it enhances the decision-making ability among children. Adey and Shayer (2006) investigated and found that there existed significant relationship between intelligence and academic achievement of secondary school students. In addition, there was a significant difference between boys and girls in terms of intelligence. Likewise, there existed significant difference between boys and girls as far as their academic achievement was concerned. Rohde and Thompson (2007) explored the differences between the genders in terms of their general intelligence. The study revealed that such differences could not be identified. The results further indicated that girls tend to excel on verbal types of problems whereas boys on quantitative and spatial. Isik and Tarim (2009) undertook a study to investigate the impact of creativity on academic achievement and revealed that creativity was an essential factor for the high academic achievement of student. It was also explained that students usually have preferences for the ways by which they learn or understand a subject and it is advisable for students to tailor these styles to suit their own learning needs. Ward and Kolomyts (2010) investigated relationship between creativity and academic performance of students and found a very low, negative and insignificant relationship between creativity and academic performance. Christensen, Johnson and Horn (2010) established that however small the effect on learning outcomes, it is accepted that learning styles can help students enhance their own learning and thus encourage self-directed learning. Naderi, Abdullah, Aizan, Sharir and Kumar (2010) revealed that multiple intelligences play a significant role on academic performance. It was established that it is necessary for students and educational institutions to understand learning style of each student to ensure that each one reaches his maximum potential to excel in scholastic achievement. Pfeiffer (2011) examined the correlation between intelligence and academic of class 9th students with an objective to study the relationship between academic achievement and intelligence and traced that there was an insignificant relationship between intelligence and academic achievement of the subjects. Altan (2012) reviewed Gardner's book titled 'Intelligence Reframed: Multiple Intelligences for the 21st Century' and investigated that the theory of multiple intelligences is very insightful for teachers because it allows them to examine their techniques and assessments in preview of individual differences. The lucid understanding of multiple intelligences enhances curriculum design. Barbot, Lubart and Besancon (2016) revealed that creativity was significantly related to the academic performance in english, mathematics, science and social studies.

## 2. Methodology

The study was conducted on a sample of 485 students including boys as well as girls aged 9 years of age. Respondents were further categorized on the basis of gender and eventually into experimental and control group. The experimental group refers to the group under study which receives the intervention during the course of study. The purpose of having the experimental group in the present research study was basically to find out the variation and changes in the dependent variables precisely focus factor, decision making ability, creative quotient and academic achievement before, during and after the implementation of intervention program. Intervention included worksheets based on Gardner's multiple intelligences. Each student was given worksheets according to his own natural learning style which was assessed during the program.

Table 1  
Details of Sample

Age	Total Sample	Gender	N	Place	n	Experimental Group	Control Group
9 years	485	M	229	Punjab	130	62	68
				Chandigarh	99	55	44
		F	256	Punjab	149	74	75
				Chandigarh	107	57	50

At the initial stage, rapport was built with the all the respondents following which they consent was taken. The respondents were encouraged to participate actively and the entire process was explained to them. On the first day of the program, all the respondents were assessed prior to the intervention, this pre-assessment was termed as TA-1. After the first intervention, the respondents in the experimental group were given customized task sheets for three months. Students were to attempt two task sheets daily on regular basis. These task sheets were different for students with different dominant multiple intelligence which was assessed in TA-1. In this way, the respondents in experimental group received sheets based on their respective intelligences. However, the subjects in the control group were not given any such worksheets and were thus excluded from the intervention program. After three months, TA-2 was conducted on respondents of both the experimental as well as the control group. After this, subjects in experimental group were given task sheets for next three months while no intervention was given to control group. After this, TA-3 was conducted following which experimental group received next three months' task sheets. Later TA-4 was conducted and three months' task sheets were given to experimental group. After this, TA-5 was conducted at the final level. In this way, five assessments were conducted in all, on all the respondents but the worksheets were given only to the subjects in experimental group. The entire program was taken up in around 12 months.

3. Results

There was insignificant difference between males of experimental and control group in IQ 1 and IQ 2 in Chandigarh. However, in Punjab, the difference was significant in IQ 1 but insignificant in IQ 2. However, in case of IQ 3, IQ 4 and IQ 5, the difference was statistically significant. Similarly, among females, the difference was statistically significant in IQ 3, IQ 4 and IQ 5 while in previous two tests, the difference was insignificant.

