

The Suez Canal University Neurodevelopmental Scale (SCUNDS) for Assessment of Infant and Children from 0-36 months

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To study the neurodevelopmental profile of Egyptian infants and children in the community of Suez Canal Area, 1600 infant and children aged from 0 to 36 months were randomly selected from different districts of Port-Said city and examined physically to assess their neurodevelopmental milestones.

A comprehensive neurodevelopmental items of 140 valid and reliable screening steps distributed over 5 major neurodevelopmental sectors derived from three well-known standardized screening instruments and tools, which were adapted and modified to suit the Egyptian culture were tested and used to screen infants and children. The screening items were administered by a well trained investigator and a test-retest reliability study suggest the internal consistency of the used instruments.

Results were expressed and tabulated in percentiles and figures 25th, 50th, 75th, and 90th of the sample to provide the normal distribution for easy use and practical application.

In addition, our results revealed that the neurodevelopmental screening instrument (SCUNDS) derived could be useful in research, training, and detection of neurodevelopmental progress and / or delay. The implication of our results are discussed.

(Egypt.J. Psychiat.,1997, 20: 151- 166).

Introduction

Traditionally, individual development has been studied by evaluation of gross motor, fine motor, and reflex patterns, by study of language and communication skills, and by evaluation of adaptive and social relationship. Each of these functional areas normally develops in a lawful and consistent process. Methodologically, the investigation and evaluation of these functional areas had proceeded in two lines: the pediatric classical medical approach with clinical examination following history taking

and the psychological study of the mental development / functioning in the form of skills of motor coordination, language, and adaptive behavior with the development of norms for each of the skills at varying ages, and the standardization of administration and scoring (Gesell and Amatruda 1941)

Bridging the medical and psychological models are the developmental schedules which describe the development in functional areas from age four weeks to three years, for example Gesell Developmental Test (Cory and Nessa 1993). Pediatric - neurological examination, standardized intelligence tests, and developmental tests each require highly trained medical and psychological personnel for their administration and interpretation, and demand more time for administration than can be especially in large - scale programs.

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Because many of these inventories and scales in general suffer from serious problems among which their cultural bias and the danger of using test norms based on samples not representative of the children screened, there appear to be a great need for a developmental screening instrument based on samples surveyed in Egypt and from local community. Currently, there is a lack of neurodevelopmental scales that are derived from samples of Egyptian infants and children, such scales are extremely important for training of child care providers, treatment, and follow up as well as for child research. However, Denver Developmental Screening Test has been one of the most commonly used scales for neurodevelopmental assessment (Shafie, 1988, Abdel Fattah, 1990, El-Salamony 1990, and Kamel et al, 1990). For that reason, this study was launched to develop a neurodevelopmental scale based on the profile of the neurodevelopmental milestones of a large community representative sample of Egyptian infants and children in a chronological pattern from birth to 36 months of age.

Subjects and Methods

1600 healthy infants and children aged from birth up to 36 weeks were recruited by cluster random sampling from the five major districts of Port - Said city (Shark, Arab, Manakh, Dawahy and Port -fouad) in the period from March 1992 to February, 1994. Infants and children were assessed by a neurodevelopmental instrument derived and constructed from the following tests:

a) **Denver Developmental Screening Test (DDST)** is the most widely developmental screening instrument employed by pediatricians and related health professionals in the United States. It was developed to provide an easily administered, reliable and rapid method for routine developmental screening (Frank

and Deock 1991). The DDST screens children 2 weeks through 6 years of age in the areas of language, personal social, fine motor-adaptive and gross-motor skills. Pass- fail questionable scores are produced for each of the four subscales and for the test as a whole. Items rely on a direct elicitation, observation and parent interview and take approximately 20 to 25 minutes to administer and score. Standardization is limited to children in the Denever area and interrater and test-retest reliability is not thoroughly assessed. Validity studies conducted by researchers other than the author are not included in the manual, because the DDST is one of the first and consequently by most researched screening instruments, such studies exist in abundance in the pediatric literature. Many suggest that the DDST fails to detect an unacceptably large number of children with handicapping conditions (Frances et al., 1990). Also, studies reporting the low sensitivity of the DDST provides systematic evidence that large number of children who are at risk for development problems are overlooked, and therefore, do not receive appropriate diagnostic and intervention services.

b) **Boyd Developmental Progress Scale**, this easily administered scale tests behavior in three areas of motor, communication and self-sufficiency skills from birth through the seventh year. The scale focuses on the adaptive aspects of behavior in each of the three test areas so that its data can be immediately useful in rehabilitation planning and training.

c) **Gesell Developmental Schedule.**

The Gesell Developmental Schedules (Gesell, 1940 & Gesell et al., 1949), are probably the most famous of the developmental progress scales. They cover the age range from four weeks to six years. No score or overall value is

computed. Rather the child's developmental level can be compared with normative data for the many age levels reported in each of four areas of behavior; motor, language, adaptive and personal social (Muriel et al., 1989).

The following aspects of development were assessed:

1- Gross motor: that is the child's ability to sit, walk and jump.

2- Fine- motor adaptive: that is the child's ability to see and to use his hands to pick up objects and to draw.

3- Language: that is the child's ability to learn, carry out commands and to speak.

4- Cognitive: by which a child accumulates organizes knowledge to solve problems and modifies behavior.

5- Personal social: that indicate the child's ability to get along with people and take care of himself.

Items were grouped under the following sectors.

I- Gross - motor development (27 items).

II- Fine - motor adaptive development (23 items).

III- Language development (25 items).

IV- Cognitive development (20 items).

V- Personal social development (43 items).

The items were cultured for-and modified to suit the Egyptian community, for example, some items were excluded such as using the fork and knife in eating and riding on bicycle which were seldomly seen with average Egyptian child skills in the population surveyed. A pilot study was done on about 200 infant and children before carrying out screening to test the suitability and

applicability of the instruments. The test retest and inter rater reliability ranged between 0.64 and 0.85 which was accepted. The instruments were developed tested and validated by the panel of supervisors including a senior pediatrician, a child development and behavior specialist, a child psychiatrist to make sure that the selected items cover the whole range of developmental assessment and are representative of the different aspects of the child's skills.

