

**SCREENING TEST BATTERY  
FOR ASSESSMENT OF  
PSYCHOSOCIAL DEVELOP-  
MENT**

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**ABSTRACT**

*A multicentric cross-sectional collaborative study was undertaken in 3 centres in India with the main aim of developing simple and reliable indicators for the early detection of developmental disabilities in children under 6 years of age and to compare the age of attainment of developmental milestones in children in the three regions. The study provided a simple low-cost and culture-appropriate psychosocial developmental screening test battery which can be used with ease by trained public health grass-roots functionaries. This instrument was standardized on a large rural, tribal and urban sample comprising more than 13,000 children from 3 regions in India. The procedure for sampling, selection of items and methodology for standardization of the instrument in the Hyderabad region detailed in this paper were replicated in other centres as well. Quality control of data was ensured through inter-rater and test-retest measures of reliability. During pre-testing, 66 culture-appropriate*

Growth and development of children forms a major area of research in almost all parts of the developed as well as the developing world. There is a general consensus that one of the priority needs is to develop and standardize ecologically sensitive tools of measurement and to encourage their use by research scholars. About a decade ago, the WHO conducted a meeting (WHO, Geneva, 1983) inviting participants from various parts of the world to initiate the development of culturally appropriate standardized technology for the measurement of growth and development especially for the developing countries.

In India, attempts have been made in the past to establish developmental norms for Indian preschool children. The study by Phatak and Mukul (unpublished report, 1986) examined a large number of children between 1 to 30 months using an adapta-

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*milestones were selected finally from a larger item pool. The 50th centile age reference values of the Hyderabad study children and those obtained by other 2 centres were comparable.*

**Key words:** *Psychosocial development, Early detection, culture appropriate indicators, Public health functionaries.*

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tion of the Bayley scales. The report of their study does not give details of the sampling techniques used, but the fact that there was a boy/girls ratio of 3:2 in the urban group suggests that the selection of the sample was not completely random. Other workers have conducted similar studies in children using an adaptation of the Gesell Developmental Schedule(1,2). However, their results were presented in broad age ranges and were, therefore, less valuable than they' would have been had centiles been constructed. There is a need to develop a culturally valid test that would cover the entire range from 0-6 years based on a large representative sample in order to yield accurate data on performance at the extreme ends of the centile range as well as the middle. In addition, the test should be simple so that they can be used with ease by health care workers at the community level.

A cross-sectional multicentric study was, therefore, initiated under the auspices of ICMR and WHO, to develop a simple screening test battery for assessment of psychosocial development of children. The study was carried out in an identical way in three centres situated at Chandigarh, Hyderabad and Jabalpur and coordinated by the National Institute of Nutrition, Hyderabad (NIN Technical Report, 1991). This paper presents details of the Hyderabad study and aims to compare the average age of attainment (50th centile) of test items obtained by Hyderabad rural children with the values obtained in the other two centres.

### Material and Methods

Two rural blocks around Hyderabad were randomly selected and consisted of 38 villages. Each block had one PHC and all the villages clustering around a sub-centre

were selected purposively. A total population of over 40,000 was covered and 3600 children were tested. *Table I* shows the distribution of children according to age and sex. Care was taken to test all available children between 0-6 years in each village.

### Pretesting and Item Analysis

Initially, an item-pool of about 90 milestones belonging to five major areas of psychosocial development, namely: Gross Motor, Vision and Fine Motor; Hearing, Language and Concept Development; Personal Skills and Social Skills were selected from protocol I provided by the WHO(3). Some items which were culture-specific and could be observed generally among children in the rural areas, for example, carrying wooden block or sticks on head, getting up from squatting position, *etc.* were

TABLE I—Distribution of Study Children

Age (mo)	Male	Female	Total (%)
0-3	162	152	314 (8.3)
4-6	147	161	308 (8.1)
7-9	169	135	304 (8.0)
10-12	153	144	297 (7.9)
13-18	182	160	342 (9.0)
19-24	159	155	314 (8.3)
25-30	163	154	317 (8.4)
31-36	176	141	317 (8.4)
37-42	147	146	293 (7.7)
43-48	153	149	302 (8.0)
49-60	169	199	368 (9.7)
61-72	162	143	305 (8.1)
Total	1942	1839	3781
%	51.4	48.6	100.0

added to these. A pilot study was conducted by the psychologists and field assistants on 200 rural children in order to pretest these 100 preliminary set of items. The items were analyzed in terms of their applicability to the rural children. Based on the results of the pilot study, items were either modified, retained as such if suitable or dropped if unsuitable. Content validity and internal consistency of the selected items was established. The following criteria were used for the selection of the items:

1. Simple, low-cost items which can be incorporated into the primary health care system.
2. Items which could measure those abilities which are relevant in the context of the cultural expectations of social competence in the area.
3. Items which could measure observable behavior with a clear "pass" or "fail" score for the ability or skill being measured.