Table 2  
Details of intelligence quotient

	Place	Gp	n	Mean	SD	Place	M/F	N	Mean	SD	Gp	Place	n	Mean	SD		
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>						<b>Area wise, Male</b>					
IQ1	Ch	EX	55	102.3	10.82	Ch	M	55	102.3	10.82	EX	Ch	55	102.3	10.82		
			44	103.5	13.76		F	57	105.9	13.26			Pb	62	105.7	10.75	
	Pb	EX	62	105.7*	10.75	Pb	M	62	105.7	10.75	CO	Ch	44	103.5*	13.76		
			68	110.2	11.61		F	74	106.2	13.41			Pb	68	110.2	11.61	
IQ2	Ch	EX	55	109.9	10.95	Ch	M	55	109.9	10.95	EX	Ch	55	109.9	10.95		
			44	105.0	13.71		F	57	106.8	13.51			Pb	62	113.2	11.44	
	Pb	EX	62	113.2	11.44	Pb	M	62	113.2	11.44	CO	Ch	44	105.0*	13.71		
			68	113.9	11.60		F	74	111.7	13.78			Pb	68	113.9	11.60	
IQ3	Ch	EX	55	117.5*	11.33	Ch	M	55	117.5	11.33	EX	Ch	55	117.5	11.33		
			44	106.4	13.67		F	57	121.8	13.94			Pb	62	120.8	12.30	
	Pb	EX	62	120.8*	12.30	Pb	M	62	120.8	12.30	CO	Ch	44	106.4*	13.67		
			68	113.3	11.61		F	74	121.5	14.31			Pb	68	113.3	11.61	
IQ4	Ch	EX	55	126.5*	13.21	Ch	M	55	126.5	13.21	EX	Ch	55	126.5	13.21		
			44	107.6	13.67		F	57	131.1	16.49			Pb	62	131.3	13.31	
	Pb	EX	62	131.3*	13.31	Pb	M	62	131.3	13.31	CO	Ch	44	107.6*	13.67		
			68	114.4	11.83		F	74	130.9	15.21			Pb	68	114.4	11.83	
I	Ch	EX	55	132.4*	13.92	Ch	M	55	132.4	13.92	EX	Ch	55	132.4	13.92		
			44	109.5	13.98		F	57	137.0	17.36			Pb	62	137.4	13.83	

	Pb	Co	EX	62	137.4*	13.83	Pb	M	62	137.4	13.83	Co	Ch	44	109.5*	13.98		
		Co		68	116.6	11.95		F	74	136.9	15.91		Pb	Ch	68	116.6	11.95	
<b>Exp. and Control Group, Female</b>				<b>Gender wise, Control</b>				<b>Area wise, Female</b>										
IQ1	Ch	Co	EX	57	105.9	13.26	Ch	M	44	103.5	13.76	Co	EX	Pb	Ch	57	105.9	13.26
				50	105.3	11.83		F	50	105.3	11.83					74	106.2	13.41
	Pb	Co	EX	74	106.2	13.41	Pb	M	68	110.2	11.61	Co	Ch	Pb	Ch	50	105.3	11.83
				75	106.6	11.87		F	75	106.6	11.87					75	106.6	11.87
IQ2	Ch	Co	EX	57	106.8	13.51	Ch	M	44	105.0	13.71	Co	EX	Pb	Ch	57	106.8*	13.51
				50	107.0	11.84		F	50	107.0	11.84					74	111.7	13.78
	Pb	Co	EX	74	111.7	13.78	Pb	M	68	113.9*	11.60	Co	Ch	Pb	Ch	50	107.0	11.84
				75	108.1	11.85		F	75	108.1	11.85					75	108.1	11.85
IQ3	Ch	Co	EX	57	121.8*	13.94	Ch	M	44	106.4	13.67	Co	EX	Pb	Ch	57	121.8	13.94
				50	108.2	11.90		F	50	108.2	11.90					74	121.5	14.31
	Pb	Co	EX	74	121.5*	14.31	Pb	M	68	113.3	11.61	Co	Ch	Pb	Ch	50	108.2	11.90
				75	109.6	11.84		F	75	109.6	11.84					75	109.6	11.84
IQ4	Ch	Co	EX	57	131.1*	16.49	Ch	M	44	107.6	13.67	Co	EX	Pb	Ch	57	131.1	16.49
				50	109.5	11.99		F	50	109.5	11.99					74	130.9	15.21
	Pb	Co	EX	74	130.9*	15.21	Pb	M	68	114.4	11.83	Co	Ch	Pb	Ch	50	109.5	11.99
				75	110.7	11.95		F	75	110.7	11.95					75	110.7	11.95
IQ5	Ch	Co	EX	57	137.0*	17.36	Ch	M	44	109.5	13.98	Co	EX	Pb	Ch	57	137.0	17.36
				50	111.2	12.16		F	50	111.2	12.16					74	136.9	15.91
	Pb	Co	EX	74	136.9*	15.91	Pb	M	68	116.6	11.95	Co	Ch	Pb	Ch	50	111.2	12.16
				75	112.7	12.07		F	75	112.7	12.07					75	112.7	12.07

Table 3  
Comparison of intelligence quotient

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
IQ	Mean	SD	Mean	SD	Mean	SD	Mean	SD
IQ1	102.3*	10.82	103.55	13.76	105.7*	10.75	110.23	11.61
IQ2	109.9*	10.95	105.04	13.71	113.2*	11.44	113.92	11.60
IQ3	117.5*	11.33	106.49	13.67	120.8*	12.30	113.30	11.61
IQ4	126.5*	13.21	107.68	13.67	131.3*	13.31	114.43	11.83
IQ5	132.4*	13.92	109.52	13.98	137.4*	13.83	116.65	11.95
Female								
IQ1	105.9*	13.26	105.37	11.83	106.2*	13.41	106.61	11.87
IQ2	106.8*	13.51	107.10	11.84	111.7*	13.78	108.12	11.85
IQ3	121.8*	13.94	108.26	11.90	121.5*	14.31	109.61	11.84
IQ4	131.1*	16.49	109.53	11.99	130.9*	15.21	110.75	11.95
IQ5	137.0*	17.36	111.30	12.16	136.9*	15.91	112.74	12.07

