



## Effect of Intervention Programme on Attention, Memory and Intellectual Ability among Tribal Children

A. Geetha<sup>1\*</sup> and K. Shivakumara<sup>1</sup>

<sup>1</sup>Department of Studies in Psychology, Karnatak University, Dharwad -03, Karnataka, India.

### Authors' contributions

*This work was carried out in collaboration between both authors. Author AG designed the study, wrote the protocol and carried out the research activity as part of PhD research and being guided by the author KS as research guide. Author KS edited the manuscript. Both authors read and approved the final manuscript.*

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### ABSTRACT

**Aim:** The present research studied the effect of intervention programme on attention, memory and intellectual ability among tribal children.

**Study Design:** A before - after group design with post assessment after three and half months of intervention programme was adapted for the study. The intervention programme consisted of art and craft work; games and play; word games; number games and cultural activities.

**Place of Study:** The research was conducted in an Ashrama School at B. Matkere Colony of Hegadadevana Kote Taluk, Mysore District, Karnataka State, India.

**Sample:** The sample consisted of 42 tribal children studying in 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> standard, aged between 9 to 12 years.

**Methodology:** Initially the group was screened on Children's Behaviour Questionnaire and then was assessed on attention, memory and intellectual ability. The intervention programme was conducted for a period of three and half months. Again the group was assessed on attention,

\*Corresponding author: E-mail: [geetha3hmt@yahoo.co.in](mailto:geetha3hmt@yahoo.co.in);

memory and intellectual ability. Paired 't' analysis was adopted to find the difference between pre and post intervention.

**Results:** On number cancellation test the tribal children demonstrated a significant improvement for double digit cancellation but not for single digit cancellation; on colour progressive matrices the tribal children demonstrated a significant improvement on total scores after intervention. On different sub tests of personal information, mental control, sentence repetition, word recall meaningful, word recall non-meaningful, digit span forward, delayed response, picture recall, paired associate learning, retentivity test, and total score for Memory Test for Children there was significant improvement after intervention. There was no significant improvement on subtests of immediate logical memory, delayed logical memory, digit span backward and Benton's Visual Retention Test.

**Conclusions:** Over all on many areas of cognitive aspects there was a significant improvement among the tribal children indicating effectiveness of intervention programme. Hence it could be concluded that play way method of intervention programmes can be used to bring improvement in attention, memory and intellectual functioning.

*Keywords: Attention; intellectual ability; intervention programme; memory and tribal children.*

## 1. INTRODUCTION

In India, education is particularly compromised for females, schedule caste and schedule tribe children, especially in rural areas [1]. Studies by Desai and Patel [2] and Pratap, Raju and Rao [3] did not project a good profile of ashram schools. Pratap and Raju [4] found the working and physical conditions of ashram schools are unsatisfactory. Promotion of the child development in the contemporary context of developmental psychology emphasizes approaches which are creative, flexible and child-centered. The methods to promote the psychosocial development are child centered, and are to be based on principles validated in the current context of developmental psychology [1]. So, if one needs to provide quality education, there should be shift of focus from teacher initiated instructional practices to improve academic skills to child initiated play-way methods, to promote development across all domains. Tribal areas in Hedadadevana Kote are economically backward areas and considered disadvantaged group. Many children in the tribal area are also first generation literates. Their performance has been below other children in many areas of education in general and specific to attention, memory and intellectual functioning. And hence an intervention programme was planned in this area by using child friendly methods and materials mostly available around the environment.

Play is universal phenomenon of childhood. Play includes games and any creative activities such as art, craft and language [1]. Play promotes motor, cognitive, language, emotional, social and

moral development. Games are also about a healthy mind and a healthy body [5]. Art is a flexible, normal developmental medium that serve to help children meet the crucial developmental needs [6]. Brem [7] has described the cultural and personal purpose of storytelling. Story telling serves the purpose of understanding of the environment, self expression to facilitate identification, preparation for problem situations, preparation for and facilitating of coping. Research suggests that engaging in dramatic play can have beneficial effects on children's cognitive development, learning, peer relationships, and emotional well-being [8-13].

