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Intervention: A Tool to Improve Cognition

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ABSTRACT The present investigation is an attempt to enhance the cognition among rural preschoolers using their immediate environment in the form of planned activities as intervention program. A total of 120 children between 3-5 years were assessed for their concept development using Bohem's Test of Basic Concepts. Half of them served as experimental group with whom the intervention was introduced while rest of them served as control group. ANOVA was used to see the differences in the performance of both the groups. At pretesting the differences came out to be non-significant statistically for Form 'C' and 'Applications', which concludes that both the groups matched on concept development statistically at initial stage. The post-testing results showed significant improvement in concept development of experimental group. The differences in performance proved to be statistically significant as revealed by F values which were 271.543 for Form 'C' and 147.192 for 'Applications'. There were marked differences in concept development of experimental and control group after intervention. A follow-up test to see the retention of concepts further proved the efficacy of intervention in improving the cognition of children, as there were significant differences in performance of experimental and control group at follow-up also. The differences proved to be statistically highly significant as revealed by 't' values which came out to be 55.354 on Form 'C' and 28.946 on 'Applications' .

INTRODUCTION

All parents want their children to succeed and be the best they can be. The early years of life (birth to age 5) are crucial for cognitive and social/emotional development. Parents play a critical role in their children's development and are responsible for their children's environment. Children develop within the context of their family and their development is affected by the nature of the relationship with their parents. It is often considered necessary to run out and buy special toys, music and a game to stimulate child's development, but it is more important to provide every day activities to the child to encourage brain development. The life of a child is full of opportunities for learning, but from decades of child development research, we know that learning is most rapid in the preschool years. Every day, children encounter dozens of situation-specific experiences that involve interaction with people and the physical environment. It is through these experiences that children learn. Piaget conceived human cognition as a network of mental structures created by an active organism constantly striving to make sense of experience. According to him, specific psychological structures, or schemes, that is, specific structures or organized way of making sense of experience, that changes with age. A concept is the basic unit of all types of learning. Human beings from the infancy to old age learn new concepts and use old concepts in new situations of their daily life. Individuals differ in their level of concept formation on the basis of their age, intelligence and experience. A child of four years may have a different concept of plant than a teacher of biology. The word concept is used to designate both mental constructs of individuals and also identifiable public entities that comprise part of the substance of the various disciplines. The process of concept formation emerges from a big, buzzing, blooming, confusion in which the child is born. The child is endowed with certain biological inheritance at the time of his birth. He gets the knowledge of the external world through sense organs, which are the gateways of knowledge. Sensation is the conscious reaction of mind. This is the process through which human beings become aware of things in their immediate environment, which stimulates their sense organs. The building of concepts starts with the process of sensation. Concepts are individualized in that no two children will have exactly the same concept of anything or idea. They are cumulative in that new concepts are welded to old ones, modifying and enlarging them. They are emotionally weighted, as the new learning is often accompanied with certain feelings about the learning. Researchers have stressed the idea that preschool years of life are the golden years for laying of good foundation for a lifelong system of thoughts and feelings about self and others. Two factors influence how the child succeeds and grows: genes and environment. One of the factors that influence child's development is their genetic

makeup or "genes", that is, "nature." Genes are the genetic material passed onto children by parents. Children are born with their "genes" in place. These genes act like a blueprint for what characteristics a child may have. The other factor that influences child development is the environment. This includes experiences children have in their home, school and community environments, that is, "nurture." The environment can either improve or harm a child's genetic blueprint. There is increasing recognition that the first few years of a child's life are a particularly sensitive period in the process of development, laying a foundation in childhood and beyond for cognitive functioning; behavioral, social, and self-regulatory capacities; and physical health. Yet many children face various stressors during these years that can impair their healthy development. Early childhood intervention programs are designed to mitigate the factors that place children at risk of poor outcomes. Such programs provide support for the parents, the children, or the family as a whole. These supports may be in the form of learning activities or other structured experiences that affect a child directly or that have indirect effects through training parents or otherwise enhancing the care-giving environment. Ade et al. (2010) studied usefulness of a package of interventions to improve preschool education through Anganwadi centers on psychosocial development of children and revealed that intervention to improve the Early Childhood Education and Development component through Anganwadi centers resulted in improvement in Developmental and Intelligence Quotient of children. Burchinal et al. (1996) indicated that patterns of cognitive development were associated with intensive early educational care and responsive stimulating care at home enhanced through intervention. The intervention on cognitive training facilitated the intelligence and creative thinking scores of children and this facilitation was maximum in the group which received training according to Hejmadi and Mohanty (1992). The draft report by Jones et al.(2011) suggested paucity of studies examining the effectiveness of such interventions in humanitarian settings. Further research needs to be done to validate these preliminary findings, explore the long term impact on child growth and intellectual development as well as maternal mood. Children in higher quality child care programs perform better on measures of social, language, and cognitive development than children who attend poorer quality settings. Keeping this in mind an intervention program was planned for preschoolers to enhance their cognition.

