Nigerian Journal of Paediatrics 2002; **29(2)**:34-39

Evaluation of Factors that Influence School Readiness among Nursery School Children in Enugu

AN Ikefuna*, SO Iloeje**

Summary

Ikefuna AN, Iloeje SO. Evaluation of Factors that Influence School Readiness among Nursery School Children in Enugu. *Nigerian Journal of Paediatrics* **2002; 29:34.** The preschool child is often confronted with adverse environmental influences that may affect his/her development and hence his readiness for schooling. The factors that affect school readiness were evaluated in 532 nursery school pupils using a proforma on perinatal problems and gross motor development of the pupils. Their nutritional status, neurodevelopment status, and their performance on the Draw-A-Person Test were assessed. Sixty (11.3 per cent) of the 532 children were unready for schooling. Factors that are responsible for this included malnutrition, adverse perinatal period and a younger age at school entry. The need for the establishment of the preschool health unit in the Local Government as well as routine medical examination of nursery school pupils is emphasized.

Introduction

SCHOOL readiness can be defined as the child's attainment of adequate physical, intellectual and neurodevelopmental competence that will enable him to cope successfully with the demands of primary school education. School readiness is basically determined by a child's maturity.[1] In Nigeria, the national policy on education recommends that the school entry age should be six years.[2] This school entry age is supported by scientific findings which indicate that neuronal maturation is completed by the last part of the preschool years.[3] Besides, it is noted that beyond five years of age, the major development occurs in the control of finer muscle co-ordination e.g. the use of hands in writing.[4] The latter attribute is one of the skills expected to be achieved in the later part of the school years. Therefore, the preschool period is a critical stage of development in a child at the verge of school entry. The preschool child, however, is the survivor of the unfavourable childhood mortality and morbidity that prevail in the environment. Some of these children still bear the 'scars' of the diseases that contributed to the death of their peers.[5] This may have contributed to the anxiety which parents express over their children's state of preparedness for primary school. The anxieties are often heightened when they either compare their children's development with those of their siblings or those of their neighbours.[6]

For a child to adequately cope with primary school work, the preschool period must be adequately stable. A sound preschool period, therefore, is a basic requirement for meeting the challenges of the child's future. It is a foundation whose weakness may be difficult to correct once it is adversely affected. There is a need to assess the children to know if they can physically and intellectually absorb the knowledge that is offered by formal education. This need is further strengthened by the knowledge of the adverse consequence that may be encountered by a child who is ill prepared for schooling.

The aim of this study was to determine the proportion of our final year nursery school children that can be said to be ready for primary school and identify factors that may influence school readiness.

Subjects and Methods

Final year nursery school children attending registered nursery schools in Enugu were chosen for the study which was carried out from July to September, 1992 and February to April, 1993. There were 618 children; of this number, 11 were excluded for several reasons, including severe bilateral talipes equinovarus (one), intractable seizure (three), surgery over the Achilles tendon (one), febrile illness (three) and refusal to participate (three). Six

University of Nigeria Teaching Hospital, Enugu

Department of Paediatrics

* Lecturer

** Senior Lecturer

Corresondence: AN Ikefuna

hundred and seven children were, therefore, available for study. Copies of a proforma questionnaire designed for the study were distributed to the 607 children, through their class teachers, for completion by their parents. The class teachers assisted the parents in situations where the parents were unable to read or understand the questionnaire which sought to obtain the prenatal, natal and immediate postnatal history of the child as well as the child's developmental history and any history of maternal illness during pregnancy. Seventy-five (12.4 per cent) of the 607 children did not return their proforma and were excluded from further study, leaving a total of 532 children whose data were finally analysed. Each child had a complete physical examination with emphasis on the central nervous and musculo-skeletal systems. At the end of the examination, each child was categorized as "normal" or "abnormal", the latter category being those with some abnormal clinical findings. The intelligence of the children was assessed with the culture-free Draw-A-Person-Test (DAPT), which had been standardized for Nigerian children by Ebigbo and Izuora.[7] A child whose Draw-A-Person-Quotient (DAPQ) is <75 per cent or one or more standard deviations below normal, is said to be mentally dull.