The number of items tested varied with the age of the child tested. The assessment procedures started with test levels below that expected from the chronological age of the child and works up to his age, continuing to test upward until she fails in more than one item in the level being assessed. The trained investigator started the assessment by using items for personal social sectors, the fine motor, language, cognitive and lastly the gross motor skills were assessed after the child has a chance to be familiar with examiner and get used to the situation. A shy child was more likely to do the fine motor adaptive items before the language. For some children the gross motor items were given at the end of the test since some children were shy and inhibited at the beginning of the procedures, however, many enjoyed doing the hopping, jumping, throwing the ball and other gross motor activities, so much that they were not willing to sit down to do items in the other sectors. When a child refuses to carry out item instructions, the mother was asked to administer the test item and explaining it to him/ her. Each child was allowed three trials to perform the item before considering it a failure (f).

At the end of the test, the investigator always check with the mother if the child's performance on the test was typical of his normal activities at other

times, no ill, or tired upset child was tested. The material of the test utilized included: 1- Raisins , 2- Toys as dolls, cat, dog, bell., 3- Eight, 1 inch, squares, colored cubes (red, blue, yellow, green), 4- Crayon and paper, 5- Pegboard 20 X 40 cm, 6- Card board 20 x 35 cm, 7- Covered small square box., 8- Form board of different forms as square, triangle, 9- Pencil, 10- small scissors, 11- Bottle and Small pieces of candies, 12- Model toys of car, bottle, cat, dog, chair, 13- Different geometric figures of squares, triangles, stars, and circles.

Testing was done during home visits after obtaining family consent and within the context of a structured interview to obtain data on the family and perinatal and developmental history. Infants and children with gross developmental deficits, prematurity or physical retardation or abnormalities were excluded from the study. Infants and children were sampled and assessed according to the chronologic age distribution as follow:

a- Three months interval for ages between 0 - 18 months.

b- Six months interval for ages between 18 - 24 months.

c- Three months interval for ages 24 - 30 months.

d- Six months interval for ages 30 - 36 months.

Results

Of the 1600 infants and children neurodevelopmentally screened, 793 (49.4%) were boys and 807 (50.6%) were girls, the majority of them ($n = 1405$) were at home with their mothers while only 195 were attending daycare centers. Table (1) shows the geographical distribution of the sample, table (2) shows the means ($\pm$ SD), range and number of infants and children by age group, table (3) shows percentiles of personal social development (Figure I), (Appendix) table (4) shows percentiles of fine motor development (Figure II), (Appendix) table (5) shows percentiles of cognitive development (Figure III), (Appendix) table (6) shows percentiles of language development (Figure IV) (Appendix) and table (7) shows percentiles of gross motor development (Figure V) (Appendix).

Table (1)
Distribution of Infants and Children
According to the Geographic Area*

Geographic Area(distaste)	No. of Population	Infants & Children < 3 years	
		N	%
Alshark	39136	2260	5.7%
Arab	84640	2993	3.5%
Manakh	172087	3472	2%
Port-Fouad	33612	3014	4.3%
Dawahy	69683	3125	4.4%

* Figures were obtained from the central Agency of population and statistics in port-said, 1992.

Table (2)
Number, Range, Mean and Standard
Deviation by Age Groups

Age group (months)	Range in days	Mean (+S.D.) in months	No. of infants and children
0 - <3 Mo.	0-82 days	2.5 (± 1.3) Mo	240
3 - <6 Mo.	98-165 days	4.3 (± 1.2) Mo	240
6 - <9 Mo.	181-250 days	7.3 (± 0.9) Mo	240
9 - <12 Mo.	285-265 days	10.2 (± 1.5) Mo	240
12 - <15 Mo.	375-445 days	13.8 (± 0.6) Mo	240
15 - <18 Mo.	470-535 days	16.2 (± 1.4) Mo	80
18 - <24 Mo.	630-720 days	22.1 (± 2.2) Mo	160
24 - <27 Mo.	725-800 days	25.1 (± 1.3) Mo	40
27 - <30 Mo.	820-890 days	28.3 (± 0.9) Mo	40
30 - <36 Mo.	991-1170 days	33.2 (± 2.1) Mo	80
Total Number			1600

Table (3)
Age (in months) at which Neurodevelopmental Items of
Personal Social Skills are Achieved: Expressed by 25 th, 50 th, 75 th & 90 th Centiles

Items	25 th	50 th	75 th	90 th
1- Regard face	0.9	1.00	1.1	1.20
2- Quits when picked up	1.4	1.95	2.5	2.83
3- Smiles responsively*	1.4	1.95	2.2	2.83
4- Cries when left alone	4.9	5.1	6.3	7.80
5- Initially shy with stranger	4.1	4.61	5.3	5.48
6- Reaches to familiar people	4.2	4.75	5.3	5.63
7- Likes physical play	3.9	4.55	5.2	5.59
8- Smiles spontaneously*	2.1	3.55	4.2	5.59
9- Smiles in mirror*	4.2	4.8	5.4	5.76
10- Watches adult walk	3.9	4.55	5.2	5.59
11- Swallows pirred food	4.0	4.6	5.2	5.56
12- Sads for toy removal	6.9	7.5	8.1	8.46
13- Touches mirror image	7.1	7.6	8.1	8.40
14- Closes lips on spoon	6.7	7.4	8.1	8.52
15- Drinks from cup with help*	6.7	7.4	8.1	8.82
16- Begins pick up spoon	7.2	7.8	8.4	8.76
17- Holds bottle to drink	7.2	7.8	8.4	
18- Discomforts when separate from mother	9.9	10.9	11.9	8.76
19- Repeats vocalization when laughed at	9.9	10.9	11.9	12.3
20- Feeds small pieces of food*	9.9	10.9	11.9	12.5
21- Ceases of drooling	9.9	10.9	11.9	12.5
22- Plays ball with examiner	13.6	14.35	15.1	12.5
23- Uses spoon, spilling a little	13.8	14.5	15.2	15.55
24- Drinks from cup	13.6	14.35	15.1	18.62
25- Chewing well	13.7	14.35	15.1	15.55
26- Remain dry for 1-2hrs*	13.7	14.4	15.1	15.52
27- Drinks without help	17.4	18.1	18.8	15.52
28- Eats by spoon alone	16.8	17.75	18.7	19.27
29- Toilet training	17.5	18.3	19.1	19.58
30- Regulates bowel movement	17.3	18.2	19.1	19.64
31 - Plays near children sometime	21.1	22.15	23.2	23.83
32- Cries with blocking activity	21.1	22.15	23.2	23.83
33- Picks up and puts toys on request	21.1	22.25	23.3	23.93
34- Undresses except for fastening	21.2	22.2	23.3	23.80
35- Attempts to put shoe on	21.1	22.15	23.2	23.83
36- Uses words to indicate need to toilet	24.5	25.75	27.0	27.75
37- Seldom has bowel accident	24.5	25.75	27.0	27.75
38- Cooperates in dressing	24.5	25.75	27.0	27.75
39- Attempts to brush hair	24.5	25.75	27.0	27.75
40- Puts on simple clothes	24.5	25.95	27.4	28.27
41- Washes and dries hand with help	24.5	25.85	27.2	28.01
42- Dries hands alone	33.5	34.90	36.3	37.14
43- Puts on dress except for buttoning	33.5	34.9	36.3	37.14