METHODOLOGY

Research Design

A Pre-Post test design was followed to judge the efficacy of the intervention program for cognition.

Experimental Group Yb X Ya
Control Group Yb - X Ya

Where

Yb = Concept Development scores before intervention program
X = Intervention Program
-X = No Intervention Program
Ya = Concept Development scores after intervention program

In order to carry out an intensive study, rural area of Hisar district of Haryana state was selected purposively as the locale of study in the year 2006-07. A list of villages of Block I (Hisar I) and Block II (Hisar II) of Hisar district was procured from Block Development Office. Following a simple random selection, a survey of 10 villages, 5 from each block, was done. Further to meet the sample size, two villages namely Ladwa and Kharar from Hisar I and two villages namely, Rawalwas and Neolikalan from Hisar II were selected purposively as they were found to be matching up to the maximum in their base line profile. Ladwa and Rawalwas from Block I and II respectively served as experimental group villages and Kharar and Neolikalan from Block I and II respectively served as control group villages. All the preschoolers of these four villages were tested for their concept development level using Bohem's Test of Basic Concepts – R. In respect of all the four villages, a separate list of boys and girls was prepared on the basis of general conceptual scores obtained by them. The conceptual scores of children (boys and girls separately) were further arranged in ascending order. From each of the experimental group village, 15 boys and 15 girls, who obtained lower conceptual scores relatively, were selected for intervention. So, experimental group comprised of 60 children in total, that is, 30 from each ex-

perimental village. Similar procedure was followed for the selection of 60 children of control group making a total of 120 children as subjects. Intervention program using the immediate surroundings and indigenous material was prepared and implemented to strengthen the concept development level of preschoolers. To see the impact of intervention, subjects from experimental group only were exposed to intervention package for 16 weeks whereas control group was left unexposed to any kind of such program. So the subjects from experimental group only served as sample. To assess the impact of intervention, Post-testing, after a period of 4 weeks of completion of intervention was conducted on all subjects from experimental as well as control group for their conceptual enhancement. To see the relatively permanent impact of intervention, Follow-up testing was carried out on the same sample, that is, 120 children after a gap of 16 weeks for conceptual development.

RESULTS AND DISCUSSION

To see the prevalent status of concept development among control and experimental group children, the mean scores of children were calculated for their performance on Form 'C' and 'Applications' of BTBC at pretest, post test and follow up. ANOVA was run to see the group differences. Results presented in Table 1 reveal the Pre-testing mean scores of control and experimental group children on performance of Form 'C' and 'Applications' of BTBC. The mean scores of control group were 33.66±2.42 and for experimental group it was 33.48±2.35 on Form 'C'. For the performance of children on 'Applications' the means were 7.96±1.38 and 8.40±1.55 for control and experimental group respectively, showing slightly higher mean of experimental group children on 'Applications' of concept development. Karoly et al. (2005) reported that early childhood intervention programs have been shown to yield benefits in academic achievement, behavior, educational progression and attainment, delinquency and crime, and labor market success, among other domains. Interventions with better-trained caregivers and smaller child-to-staff ratios appear to offer more favorable results.

ANOVA was used to see the differences in the performance of both the groups. The differences came out to be non-significant statistically for Form 'C' (F=0.176, P=0.05) and 'Applications' (F=2.655, P=0.05), which concludes that both the groups matched on concept development statistically at pre-testing stage as revealed by their performance on Form 'C' and 'Applications'.

Table 1: Comparison of pre-testing mean score on concept development N=120

Components of BTBC	*Control Mean ±S.D*	*Experimental Mean ±S.D*	*'F' value*
Form 'C'	33.66±2.42	33.48±2.35	0.176
Applications	7.96±1.38	8.40±1.55	2.655

Significant at ** p<0.01

Post-testing Performance of Children

After exposure of experimental group children to the intervention package, children of both the study groups were post tested after a gap of one month to assess the impact of stimulatory intervention package. Table 2 depicts post-testing mean scores of control group and experimental group children. The mean score and SD of control group on the performance of Form 'C' at post-testing stage was 37.45±3.34. Their mean score and S.D. in 'Applications' of BTBC was 10.38±1.99. Whereas the experimental group children had higher mean score on both Form 'C' and 'Applications' at post-testing. The mean score and S.D. of experimental group children were 46.76±2.83 and 15.86±2.87 for Form 'C' and 'Applications' respectively. Therefore, it can be concluded that intervention resulted in higher mean score of experimental group respondents. Many interventions, particularly in education, attempt to enhance self-concept indirectly by enhancing the individual's abilities (O'Mara et al. 2004). The results suggested that self-concept can be improved through enhancement treatments with children and adolescents.

