

Psychomotor Development in Babies and its Improvement in Relation to Some Ecological Factors

Bimla Dhanda and Sudha Chhikara

Department of HDFS, College of Home Science, CCS HAU, Hisar

KEY WORDS Psychomotor development index (PDI), babies; intervention; analyses of variance; socio-economic factors.

ABSTRACT The present investigation was undertaken to assess the psychomotor development index (PDI) of 400 babies during the age of one to two years selected from urban and rural area of district Hisar in Haryana state. The babies were divided into four categories of age groups, two categories of localities and gender. Thus, making a sample of 25 male and 25 female babies in each age group from urban and rural localities. The selection of localities was purposive, while that of babies was at random. Significant differences observed at all the age groups for psychomotor development revealed that formation different age group categories was appropriate. Male babies, in general, were better in psychomotor development than female babies in rural area, but at par in urban area. Non significant interaction between age and gender indicated similar growth rate in both genders under urban and rural area. Comparison of localities indicated that babies from urban area had better motor activities than rural area for all the age groups. Among ecological variables, birth order, fathers' education and family income were important variables than fathers occupation and size of family. Improvement in motor activity due to intervention programme was much better in rural area than in urban area.

INTRODUCTION

Babyhood is a critical period for physical and motor development. During this period children learn to control over their body and become physically independent. To get a complete picture of development of child-ren, is essential to know how they develop physically as well as psychologically. Secondly, physical development determines what children can do, if children are well developed for their ages, they will be able to compete in equal terms with their peers in various aspects of developments. If not, they will be handicapped in competition with them and may be excluded from the peer group. By the end of the first year, infants deliberately feel shyness when they meet stranger. These emotions of children affect the behaviour of others, and emotional reactions of others regulate children's social behaviour. Therefore, it is very important to take care of them during this period so that they develop

confidence in their body movements.

Robert and Bythye (1984) studied psychomotor development of babies during the age 12 to 24 months of age and found that PDI score was related to IQ scores of child-ren. Dale et al. (1984) applied PDI score on 12 to 24 months old babies and found that majority of parameters of PDI were related to family, income, education of parents and vocabulary level of babies. Siegel (1984) found significant correlations for PDI score with total personality score. In an intervention programme to the babies, Dale et al. (1984) found improvement in PDI score of babies during the age group of 12 to 24 months. Bradley and Caldwell (1976) found that early score on the involvement of toys scales were significant predictors of increase in psychomotor development of babies. With regard to differences in gender, Dale et al. (1984) did not found any differences for psychomotor development in the boys and girls during the age of 12 to 24 months. They further reported that educational level of parents, family income and number of children in the house produced significant correlations with psychomotor development of babies.

Siegel (1984) observed nonsignificant correlations of PDI score with maternal care, but significant positive with socio-economic status and home environment. They also reported that PDI score of babies was significantly positively related with Bayley's scale for cognitive development and Raynell's scale of language development. Watson (1993) studied various aspects of physical development, namely, height, body weight, skin-fold thickness, biceps and subscapular and suprailiac skinfolds of 1200 babies of one year old. These babies were at par in height and better in weight and skinfolds than the mean values obtained at international level. Unti (1994) suggested that paediatricians should implement an optional health care in a child's critical first year of life because this is the most important period of physical development. Thus, infancy is the most important period for physical development therefore, they require critical care during this

period. Besides, physical and motor developments of babies were also dependent on socio-economics status and home environment, parents' education and play materials. In view of this, the study was undertaken to assess the psychomotor development and its improvement in the babies from urban and rural areas of Hisar.

METHODOLOGY

Sample: The sample of present study consisted of 200 boys and 200 girls (N=400) selected from urban and rural areas of Hisar district. The babies were divided in four age groups, namely, 12-15, 15-18, 18-21 and 21-24 months. There were 25 boys and 25 girls in each age group from both urban and rural areas. Thus making total sample equal to 400. Data on urban babies were collected from Hisar city and for rural babies from Rawalwas and Siswala villages which are situated about 20 kms away from Hisar city.

Procedures: Bayley's scale of infant development (Bayley, 1969) was used to assess the psychomotor development of babies. Data were further subjected to statistical analysis namely, calculation of mean, pooled mean, Z and t tests, and analyses of variances.

Intervention Programme: The deficient group of babies for cognitive development was identified on the basis of the mean performance of the babies. A total of 40 babies from low performing group were identified and out of the half were taken as control and half as experimental group. An intervention programme on home based techniques was

developed for each age group for all the variables under study. Before administering the intervention, the programme was assessed by the team of learned scientists of College of Home Science, CCS HAU, Hisar as well as from other institutions. All the necessary suggestions were incorporated. The intervention programme was first applied on a part of sample and its effects were assessed. Then all the items were scrutinised carefully and some of unimportant items were dropped. The finally prepared intervention programme was Administered only on the experimental group and data were obtained on experimental and control groups.