* Items pass by maternal report

Table (4)
Age (by months) at which Pass Items of Fine Motor Skills are
Achieved: Expressed by 25 th, 50 th, 75 th & 90 th, Centiles

Items	25 th	50 th	75 th	90 th
1- Follows moving objects*	1.1	1.21	1.26	1.46
2- Reaches for toy rattle or touch it*	2.2	3.10	4.6	5.46
3- Moves head to follow objects*	2.8	3.5	3.84	4.12
4- Moves to touch object	3.2	3.75	5.3	5.63
5- Transfers toy from hand to hand	4.5	5.0	5.5	6.87
6- holds 2 cubes in hands	6.8	7.45	8.1	8.49
7- Shakes rattle	6.7	7.4	8.1	8.52
8- Pulls one peg out of peg board	7.1	7.65	8.2	8.53
9- Scribbles spontaneously	13	13.9	16.4	26.0
10- Holds crayon*	12.2	13.15	14.1	18.67
11- Turns page of cardboard book	17.8	18.5	20.1	20.55
12- Removes cover from small box	13.7	14.4	15.1	15.52
13- Places one or two pegs in pegboard	13.7	14.4	15.1	15.52
14- Tower of 2 cubes	13.7	14.4	15.3	18.2
15- Places six pegs in pegboard without help	16.8	17.8	18.8	19.4
16- Tower of 3 cubes	17.4	18.1	18.8	19.28
17- Makes vertical and circular scribble after demo.	21.4	22.4	23.4	24.0
18- Completes three pieces formboard	21.2	22.3	23.4	2.06
19- Draw vertical & horizontal scribble imitatively	24.5	25.7	26.9	27.62
20- Aligns two or more cubes for train	24.5	25.7	26.9	27.62
21- Tower of 6 cubes	28.7	29.65	30.6	31.17
22- Copies circle	27.7	30.1	32.5	37.34
23- Cuts with scissors*	34.6	35.25	36.5	37.25

* Items pass by maternal report

Table (5)
Age (by months) at which Pass Items of Cognitive Skills
are Achieved: Expressed by 25th, 50th, 75th & 90th Centiles

Items	25th	50th	75th	90th
1- Looks to light*	0.9	1.5	2.1	2.46
2- Demonstrates vocal contagion*	3.9	4.55	5.2	5.59
3- Repeats random movements*	4.4	4.9	5.4	5.70
4- Watches places where object disappeared*	4.1	4.65	5.2	5.53
5- Attains partially hidden object*	7.1	7.65	8.2	8.53
6- Looks to the floor when object falls*	6.7	7.4	8.1	8.52
7- Uncover face*	6.7	7.4	8.1	8.52
8- Attains completely hidden object*	10.0	10.95	11.9	12.47
9- Rotates bottle to drink*	10.0	10.95	11.9	12.47
10- Finds toys hidden under several covers*	13.7	14.4	15.1	15.52
11- Lifts 2 cm cub and pincer grasp	13.6	14.3	15.0	15.42
12- Inverts a vial to gain raisin	13.6	14.45	15.1	15.55
13- Uses stick to attain an object*	16.8	17.75	18.7	19.27
14- Indicates knowledge of cause - effect relation*	21.4	22.4	23.4	24.00
15- Imitates sounds without practicing*	21.4	22.35	23.3	23.87
16- Matches colored clocks (red-yellow-blue - green)	24.5	25.85	27.2	28.01
17- Repeats two digits	28.8	30.4	33.5	36.20
18- Identifies objects by their use	33.5	34.9	36.3	37.14
19- Identify the function of objects	33.5	34.9	36.3	37.14
20- Matches four shapes (star-square-cross-circle)	33.7	35.1	36.5	37.34

* Items pass by maternal report

Table (6)
Age (by months) at which Pass Items of Language Skills are
Achieved: Expressed by 25th, 50th, 75th, & 90th Centiles

Items	25 th	50 th	75 th	90 th
1- Respond to bell*	1.0	1.2	1.4	1.49
2- Vocalizes when talked to or sung to*	1.9	2.55	2.8	3.59
3- Turns to voice*	3.8	4.5	5.2	6.22
4- Exhibits differentiated crying*	4.3	4.85	5.4	5.73
5- Laughs out loud*	3.9	4.55	4.82	5.39
6- Imitates speech sound*	7.1	7.75	8.1	8.33
7- Ba-Ba or Ma Ma non-specific*	7.2	7.75	8.3	8.63
8- Waves when only verbal cue is given*	9.9	10.9	11.9	12.5
9- Inhibits activity response to no*	10.0	11.0	12.0	12.6
10- Imitates words inexactly	13.6	14.35	15.1	15.55
11- Imitates sound and words spontaneously*	18.3	18.8	19.3	19.60
12- Points to 1 named body part	17.4	18.1	19.8	21.22
13- Labels one object	17.0	17.85	18.7	19.21
14- Names 1 picture	17.4	18.1	18.8	21.22
15- Says the name of 3 common objects	17.4	18.25	19.1	19.61
16- Using simple two-word sentences	21.9	22.3	23.2	23.79
17- Gives first name	24.5	25.85	27.2	28.01
18- Uses three-word sentences	24.4	25.65	26.9	27.65
19- Uses negation, NO*	24.5	25.75	27.0	27.75
20- Uses simple pronouns (I, me, you)*	24.5	25.75	27.0	27.75
21- Comprehensive prepositions	28.7	29.75	30.8	31.43
22- Understands body part function	29.8	31.7	33.6	36.14
23- Uses plurals	33.8	35.15	36.5	37.31
24- Gives first and last name	33.5	34.9	36.3	37.14
25- Forms question using a verb	33.7	35.1	36.5	37.34
26- Follows two-step commands	33.5	34.9	36.3	37.14