A cursory look at Table 2 reveals that at post-testing there were highly significant and marked

Table2: Comparison of post-testing mean score on concept development N=120

Components of BTBC	*Control Mean ±S.D*	*Experimental Mean ±S.D*	*'F' value*
Form 'C'	37.45±3.34	46.76±2.83	271.543**
Applications	10.38±1.99	10.38±1.99	10.38±1.99

Significant at ** p<0.01

differences in the concept development of control and experimental group children. The mean score of children from control group were lower than mean score of experimental group children on Form 'C' and 'Applications'. The differences in performance proved to be statistically significant as revealed by F values which were 271.543 for Form 'C' and 147.192 for 'Applications'. Light and Drager (2007) too revealed that after conducting intervention, all of the children made substantial gains in their language and communication skills. They demonstrated significant increases in the number of words and ideas they were able to express. They learned many new words and concepts. A study by Bakken et al. (2001) examined strategies for enhancing concrete operation reasoning through guided intervention. Half the children received training involving special activities intended to promote logical problem solving and abstract thinking. This intervention was found to be successful in promoting concrete operational thought among children.

Follow- up Performance of Children

The intervention package was exposed only to the children and mothers of experimental group, but both the study group respondents were post tested after a month to see the impact of package. Further a follow-up was carried out to see the performance of children after 4 months. Follow up testing was done on respondents in both the settings to see how much children are able to retain after the seizure of intervention.

Perusal of Table 3 revealed the mean scores of children's performance on Form 'C' and 'Applications' of BTBC. The mean scores of control group children at follow-up for concept development were 37.63±3.45 and 10.40±2.01 on Form 'C' and 'Applications' respectively. On the other hand, the experimental group children's mean score on Form 'C' was 44.90±3.18 and 14.53±2.87 on 'Applications' of BTBC. It is evident from Table 3 that means scores of control group children on Form 'C' and 'Applications' were lower than the mean scores of experimental group children. Highly significant differences were found in the performance of control and experimental group children on both Form 'C' and 'Applications' of BTBC as revealed by the F values which were 143.643 on Form 'C' 83.381 on 'Applications', p<0.001 and 0.01 respectively.

Table 3: Comparison of follow-up mean score on concept development N=120

Components of BTBC	*Control Mean ±S.D*	*Experimental Mean ±S.D*	*'F' value*
Form 'C'	37.63±3.45	44.90±3.18	143.643***
Applications	10.40±2.01	10.40±2.01	83.381**

Significant at ***P<0.001 and **P<0.01.

Pre and Post-testing Performance of Control and Experimental Group

Separate paired t-test was computed to compare the Pre and Post-testing performance of control and experimental group children. As presented in Table 4 there were significant differences in pre-testing and post-testing performance of children in both the study groups. The mean difference in pre and post-testing score on Form 'C' of control group was 3.79 and it was found to be significant as the paired t-value was 13.594. On the other hand, the mean difference between pre-testing and post-testing mean score of experimental group children on Form 'C' was 13.28 and was proved statistically highly significant as the t-value was 69.268. Similarly, the mean difference of control group children on 'Applications' from pre-testing to post-testing stage proved to be statistically significant as 't' value was 16.649. Still higher difference of 7.46 was evident in pre and post-testing mean scores of experimental group children. The t-value for 'Applications' was 34.804 indicating highly significant differences in the performance of experimental group children in both the testing stages. Home based development program aimed to optimize children's development outcomes through educating, training and supporting parents in their own home to provide a more nurturing and stimulating environment for their children revealed that interventions in this period are not only important for brain and physiological development, but can also be feasible and relatively cost-effective (Heckman and Masterov 2005).