A list of 66 items were finally selected constituting the psychosocial developmental screening battery used" for testing the study children.

#### ***Personnel and Training***

Since the main emphasis was on incorporating the screening test battery as part of the primary health care (PHC) activities eventually, the personnel selected for testing children essentially resembled community health workers (CHWs) with regard to age, educational qualifications and habitat. Groups of seven to ten unemployed individuals residing in each selected village with minimum education upto 7th standard were thus selected as CHWs. They were trained in testing children's psychosocial development. The training procedure

included two theory classes on principles of child development and method of assessment. Two weeks were devoted to practical training in the rural areas consisting of demonstration on how to administer and score each of the items (milestones) in the test battery and making the CHWs administer the items to the children and score them based on children passing or failing a milestone. Approximately 7 to 8 individuals were efficient after training each time in each study village. Whenever a group of trained CHWs of one village were willing to collect data from other nearby villages, their services were utilized. In total about 6 groups of 7 to 8 CHWs were trained to collect data on 3600 children spread over 40 selected villages about 50 kilometers from Hyderabad city. Inter-tester reliability coefficients were calculated between the supervising psychologists and the CHWs periodically during the training period. The coefficients ranged from 95 to 98% for the selected CHWs. CHWs found to be poor as testers were dropped. The selected CHWs were also trained in the assessment of age using a local events calendar prior to the actual data collection for the study. Children between 0-6 years were tested in their own homes and their age was assessed using a local events calendar in the absence of birth certificates. The same procedure was followed in all the selected villages. Retest reliability coefficients were calculated on 1% children retested during surprise visits by the psychologists as a measure of quality control. The coefficients ranged from 95 to 99%. Not more than one week gap was allowed between the test-retest. Data were collected under the supervision of the research team and problems encountered normally- such as leave of absence from duty, *etc.*, were overcome without compromising on the quality of the data. The

statistician from the National Institute of Nutrition, Hyderabad, was trained at WHO, Geneva in the use of computer software(4) for analyzing developmental data in order to construct age centile reference values.

#### ***Analysis and Standardization of the Test Items***

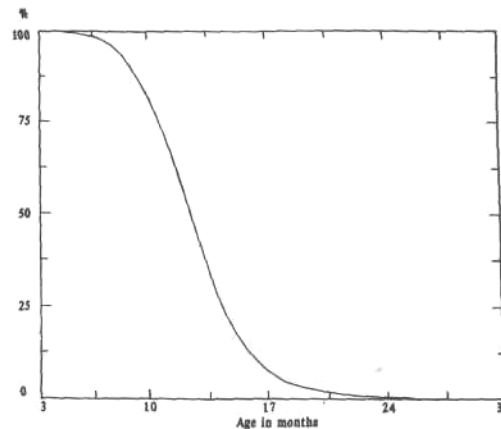
As a part of the standardization procedure, item difficulty level of each of the 66 items was measured by calculating the percentage of children in an age-group who could pass that item. Point biserial correlation was used to determine the extent to which an item could discriminate between children in an age-group.

Using the software developed by WHO(4), the data were analyzed by examining the records of 3,600 children based on their performance on 66 milestones constituting the screening battery. Centiles from the 3rd to the 97th were calculated by using the procedure whereby the first fifty records of the youngest sample children were selected and a note made of children who had not achieved a milestone. The percentage of such children was plotted at the oldest age in the class-interval. Similarly, all the records were analyzed selecting fifty records at a time. This is the description of the type of analysis which is done by the computer software package used. Based on this, curves were obtained for each of the 66 milestones of children not achieving the milestones. These curves were used to read off the age centiles of children's attainment of milestones at 3rd, 5th, 25th, 50th, 75th, 95th and 97th levels. This method of analysis demonstrates simple ways of constructing reference values (for *e.g.*, *Fig. 1* shows age and percent of children not achieving the milestone "stands alone").

#### **Results**

The age of attainment (months) of the sample children under the 7 centile levels for each of the 66 milestones included for study were noted down (*Table II*).