* Items pass by maternal report

Table (7)
Age (by months) at which Pass Items of Gross Motor are
Achieved: Expressed by 25th, 50th, 75th, & 90th Centiles

Items	25 th	50 th	75 th	90 th
1-Prone, lifts head*	1.7	0.78	0.88	0.99
2- Prone, head up to 45 C*	1.6	2.05	2.5	2.77
3- Supine: Kicks feet alternately*	1.5	1.90	2.1	2.40
4- Prone, head up to 90 with forearm supported*	1.8	2.4	2.9	3.60
5- Prone, rolls to supine*	4.3	4.8	5.3	5.60
6- Prone: rolls to supine*	6.9	7.55	8.2	8.59
7- Sits alone for at least 5 seconds*	5.1	5.82	6.2	6.80
8- Supine: rolls to prone*	7.1	7.65	8.2	8.53
9- Prone: Crawls*	7.4	7.9	8.4	8.70
10-Sits alone for 10 mon*	11.1	11.55	12.0	12.27
11- Pulls to standing furniture*	8.8	9.6	10.5	11.50
12- Walks with one hand hold*	10.3	11.2	12.1	12.64
13- Stands alone*	10.3	11.4	12.2	12.68
14- Walks by himself*	13.6	14.32	15.1	15.55
15- Walks well (stops-stands)*	13.7	14.4	15.1	15.52
16-Supine: raises self to standing*	13.7	14.4	15.1	15.52
17- Position independently run some steps*	17.0	17.85	18.7	19.2
18- Walks up stairs hold by one hand*	17.0	17.85	18.7	19.2
19- Seats self in small chair*	16.8	17.8	18.8	19.4
20-Balances on one foot with help*	17.9	18.6	19.3	19.72
21- Walks down stair with one hand holding*	21.1	22.15	23.2	23.93
22-Jumps in place*	21.2	22.25	23.2	23.93
23-Goes up and down stairs alone*	24.5	25.85	27.2	28.01
24-Walks on tip toes	18.9	19.2	22.1	24.4
25- Throws ball in a vertical pattern	18.9	19.2	22.1	24.4
26- Stands on one foot and balance	23.4	23.9	36.4	37.8
27- Runs quickly	23.5	23.9	24.3	24.6

* Items pass by maternal report

Discussion:

Developmental screening tests must meet a rigorous set of criteria to be considered effective. They must be brief, referenced to a norm, inexpensive, standardized in administration, objectively scored, broadly focused across all areas of performance, developmental in content, reliable and valid. All these criteria must be considered when selecting a developmental screening instrument as well as the test's sensitivity and specificity (Samuel and Meisels 1984). (Frankenburg et al., 1992). Our sample was large enough ($n=1600$) to generalize the findings and give confidence in the results. This is particularly true if we consider that in 1967, when the Denver study was published, it was based on a sample of over 1000 children (Ronald and Illigronths, 1989) and when Denver II was standardized in 1988 and 1989 it was based on screening of 2096 children (Frankenburg et al., 1992).

In Egypt, our children are at a great risk for developmental abnormalities for many reasons among which marital consanguinity and exposure to public health problems at early age such as gastroenteritis, dehydration, malnutrition, anemia and other environmental hazards (world Health Organization, 1990).

Among the implications for our findings is that the application of neurodevelopmental assessment should be obligatory by public laws to expand the role of child health care providers in early identification of delayed children, to nominate children at risk for developmental monitoring, and to determine program eligibility, i.e. percentage of delay relative to chronological age, age equivalents or cutoffs reflecting standard deviation from the mean (Glasco et al., 1990). In addition, studies surveying development in children in the Suez Canal area should use this derived scale to be

more realistic and not culturally biased rather than using unadapted screening instruments.

Future studies should extend the use and application of this instrument to local communities in upper Egypt, Lower Egypt, and Greater Cairo to test the applicability and reliability of SCUNDS.

Furthermore, routine use of the obtained instrument should be encouraged in medical undergraduate training, (El Defrawi, 1995, a) in studies of developmental delays in Egyptian children (El-Defrawi, 1995 b), and rehabilitation programs for risky and vulnerable children (El-Salamoni, 1995).

Although comparing the developmental profile drawn in our study with other similar scoring studies was not one of the objectives of our work, yet we felt that the following deserve notification:

As regard the motor milestones, it was found that there was no considerable delay as regards the studied sample compared to other studies using similar scoring system particularly DDST. The gross motor developmental milestones, especially during the first few months of life, were found to be in accordance with the known scoring systems this might be attributed to the fact that genetic and hereditary factors might affect these early gross developmental milestones than the environmental factors that affect more the fine motor skills that needs more training, care and adaptation. As regards the language there was no apparent delay, regards the milestones concerning the first three months of life but on the contrary there was progress relative to the DDST systems used for comparison. Those could be explained on hereditary and environmental basis as most of our studied sample were infants and children of housewives mothers who did not go to work within the first two or three months following delivery. This may be

has allowed more contact between their children and mothers leading to more training and help to the infant while entering the new world of speech.

Concerning the personal, social and cognitive developmental milestones, it was found that there were two periods in which the milestones were more or less in accordance with the compared scoring systems, DDST, these were in the first few months of the child's life and then later when he is in the age between one and half and three years. However, these observations and tendencies must be thoroughly studied, investigated and replicated.

Many cases of slow development are not discovered until children enter school. Since many causes of slow development can be treated if diagnosed early, it is important to find children with problems in development and behavior as early as possible (Robert and Summit, 1990). An assessment of neurodevelopmental status of infants and children should be a routine part of each clinical encounter, since developmental and behavioral problems are more common than any category of problems in pediatrics except acute infections and trauma (Behrman et al. 1992).