The mean value ranged from 102.3 to 137.4 in experimental group while it ranged from 102.3 to 116.6 in control group. The mean value of experimental group was significantly higher than the control group in all the tests. When the IQ of respondents in experimental group was compared gender wise, insignificant difference was found in all the cases in Chandigarh as well as Punjab. Likewise, when comparison was made between males and females in control group for both the places, no significant difference was found except in IQ 2 between males and females of Punjab. Females had higher values as compared to males. The mean values among males ranged from 102.3 to 137.4 and among females, it ranged from 105.9 to 137. When comparison was made between males of Chandigarh and Punjab in control group, highly significant difference was found between their IQ in all the 5 tests whereas in case of experimental group, no significant difference was found between IQ of males in Chandigarh and Punjab in any test.

On the contrary, in case of female's significant difference was found only in their IQ 2 in experimental group. The mean of IQ varied from 105.7 to 137.4 in Chandigarh while in Punjab it varied from 102.3 to 132.4.

Table 4  
Details of FF

9	Place	Gp	N	Mean	SD	Place	M/F	N	Mean	SD	Gp	Place	N	Mean	SD
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>				
FF1	Ch	EX	55	64.72	12.92	Ch	M	55	64.72	12.92	Ex	Ch	55	64.72	12.92
		Co	44	66.65	13.17		F	57	66.45	14.18		Pb	62	67.64	12.86
	Pb	EX	62	67.64	12.86	Pb	M	62	67.64	12.86	Co	Ch	44	66.65	13.17
		Co	68	70.17	14.09		F	74	70.72	15.42		Pb	68	70.17	14.09
FF2	Ch	EX	55	72.30	12.90	Ch	M	55	72.30	12.90	Ex	Ch	55	72.30	12.90
		Co	44	68.14	13.16		F	57	74.41	14.37		Pb	62	75.18	13.18
	Pb	EX	62	75.18	13.18	Pb	M	62	75.18	13.18	Co	Ch	44	68.14	13.16
		Co	68	71.71	14.08		F	74	78.37	15.41		Pb	68	71.71	14.08
FF3	Ch	EX	55	79.88*	13.11	Ch	M	55	79.88	13.11	Ex	Ch	55	79.88	13.11
		Co	44	69.54	13.18		F	57	82.37	14.74		Pb	62	82.72	13.70
	Pb	EX	62	82.72*	13.70	Pb	M	62	82.72	13.70	Co	Ch	44	69.54	13.18
		Co	68	73.21	14.10		F	74	86.03	15.57		Pb	68	73.21	14.10
FF4	Ch	EX	55	86.21*	14.87	Ch	M	55	86.21	14.87	Ex	Ch	55	86.21	14.87
		Co	44	70.33	13.36		F	57	88.86	16.96		Pb	62	90.01	15.17
	Pb	EX	62	90.01*	15.17	Pb	M	62	90.01	15.17	Co	Ch	44	70.33	13.36
		Co	68	73.95	14.32		F	74	92.76	16.54		Pb	68	73.95	14.32
FF5	Ch	EX	55	90.22*	15.59	Ch	M	55	90.22	15.59	Ex	Ch	55	90.22	15.59
		Co	44	71.53	13.64		F	57	92.88	17.80		Pb	62	94.17	15.82
	Pb	EX	62	94.17*	15.82	Pb	M	62	94.17	15.82	Co	Ch	44	71.53	13.64
		Co	68	75.38	14.54		F	74	97.00	17.25		Pb	68	75.38	14.54
<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>				
FF1	Ch	EX	57	66.45	14.18	Ch	M	44	66.65	13.17	Ex	Ch	57	66.45	14.18
		Co	50	65.73	12.39		F	50	65.73	12.39		Pb	74	70.72	15.42
	Pb	EX	74	70.72	15.42	Pb	M	68	70.17	14.09	Co	Ch	50	65.73	12.39
		Co	75	68.44	14.38		F	75	68.44	14.38		Pb	75	68.44	14.38
FF2	Ch	EX	57	74.41*	14.37	Ch	M	44	68.14	13.16	Ex	Ch	57	74.41	14.37
		Co	50	67.20	12.39		F	50	67.20	12.39		Pb	74	78.37	15.41
	Pb	EX	74	78.37*	15.41	Pb	M	68	71.71	14.08	Co	Ch	50	67.20	12.39
		Co	75	69.95	14.37		F	75	69.95	14.37		Pb	75	69.95	14.37
FF3	Ch	EX	57	82.37*	14.74	Ch	M	44	69.54	13.18	Ex	Ch	57	82.37	14.74
		Co	50	68.56	12.42		F	50	68.56	12.42		Pb	74	86.03	15.57
	Pb	EX	74	86.03*	15.57	Pb	M	68	73.21	14.10	Co	Ch	50	68.56	12.42
		Co	75	71.40	14.35		F	75	71.40	14.35		Pb	75	71.40	14.35
FF4	Ch	EX	57	88.86*	16.96	Ch	M	44	70.33	13.36	Ex	Ch	57	88.86	16.96
		Co	50	69.37	12.62		F	50	69.37	12.62		Pb	74	92.76	16.54
	Pb	EX	74	92.76*	16.54	Pb	M	68	73.95	14.32	Co	Ch	50	69.37	12.62
		Co	75	72.15	14.54		F	75	72.15	14.54		Pb	75	72.15	14.54
FF5	Ch	EX	57	92.88*	17.80	Ch	M	44	71.53	13.64	Ex	Ch	57	92.88	17.80
		Co	50	70.48	12.78		F	50	70.48	12.78		Pb	74	97.00	17.25
	Pb	EX	74	97.00*	17.25	Pb	M	68	75.38	14.54	Co	Ch	50	70.48	12.78
		Co	75	73.44	14.75		F	75	73.44	14.75		Pb	75	73.44	14.75

