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DEVELOPMENT OF CONSERVATION CONCEPTS IN MILD, MODERATELY SEVER AND PROFOUND HEARING IMPAIRED CHILDREN

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Abstract: *The objective of the study was to investigate degree of hearing impairment as a determinant of the development of conservation concepts in hearing impaired children compared to normally hearing children. A sample of 210 hearing impaired children (ranging from age 6 to 12 years) 70 each from mild category, moderately severe category and profound category was selected randomly. Besides these, a sample of 35 normally hearing children ranging from age 6 to 12 was also selected as control group randomly. The nonverbal conservation concept development test consisting of three subtests one each on conservation of mass, weight and volume was used to collect data. The findings emerged were (i) the mild hearing impaired, the moderately severe hearing impaired and the normally hearing children developed conservation of mass, weight and volume on similar lines; and (ii) the profound hearing impaired children lagged significantly behind the mild hearing impaired, the moderately severe hearing impaired and the normally hearing children developing conservation of mass, weight and volume.*

Keywords: *Conservation Concepts; Mild, Moderately Sever and Profound Hearing Impaired*

I. INTRODUCTION

Cognition does not depend upon language. However, lack of language experience may have a retarding effect on the cognitive functioning. Verbal interaction with the environment, what Piaget terms social transmission may accelerate intellectual development by providing the opportunity for additional experience through exchange of ideas with others using symbols (words) and linguistic habits in specific situation. Hearing impairment varies in degree and on the basis of hearing loss; hearing impaired children are divided broadly into five categories, namely mild, moderate, moderately severe, severe

and profound. The severely and profound hearing impaired children lack verbal linguistic ability considerably. However, the mild hearing impaired and moderate hearing impaired children possess certain level of verbal linguistic ability. Possession of linguistic ability in hearing impaired children varies with the degree of hearing impairment. Thus, it is assumed that this variation of linguistic ability may play significant role in influencing the development of conservation concepts.

II. RATIONALE OF THE STUDY

The results of 6 years delay of deaf children in conservation performance as compared to normally hearing children found by Ole'ron & Herren in 1961 (reported in Furth, 1966) to 1 ½ year delay (Furth, 1964) to no significant difference between hearing impaired and normally hearing children (Rittenhouse & Spiro, 1979) revealed that linguistic deficiency in hearing impaired children did not play significant role in influencing cognitive functioning. Watts (1979) conducted a cross-sectional study on conservation over 70 deaf, 70 partially hearing and 70 normally hearing children between the ages of 10 and 16 years and found out that at the younger age (10-14), the partially hearing children performed better than the deaf children, while at the older ages (15-16), the deaf children performed better than the partially hearing children. However, the normally hearing children showed superiority over the deaf and partially hearing children for all the tasks over the whole age range. The results obtained in this investigation did not support the language based theory of development conservation concepts. Rittenhouse, Morreau and Iran-Nejad (1981) studied six hard of hearing and eight profound deaf children ranging in age from 11 years to 16 years 9 months enrolled in a day school on conservation concepts and found out no significant results. Thus, the supposedly superior linguistic ability of hard of hearing children did not necessarily result in superior cognitive development. The effect of different degrees of linguistic competency on the development of conservation performance requires to be examined to resolve the doubt of dependence or independence of cognition and language.

Objective

- To study degree of hearing impairment as a determinant of the development of conservation concepts in hearing impaired children as compared to normally hearing children.

Hypothesis

- There exists significant difference among mild hearing impaired, moderately severe hearing impaired, profound hearing impaired and normally hearing children in the development of conservation concepts.

III. METHODOLOGY OF THE STUDY

Design of the study : The present study is a developmental study in which the independent variable that is degree of hearing impairment as determinant of the development of conservation concepts in hearing impaired children as compared to normally hearing

children (control group) has been investigated following cross-sectional and causal-comparative methods. The dependent variables studied were the development of conservation of mass, weight and volume in hearing impaired and normally hearing children.