RESULTS AND DISCUSSION

Mean sum of squares for age were significant for both locale, while for gender these were significant only in rural area ($F=11.32^{**}$) (Table 1). This revealed that both male and female babies had similar values for PDI in urban area, while different in rural area. Interaction due to age x gender was nonsignificant in both the areas again indicating the similar response of male and female babies with increase in age (Fig. 1). Pooled mean of male babies was at par to that of the female babies ($F=0.00$), in urban area, but higher in rural area ($F=11.32^{**}$) (Table 2). When overall mean of urban babies (140.93 ± 5.93) were compared with that of rural babies (121.86 ± 6.10), it was revealed that urban babies were better than rural in all the age groups and in overall mean.

There were also clear differences of motor activity of babies in different age groups over

Table 1: Analysis of variance for psychomotor development index (PDI) of babies during the age of one to two years

Source of variation	Df.	Urban		
		SS	MS	F
Age	3	17197.55	5732.52	15.12**
Gender	1	0.98	0.98	0.00
Age X Gender	3	364.07	121.36	0.32
Error	192	72802.56	379.18	
Total	199	90365.16		
Source of variation	Df.	Rural		
		SS	MS	F
Age	3	5094.63	1698.21	4.13**
Gender	1	4656.13	4656.13	11.32**
Age X Gender	3	77.56	25.85	0.06
Error	192	78944.64	411.17	
Total	199	88772.96		

*, ** : Significant at 5% and 1% level of significance, respectively.

the different areas. This is in consistent with Meltzoff and Moore (1994). They have shown that even new borns seem able to perceptually represent and imitate another persons movements and their activity is much faster in early years of life. Meltzoff (1995) have also shown that 18 month old baby can infer what action another person trying to perform. Research reported by Spelke *et al.* (1995) further suggested that 12-month-olds expect a person to reach for an object that the person is looking at with positive effect rather than for another one to which the person is not attending. By the age of 18 months, infants even seem to understand that they should give an experimenter an object of choice. In contrast, 14-month-olds do not show this understanding (Repacholi and Gopnik, 1997). Thus, motor development was significant at each age interval. As in case of mental development psychomotor development of urban babies was better in urban than in case of rural area and trend of learning psychomotor was same in both genders.

These findings appears to confirm that babies of this age have very fast psycho-motor development and they have at least some limited ability to understand a person's desires. The trend of mean values obtained over different age groups suggested superiority of males over females in rural area, while similarity in urban area. Urban children also had better psychomotor activity than rural. Such types of differences may occur due to gender preferences and cultural variations.

Association of Psychomotor Development with Ecological Factors

Birth order had significant influence on the

psychomotor development of babies in both urban and rural areas (Table 1). This revealed that facilities for upbringing the child get affected with the increase in number of children. Bradley and Caldwell (1984) also found significant effect of birth order on various development of babies. However, Gottfried and Gottfried (1984) did not observe any difference in development of babies due to birth order. In the present study late born babies were better in psychomotor development index in both areas. Bradley and Caldwell (1984) also reported that substantial relationship exist between birth order and home score of babies during 12 to 24 months. Ordinal position negatively correlated with organisation of environment, play material and maternal involvement (Bradley and Caldwell, 1984), probably because of competition for material and emotional resources.

Education of fathers of babies had significant impact on psychomotor development in both urban and rural areas ($\chi^2=17.85^{**}$ and 10.24^* , respectively) This indicated that educated fathers were comparatively more responsive than those who were illiterate or had low level of education. Education of fathers had great impact on psychomotor and cognitive development of babies during the age of 12 to 14 months (Gottfried and Gottfried, 1984). Bradley and Caldwell (1984) had also observed that father's education had an important role on physical and intellectual development of babies.

Occupation of parents and size of family had little effect on psychomotor developments. This indicated that there was similar response of all the developmental parameters except for psychomotor development. Bradley and Caldwell (1984) had also observed that

Table 2: Means and standard deviations of psychomotor development index (PDI) of the babies during the age one to two years

	Age in months				Pooled Mean
	12-15	15-18	18-21	21-24	
			Urban		
Mean	126.83 (6.35)	139.45 (7.50)	145.44 (6.13)	152.01 (5.32)	140.93 (5.93)
			Rural		
Mean	114.66 (5.83)	120.34 (7.01)	124.06 (6.78)	128.41 (5.95)	121.86 (6.10)
Z test for Urban vs Rural	9.98**	13.16**	16.56**	20.91**	6.34**

Figures in parantheses denote standard deviations.

* : Significant at 5% and 1% level of significance, respectively.