The age of attainment of a milestone at the 50th centile (*Table II*) was used for age-placement of that item. In other words, the age at the 50th centile is the average age at which a child can pass that item. The 50th centile ages of attainment of children in the Hyderabad centre were compared with the 50th centile values of children studied in Chandigarh and Jabalpur. Comparing the values in *Table III* shows that on the whole, the 50th centiles of the three centres compare well on most of the milestones. In a recent study in Jabalpur(5), the authors used the WHO protocol I to study culture appropriate indicators of psychosocial development and presented their results on age centile values for a few milestones. Comparison of these values (*Table III*) indicated that although this study was conducted independent of the WHO-



*Fig. 1. Plotted curve for obtaining centile age values for psychosocial developmental milestones. The milestone referred to here is 'Stands Alone.'*

TABLE II-Age Gentile Values (mo)

	3rd	5th	25th	50th	75th	95th	97th
<i>I. Gross Motor</i>							
Lifts head when on stomach	1.8	2.1	3.1	3.7	4.6	5.9	6.5
No head lag in sitting position	1.9	2.2	3.1	3.8	4.7	5.9	6.5
Sits alone	4.2	4.5	5.8	6.6	7.7	9.4	10.0
Crawls'	4.1	4.4	5.6	6.4	7.3	9.0	9.7
Stands alone	6.1	6.9	9.8	11.8	14.1	19.0	-
Stands on one foot with help	11.7	12.6	16.2	18.9	23.0	-	-
Hops on one foot	-	30.1	42.2	49.9	58.0	-	-
Walks backwards	-	12.5	19.2	24.1	30.7	-	-
Came wooden block on head and walks 5 steps	-	-	27.0	35.2	44.6	-	-
Gets up from squatting position without help	-	-	19.2	25.3	33.4	-	-
<i>II. Vision and Fine Motor</i>							
Regards objects	-	-	0.1	0.6	2.0	2.1	-
Sustained attention	-	-	1.2	1.8	2.6	4.0	4.6
Reaches for objects	1.4	2.0	3.4	4.4	5.3	6.8	7.0
Grasps objects	2.0	2.2	3.4	4.2	5.0	6.9	7.6
Picks up cube/pebble	3.1	3.5	5.2	6.3	7.6	10.5	11.7
Attempts imitation of scribble	7.6	8.3	11.2	13.1	15.6	-	-
Puts 3 or more cubes/pebbles into cup	9.8	10.4	12.9	14.7	17.0	-	-
Draws straight line in imitation	15.3	16.4	20.8	24.2	29.5	-	-
Draws circle in imitation	-	21.3	31.5	39.3	49.9	-	-
Draws square in imitation	-	-	49.7	60.4	-	-	-
Draws diamond in imitation	-	-	-	-	-	-	-
Movement of thumb	-	-	-	36.7	52.8	-	-
Can close one eye lid	-	-	-	43.1	57.3	-	-
Threads one bead with nylon wire	-	12.0	17.1	20.8	25.2	41.0	-
Makes ball from dough or clay	-	-	24.9	32.0	42.4	-	-
Thumb and finger snap test	-	-	21.9	29.6	41.3	-	-
<i>III. Hearing, Language and Concept Development</i>							
Responds to sound	-	-	-	0.1	0.9	2.5	2.9
Manipulates bell	-	4.2	6.3	7.8	9.6	14.0	-