Play is the most popular tool which enables a child to achieve overall normal development. Hence, in the present study an integrated combination of intervention programme was used. This intervention programme aimed at development of the individual in terms of cognitive abilities like attention, memory and intellectual functioning.

### 1.1 Attention

Attention is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. In a study conducted by Das [14] the performance of the advantaged children was better than that of the disadvantaged children on Digit-Span. One such study showed that the undernourished children were less sociable and less attentive. Some of the strategies to enhance attention includes stringing beads, matching, sorting, finger dexterity games, mazes, colouring and painting within the lines, jig saw puzzles, scanning

pictures and numbers, listening to stories, tapping boards etc [15]. Some studies have used intervention techniques like giving extra play time, child centered play therapy, reading mentoring and cognitive training program to enhance attention [16].

## 1.2 Memory

Memory refers to the processes that are used to acquire, store, retain and later retrieve information. There are three major processes involved in memory: encoding, storage and retrieval. Results of study by Tiwari [17] showed that urban girls scored higher on serial recall than rural girls. Das [14] reported that the performance of the advantaged children was better than that of the disadvantaged children on Digit-Span, Free Recall, and Serial Recall. These evidences further emphasis the need to specifically use intervention and preventive strategies at all levels for development of memory with children from disadvantaged background. Some of the studies as conducted by different researchers regarding memory are for enhancing verbal memory [18]; verbal learning, retention abilities and verbal memory [19]; and academic achievement [20]. A study of 90 six to fifteen year old boys found that those with music training had significantly better verbal learning and retention abilities [19].

## 1.3 Intelligence

Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment [21]. Studies by Gaur and Sen [22], Flores-Mendoza and Nascimento [23] and Balkrishna [24] do point out that disadvantaged groups are indeed lagging behind in their cognitive ability in intellectual ability, mainly due to environmental conditions. As observed by Balkrishna [24], Christian tribal students possessed more intelligence and better reasoning ability than non-Christian tribal students. Research suggests that engaging in dramatic play can have beneficial effects on children's cognitive development, learning, and other psycho-social aspects [8-9,19,11,12-13]. The research by Thompson [25] examined the effect of playing strategic board games among pre-adolescent children assessed on WISC III Coding and Block Design subscale. The results showed that there were significant differences amongst the group who did and did not play strategic board games on spelling, academic

achievement and visual perceptual skills of children. Smilansky's [13] findings say that there are gains in cognitive activities like better verbalization, better problem-solving strategies, better ability to take on the perspective of another and higher intellectual competence if children get involved in active play.

Considering the above mentioned review and the theoretical input the present study concentrated on evolving a play-way intervention programme for development of tribal school children in terms of cognitive abilities (attention, memory and level of intellectual functioning).

## 2. METHODOLOGY

### 2.1 Objective

The objective was to evaluate the effect of the intervention programme (A child friendly play way method intervention using materials mostly available around the environment consisting of art and craft wok; games and play; word games; number games and cultural activities) on attention, memory and intellectual ability among 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> standard tribal children.

### 2.2 Research Design

A before - after quasi experimental design with post- assessment after three and half months of the pre-assessment was adapted for the study. The intervention programme consisted of art and craft wok; games and play; word games; number games and cultural activities.

### 2.3 Study Area and Sample

The research was conducted in Ashrama School at B. Matkere Colony of Hegadadevana Kote Taluk of Karnataka State, India. The sample consisted of 42 tribal children studying in 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> standard aged between 9 to 12 years. Ashrama schools are a group of institutions run at tribal areas by the Social Welfare Department of Karnataka State to cater to the educational needs of only tribal children. Permission for conducting the intervention programme was given by the authorities and the Head's of the schools. Ethical considerations included detail examination of the child once identified on screening tool; providing of information about the options of further referrals; and intervention programme to control group after the waitlist period.

Table 1 shows the sample selected for the study. Both boys and girls were considered for the study. The school consisted of 52 children studying in 4<sup>th</sup> to 6<sup>th</sup> standard. Three children scoring above cutoff point, on Children's Behaviour Questionnaire which is an indication of considerable behavioural problem. Of the three children one child was considered for referral. Total of 47 children were considered further for study. Through the study two children were noted to be irregular and dropped out later. The post assessment for 02 children was not completed as the children were not regular for post assessment. 03 children had not completed the test adequately. The above mentioned number of student's data was not considered for the analysis. Hence finally 42 student's data was considered for further analysis.