Table 5  
Comparison of FF

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
FF	Mean	SD	Mean	SD	Mean	SD	Mean	SD
FF1	64.72*	12.92	66.65	13.17	67.64*	12.86	70.17	14.09
FF2	72.30*	12.90	68.14	13.16	75.18*	13.18	71.71	14.08
FF3	79.88*	13.11	69.54	13.18	82.72*	13.70	73.22	14.10
FF4	86.21*	14.87	70.33	13.36	90.01*	15.17	73.95	14.32
FF5	90.22*	15.59	71.54	13.64	94.17*	15.82	75.38	14.54
Female								
FF1	66.45*	14.18	65.74	12.39	70.72*	15.42	68.45	14.38
FF2	74.41*	14.37	67.21	12.39	78.37*	15.41	69.96	14.37
FF3	82.37*	14.74	68.57	12.42	86.03*	15.57	71.40	14.35
FF4	88.86*	16.96	69.37	12.62	92.76*	16.54	72.15	14.54
FF5	92.88*	17.80	70.48	12.78	97.00*	17.25	73.44	14.75

Among 9 year old respondents, significant difference was recorded in case of their FF 3, FF 4 and FF 5. Similarly, among females except FF 1 in Chandigarh as well as Punjab, the other cases recorded significant difference. The mean value ranged from 64.72 to 94.17 in experiment group while it ranged from 66.65 to 75.38 in control group. The mean value of experiment group was lower than the control group in all the tests. Among females, the mean value ranged from 66.45 to 97 in experiment group while it ranged from 65.73 to 73.44 in control group. The mean value of experiment group was higher than the control group in all the tests. When the FF of respondents in experiment group was compared gender wise, insignificant difference was found in all the cases. Same trend was followed in case of respondents in control group. Females had higher values as compared to males. The mean values among males ranged from 64.72 to 94.17 and among females ranged from 66.45 to 97. In control group, females had lower values as compared to males. The mean values among males ranged from 66.65 to 75.38 and among females ranged from 65.73 to 73.44. Likewise, when comparison was made between males of Chandigarh and Punjab in control as well as experiment group, no significant difference was found between their FF of the 5 tests in any of the groups. Same trend was followed in case of females. The mean of FF varied from 64.72 to 90.22 in Chandigarh while in Punjab it varied from 67.64 to 94.17. In case of females, the mean of FF varied from 65.73 to 92.88 in Chandigarh while in Punjab it varied from 68.44 to 97.

Table 6  
Details of DMA

9	Place	Gp	N	Mean	SD	Place	M/F	N	Mean	SD	Gp	Place	N	Mean	SD
Exp. and Control Group, Male					Gender wise, Experiment					Area wise, Male					
DMA1	Ch	Ex	55	0.31	0.08	Ch	M	55	0.31	0.08	Ex	Ch	55	0.31	0.08
		Co	44	0.32	0.08		F	57	0.32	0.08		Pb	62	0.33	0.08
	Pb	Ex	62	0.33	0.08	Pb	M	62	0.33	0.08	Co	Ch	44	0.32	0.08
		Co	68	0.34	0.08		F	74	0.35	0.09		Pb	68	0.34	0.08
DMA2	Ch	Ex	55	0.52*	0.13	Ch	M	55	0.52	0.13	Ex	Ch	55	0.52	0.13
		Co	44	0.37	0.09		F	57	0.53	0.14		Pb	62	0.55	0.13
	Pb	Ex	62	0.55*	0.13	Pb	M	62	0.55	0.13	Co	Ch	44	0.37	0.09
		Co	68	0.39	0.10		F	74	0.58	0.15		Pb	68	0.39	0.10
DMA3	Ch	Ex	55	0.58*	0.15	Ch	M	55	0.58	0.15	Ex	Ch	55	0.58	0.15
		Co	44	0.39	0.10		F	57	0.59	0.16		Pb	62	0.61	0.14
	Pb	Ex	62	0.61*	0.14	Pb	M	62	0.61	0.14	Co	Ch	44	0.39	0.10
		Co	68	0.41	0.11		F	74	0.65	0.17		Pb	68	0.41	0.11
DMA4	Ch	Ex	55	0.63*	0.17	Ch	M	55	0.63	0.17	Ex	Ch	55	0.63	0.17
		Co	44	0.40	0.10		F	57	0.64	0.18		Pb	62	0.67	0.16