**TABLE II** (Contd.)

	3rd	5th	25th	50th	75th	95th	97th
Rings bell	-	-	7.7	9.9	12.6	-	-
Repeats a number or word	-	-	19.3	25.0	30.4	-	-
Says one word	11.3	12.0	14.9	17.3	21.1	-	-
Identified one object	-	-	13.5	18.6	23.6	31.0	33.7
Names one object	-	-	20.5	25.1	30.7	-	-
Enjoys looking at pictures	-	-	9.5	13.4	18.8	27.7	-
Points two parts of body	-	-	18.4	22.4	26.9	37.0	-
Says two words together	-	-	23.4	30.4	37.6	-	-
Names three objects	-	-	22.6	27.5	33.6	-	-
Relates two objects	-	-	20.5	25.4	31.6	-	-
Points to 4 parts of body	-	-	-	24.4	30.2	-	-
Concept of big and little	-	-	26.2	33.3	43.3	-	-
Concept of heavy and light	-	-	-	35.4	44.0	60.8	66.3
Repeats 2 numbers	-	-	27.3	35.4	44.5	-	-
Recognizes 3 colors	-	-	50.1	63.0	-	-	-
Understands prepositions	-	-	23.0	29.4	36.9	-	-
Completes sentence	-	-	40.6	50.4	61.3	-	-
Understands money	-	-	18.5	23.3	28.5	39.1	-
Signs 2 lines of song/folklore	-	-	43.6	60.7	-	-	-
<i>IV. Self Help Skills</i>							
Feeds self in any way	3.7	4.3	6.3	7.6	8.9	11.3	12.0
Drinks from cup or glass	-	8.9	14.8	19.0	24.1	-	-
Feeds self appropriately	8.1	9.0	12.2	14.5	17.2	24.2	-
Bladder control during day	10.7	12.3	18.6	23.0	28.4	-	-
Bladder control during night	6.1	8.6	18.4	25.7	35.7	-	-
Bowel control during day	9.6	11.1	16.6	20.5	25.2	-	-
Bowel control during night	-	-	9.5	15.8	22.9	-	-
Cleans teeth	-	-	25.8	33.0	43.2	-	-
Washes hand	-	-	19.3	24.4	30.4	45.0	-
Washes face	-	-	21.2	26.7	33.3	-	-
Dresses self without help	-	32.9	44.6	55.9	-	-	-
Visits key places in villages	-	-	30.7	40.7	52.6	-	-

**TABLE II (Contd.)**

	3rd	5th	25th	50th	75th	95th	97th
<i>V. Social Skills</i>							
Smiles in response	-	-	-	1.7	2.7	4.2	4.8
Vocalizes in response	-	-	1.6	2.9	4.4	7.1	8.0
Awareness of strangers	-	-	6.7	9.4	12.7	-	-
Can tell his/her name	-	-	24.7	30.1	36.4	-	-
Can tell gender	-	-	31.2	38.5	47.9	-	-
Plays with other children	-	-	15.5	20.4	26.3	-	-
Rules of games understood	-	33.3	47.0	62.4	-	-	-

**TABLE III-Comparison of the 50th Centile in the Three Collaborating Centres**

Psychosocial development items	50th centile		
	Chandigarh (Rural)	Jabalpur (Tribal)	Hyderabad (Rural)
<i>I. Gross Motor</i>			
1. Lifts head when on stomach	2.0	1.4	3.7
2. No head lag in sitting position	2.5	3.5	3.8
3. Sits alone	5.8	5.6	6.6
4. Crawls	7.6	6.9	6.4
5. Stands alone	12.3	11.1	(11.8)*
6. Stands on one foot with help	16.8	25.6	18.9
7. Hops on one foot	50.2	38.4	49.9
8. Walks backwards	21.8	26.3	24.1
9. Carries wooden block on head and walks 5 steps	47.2	51.0	35.2
10. Gets up from squatting position without help	15.2	32.4	25.3
<i>II. Vision and Fine Motor</i>			
11. Regards objects momentarily	0.0	1.7	(1.1)*
12. Sustained attention of objects	0.8	3.5	(2.0)*

TABLE III(Contd.)

Psychosocial development items	50th centile			Hyderabad (Rural)
	Chandigarh (Rural)	Jabalpur (Tribal)		
13. Reaches for objects	4.2	5.0	(5.1)*	4.4
14. Grasps objects	4.3	5.6		4.2
15. Picks up cube/pebble	5.5	8.3		6.3
16. Attempts imitation of scribble	12.5	18.9		13.1
17. Puts 3 or more cubes/pebbles into cup	13.2	15.5	(17.2)*	14.7
18. Draws straight line in imitation	30.2	27.4	(28.0)*	24.2
19. Draws circle in imitation	43.4	36.1	(41.4)*	39.3
20. Draws square in imitation	54.8	57.6	(54.0)*	60.4
21. Draws diamond in imitation	-	-		-
22. Movement of thumb	31.6	36.7		36.7
23. Can close one eye lid	62.3	60.1		43.1
24. Threads one bead with nylon wire	21.8	35.3		20.8
25. Makes ball from dough or clay	40.5	27.2		32.0
26. Thumb and finger snap test	43.8	24.7		29.6
<i>III. Hearing, Language and Concept Development</i>				
27. Responds to sound	0.0	1.5		0.1
28. Manipulates bell	4.9	5.2	(6.4)*	7.8
29. Rings bell	7.5	6.8	(9.1)*	9.9
30. Repeats a number or word	20.5	10.2	(11.2)*	25.0
31. Says one word	16.0	12.2	(11.6)*	17.3
32. Identified one object	17.6	13.2		18.6
33. Names one object	22.1	20.5		25.1
34. Enjoys looking at pictures	7.8	9.8		13.4
35. Points two parts of body	19.8	20.6		22.4
36. Says two words together	23.8	24.3		30.4
37. Names three objects	24.2	28.2		27.5
38. Relates two objects	24.9	41.7	(42.9)*	25.4
39. Points to 4 parts of body	21.9	25.3		24.4
40. Concept of big and little	33.9	36.0	(49.9)*	33.3



TABLE III (Contd.)