The Table 2 indicates number of students selected for the final analysis. Total of 21 children belonged to 4<sup>th</sup> standard, of which 13 were boys and 08 were girls. Total of 12 children belonged to 5<sup>th</sup> standard, of which 07 were boys and 05 were girls. Total of 09 children belonged to 6<sup>th</sup> standard, of which 04 were boys and 05

were girls. Totally 42 children were considered for the study and analysis.

## 2.4 Tools

### 2.4.1 Children's Behavior Questionnaire (CBQ) [26]

Rutter's proforma is a screening instrument to be completed by teachers. Proforma 'B' deals with behavioral problems of psychological nature. Rutter [26] found that a cut off score of nine or more had a discriminative value. Test-retest reliability of proforma B is 0.89 over a three month period and inter-rater reliability is 0.72 to discriminate between children attending a child guidance clinic and children in the general population [26,27]. Zimmerman, Mingletti, Tacconi and Tansella [28] established that 34 out of 41 cases could be correctly identified by the tool, showing a sensitivity of 0.83. This scale has been used in many Indian studies by Parvatha Vardhini [29], Savithri [30], Uma [31], Sarkar [32], Rozario [33], Kapur and Kaliaperumal [34] and Shenoy [35].

**Table 1. Sample selection of Ashrama school children from B. Matkere colony for the study**

Ashrama school		
1	Type of school	Ashrama Achool
2	Class	4th to 6 <sup>th</sup> standard
3	Age range	9 to 11& 1/2 yrs
4	No of schools considered for the study	01
5	Total no of students who were administered CBQ	52
6	No of students - above cut off point- considered for in-depth analysis	03
7	Total no of children analysed for referral	01
8	No. of students considered for referral and individual intervention	01
9	No. of students finally considered for the study	49
10	No. of students who were irregular & drop out from school through intervention period	02
11	No. of students whose post assessment could not be completed	02
12	No. of students - one or more test results incomplete	03
13	Final no. of individuals considered for analysis of the study	42

**Table 2. Sample characteristics across class and gender of the sample groups**

Age range (years)	Class	Boys	Girls	Total
9 - 10	4 <sup>th</sup> std	13	08	21
10 - 11	5 <sup>th</sup> std	07	05	12
11 - 12	6 <sup>th</sup> std	04	05	09
	Total	24	18	42

#### **2.4.2 Number cancellation test/speed and accuracy test [36]**

This test is used to assess attention and concentration. The test consists of a sheet with random numbers ranging from 1 to 9. This type of test is also used to assess the level of attention and concentration in NIMHANS index of Specific Learning Disability Battery [37]. This test was used by Kapur and Uma [38] on a rural sample of 800 students and found that this test was sensitive enough to assess the level of attention and concentration in children (eight-fifteen years). They had used this as a test (for 60 seconds), and the same procedure of administration and scoring was followed for this study.

#### **2.4.3 Test of memory for children [39]**

The Test of Memory for Children consists of 12 sub tests (147 items). The test-retest reliability of the whole battery is found adequate ranging from 0.51 to 0.97 for different sub tests. Validity in terms of internal consistency among the subtests and correlation of different test scores with total memory score had been calculated that ranged from 0.27 to 0.78. Content validity of the test has been established through the use of consensus among five experts on adequacy and represents activeness of the sampling domain in the items of the sub tests.

#### **2.4.4 Colored progressive matrices [40]**

The Colored Progressive Matrices is designed to assess as accurately as possible a person's present clarity of observation and level of intellectual development. A test-retest reliability (interval of 3 months period) of Colored Progressive Matrices for six and half to twelve and half (6½- 12½) years aged normal school children was found to be 0.89. The internal consistency (Correlation) between sets was found to be .82, .76 and .68 respectively [41].