DMA5	Pb	EX	62	0.67*	0.16	Pb	M	62	0.67	0.16	Co	Ch	44	0.40	0.10
		Co	68	0.42	0.11		F	74	0.69	0.18		Pb	68	0.42	0.11
	Ch	EX	55	0.66*	0.17	Ch	M	55	0.66	0.17	Ex	Ch	55	0.66	0.17
		Co	44	0.40	0.11		F	57	0.66	0.19		Pb	62	0.70	0.17
	Pb	EX	62	0.70*	0.17	Pb	M	62	0.70	0.17	Co	Ch	44	0.40	0.11
Co		68	0.43	0.11	F		74	0.72	0.19	Pb		68	0.43	0.11	
Exp. and Control Group, Female						Gender wise, Control				Area wise, Female					
DMA1	Ch	EX	57	0.32	0.08	Ch	M	44	0.32	0.08	Ex	Ch	57	0.32	0.08
		Co	50	0.32	0.07		F	50	0.32	0.07		Pb	74	0.35	0.09
	Pb	EX	74	0.35	0.09	Pb	M	68	0.34	0.08	Co	Ch	50	0.32	0.07
		Co	75	0.33	0.09		F	75	0.33	0.09		Pb	75	0.33	0.09
DMA2	Ch	EX	57	0.53*	0.14	Ch	M	44	0.37	0.09	Ex	Ch	57	0.53	0.14
		Co	50	0.35	0.08		F	50	0.35	0.08		Pb	74	0.58	0.15
	Pb	EX	74	0.58*	0.15	Pb	M	68	0.39	0.10	Co	Ch	50	0.35	0.08
		Co	75	0.38	0.10		F	75	0.38	0.10		Pb	75	0.38	0.10
DMA3	Ch	EX	57	0.59*	0.16	Ch	M	44	0.39	0.10	Ex	Ch	57	0.59	0.16
		Co	50	0.37	0.09		F	50	0.37	0.09		Pb	74	0.65	0.17
	Pb	EX	74	0.65*	0.17	Pb	M	68	0.41	0.11	Co	Ch	50	0.37	0.09
		Co	75	0.40	0.11		F	75	0.40	0.11		Pb	75	0.40	0.11
DMA4	Ch	EX	57	0.64*	0.18	Ch	M	44	0.40	0.10	Ex	Ch	57	0.64	0.18
		Co	50	0.38	0.09		F	50	0.38	0.09		Pb	74	0.69	0.18
	Pb	EX	74	0.69*	0.18	Pb	M	68	0.42	0.11	Co	Ch	50	0.38	0.09
		Co	75	0.41	0.11		F	75	0.41	0.11		Pb	75	0.41	0.11
DMA5	Ch	EX	57	0.66*	0.19	Ch	M	44	0.40	0.11	Ex	Ch	57	0.66	0.19
		Co	50	0.38	0.10		F	50	0.38	0.10		Pb	74	0.72	0.19
	Pb	EX	74	0.72*	0.19	Pb	M	68	0.43	0.11	Co	Ch	50	0.38	0.10
		Co	75	0.41	0.11		F	75	0.41	0.11		Pb	75	0.41	0.11

Table 7  
Comparison of DMA

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
DMA	Mean	SD	Mean	SD	Mean	SD	Mean	SD
DMA1	0.31*	0.08	0.33	0.08	0.33*	0.08	0.35	0.08
DMA2	0.52*	0.13	0.37	0.09	0.55*	0.13	0.39	0.10
DMA3	0.58*	0.15	0.40	0.10	0.61*	0.14	0.42	0.11
DMA4	0.63*	0.17	0.40	0.10	0.67*	0.16	0.42	0.11
DMA5	0.66*	0.17	0.41	0.11	0.70*	0.17	0.43	0.11
Female								
DMA1	0.32*	0.08	0.32	0.07	0.35*	0.09	0.34	0.09
DMA2	0.53*	0.14	0.36	0.08	0.58*	0.15	0.38	0.10
DMA3	0.59*	0.16	0.38	0.09	0.65*	0.17	0.41	0.11
DMA4	0.64*	0.18	0.38	0.09	0.69*	0.18	0.41	0.11
DMA5	0.66*	0.19	0.39	0.10	0.72*	0.19	0.42	0.11