Because of the need for trained personnel and the time required for screening each child, one of the implications and recommendation should be, developing perhaps, a short version or summarized form of this screening scale and its use be verified in clinical and community surveys studies. In addition, it is possible to develop a prescreening questionnaire requiring the parent to answer age-appropriate developmental questions that could be adapted in a reduced form where it can be used by non professional similar to the Prescreening Developmental Questionnaire (PDQ) of Denver (Frankenberg 1975).

During the implementation of this study it came to our knowledge that the National Council for Maternity and childhood has started investigating and drawing a developmental profile for samples preschool Egyptian Children (2-6 years). Comparative studies should be carried out in the future comparing findings of similar tools and applying both to different subgroups.

References

- Abdel, Fattah, M. (1990) Growth and development in children aged 1-4 years in relation to family profile. PhD thesis (Unpublished) Institute of Post Graduate Childhood Studies. Ain Shams University.
- Behrman, R. E., Robert, M., Kliegman, N., Waido, E., and Victor, C. (1992) Nelson Textbook of Pediatrics, 14th ed. W. B. Saunders Co., Philadelphia, London.
- Coury, P. and Nessa, D.B. (1973). Memphis City School Screening, Board of Education Memphis, Tenn.
- Frankenberg, W.K. (1975) Denver Prescreening Developmental Questionnaire (PDQ) Department of Pediatrics, University of Colorado, Denver Colorado
- El-Salamoni, O. (1995) Promotion of Child Development through maternal and Child health Services. Paper Presented at the XXI International Congress of Pediatrics, 10-15 September. Cairo - Egypt.
- El-Defrawi, M.H. (1995b) Neurodevelopmental screening of Egyptian Infants and children Aged from 0-36 Months. Paper Presented at the XXI International Congress of Pediatrics 10-15 September. Cairo- Egypt.
- El-Defrawi, M.H. (1995a). Introducing Pediatric Psychiatry to the Medical Undergraduate. Paper Presented at the XXI International Congress of Pediatrics, 10-15 September. Cairo- Egypt.
- El-Salamony, O. K. (1990) Assessment of Development among Group of Children

- Aged 1-3 years. M. Sc. Thesis (Unpublished). Department of Public Health. Faculty of Medicine Cairo University
- Franke, P. and Deock, J. (1991) Developmental screening techniques for pediatricians. *Pediatrics*, 83 (8) : 8 - 12.
- Frances, P., Glascoe, P. H., El-Aine, D., and Steven, H. (1990) A comparative review of developmental screening test. *Pediatrics*, 86 (4) : 547 - 553.
- Frankenburg, K., Josiah, D., Philip, A., Shapiro, H., and Beverly, B. (1992). the Denver II: A Major Revision and Restandardization of the Denver Developmental Screening Test. *Pediatrics*, 89: 91-97.
- Gesell, A., and Amatruda C. (1941) Developmental Diagnosis Paul Hoeber, New York.
- Glasco, H., William, A., Altemeir, S., and Frances, P. (1990). The importance of parents concerns about their child's development. *J. Develop. Pediat.*, 18: 955-958.
- Kamle, L. M., Labih, N. A., and El-Salamony, O.K. (1990) Assessment of Denver's Developmental Screening Test as a Tool for Developmental Screening among a Group of Children Aged 1-3 years. *J. Arab Child*, 1 : 53 - 60
- Muriel, D. L. (1984) Child Developmental Scale. In : *Neuropsychological Assessment* (2nd. ed) Oxford University Press. New York.
- Robert, L. and Sumnit, S. (1990) Comprehensive Pediatrics. L Growth and Development. (ChapterII) The C. V. Mosby Co. St. Louis, Baltimore, Philadelphia, Toronto.
- Ronald, S., and Illingworth, T. (1989) Prenatal and Perinatal factors relevant to developmental assessment. In : *The development of the infant and young child*. English Language Book Society. Churchill Livingstone.
- Shafie, H. F. (1988) A longitudinal study for growth and development of Egyptian infants in the first year of life. Ph D Thesis (Unpublished). Institute of Post Graduate Childhood Studies. Ain Shames University.
- Samuel, J. and Meisels, D. (1989) Can developmental screening tests identify children who are developmentally at risk ? *Pediatrics*, 83: 578 - 585.
- World Health Organization (1990). Nutritional Anemia. Technical Report. Vol, 503: 35-41. World Health Organization, Geneva.