Sample : A sample of 210 hearing impaired children (ranging from age 6 to 12) years 70 each from mild category, moderately severe category and profound category was selected randomly. Besides these, a sample of 35 normally hearing children ranging from age 6 to 12 was also selected as control group randomly. The hearing impaired children selected under different categories had the impairment at any time between birth and age of 6 months. The mild hearing impaired children met the criterion of hearing threshold level between 27 and 40 dB in the better ear. The moderately severe hearing impaired children met the criterion of hearing threshold level between 56 and 70 dB in the better ear. The profound hearing impaired children met the criterion of hearing threshold level of greater than 90 dB in the better ear

Tools: The nonverbal conservation concept development test consisting of three subtests one each on conservation of mass, weight and volume was developed by the investigator following the original sources of Piaget and Inhelder (1941), Elkind (1961), Furth(1964), Ole'ron and Herren(1961), Furth and Youniss (1969), Watts (1979), Rittenhouse and Spiro (1979), and Rittenhouse et al. (1981).

The calculated phi coefficients of 0.80 for conservation of mass, 0.80 for conservation of weight and 0.81 for conservation of volume against Piagetian verbal test gave evidence of high construct validity for the test. The test-retest reliability coefficients calculated were 1.00 for conservation of mass, 1.00 for conservation of weight and 0.97 for conservation of volume.

IV. RESULTS

As can be seen in the Table 1, 86 per cent mild hearing impaired children and 86 per cent moderately severe hearing impaired children developed conservation of mass, 53 per cent mild hearing impaired children and 46 per cent moderately severe hearing impaired children developed conservation of weight, and 10 per cent mild hearing impaired children and 14 per cent moderately severe hearing impaired children developed conservation of volume. The differences found were not significant for the conservation of mass ($Z=0.00$; $p>0.5$), weight ($Z=0.83$; $p>0.05$), and volume ($Z=0.72$; $p>0.05$). The mild hearing impaired children when compared with the profound hearing impaired children on different conservation performances, it was found out that 86 per cent mild hearing impaired children and 79 per cent profound hearing impaired children developed conservation of mass, 53 per cent mild hearing impaired children and 27 per cent profound hearing impaired children developed conservation of weight, and 10 per cent mild hearing impaired children and 7 per cent profound hearing impaired children developed conservation of volume. The difference found between the performance of mild hearing impaired and profound hearing impaired children was not significant for the conservation of mass ($Z= 1.08$; $p>0.05$) and volume ($Z=0.63$; $p>0.05$). However, the difference between the performance of mild hearing impaired and profound hearing children in

favour of mild hearing impaired children was significant for the conservation of weight ($Z=3.25$; $p< 0.01$). The mild hearing impaired children when compared with the normally hearing children on conservation performances, it was found that 86 per cent mild hearing impaired children and 91 per cent normally hearing children developed conservation of mass; 53 per cent mild hearing impaired children and 66 per cent normally hearing children developed conservation of weight; and 10 per cent mild hearing impaired children and 20 per cent normally hearing children conserved volume. The difference found between the performance of mild hearing impaired children and normally hearing children was not significant for the conservation of mass ($Z=0.73$; $p>0.05$), weight ($Z=1.27$; $p>0.05$) and volume ($Z=1.43$; $p>0.05$). The moderately severe hearing impaired children when compared with the profound hearing impaired children, there found out that 86 per cent moderately severe hearing impaired children and 79 per cent profound hearing impaired children conserved mass; 46 per cent moderately severe hearing impaired children and 27 per cent profound hearing impaired children conserved weight; and 14 per cent moderately severe hearing impaired children and 7 per cent profound hearing impaired children conserved volume. The difference found between the performance of moderately severe hearing impaired children and profound hearing impaired children was not significant for the conservation of mass ($Z=1.08$; $p>0.05$) and volume ($Z=1.34$; $p>0.05$). However, difference between the performance of moderately severe hearing impaired children and profound hearing impaired children in favour of moderately severe hearing impaired children was significant for the conservation of weight ($Z=2.35$; $p< 0.05$). The moderately severe hearing impaired children when compared with the normally hearing children, there found that 86 per cent moderately severe hearing children and 91 per cent normally hearing children conserved mass; 46 per cent moderately severe hearing impaired children and 66 per cent normally hearing children conserved weight; and 14 per cent moderately severe hearing impaired children and 20 per cent normally hearing children conserved volume. The difference found between the performance of moderately severe hearing impaired children and normally hearing children was not significant for the conservation of mass ($Z=0.73$; $p>0.05$); weight ($Z=1.93$; $p>0.05$) and volume ($Z=0.79$; $p>0.05$). The profound hearing impaired children when compared with the normally hearing children, it was found that 70 per cent profound hearing impaired children and 91 per cent normally hearing children conserved mass; 27 per cent profound hearing impaired children and 66 per cent normally hearing children conserved weight; and 7 per cent profound hearing impaired children and 20 per cent normally hearing children conserved volume. The difference between the performance of profound hearing impaired children and normally hearing children was not significant for the conservation of mass ($Z=1.54$; $P>0.05$). However, significant difference between the performance of profound hearing impaired children and normally hearing children was found for the conservation of weight ($Z=3.90$; $p<0.01$) and volume ($Z=1.97$; $p<0.05$).