There was insignificant difference between males of experiment and control group in DMA 1 in Chandigarh as well as Punjab. In all other subsequent tests, the difference was statistically significant. Similarly, among females, the difference was statistically significant in DMA 2, DMA 3, DMA 4 and DMA 5. The mean value ranged from 0.31 to 0.7 in experiment group while it ranged from 0.32 to 0.43 in control group. The mean value of experiment group was lower than the control group in all the tests. Among females, the mean value ranged from 0.32 to 0.72 in experiment

group while it ranged from 0.32 to 0.41 in control group. The mean value of experiment group was lower than the control group in all the tests. When the DMA of respondents in experiment group was compared gender wise, insignificant difference was found in all the cases in Chandigarh as well as Punjab. Likewise, when comparison was made between males and females of in control group in both the places, no significant difference was found. Females had higher values as compared to males. The mean values among males ranged from 0.31 to 0.7 and among females ranged from 0.32 to 0.72. In control group, females had lower values as compared to males. The mean values among males ranged from 0.32 to 0.43 and among females ranged from 0.32 to 0.41. When comparison was made between males of Chandigarh and Punjab in control group, no significant difference was found between DMA of males as well as females. The mean of DMA varied from 0.31 to 0.66 in Chandigarh while in Punjab it varied from 0.33 to 0.7. In case of females, the mean of DMA varied from 0.32 to 0.66 in Chandigarh while in Punjab it varied from 0.33 to 0.72.

Table 8  
Details of CQ

9	Place	Gp	N	Mean	SD	Place	M/F	N	Mean	SD	Gp	Place	N	Mean	SD
<b>Exp. and Control Group, Male</b>						<b>Gender wise, Experiment</b>					<b>Area wise, Male</b>				
CQ1	Ch	Ex	55	0.54*	0.08	Ch	M	55	0.54	0.08	Ex	Ch	55	0.54*	0.08
		Co	44	0.39	0.06		F	57	0.54	0.08		Pb	62	0.57	0.06
	Pb	Ex	62	0.57*	0.06	Pb	M	62	0.57*	0.06	Co	Ch	44	0.39	0.06
		Co	68	0.39	0.05		F	74	0.53	0.08		Pb	68	0.39	0.05
CQ2	Ch	Ex	55	0.66*	0.10	Ch	M	55	0.66	0.10	Ex	Ch	55	0.66*	0.10
		Co	44	0.44	0.06		F	57	0.66	0.10		Pb	62	0.69	0.08
	Pb	Ex	62	0.69*	0.08	Pb	M	62	0.69*	0.08	Co	Ch	44	0.44	0.06
		Co	68	0.43	0.06		F	74	0.64	0.09		Pb	68	0.43	0.06
CQ3	Ch	Ex	55	0.70*	0.11	Ch	M	55	0.70	0.11	Ex	Ch	55	0.70*	0.11
		Co	44	0.47	0.07		F	57	0.70	0.11		Pb	62	0.73	0.08
	Pb	Ex	62	0.73*	0.08	Pb	M	62	0.73*	0.08	Co	Ch	44	0.47	0.07
		Co	68	0.46	0.06		F	74	0.68	0.10		Pb	68	0.46	0.06
CQ4	Ch	Ex	55	0.74*	0.12	Ch	M	55	0.74	0.12	Ex	Ch	55	0.74*	0.12
		Co	44	0.50	0.07		F	57	0.74	0.11		Pb	62	0.78	0.09
	Pb	Ex	62	0.78*	0.09	Pb	M	62	0.78*	0.09	Co	Ch	44	0.50	0.07
		Co	68	0.49	0.07		F	74	0.72	0.10		Pb	68	0.49	0.07
CQ5	Ch	Ex	55	0.82*	0.13	Ch	M	55	0.82	0.13	Ex	Ch	55	0.82*	0.13
		Co	44	0.14	0.19		F	57	0.82	0.12		Pb	62	0.87	0.10
	Pb	Ex	62	0.87*	0.10	Pb	M	62	0.87*	0.10	Co	Ch	44	0.14	0.19
		Co	68	0.16	0.19		F	74	0.81	0.12		Pb	68	0.16	0.19
<b>Exp. and Control Group, Female</b>						<b>Gender wise, Control</b>					<b>Area wise, Female</b>				
CQ1	Ch	Ex	57	0.54*	0.08	Ch	M	44	0.39	0.06	Ex	Ch	57	0.54	0.08
		Co	50	0.38	0.05		F	50	0.38	0.05		Pb	74	0.53	0.08
	Pb	Ex	74	0.53*	0.08	Pb	M	68	0.39	0.05	Co	Ch	50	0.38	0.05
		Co	75	0.38	0.05		F	75	0.38	0.05		Pb	75	0.38	0.05
CQ2	Ch	Ex	57	0.66*	0.10	Ch	M	44	0.44	0.06	Ex	Ch	57	0.66	0.10
		Co	50	0.42	0.06		F	50	0.42	0.06		Pb	74	0.64	0.09
	Pb	Ex	74	0.64*	0.09	Pb	M	68	0.43	0.06	Co	Ch	50	0.42	0.06
		Co	75	0.43	0.06		F	75	0.43	0.06		Pb	75	0.43	0.06
CQ3	Ch	Ex	57	0.70*	0.11	Ch	M	44	0.47	0.07	Ex	Ch	57	0.70	0.11
		Co	50	0.45	0.06		F	50	0.45	0.06		Pb	74	0.68	0.10
	Pb	Ex	74	0.68*	0.10	Pb	M	68	0.46	0.06	Co	Ch	50	0.45	0.06
		Co	75	0.46	0.06		F	75	0.46	0.06		Pb	75	0.46	0.06
CQ4	Ch	Ex	57	0.74*	0.11	Ch	M	44	0.50	0.07	Ex	Ch	57	0.74	0.11
		Co	50	0.48	0.07		F	50	0.48	0.07		Pb	74	0.72	0.10
	Pb	Ex	74	0.72*	0.10	Pb	M	68	0.49	0.07	Co	Ch	50	0.48	0.07