Table 3: Association of psychomotor development of babies with socio-economic variables

Socio-economic variables	<i>X²</i> values under	
	Urban area	Rural area
Birth order	12.53**	16.65**
Father's education	17.85**	10.24**
Father's occupation	5.19	6.21
Size of family	5.82	3.30
Family income	16.30**	14.53**

** : Significant at 1% level of significance.

occupation of parents was not associated with developmental parameters of babies during the age of 12 to 24 months of age. This may be attributed either to the much youngest age of children to influenced by different occupation or due to similar approaches being applied in all the occupations.

Family income appeared to be the most important variable among all the independent variable because it had maximum associations with dependant variables. This may be attributed to better nutrition, play material, care and involvement with children in high income group Bradley and Caldwell (1984). Similarly in a study of 12 to 24 months old babies, Gottfried (1983) observed that SES was positively related with various parameters of child development and particularly with cognitive development. Wachs (1984) also reported that family income was closely related with developmental parameters of babies.

Impact of Intervention

The number of babies having below average psychomotor index were comparatively more in rural (13.75%) than in urban (11.75%) area. The mean values for PDI were increased from 119.46 ± 8.78 to 131.96 ± 9.07 in urban area and 105.30 ± 8.77 to 121.97 ± 6.40 in rural area over the different age groups after administering the intervention programme. Comparison of post intervention data in both area revealed that there was significant effect of intervention for majority of the age group in both areas. Percentage of improvement over control group was in the range of 7.74% to 12.70% in urban area, while 10.77% to 16.50% in rural area. Mean per cent of increase over control group was higher in rural area (13.43%) than in urban area (9.19%).

Responses of babies towards psycho-motor development in rural area was significant on individual age groups as well as an overall basis. But in urban area improvement in psychomotor development was not as good as in rural area. The individual age groups in both area indicated that intervention programme was an effective tool for improving efficiency of babies. In an intervention experiment Bradley and Caldwell (1981) got improved psychomotor activities of babies during the age 12 to 24 months through home based techniques. Siegel (1981) also found significant correlations for number of involvement with toys and their PDI scores. But

Table 4: Effect of intervention programme on the development of babies during the age of one to two years

Variable/ age	No. of babies below mean	Mean of babies before intervention	Mean of babies after intervention	Mean of babies in control	% of increase over control	t test for control vs intervention
Urban						
12-15	11(2.75)	108.15 $\pm$ 4.51	119.56 $\pm$ 5.10	109.55 $\pm$ 9.15	9.14	2.13
15-18	13(3.25)	117.50 $\pm$ 5.15	131.50 $\pm$ 9.21	116.68 $\pm$ 6.15	12.70	2.99
18-21	12(3.00)	123.65 $\pm$ 4.90	136.16 $\pm$ 4.63	125.57 $\pm$ 4.15	8.43	3.81**
21-24	11(2.75)	128.52 $\pm$ 5.61	140.62 $\pm$ 4.67	130.52 $\pm$ 4.11	7.74	3.63**
Total/ Pooled mean	47(11.75)	119.46 $\pm$ 8.78	131.96 $\pm$ 9.07	120.58 $\pm$ 9.32	9.19	1.96
Rural						
12-15	16(4.00)	95.38 $\pm$ 6.30	114.65 $\pm$ 7.16	98.41 $\pm$ 6.31	16.50	3.81**
15-18	16(4.00)	101.51 $\pm$ 5.61	119.72 $\pm$ 4.86	105.55 $\pm$ 6.12	13.42	4.05**
18-21	11(2.75)	108.67 $\pm$ 4.92	123.68 $\pm$ 5.63	111.65 $\pm$ 4.68	10.77	4.14**
21-24	12(3.00)	115.63 $\pm$ 5.76	129.81 $\pm$ 6.43	114.50 $\pm$ 5.21	13.37	4.14**
Total/ Pooled mean	55(13.75)	105.30 $\pm$ 8.77	121.97 $\pm$ 6.40	107.53 $\pm$ 7.13	13.43	3.37*

*, ** : Significant at 5% and 1% level of significance, respectively.

Dale et al. (1984) did not observe significant differences in PDI scores of intervention group with control group. Siegel (1984) also reported positive correlation of play material and maternal involvement with PDI scores of babies during the age of one to two years.

Horn et al. (1995) improved the motor skills of the babies through neurobehavioural intervention programme during the age of 12 and 36 months. On contrary, Shen et al. (1998) could not get expected improvement in PDI score of babies during the age of 12-24 months through an intervention programme based on neurobehavioural approach. But Taylor (1999) observed significant associations of play material which could be a basis of improvement of psychomotor development in babies. Thus, intervention showed better results in rural area than in urban area.