Table 1 : Summary of the “Z” ratios of conservation responses of mild, moderately severe and profound hearing impaired children, and normally hearing children for mass, weight and volume (N = 70 for each category of hearing impaired children and N=35 for normally hearing children)

Concept Children	Conservation of Mass		Conservation of Weight		Conservation of Volume	
	%	“Z”ratio	%	“Z” ratio	%	“Z” ratio
Mild	86	0.00	53	0.86	10	0.72
Moderately Severe	86		46		14	
Mild	86	1.08	53	3.25**	10	0.637
Profound	79		27			
Mild	86	0.73	53	1.27	10	1.43
Normally Hearing	91		66		20	
Moderately Severe	86	1.08	46	2.35*	14	1.34
Profound	79		27		7	
Moderately Severe	86	0.73	46	1.93	14	0.79
Normally Hearing	91		66		20	
Profound	79	1.54	27	3.90**	7	1.97*
Normally Hearing	91		66		20	

* Significant at 0.05 level. ** Significant at 0.01 level

Major Findings

(i) The mild hearing impaired, the moderately severe hearing impaired and the normally hearing children developed conservation of mass, weight and volume on similar lines.

(ii) The profound hearing impaired children lagged significantly behind the mild hearing impaired, the moderately severe hearing impaired and the normally hearing children developing conservation of mass, weight and volume.

DISCUSSION

The differences found among mild hearing impaired children, moderately severe hearing impaired children and normally hearing children for the development of conservation of mass, weight and volume were not significant. These three groups developed conservation concepts on similar lines. The performances of mild hearing impaired children, moderately

severe hearing impaired children and normally hearing children when compared with the performance of profound hearing impaired children, there found significant differences. The proportion of profound hearing impaired children developing conservation concepts was consistently less than the proportion of mild hearing impaired children, moderately severe hearing impaired and normally hearing children. The proportion of mild hearing impaired children, moderately severe hearing impaired children and normally hearing children was significantly higher than the proportion of profound hearing impaired children developing conservation of weight. Similarly, significantly more proportion of normally hearing children developed conservation of volume in comparison to the proportion of profound hearing impaired children. The results yield that the extreme degree of hearing impairment retards development of conservation concepts significantly. The results emerged support the earlier findings (Ole'ron & Herren, 1961; Furth, 1964). It is obvious that the mild hearing impaired and the moderately severe hearing impaired children possess some degrees of linguistic ability, whereas the profound hearing impaired children lack linguistic ability totally. Therefore, the results can be interpreted that superior linguistic ability results in superiority in development of conservation concepts. Though, linguistic ability is not a necessary condition for the development of conservation concepts but complete absence of linguistic ability retards concept development significantly. The mild hearing impaired and the moderately severe hearing impaired children possess minimal degree of linguistic ability which they try to exploit maximum to interact with the environment. Thus, indirectly linguistic ability influences development of conservation concepts by providing opportunity for additional experiences through giving information and exchange of ideas, and by furnishing ready symbols and linguistic habits.

Educational Implications

The study revealed that the profound hearing impaired children lagged significantly behind the mild hearing impaired children, moderately hearing impaired children and normally hearing children in developing conservation concepts. Because of the linguistic deficiency which retards cognitive functioning of profound hearing impaired children, it is suggested that the profound hearing impaired children can be more profitable from the vocational education than the general education for earning their livelihood after schooling. So, steps need to be taken by the educational planners to integrate profound hearing impaired children in the vocational stream of education, so that; they can be the meaningful partners of the digital society.

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