CQ5	Ch	Co	75	0.49	0.07	Ch	F	75	0.49	0.07	Ex	Pb	75	0.49	0.07
		Ex	57	0.82*	0.12		M	44	0.14	0.19		Ch	57	0.82	0.12
		Co	50	0.10	0.15		F	50	0.10	0.15		Pb	74	0.81	0.12
	Pb	Ex	74	0.81*	0.12	Pb	M	68	0.16	0.19	Co	Ch	50	0.10	0.15
		Co	75	0.16	0.19		F	75	0.16	0.19		Pb	75	0.16	0.19

Table 9  
Comparison of CQ

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
CQ	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CQ1	0.54*	0.08	0.40	0.06	0.57*	0.06	0.39	0.05
CQ2	0.66*	0.10	0.44	0.06	0.69*	0.08	0.44	0.06
CQ3	0.70*	0.11	0.48	0.07	0.73*	0.08	0.47	0.06
CQ4	0.74*	0.12	0.51	0.07	0.78*	0.09	0.50	0.07
CQ5	0.82*	0.13	0.15	0.19	0.87*	0.10	0.16	0.19
Female								
CQ1	0.54*	0.08	0.38	0.05	0.53*	0.08	0.39	0.05
CQ2	0.66*	0.10	0.42	0.06	0.64*	0.09	0.43	0.06
CQ3	0.70*	0.11	0.46	0.06	0.68*	0.10	0.46	0.06
CQ4	0.74*	0.11	0.49	0.07	0.72*	0.10	0.49	0.07
CQ5	0.82*	0.12	0.11	0.15	0.81*	0.12	0.16	0.19

There was insignificant difference between males as well as females of experiment and control group in terms of their CQ in all the tests. The mean value ranged from 0.54 to 0.87 in experiment group while it ranged from 0.14 to 0.5 in control group. The mean value of experiment group was higher than the control group in all the tests. Among females, the mean value ranged from 0.53 to 0.82 in experiment group while it ranged from 0.1 to 0.49 in control group. The mean value of experiment group was higher than the control group in all the tests. When the CQ of respondents in experiment group was compared gender wise, significant difference was found in all the cases in Punjab. However, among the control group counterparts, insignificant differences were observed. Females had lower values as compared to males. The mean values among males ranged from 0.54 to 0.87 and among females ranged from 0.53 to 0.82. In control group, females had lower values as compared to males. The mean values among males ranged from 0.14 to 0.5 and among females ranged from 0.1 to 0.49. When comparison was made between males of Chandigarh and Punjab in experiment group, highly significant difference was found between their CQ in all the 5 tests. On the contrary, in case of female's insignificant difference was found. The mean of CQ varied from 0.14 to 0.82 in Chandigarh while in Punjab it varied from 0.16 to 0.87. In case of females, the mean of CQ varied from 0.1 to 0.82 in Chandigarh while in Punjab it varied from 0.16 to 0.81.

Table 10  
Details of marks

9	Place	Gp	N	Mean	SD	Place	M/F	N	Mean	SD	Gp	Place	N	Mean	SD
<b>Exp. and Control Group, Male</b>					<b>Gender wise, Experiment</b>					<b>Area wise, Female</b>					
M1	Ch	Ex	55	56.82	5.66	Ch	M	55	56.82	5.66	Ex	Ch	55	56.82	5.66
		Co	44	57.31	7.04		F	57	58.66	6.66		Pb	62	58.46	5.62
	Pb	Ex	62	58.46*	5.62	Pb	M	62	58.46	5.62	Co	Ch	44	57.31*	7.04
		Co	68	60.72	5.90		F	74	58.78	6.82		Pb	68	60.72	5.90
M2	Ch	Ex	55	61.51*	8.27	Ch	M	55	61.51	8.27	Ex	Ch	55	61.51*	8.27
		Co	44	57.43	9.40		F	57	64.11	9.41		Pb	62	64.62	8.55
	Pb	Ex	62	64.62*	8.55	Pb	M	62	64.62*	8.55	Co	Ch	44	57.43	9.40
		Co	68	60.61	7.84		F	74	69.62	9.27		Pb	68	60.61	7.84
<b>Exp. and Control Group, Female</b>					<b>Gender wise, Control</b>					<b>Area wise, Male</b>					