Psychosocial development items	50th centile		
	Chandigarh (Rural)	Jabalpur (Tribal)	Hyderabad (Rural)
41. Concept of heavy and light	35.5	40.9	(59.6)* 35.4
42. Repeats 2 numbers	35.3	34.1	35.4
43. Recognizes 3 colors	69.4	58.6	63.0
44. Understands prepositions	25.8	31.3	29.4
45. Completes sentence	46.5	52.3	(68.7)* 50.4
46. Understands money	22.5	29.2	23.3
47. Signs 2 lines of song/folklore	53.4	45.1	60.1
<i>IV. Self Help Skills</i>			
48. Feeds self in any way	8.1	7.2	7.6
49. Drinks from cup or glass	25.8	34.3	19.0
50. Feeds self appropriately	14.1	19.6	14.5
51. Bladder control during day	21.0	21.5	(20.8)* 23.0
52. Bladder control during night	30.4	36.1	25.7
53. Bowel control during day	18.3	20.7	20.5
54. Bowel control during night	16.6	22.2	15.8
55. Cleans teeth	30.5	35.4	33.0
56. Washes hand	27.7	28.1	24.4
57. Washes face	28.8	30.1	26.7
58. Dresses self without help	53.2	54.4	55.9
59. Visits key places in villages	26.8	42.3	40.7
<i>V. Social Skills</i>			
60. Smiles in response	1.5	2.7	1.7
61. Vocalizes in response	2.2	5.1	2.9
62. Awareness of strangers	6.4	14.9	9.4
63. Can tell his/her name	30.4	32.8	(36.0)* 30.1
64. Can tell gender	34.5	44.6	38.5
65. Plays with other children	13.0	23.6	20.4
66. Rules of games understood	41.2	60.8	62.4

\* 50th centile age values obtained by Dixit *et al.*(7). 1992.

ICMR collaborative study and employed different methods for data analysis, their 50th centile values were close to the values obtained by the collaborative study (Jabalpur tribal centre values). This finding ensures the validity of the age reference values established for the milestones in the present collaborative study.

### Discussion

The final set of 66 items selected from the pool of 100 items after pilot testing were culturally appropriate, simple and easy to be administered by the village level workers. The items could also discriminate between the children in terms of their developmental level. One item which all the study children consistently failed to attain even by 6 years of age was "draws a diamond in imitation". The software (Grostat) provided by WHO(4) was extremely useful in calculation of centiles in terms of age of attainment. These centiles are useful as reference values for comparing children at the community level.

Results obtained in the Hyderabad centre on rural children were sufficiently similar to those found in the rural areas in Chandigarh and tribal areas in Jabalpur (*Table III*) to allow the pooling of data and the creation of a scale now known as the ICMR Developmental Screening Scale for Indian Rural Children.

The pool of items derived in this study can be used in a number of ways in future studies. The first is to select a small number of critical developmental milestones for inclusion in a home-based record/card along side the growth curves (a prototype has been designed at NIN, Hyderabad). This card however, will be pretested on a new sample. A second use is to employ some or all the items as a screening test to detect children

at the community level who are developmentally delayed or in other words developmentally deviant compared to the reference values constructed in this study. There has been severe criticism of indiscriminate screening in recent years(6). However, experience in Baroda(7) using a screening test derived from an earlier study(8) suggests that screening can be of value in the early detection of developmental delay.

A third way of using the scale is for evaluation of intervention studies. This was attempted in a study of preschool ICDS beneficiaries exposed to non-formal education (Annual Report, NIN, 1990).

Finally, the complete battery of items could be used at a second referral level, for example, in health centres when delayed development in a child is suspected through use of crude methods. Care should be taken however, not to inflate the use of the battery at this referral level since it is no more than an intermediary between preliminary level detection and sophisticated multidisciplinary assessment which is required for diagnostic purposes.

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