Gross assessment of the nutritional status of the children was done by measuring their weights and heights. The observed weights of the children were compared with reference weights of children with similar heights (weight-for-height). A value that is below 80 per cent was considered as wasting or acute malnutrition. Similarly, the heights of the children were expressed as a percentage of the reference height-for-age. A value of below 90 per cent indicates stunting, signifying malnutiriton over a long time.[8]

Neurodevelopmental assessment was done using a battery of tests proposed by Huttenlocher *et al.*[9] The tests assess a child's attention and co-ordination as well as his or her fine and gross motor functions. There are ten different tasks in the test and each task is scored as a pass or fail. A child scores one point if he/she fails a task or zero (0) if he/she passes it. The total neurodevelopmental scores (NDS) for each child ranges from zero (all tests passed) to ten(all tests failed). It therefore, follows that the higher the child's score, the poorer the neurodevelopmental status. Huttenlocher and his co-workers[9] observed that children who score four and above, develop learning problems later. The tasks contained in the tests were appealing to the children and it was possible to obtain their full co-operation.

At the end of the examination, a child is found to be unready for school if he/she had any of the following occurring either singly or in combination:

1. Mental dullness, that is, a Draw-A-Person-Quotient (DAPQ) that was less than 75 per cent, or one or more standard deviations below the normal for his age and sex.
2. A neurodevelopmental score that is four or more.

Results

Table I shows the age and sex distribution of the children. Their ages ranged from 60-75 months (mean 65.07±5.17). Table II shows the results of the Draw-A-Person-Test for the 532 pupils analysed. Twenty-five (4.7 per cent) of them were mentally dull. This number consisted of 14 males and 11 females. Their DAPQ values ranged from 66.7 per cent to 73.8 per cent. The remaining 507 (95.3 per cent) children were of normal intelligence

Table I

Age and Sex Distribution of the 532 Nursery School Pupils

Age (months)	*Males*	*Females*	*Total(Per Cent)*
60-61	67	92	159 (29.9)
62-63	45	36	81 (15.2)
64-65	59	42	101 (19.0)
66-67	38	29	67 (12.6)
68-69	28	29	57 (10.7)
70-71	19	17	36 (6.8)
72-73	11	10	21 (3.9)
74-75	9	1	10 (1.9)
Total	276	256	532 (100)

Table II

Result of the Draw-A-Person-Test on 532 Children

Draw-A-Person Quotient (DAPQ) (Per Cent)	*Males*	*Females*	*Total (Per Cent)*
50-74	14	11	25 (4.7)
75-99	63	58	121 (22.7)
100-124	125	96	221 (41.6)
125-149	63	76	139 (26.1)
150-174	11	13	26 (4.9)
Total	276	256	532 (100)

Table III

Weight-for-Height and Height-for-Age Values in the 532 Children

Weight-for-Height (Per Cent)	*Males*	*Females*	*Total(Per Cent)*
70-79	1	4	5(0.9)
80-89	6	10	16(3.0
90-99	116	99	215(40.4)
100-109	144	132	276(51.9)
110-119	9	11	20(3.8)
Total	276	256	532(100)
Height-for-Age (Per Cent)			
70-79	1	-	1(0.2)
80-89	13	11	24(4.5)
90-99	130	121	251(47.2)
100-109	126	119	245(46.0)
110-119	6	5	11(2.1)
Total	276	256	532(100)

for their age and sex. Table III reveals the results of the weight-for-height and height-for-age assessments. Five children (0.9 per cent) had weight-for-height values of less than 80 per cent and were acutely undernourished while 24 children (4.5 per cent) had height-for-age values of less than 90 per cent and were therefore stunted using the Havard Standard.Only one child was both wasted and stunted. The neurodevelopmental test results are shown in Table IV. Sixty-five (12.2 per cent) children passed all the tests (NDS=0), 411 (77.3 per cent) had NDS between 1 and 3 while 56 (10.6 per cent) had scores of ≥ 4 and therefore, failed the test. The age and sex distribution of the 56 children with NDS ≥ 4 are shown in Table V. Forty-six (82.1 per cent) of these children were below 66 months of age as against 10 children (17.9 per cent) who were 66 months and above. Besides, it is observed that of the 341 children who were less than 66 months of age, 46 (13.5 per cent) failed their neurodevelopmental tests (i.e NDS ≥ 4). Of 191 children who were older than 66 months, only 10 (5.3 per cent) had NDS ≥ 4 ($\chi^2 = 5.3$, $p<0.001$). Thus, a significantly higher number of pupils failed the tests at younger ages (<66 months).