### **2.5 Procedure**

Initially the group of 52 children was screened on Children's Behaviour Questionnaire. Of them 49 children who had below cut off point on Children's Behaviour Questionnaire were assessed (pre-assessment) on attention, memory and intellectual ability. The Intervention programme consisting of art and craft work; games and play; word games; number games and cultural activities were carried out for a

period of three and half months. Then the group was again assessed (post-assessment) on attention, memory and intellectual ability to evaluate the impact of intervention programme.

### **2.6 Analysis of Data**

Data analysis was conducted using statistical technique of paired't' test to find the difference in scores between pre and post intervention programme using the 16.0 version of SPSS.

## **3. RESULTS AND DISCUSSION**

The mean scores on different pre and post tests of Number Cancellation Test, Test of Memory for Children and Colored Progressive Matrices have been tabulated in Table 3.

### **3.1 Number Cancellation Test (Attention)**

On number cancellation test, there was no significant difference between the means of pre intervention and post intervention on the subtest of single digit cancellation ( $t = 1.46$ ;  $p > .05$ ) indicating no significant effect of intervention programme on single digit cancellation. There was a significant difference between the means of pre-intervention and post-intervention for double digit cancellation ( $t = 3.10$ ;  $p < 0.01$ ) indicating that the group has improved significantly after intervention. On Number Cancellation Test the tribal children demonstrated a significant improvement for double digit cancellation but not for single digit cancellation after intervention.

Some of the strategies to enhance attention includes stringing beads, matching – sorting, finger dexterity games, mazes, colouring and painting within the lines, jig saw puzzles, scanning pictures and numbers, listening to stories, tapping boards etc [42]. Though in the present study the attention enhancing tasks were specifically not used, the intervention programme package consisted of a combination of art and craftwork, play, cultural activities, number, word-language games and life skills activities, which adopted a child-to-child approach. This intervention programme aimed at enhancement of level of attention.

Some studies have used intervention techniques like giving in extra play time, child centered play therapy, reading mentoring and cognitive training program to enhance attention. It can be seen that some studies were very keen about tackling attention problem with Attention Deficit

Hyperactive Disorder [43] and some others - 'attentiveness' as personality trait [44] and others studies saw attention as associated cognitive issues with other major cognitive aspects like problem solving and information processing. In a study by Pellegrini and Davis [44] which charted the behaviour of 14 boys and 9 girls (aged 9 years) results showed that play time improved attention to seat work. In another intervention study of child centered play therapy and reading mentoring on Attention Deficit Hyperactive Disorder children showed that children who participated in either of the intervention conditions demonstrated significant improvement on the Conner's Teacher Rating Scale [45].

The research on the effect of cognitive training program for different aspects of the problem-solving abilities along with levels of attention showed significant improvement on all the measures, which also involved levels of attention [46].

Russ [47] points out that play is involved in the development of many cognitive, affective and personality process that are important for adaptive functioning and play is important to healthy brain development [48-50]. Among the

domains of development enhanced through games and play are reaction time and quick response which are components of attention.

### 3.2 Colored Progressive Matrices (Intellectual Ability)

On Colour Progressive Matrices there was significant difference between the means of pre-intervention and post-intervention on total scores of Colour Progressive Matrices ( $t = 3.78$ ;  $p < 0.01$ ) indicating that the group has improved significantly on intellectual ability after intervention.

Researches show that play contributes to all the areas of development. Play leads to maturation in a number of developmental arenas including cognitive skills [7]. Play is involved in the development of cognitive process [47]. The attributes of games can be psychosocial, sensory, communication, intellectual or biomechanical [51]. Research suggests that engaging in dramatic play can have beneficial effects on children's cognitive development and learning [8-13]. Researchers have concluded that children who participate in dramatic play during