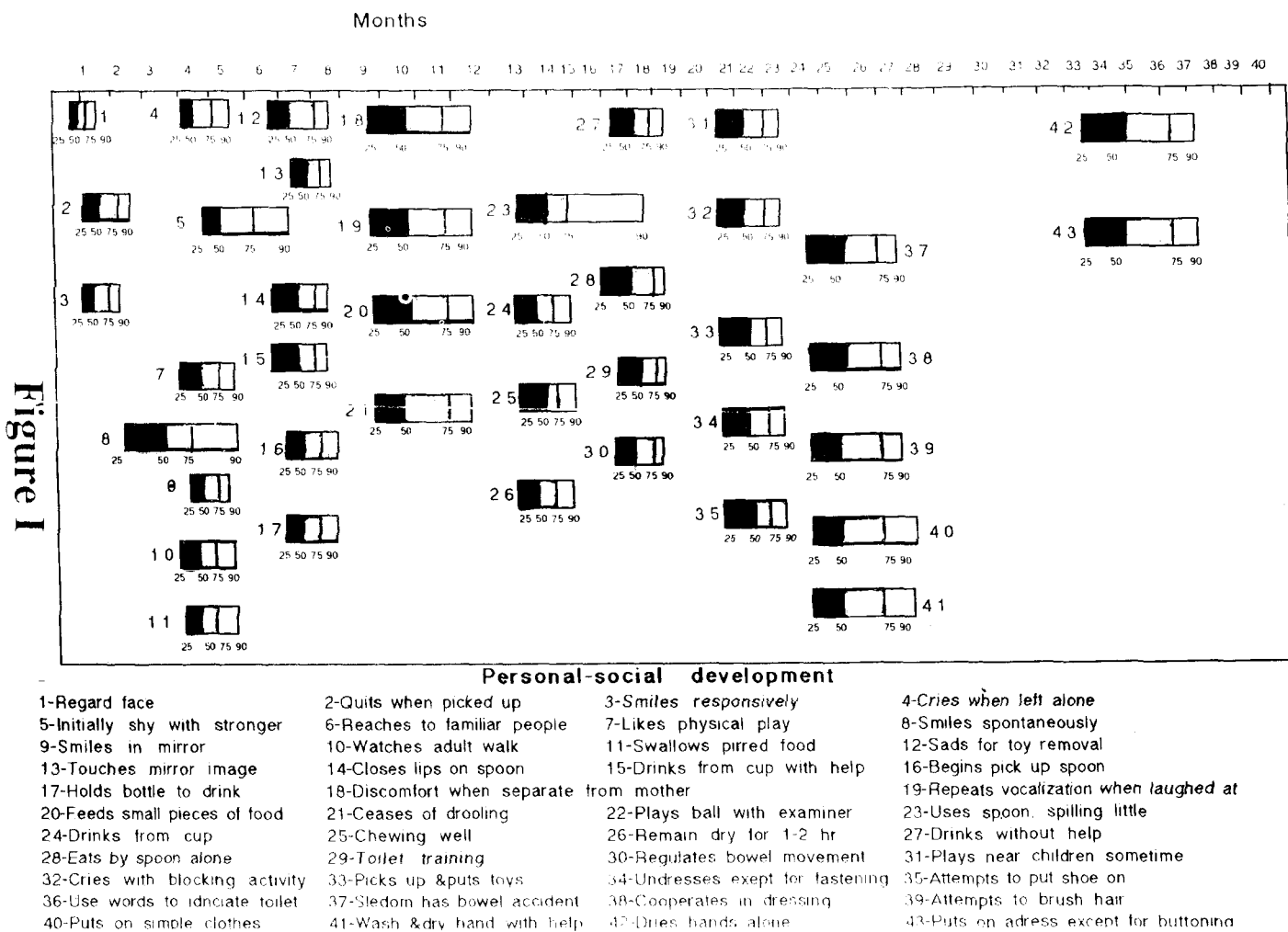
L' échelle Neuro developmentale de L'université du Canal El Suez pour L'évaluation des enfants de L'âge de 0 à 36 mois .

On a choisis au hasard 1600 enfants de l'âge de 0 à 36 mois des différentes parties du Port - Said . Ces enfants ont été examinés Physicalement pour étudier leur profil neurodevelopmentale . Nos resultats on démontré que cette échelle neurodevelopmentale peut être utilisée pour le recherche scientifique , l'entraînement et pour la detection de la retardation neuro developementale. .

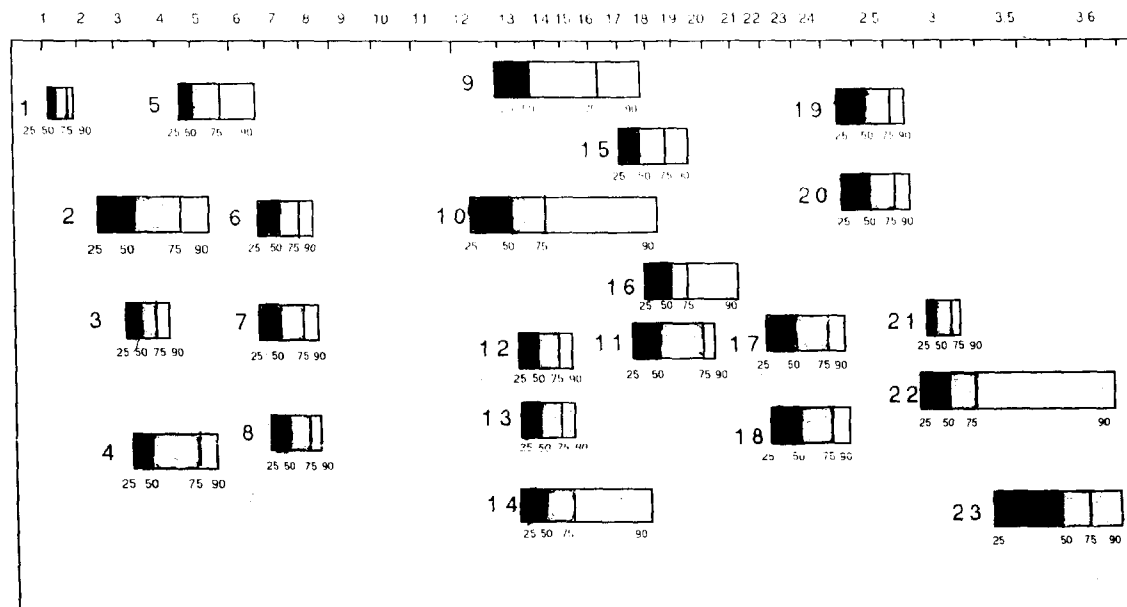
مقياس جامعة قناة السويس الانمائى العصبى لتقييم الأطفال منذ الولادة وحتى سن ٣٦ شهراً

أجرى هذا البحث لرسم الملامح الانمائية العصبية وخطوات تقدم النمو للأطفال في منطقته قناة السويس لبناء مقياس موحد يمكن استخدامه في التدريب والأبحاث واكتشاف حالات التأخر النمائي ويكون مبنياً على عينه من الأطفال المصريين وقد تم إختيار عينه بطريقة المسح العنقودي لأحياء مدينه بور سعيد استخدمت فيها بنود ومقاييس فرعية مستنبطة من ثلاثة مقاييس متداوله ومعروفه وصادقه وهى مقاييس دنفر، بويد، جيزل - وذلك لرسم خريطه للمهارات الانمائيه فى أطفال منطقة قناة السويس على خمسة محاور وهى المهارات الشخصية الاجتماعية، مهارات الحركة البسيطة، مهارات الحركة الكبرى - المهارات المعرفيه والمهارات اللغوية وقد تم عمل تحليل احصائى واستنباط نسب مئوية للمهارات المختلفة وقدمت فى صورة جداول ورسومات يمكن استخدامها فى الأبحاث والتدريب والدراسات المقارنة.