Table IV

Neurodevelopmental Tests on the 532 Nursery School Children

Neurodevelopmental Score (NDS)	*Males*	*Females*	*Total (Per Cent)*
0	37	27	65(12.2)
1	48	50	98(18.4)
2	84	90	174(32.7)
3	79	60	139(26.1)
4	10	12	22(4.2)
5	7	9	16(3.0)
6	5	5	10(1.9)
7	4	2	6(1.1)
8	2	-	2(0.4)
Total	276	256	532(100)

Using the stated criteria, a total of 60 children consisting of 32 males and 28 females could be said to be unready for primary school, representing 11.3 per cent of the entire school population studied. Twenty-one (35 per cent) children failed both the neurodevelopmental tests and had DAPQ values of less than 1SD, four, all males, were mentally dull and the remaining 35 (58.3 per cent), made up of 18 males and 17 females scored ≥ 4 in the neurodevelopmental test. Table VI reveals that 11 of the 29 malnourished children were unready for school while the remaining 18 children were. Of the 503 well-nourished children, 49 of them were unready for school. Analysis of this reveals that malnutrition had significant adverse effect on school readiness ($\chi^2=21.8$, $p<0.001$). Examination of the effect of gender on school readiness (Table VI) shows that 32 (11.6 per cent) of the 276 male children and 28 (10.9 per cent) of the 256 female children examined were unready for schooling. Analysis of this result shows that gender differences, did not influence readiness for schooling ($\chi^2=0.06$, $p>0.5$). However when the influence of age on school readiness was examined, it was found that 49 (14.3 per cent) of the 341 children whose ages were below 66 months, were unready for school while only 11 (5.8 per cent) of the 191 children who were older failed their tests. Analysis of the test results shows that age less than 66 months had adverse effect on school readiness ($\chi^2=9.6$, $p<0.01$).

Twenty-five (5.7 per cent) children had perinatal problems. These were neonatal convulsions (five), perinatal

Table V

Age and Sex Distribution of 56 Children with Neurodevelopmental Score of ≥ 4

Age (months)	*Males*	*Females*	*Total(Per Cent)*
60-61	10	16	26(46.4)
62-63	9	4	13(23.2)
64-65	6	1	7(12.5)
66-67	-	2	2(3.6)
68-69	1	4	5(8.9)
70-71	1	-	1(1.8)
72-73	1	1	2(3.6)
Total	28	28	56(100)

asphyxia (five), neonatal jaundice (13); however, one child each had a combination of convulsion with asphyxia and jaundice with birth asphyxia, respectively. When the influence of perinatal problems (irrespective of type) on school readiness was examined, it was found that 15 (60 per cent) of the 25 children with perinatal problems, were unready for school while 45 (8.9 per cent) of the 507 children without perinatal problems failed the criteria for school readiness. Analysis of this results shows that there is a strong association between perinatal problems, no matter the type, and school readiness (χ^2=62.4, p<0.001).

Discussion

One of the problems encountered in the use of proforma or questionnaires in studies of this type is non-response by subjects. However, it is encouraging that 532 (87.6 per cent) of the proformas were returned after full completion. This is comparable to the 88 per cent obtained by Iloeje[10] in his study. This response indicates that the parents understood the questions and were willing to provide appropriate answers. The present study identified mental dullness in 25 children (4.7 per cent), which is lower than the 10.2 per cent obtained by Ebigbo

Table VI

Relationship Between School Readiness and Nutrition, Gender and Age

	School Readiness		*Total*	*Per Cent of School Unreadiness*
	Ready	*Not Ready*		
Nutritional Status				
Well nourished	454	49	503	9.7
Undernourished	18	11	29	37.9
Total	472	60	532	
Gender				
Male	244	32	276	11.6
Female	228	28	256	10.9
Total	472	60	532	
Age (mons)				
<66	292	49	341	14.4
≥66	180	11	191	5.8
Total	472	60	532	

and Izuora[7] among school children in the same town. A possible explanation is the presence of large number of children from the upper social classes in this study whereas the children studied by Ebigbo and Izuora included urban and rural children, the latter belonging mainly to lower social classes.

This study reveals that 29 (5.5 per cent) of the children were undernourished or stunted. This lies within the reported range of 5.4-4.9 per cent of stunting/undernutrition among children in developing countries,[11] but is on the lower side of the spectrum. This may also be due to the preponderance of children from the upper social classes in this study. Oduntan[12] had observed an increased prevalence of malnutrition among school age children in the lower social classes. Analysis of the influence of malnutrition on readiness for schooling in the present study, reveals a significantly adverse effect ($p<0.001$). Earlier workers have also noted a significant relationship between malnutrition and intellectual attainment of children. For example, Grantham-Mc Gregor[13] noted a significant relationship between the duration of malnutrition and intellectual performance of Jamaican children. The presence of stunting in 25 (86.2 per cent) of the 29 children with malnutrition in the present study corroborates Grantham-McGregor's findings.[13]