These results reveal that there was significant improvement in concept development of children from pre to post-testing stage in both the study groups. Rani (2001) too indicated significant improvement in children's performance on cognition at different testing stages in all the three study groups after intervention. She found that although the increase in cognitive development took place in case of both control and experi-

Table 4: Group-wise differences in concept development at pre-post testing N=120

Components of BTBC	*Pre-testing mean score*	*Post-testing mean score*	*Mean difference*	*Paired t value*
Form 'C'				
Control	33.66	37.45	3.79	13.594*
Experimental	33.48	46.76	13.28	69.268**
Mean difference	0.18	9.31		
'Applications'				
Control	7.96	10.38	2.42	16.649*
Experimental	8.40	15.86	7.46	34.804**
Mean difference	0.44	5.48		

Significant at *p<0.05 and ** p<0.01

mental groups. But, gain in mean scores on different aspects of cognition in experimental group was significantly higher than mean scores of control group children. As indicated in Table 4, the mean scores of control and experimental group children at pre-testing stage did not vary significantly. But at post-testing a different trend was observed. A difference of 9.31 and 5.48 in favour of experimental group children was revealed in the mean scores of control and experimental group children on Form 'C' and 'Applications' respectively. The higher mean scores of experimental group children indicated the impact of intervention package on the concept development of experimental group children. Dhanda (2000) in her intervention programme for the mothers of babies with developmental deficiencies revealed that intervention was effective for improvement of cognitive abilities along with other developments in urban children.

Pre and Follow-up Performance of Control and Experimental Group

As evident from Table 5, a significant improvement was visualized, t value being 14.056, in the follow-up and pre-testing performance of control group children on Form 'C' as the mean difference was 4.17. Similarly for the performance of control group children on 'Applications' of BTBC, a significant improvement was observed in follow-up and pre-testing performance as the mean difference was 2.94 supported by a t-value of 16.747. As regards the performance of experimental group children, on both Form 'C' and 'Applications' highly significant differences were found between follow-up and pre-testing performance. Higher mean differences of 11.42, on Form 'C' and 6.13 on 'Applications' than control group indicated towards better performance of experimental group children. The differences proved to be statistically highly significant as revealed by 't' values which came out to be 55.354 on Form 'C' and 28.946 on 'Applications' of BTBC. Short term intervention training was given by Mishra and found significant improvements in cognitive skills of the children of the experimental group. In another study, Mohanty and Mishra (1991) found that children who received cognitive intervention scored better in cognitive as well as other intellectual abilities. It was further studied that the preschool children receiving cognitive intervention training showed significant gains in intellectual as well as other cognitive abilities compared to control group children from similar backgrounds.

Table 5: Group-wise differences in concept development at pre and follow-up testing N=120

Components of BTBC	*Pre-testing mean score*	*Follow-up mean score*	*Mean difference*	*Paired t value*
Form 'C'				
Control	33.66	37.63	4.17	14.056*
Experimental	33.48	44.90	11.42	55.354**
Mean difference	0.18	7.27		
Applications				
Control	7.96	10.40	2.94	16.747*
Experimental	8.40	14.53	6.13	28.946**
Mean difference	0.44	4.13		

Significant at *p<0.05 and ** p<0.01

Significant differences were observed in the pre-testing and follow-up performance of both the study groups. It can be visualized from Table 5 that there were negligible differences in pre-testing mean score of control and experimental group children. But on observing the follow-up performance of both the study groups, the mean difference came out to be 7.27 and 4.13 for performance on Form 'C' and 'Applications' respectively. So, the experimental group children had excelled the control group children on concept development after receiving intervention. It can thus be concluded that the mean difference in concept development of both the groups, which were negligible at pre-testing stage, rose by many folds at post-testing. This indicates higher mean scores of experimental group children after their exposure to intervention. Though gain was ob-

served in the concept development of control group children as indicated by the't' values but higher 't' values for experimental group indicate that these children performed much better and this improvement can be attributed to intervention provided to them and mothers. Mothers were stimulated who further motivated the children and made them actively learn for their enhancement of conceptual development. Although the control group children did not receive any intervention, there was gain in their scores of concept development. This gain might be a natural gain. Whatever could be the reason, these factors might have also been operating behind the gain in experimental group. Dhanda (2000) in an intervention study also found that post- testing scores of control as well as experimental group increased. However, improvement in control group might be normal development over a course of time, which could not be controlled. The results of present study are in line with the findings of Kaliramna (1999), Dhanda (2000) and Sandhu (2001) who concluded that at pretesing stage both the groups were almost similar in cognitive and language performance. At 1st and 2nd post-testing stage, significant differences were observed as intervention group performed much higher than those of control group, which means the gain was higher in intervention group. The reason may be coverage of cognitive and language aspects by researcher with maximum use of related literature and various teaching aids which led to improvement of knowledge on these concepts.

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