ويناقش البحث التطبيقات الإكلينيكية والإستخدامات المختلفة والمجالات التى يمكن استخدام هذا المقياس فيها كما يدعو إلى مزيد من الدراسات المقارنة بإستخدام مقاييس أخرى لتحرى مدى الصدق والثبات وذلك فى عينات من الأطفال فى المجتمعات المحلية فى مصر وفى مجاميع بيئية مختلفة المستوى الأقتصادى والإجتماعى وخصوصاً مجموعات الأطفال الأكثر تعرضاً لمخاطر التأخر الإنمائى وكذلك لتدريب العاملين فى خدمة ورعاية وصحة الطفل المصرى.



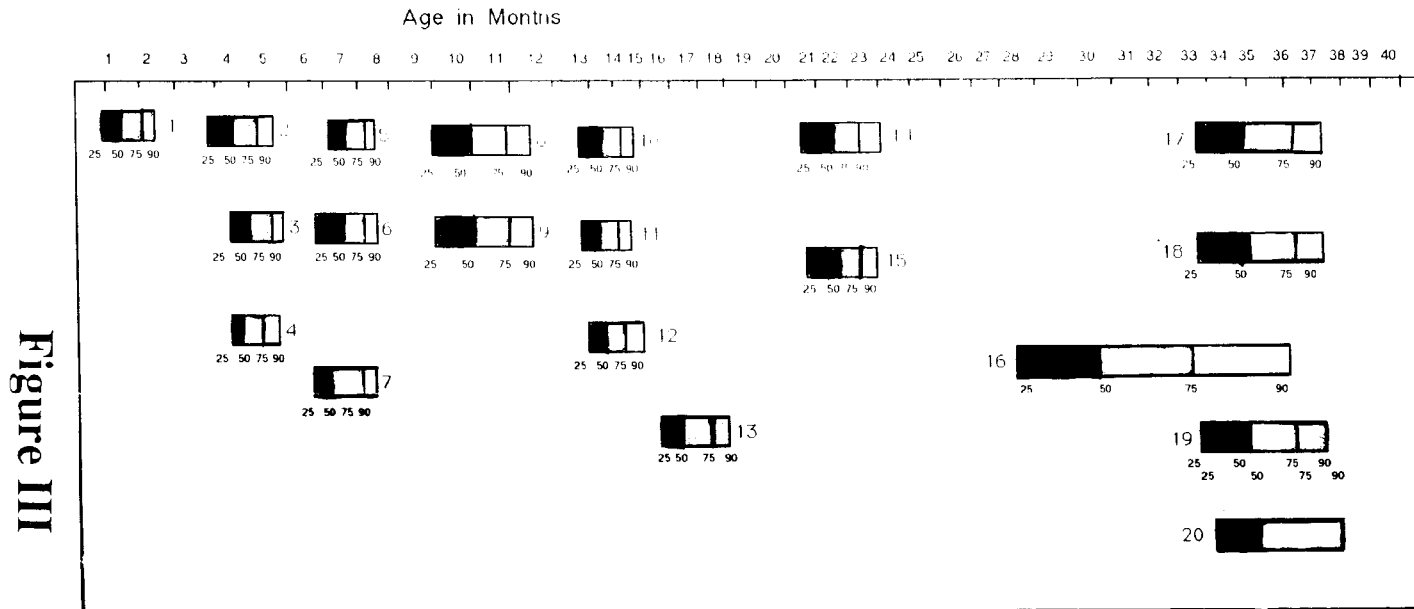
Appendix



Fine motor development

- | | | |
|---------------------------------------|---|---|
| 1-Follows moving objects | 2-Reaches for toy or rattle or touch it | 3-Moves head to follow objects |
| 4-Moves to touch object | 5-Transfers toy from hand to hand | 6-Holds 2 cubes in hands |
| 7-Shakes rattle | 8-Pulls one peg out of peg board | 9-Scribbles spontaneously |
| 10-Holds crayon | 11-Turns page of cardboard book | 12-Removes cover from smallbox |
| 13-Places one or two pegs in pegboard | 14-Tower of 2 cubes | 15-Places 6 pegs in pegboard without help |
| 16-Tower of 3 cubes | 17-Makes vertical and circular scribble after demonstration | |
| 18-Completes three pieces formboard | 19-Draw vertical and horizontal scribble imitatively | |
| 20-Aligns tow or more cubes for train | 21-Tower of 6 cubes | 22-Copies circle |
| 23-Cuts with scissors | | |