M1	Ch	EX	57	58.66	6.66	Ch	M	44	57.31	7.04	EX	CF	57	58.66	6.66
		Co	50	58.37	6.10		F	50	58.37	6.10		Pb	74	58.78	6.82
	Pb	EX	74	58.78	6.82	Pb	M	68	60.72	5.90	Co	CF	50	58.37	6.10
		Co	75	58.86	6.09		F	75	58.86	6.09		Pb	75	58.86	6.09
M2	Ch	EX	57	64.11*	9.41	Ch	M	44	57.43	9.40	EX	CF	57	64.11*	9.41
		Co	50	57.77	8.53		F	50	57.77	8.53		Pb	74	69.62	9.27
	Pb	EX	74	69.62*	9.27	Pb	M	68	60.61	7.84	Co	CF	50	57.77	8.53
		Co	75	59.16	8.00		F	75	59.16	8.00		Pb	75	59.16	8.00

Table 10  
Comparison of marks

Male								
Place	Chandigarh				Punjab			
Group	Ex		Co		Ex		Co	
Marks	Mean	SD	Mean	SD	Mean	SD	Mean	SD
M1	56.82*	5.66	57.31	7.04	58.46*	5.62	60.72	5.90
M2	61.51*	8.27	57.44	9.40	64.62*	8.55	60.62	7.84
Female								
Marks	Mean	SD	Mean	SD	Mean	SD	Mean	SD
M1	58.66*	6.66	58.37	6.10	58.78*	6.82	58.86	6.09
M2	64.11*	9.41	57.77	8.53	69.62*	9.27	59.16	8.00

Among male respondents, there was insignificant difference between experiment and control group in M 1 and M 2 in Punjab along with M 2 in Chandigarh. However, in Punjab, the difference was significant in M 2 but among females. The mean value ranged from 56.82 to 64.62 in experiment group while it ranged from 57.31 to 60.72 in control group. The mean value of experiment group was lower than the control group in both the tests. Among females, the mean value ranged from 58.66 to 69.62 in experiment group while it ranged from 57.77 to 59.16 in control group. The mean value of experiment group was higher than the control group in both the tests. When the marks of respondents in experiment group were compared gender wise, significant difference was found in M 2 of respondents in Punjab. On the contrary, no significant difference was found in control group. Females had higher values as compared to males. The mean values among males ranged from 56.82 to 64.62 and among females ranged from 58.66 to 69.62. In control group, females had higher values as compared to males. The mean values among males ranged from 57.31 to 60.72 and among females ranged from 57.77 to 59.16. When comparison was made between males of Chandigarh, highly significant difference was found between their 1 of control group and M 2 of experiment group. Among female respondents, significant difference was found between M 2 of experiment group. The mean of marks varied from 56.82 to 61.51 in Chandigarh while in Punjab it varied from 58.46 to 64.62. In case of females, the mean of marks varied from 57.77 to 64.11 in Chandigarh while in Punjab it varied from 58.78 to 69.62.

4. Conclusion

There was significant rise in the IQ of 9 years old male respondents of experimental groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 102.30 to 132.40. In Punjab, the mean value rose from 105.70 to 137.40. Similarly, among females, significant increase was recorded. The mean value increased from 105.90 to 137.0 in experimental group of Chandigarh and it rose from 106.20 to 136.90 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the FF of male respondents of experiment groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 64.72 to 90.22. In Punjab, the mean value rose from 67.65 to 94.18. Similarly, among females, significant increase was recorded. The mean value increased from 66.46 to 92.88 in experiment group of Chandigarh and it rose from 70.72 to 97.01 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the DMA of male respondents of experiment groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 0.32 to 0.66. In Punjab, the mean value rose from 0.34 to 0.7. Similarly, among females, significant increase was recorded. The mean value increased from 0.33 to 0.67 in experiment group of Chandigarh and it rose from 0.35 to 0.73 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the CQ of male respondents of experiment groups in

Chandigarh and Punjab. The mean value in Chandigarh increased from 0.54 to 0.83. In Punjab, the mean value rose from 0.57 to 0.87. Similarly, among females, significant increase was recorded. The mean value increased from 0.54 to 0.83 in experiment group of Chandigarh and it rose from 0.53 to 0.81 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts. There was significant rise in the marks of male respondents of experiment groups in Chandigarh and Punjab. The mean value in Chandigarh increased from 56.82 to 61.51. In Punjab, the mean value rose from 58.46 to 64.62. Similarly, among females, significant increase was recorded. The mean value increased from 58.66 to 64.11 in experiment group of Chandigarh and it rose from 58.78 to 69.62 in Punjab. In contrast, insignificant changes were witnessed among their control group counterparts.

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