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Heredity as determinants of mental development in children

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Abstract

Investigation was carried out in rural area of three districts of Haryana state. From each district two villages were selected. Kaimari and Muklan from Hisar district, Kalwan and Danoda from district Jind and from district Kaithal Rohera and Majara villages were selected. Sample of 100 respondents was selected from each village comprising of 50 preschoolers and their mothers. Thus total sample of 600 respondents was observed for this study. For measurement of intellectual abilities of preschoolers and their mothers the Stanford Bine Intelligence Scale, (Binet, 1960) was used. The influence of heredity on intellectual abilities was found 55.20 per cent and remaining 44.80 per cent was the contribution of environment.

Key words: Heredity, determinants, mental development, children.

Introduction

Intellectual abilities refer to the inner processes (viz. perception, thinking, attention, language, reasoning, problem solving etc.) and these are the products of mind that leads to knowing (Flavell,1999) and permit children to adapt more effectively to the environment. These intellectual abilities develop differently under the force of environmental and genetic factors. Parents who had high intelligence quotient tend to have children with high intelligence quotient score (Jenson, 1969). Environmental factors does not account for much of that variation in intelligence quotient (Scarr, 1992). Whereas analysis of variance on genetic influence suggested that general cognitive abilities showed only modest heritability in infancy and early childhood with increasing heritability in middle childhood and adolescence (McGue *et al.*, 1993; Ruston and Jensen, 2005). Children become more like to their biological parents because of increasing genetic influences and increasing genetic stability from 14-36 months (Plomin *et al.* 1996).The study was conducted with the objective to find out an influence of heredity on intellectual abilities of children.

Methodology

An investigation was carried out in rural area of three districts of Haryana state. From each district two villages were selected. Kaimari and Muklan from Hisar district, Kalwan and Danoda from district Jind and from district Kaithal Rohera and Majara villages were selected. A sample of 100 respondents was randomly selected from each village comprising of 50 preschoolers and their mothers. Thus total sample of 600 respondents was observed for this study. In order to find out the existing level of intellectual of respondents Stanford Binet Intelligence Scale (Binet, 1960) was used. Heritability was calculated to find out the influence of heredity on intellectual abilities of pre-schoolers.

Results and Discussion

Mean performance and standard deviation of children for intellectual quotient

Data presented in table 1 indicated that the mean of boys for intelligence quotient was (100.01 ± 9.69) higher than the mean of the girls (95.51 ± 13.12) as indicated by significant value of Z-test (Z=1.97*). Results were supported by Banach *et al.* (2008) and contradicted by Maccoby and Martin (1983).

Table 1. Mean performance and standard deviation of children for intelligence quotient (IQ)

Gender	No. of respondents	Common score	Z-test
Boys	156	100.01±9.69	1.97*
Girls	144	92.51±13.12	
Overall mean	300	96.26±11.50	

** Significant at .01 levels *Significant at .05 levels

Number of children in various categories of intelligence quotient (IQ) score

Table 2 showed that 78.33 per cent of the respondents had adequate level of intelligence followed by 19.67 per cent respondents having low level of intelligence and only 2.00 per cent had high level of knowledge. Schuck (1998) observed that preschoolers had different pattern of intellectual performance.

Table 2. Number of children in various categories of intelligence quotient (IQ) score

IQ Score	No. of children	% of total sample
Low (60- 85)	59	19.67
Medium (86-111)	235	78.33
High (112-137)	6	2.00
Total	300	100.00

Estimation of heritability for intellectual abilities of pre-schoolers

Table 3 showed that the role of heritability in the development of intellectual abilities of children was found 55.20 per cent and remaining was the impact of environment. Ruston and Jensen (2005) also found that heredity influences was 50.00 per cent and 50.00 per cent was the influence of environment in the development of the intellectual abilities. The similar trends were found by E-Risk Study Team (2006). Jensen (1998) reported that 80.00 per cent of the intellectual abilities were the result of genetical components and 20.00 per cent were the result of environmental influences.

Table 3. Estimation of heritability for intellectual abilities of pre-schoolers

Source of variance	Degree of freedom	Sum of square	Mean sum of square	f- test
With family	299(f-1)	64421.6	215.5	3.46
With in individual	300	18678.7	62.3	
Total	599	83100.4		

Error variance ($\sigma^2 e$) = 62.3

$$\text{Genotype variance } (\sigma^2 g) = \frac{\text{SMS due to within family} - \text{MS due to within individual}}{\text{No. of family}}$$

$$\frac{215.5 - 62.3}{2} = 76.6$$

$$\text{Phenotypic variance } (\sigma^2 p) = (\sigma^2 g) + (\sigma^2 e) = 76.6 + 62.3 = 138.9$$

$$\text{Heritability (hs)} = \frac{(\sigma^2 g)}{(\sigma^2 p)} \times 100 = \frac{766 \times 100}{138.9} = 55.20$$

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