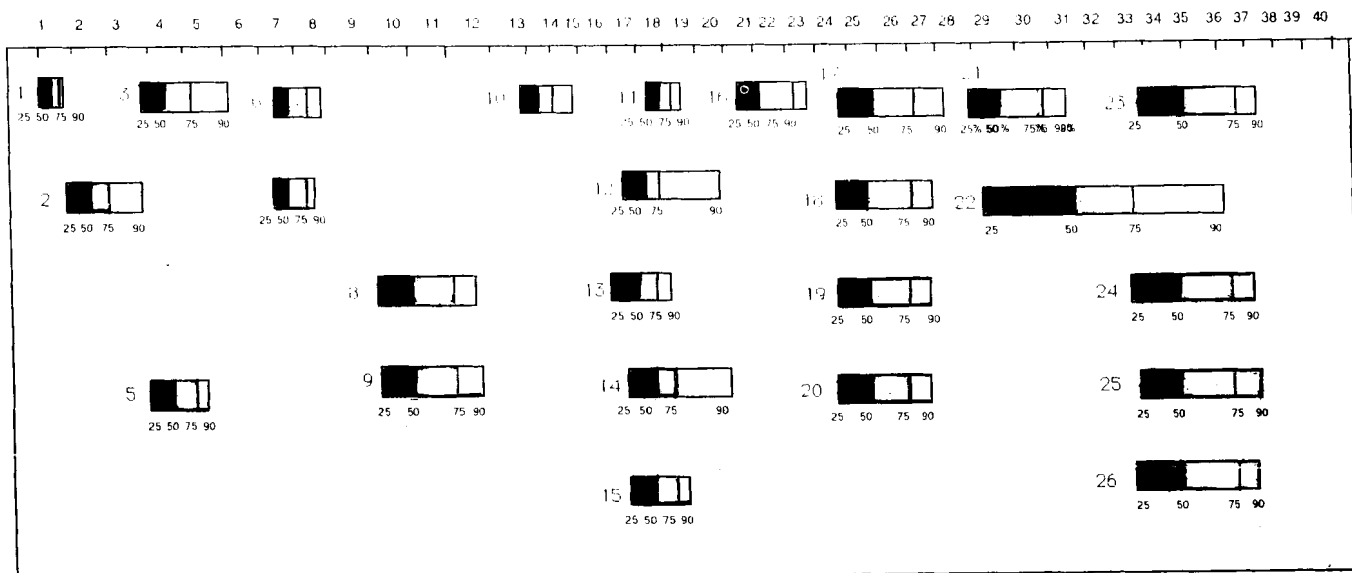
Figure II



Cognitive development

- | | | |
|---|---|---------------------------------------|
| 1-Looks to light | 2-Demonstrates vocal contagion | 3-Repeats random movements |
| 4-Watches places where object disappeared | | 5-Attains partially hidden object |
| 6-Looks to the floor when object falls | 7-Uncover face | 8-Attains completely hidden object |
| 9-Rotates bottle to drink | 10-Finds toys hidden under several covers | |
| 11-Lifts 2 cm cub and pincer grasp | 12-Inverts a vial to gain raisin | 13-Uses stick to attain an object |
| 14-Indicates knowledge of cause-effect relationship | | 15-Imitates sounds without practicing |
| 16-Matches colored blocks (red-yellow-blue-green) | | 17-Repeats two digits |
| 18-Identifies objects by their use | 19-Identify the function of objects | 20-Matches four shapes |

Appendix

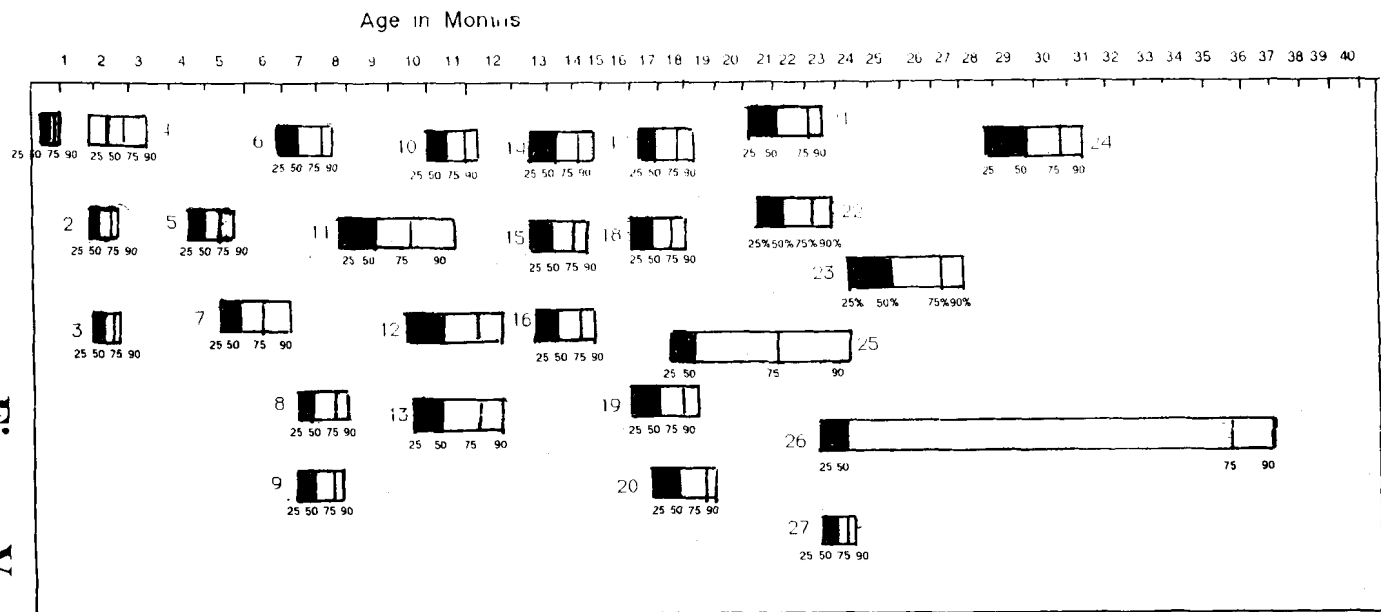


Language development

- | | | |
|---|---------------------------------------|---|
| 1-Respond to bell | 2-Vocalizes when talked to or sung to | 3-Turns to voice |
| 4-Exhibits differentiated crying | 5-Laughes out loud | 6-Imitates speech sound ba-ba or Ma Ma non-specific |
| 7-Waves when only verbal cue is given | 8-Inhibits activity response to no | 9-Imitates words ineactly |
| 10-Imitates sound & words spontaneously | 11-Points to 1 named body parts | 12-Labels one object |
| 13-Names 1 picture | 14-Says the name of 3 common objects | 15-Using simple two-word sentences |
| 16-Gives first name | 17-Uses three-word sentences | 18-Uses negation No |
| 19-Uses simple pronouns (I, me, you) | 20-Comprehensive prepositions | 21-Understands body part function |
| 22-Uses plurals | 23-Gives first and last name | 24-Forms question using a verb |
| 25-Follows two-step commands | | |

Figure IV

Figure V



Gross Motor Development

- | | | |
|--|--------------------------------------|--|
| 1-Prone, lifts head | 2-Prone, head up to 45° | 3-Supine: kicks feet alternately |
| 4-Prone, head up to 90° with forearm supported | 5-Prone: rolls to supine | |
| 6-Sitting: trunk erect | 7-Sits alone for at least 5 seconds | 8-Supine: rolls to prone |
| 9-Prone: Crawls | 10-Sits alone for 10 min | 11-Pulls to standing using furniture |
| 12-Walks with one hand hold | 13-Stands alone | 14-Walks by himself |
| 15-Walks well (stops - stands) | 16-Supine: raises self to standing | 17-Position independently run some steps |
| 18-Walks up stairs hold by one hand | 19-Seats self in small chair | 20-Balances on one foot with help |
| 21-Walks down stair & one hand holding | 22-Jumps in place | 23-Goes up and down stairs alone |
| 24-Walks on tip toes | 25-Throws ball in a vertical pattern | 26-Stands on one foot and balances |
| 27-Runs quickly | | |