CONCLUSIONS

In urban area motor activities of male babies was equal to that of female, but in rural area males were better than in females. This implied that there is more need to concentrate our efforts on the development of motor activities of female babies particularly in rural areas. In addition, poor health status of babies in rural areas than in urban areas again emphasised the need of improvement of health status in rural areas. The intervention programme was also more effective in rural area than under urban area under the present study.

REFERENCES

- Bayley, N. 1969. *Bayley's Scale of Infant Development*. USA: Psychological Corporation, Berkeley.
- Beckwith, L. 1971. "Relationship between Attributes of Mothers and their Infants' I.Q. Scores," *Child Dev.* 42: 1083-1097.
- Berk, L. E. 1996. *Child Development*. New Delhi: Prentice Hall of India.
- Bradley, R. H. and B. M. Caldwell. 1976. "Early Home Environment and Changes in Mental Test Performance in Children During the Age of 3 to 36 Months," *Development Psychology* 12: 93-97.
- . 1981. "The Home Inventory. A Validation of Preschool Scale for Black Children," *Child Development*, 52: 708-710.
- . 1984. "A Study of the Relationship Between Home Environment and Cognitive Development During First Five Years," in A. W. Gottfried (ed.), *Home Environment and Early Cognitive Development*. New York: Academic Press.
- Dale, L. J., N. B. James and J. M. Rovald. 1984. "Home Environment Cognitive Development in Mexican - American Children," in A. W. Gottfried (ed.), *op.cit.*
- Gottfried, A.W. 1983. "Measurements of Socio-Economic Variables in Child Development Research: Data and Presentations," paper presented at Biennial Convention for the Society for Research in Child Development, Detroit.
- Gottfried, A. W. and A. E. Gottfried. 1984. "Home Environment and Cognitive Development in Young Children of Middle Socio-Economic Status Families," in A. W. Gottfried, (ed.), *op.cit.*
- Horn, E. M., S. F. Wareen, and H. A. Jones. 1995. "An Experimental Analysis of Neurobehavioural Motor Intervention," *Dev. Med Child Neurol*, 37 (8): 697-714.
- Meltzoff, A. N. 1995. "Understanding of Intentions of Others: Re-enactment of Intended acts by 18 Month old Children," *Dev. Psychol.* 31: 838-850.
- Meltzoff, A. N. and M. K. Moore. 1992. "Early Imitation within a Functional Framework," *Infant Behv. Dev. Lang.*, 15: 479-505.
- Repacholi, B. M. and A. Gopnik. 1997. "Early Reasoning About Desires: Evidence from 14 - and 18 - Months Olds," *Dev. Psychol.* 33: 12-21.
- Robert, H. B. and M. Bethye. 1984. "Study of the Relationship Between Home Environment and Cognitive Development During the First Year. In A. W. Gottfried. (eds.), *op. cit.*, New York.
- Shen, X. M., C. H. Yan, D. Guo, S. M. Wu, R.G. Li, H. Huang, L. M. Ao, J. D. Zhou, Z. Hong, Y. Xu, J. D. Jin and J. M. J. 1998. "Low-Level Prenatal Bad Exposure and Neurobehavioural Development of Children in the First Year of Life : A Prospective Study in Shanghai," *Environ. Res.*, 79 (1): 1-8.
- Siegel, L. 1981. "Infants Test as Predictor of Cognitive and Language Development at Two Years," *Child Dev.*, 52: 545-547.
- . 1984. "Home Environmental Influences on Cognitive Development in Preterm and Fullterm Development During the First Five Years," in A. W. Gottfried (ed.) *op. cit.*
- Spelke, E. S., A. Phillips, and A. L. Woodward. 1995. "Infant's Knowledge of Object Motion and Human Action," in D. Spencer, D. Pre-mack, A. J. Perneck (eds.), *Casual Cognition*. Clarendon: Oxford
- Taylor, K. M. 1999. "Relationship between Visual Motor Integration Skill and Academic Performance in Kindergarten through Third Grade," *Optom Vis. Sci.*, 76 (3): 159-163.
- Unti, S. M. 1994. "The Critical First Year of Life. History-Physical Examination, and General Developmental Assessment," *Pediatr. Clin North. Am.*, 41 (5): 859-73.
- Wachs, T. D. 1984. "Proximal Experience and Early

- Cognitive-intellectual Development," in A. W. Gottfried. (ed.) *op.cit.*
- Walters, E. and L. Shronfe, 1983. "Social Competence as a Developmental Construct," *Developmental Review*, 3: 79-97.
- Watson, A. W. 1993. "Height, Body Weight, Skinfold Thickness and Endurance Fitness of Children Attending National Schools in Ireland," *Jr. J. Med. Sci.*, 162 (9): 358-361.