**Table 3. Comparison of the children on the mean scores and t values of pre-post intervention on different tests**

Test/Group (N= 42)	Pre		Post		't' value
	Mean	SD	Mean	SD	
<b>Number cancellation test/ Speed and accuracy test</b>					
Attention: Single Digit	25.57	11.00	29.17	13.95	1.46
Attention: Double Digit	32.19	11.50	41.14	15.37	3.10**
<b>Coloured progressive matrices</b>					
Intellectual functioning: CPM total	14.33	5.99	18.95	6.97	3.78**
<b>Test of memory or children</b>					
Personal information	4.12	0.89	4.62	0.62	4.19**
Mental control	9.57	3.49	12.36	2.12	4.94**
Sentence repetition	6.95	2.12	7.64	1.27	2.54*
Immediate memory	4.36	4.26	3.90	4.28	0.52
Delayed logical	5.00	3.79	6.74	2.37	1.10
Word recall meaningful	6.74	2.37	8.69	1.09	5.30**
Word recall non-meaningful	5.62	1.97	6.71	1.63	2.62*
Digit span forward	4.02	0.71	4.48	1.45	2.55*
Digit span backward	3.60	1.45	3.60	0.86	0.00
Delayed response	1.88	1.48	2.69	1.30	3.11**
Picture recall	2.83	0.54	3.24	0.43	3.74**
BVRT	5.29	2.52	5.38	2.29	0.19
Paired associate learning	10.79	3.54	16.57	2.41	9.06**
Retentivity test	6.36	1.45	7.48	1.63	3.83**
Total	76.29	20.98	92.31	15.27	5.27**

\*\* P = .01-Significant at 0.01 level \* P = .05- significant at 0.05 level

school period are advanced in intellectual development, score higher on tests of imagination and creativity, and have an enhanced ability to think inventively [13,52-53]; findings says that there is gains in cognitive activities like better verbalization, better problem-solving strategies, better ability to take on the perspective of another and higher intellectual competence if children get involved in active play.

### 3.3 Test of Memory for Children

On different sub tests of personal information ( $t = 4.19$ ;  $p < 0.01$ ), mental control ( $t = 4.94$ ;  $p < 0.01$ ), sentence repetition ( $t = 2.54$ ;  $p < 0.01$ ), word recall meaningful ( $t = 5.34$ ;  $p < 0.01$ ), word recall non meaningful ( $t = 2.62$ ;  $p < 0.01$ ), digit span forward ( $t = 2.55$ ;  $p < 0.01$ ), delayed response ( $t = 3.11$ ;  $p < 0.01$ ), picture recall ( $t = 3.74$ ;  $p < 0.01$ ), paired associate learning ( $t = 9.06$ ;  $p < 0.01$ ), retentivity test ( $t = 3.87$ ;  $p < 0.01$ ), and total score for Memory Test ( $t = 5.27$ ;  $p < 0.01$ ) there was significant difference between the means of pre-intervention and post-intervention period indicating that the group has improved significantly on these above mentioned subtests of memory after intervention. But for the subtests of immediate logical memory ( $t = 0.52$ ;  $p > .05$ ), delayed logical memory ( $t = 1.10$ ;  $p > .05$ ), digit span backward ( $t = 0$ ;  $p > .05$ ), and Bentons Visual Retention Test ( $t = 0.19$ ;  $p > .05$ ) there was no significant difference between the means of the group in the pre and post intervention period indicating no significant effect of intervention programme on the above mentioned subtests of memory.

Not many specific studies were available which had used play, games or any other play-way methods to improve memory among children, may be because there is already theoretically and experimentally proven fact that mnemonic techniques [54-55] can be used to improve the memory ability in individuals. But some studies have used music to enhance memory. Adults with music training in their childhood demonstrated better verbal memory, according to a study by Chan and Cheung [18]. A study of ninety 6- to 15-year-old boys found that those with music training had significantly better verbal learning and retention abilities [19]. A study of elementary and middle school revealed a strong relationship between elementary (third or fourth grade) student's academic achievement as measured by test scores and their participation in high-quality music programs [56].

## 4. CONCLUSIONS

The objective of the study was to evaluate the effect of the outcome of the intervention programme on promotion of attention, memory and intellectual ability among 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> standard tribal children. This particular study was a pilot study considered to study the suitability of measuring tools, and efficacy of play intervention on cognitive abilities. Results did indicate the suitability of the tools for assessing attention, memory and intellectual abilities and it was found that the intervention had effect in enhancing attention, memory, and intellectual abilities.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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