

Understanding the Cognitive Development of children in India

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Importance of problem and Objectives

- Children are the future of the human societies, and investing human capital in the first few years of life have increasingly been emphasised to be the important determinants of cognitive development, performance in school, productivity, health and nutritional status over the life course.
- As per the study of Mustard (2007), substantial evidence has been found that “experiencing-based” brain development in early years sets neurological and biological pathways that affect health, learning and behaviour throughout life.
- In 2011, population aged 0-14 years contributed 31.8% of the total population out of it 9% belong to population aged 0-4 years.
- Providing proper education to these population is a big challenge for any country especially when the most population belongs to middle-income and poor family who don't have enough money.
- Further, national policy on education which came into the picture in 1986 and its programme of action came in 1992, stated that all children, irrespective of caste, creed, location or gender, should have equal access to elementary education of similar quality.
- However, in reality, this is not the case as it favours only the better off, while the disadvantaged groups have less access to quality of education.
- This study has focused on the cognitive development of children, as it reflects their true performance regarding education. Further, the study has emphasized the role of school type, educational infrastructure available in school, teacher-student ration and nutritional status of children on their cognitive score.

Data Source and Methodology

- For this study 2nd round of IHDS data has been used which longitudinal in nature. For this study, the school file, women file, individual file and birth file of the children was combined together which gave us the sample of 7,998 children.
- The cognitive index was calculated by combing three indicators viz. 1. Reading ability; 2. Writing ability; 3. Numerical ability.
- The combined score of the three-variables (reading, writing and arithmetic) provides the overall performance of the children.
- The educational infrastructure index was developed using the principal component analysis method. The education infrastructure index was comprised of several indicators such as the number of classrooms, electricity, water facility, toilet facility and physical structure.
- Further, The nutritional status of children aged 8-11 years was calculated using STATA- macro file provided by WHO. This STATA macro file calculates the height for age z-scores (5-19 years).
- Besides, the mean score of educational infrastructure index and a cognitive score was calculated by type of schooling. Additionally, teacher-student ratio was also estimated.
- Furthermore, linear regression was used to examine the important determinants of the cognitive score.
- The interaction term of educational infrastructure index and type of schooling was also included in the model.

Result of Linear Regression for Cognitive Score (adjusted R²= 0.286)

Covariates	Coef.	95% C.I.	
Height for age Z-score	0.283***	0.244	0.323
Mother's year of education	0.104***	0.088	0.120
Wealth Index			
Lowest®			
Lower	0.490***	0.323	0.657
Middle	0.738***	0.555	0.921
Higher	1.014***	0.815	1.214
Highest	1.219***	0.987	1.451
Number of People	-0.029	-0.068	0.008
Number of Children	-0.177***	-0.243	-0.110
Place of Residence			
Rural®			
Urban	0.315***	0.165	0.466
Age of Children	0.514***	0.468	0.561
Sex of the Children			
Male®			
Female	-0.018	-0.135	0.098
Working status of mother			
Not Working®			
Working	-0.116*	-0.247	0.0135
Caste			
General®			
OBC	-0.291**	-0.581	-0.002
SC	-0.403**	-0.706	-0.101
ST	-0.924***	-1.279	-0.570
Other	-0.086	-0.391	0.218
Religion			
Hindu®			
Muslim	-0.446***	-0.632	-0.259
Others	0.050	-0.224	0.323
Type of School			
Government®			
Private	0.539***	0.401	0.678
Educational Infrastructure Index	0.088**	0.006	0.170
TOS*EII	-0.185***	-0.307	-0.063
Student-Teacher Ratio	5.907***	4.117	7.697
Constant	0.101	-0.481	0.683

Note: 1. ®=denotes the reference category and ***($p<0.01$), **($p<0.05$), *($p<0.10$)

- TOS stands for Type of school
- EII stands for Educational Infrastructure Index

Result

- Table 1 depicts mean cognitive score and educational infrastructure index by type of schools i.e., Govt. and private school. The mean cognitive score turns out to be 6.049 ($p<0.05$) for private school compared to Govt. school which was found to be 4.581 ($p<0.05$) respectively. Further, the mean infrastructural index abated to -0.191 ($p<0.05$) for Govt. school while for private school the index came to be 0.372 ($p<0.05$).
- The given table 2, denotes the results of liner regression for cognitive score by various socio-economic and demographic variables. It shows that one unit of increase in the height for age z-score leads to 0.283 ($p<0.001$) unit of increase in the cognitive score. Similarly, one year of increase in the mother's education increases the cognitive score by 0.104 ($p<0.001$) unit.
- Further, the economic factor also plays an important role for determining cognitive score among the children. Noteworthy differences can be found as we move from lowest to high wealth index, there has been an upsurge in cognitive score.
- Moreover, increase in the additional child in the family abates the cognitive score by 0.177 ($p<0.001$) unit. In urban areas, children tend to have 0.315 ($p<0.001$) unit more of cognitive score than in rural areas. Again, one year of increase in the age of the children increases the cognitive score by 0.514 ($p<0.001$) unit.
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- In case of caste and religion, among scheduled tribe, scheduled caste and other backward castes, the cognitive score tends to be lesser as compared to general caste whereas the same picture can be seen in Muslim community were the cognitive score has decreased by 0.446 ($p<0.001$) unit.
- To understand the combine role of educational infrastructure index and type of schooling, the interaction was added in the model. The interaction was graphically presented in figure 1. It shows that there is clear positive relationship between educational infrastructure index and cognitive score. However, the interaction term shows that cognitive score is more in favour of private school compared to government school.

Discussion and conclusion

- The result shows that the cognitive index is significantly different between children studying in government and private schools. The mean cognitive index of government school is much lower than cognitive index of children in private school. This reflects the poor performance of government schools in terms of providing better education to the children.
- There is also poor performance of govt. schools in terms of providing the better physical infrastructure as they don't have proper basic resources to provide. Result of linear regression vividly brings out the fact that educational infrastructure, type of school and teacher-student ratio plays very important role in children's cognitive ability.
- Moreover, children with good nutritional status also tend to have better cognitive index. Other factors like mother's education is positively associated with cognitive index while factors, number of children, working status of mother are negatively associated with cognitive index.
- The cognitive score also varies by caste and religion. Children of OBC, SC and ST have less cognitive ability compared to forward caste children. Similarly, children belong Muslim religion also have low cognitive score compared to Hindu children.
- In India, there are some programs going on to provide basic education to children from different caste, communities and places so SDG goals can be achieved. Although bringing all children of different caste and communities to get education is a big step but still without a good infrastructure it becomes very difficult to achieve. Therefore, there is also need to have some programs which especially focuses on providing better infrastructure to govt. schools so that it may create a better future for children.

Table 1: Cognitive and Educational Infrastructure Index by type of school

Type of School	Mean (Standard Error)	
	Cognitive Score***	Educational Infrastructure***
Government	4.581 (0.041)	-0.191 (0.012)
Private	6.049 (0.051)	0.372 (0.021)
t-statistics	-21.8162	-24.6792

Notes: 1. Difference by type of school and cognitive score were tested by performing t-test.
***P-value< 0.01, **P-value<0.05

Figure 1 : Interaction effect of type of school and education infrastructure on cognitive development