The present study has revealed that 10.5 per cent of children had NDS of four or more. This is high compared to findings by Bax and Whitmore[14] who observed similar problems in six per cent of school entrants. The high prevalence of impaired neurodevelopmental attainment in this study can be attributed to delayed myelination, hence a delay in the acquisition of skills necessary for primary school work. This delay can be due to some environmental factors such as malnutrition and stressful perinatal period. For example, in this study, 12 (48 per cent) of the 25 children with stressful perinatal problems failed their neurodevelopmental tests ($p<0.001$). Similarly, of the 29 children with malnutrition, 9 (31 per cent) had NDS>4 ($p<0.001$). Besides, the ages of the children in this study may have contributed to their performance in the neurodevelopmental tests. It is noted that more children failed their tests at younger ages.

Sixty of the 532 children studied had significant problems that rendered them unready for schooling. This gives a school unreadiness prevalence of 11.3 per cent which is higher than the 5-10 per cent reported by Fowler *et al*[15] in the United States. It is possible that the increased prevalence of some retarding factors such as malnutrition and birth asphyxia on child development, may be responsible for this difference. Indeed, from this study, the prevalence of perinatal problems, irrespective of type, seems to increase the chance of a child not being ready for schooling ($p<0.001$).

This study reveals a significant relationship between ages of the pupils and their readiness for schooling. This implies that childen who commence primary school education at younger ages are more likely to have problems at school. Therefore, the school entry age of six years as recommended by the National Policy on Education is very appropriate and should be sustained.

The factors shown to affect school readiness in the present study namely, malnutrition and adverse perinatal problems, are amenable to prevention. Routine preschool medical examination should be initiated for the early detection of those who may have medical problems. Remedial measures can then be arranged for these children. In addition, preschool health units can be established in local governments so as to ensure proper monitoring of nursery school children in the area, with regard to their health.

References

1. Oberst BB. School readiness – why there is need to determine it – a philosophical discussion based on long-term experience. *Pediatrician* 1979; **8**: 133-9.
2. Federal Republic of Nigeria – New National Policy on Education, Federal Ministry of Information,Printing Division, 1981.
3. Cutting WAM. Growth and development. In: Hendrickse RG, Barr DGB, Mathews TS, eds. Paediatrics in the Tropics. London: Blackwell Scientific Publications, 1989: 68-89.
4. Hurlick EB. Motor development. In: Child Development. Tokyo: McGraw-Hill International Book Company, 1981: 138-57.
5. Lucas AO, Gilles HM. A Short Textbook of Preventive Medicine for the Tropics. London: Unibooks Hodder and Stoughton, 1976: 268-71.
6. Illingworth R, Illingworth C. On bringing out the best of child. In: Babies And Young Children – Feeding Management and Care. London: Churchill Livingstone, 1979: 318-29.
7. Ebigbo PO, Izuora GI. Draw-A-Person-Test – Standardization, Validation and Guidelines for use in Nigeria. Enugu: Chuka Printing Company Ltd, 1981: 7-22.
8. Cameron M, Hofvander Y. Body measurement – reference values for weights and lengths/heights. In: Manual on Feeding Infants and Young Children. New Delhi: Oxford University Press, 1983: 174-86.
9. Huttenlocher PR, Levin SC, Huttenlocher *et al.* Discrimination of normal and at risk preschool children on the basis of neurological test. *Dev Med Child Neurol* 1990; **32**: 394-402.
10. Iloeje SO. Rutters behavior scales for children (Teachers scale). Validation and standardization for use in Nigerian children. *J Trop Pediatr* 1992; **38**: 235-9.

11. Reddy V. Protein energy malnutrition. In: Stanfield P, Brueton M, Chan M, Parkin M, Waterston T eds. Diseases of Children in the Subtropics and Tropics. London: Edward Arnold, 1991: 335-7.
12. Oduntan SO. The health of Nigerian children of school age. III. *Ann Trop Med Parasitol* 1974; **68**: 157-65.
13. Grantham-McGregor S. Studies in behaviour and malnutrition in Jamaica. *Tran Roy Soc Trop Med Hyg* 1988; **82**: 7-9.
14. Bax MCO, Whitmore K. Neurodevelopmental screening in the school entrant medical examination. *Lancet* 1973; **2**: 368-70.
15. Fowler GM, Cross AW. Preschool risk factors as predictors of early school performance. *J Dev Behav Pediatr* 1986; **7**: 237-41.