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Research Paper

Evaluation of the psychomotor development of the Congolese children by the Bayley scales of infant development - second edition

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ABSTRACT

Background and Objective: Resource-poor countries are at high risk of falling behind in all 4 areas of development and the rate of disability in one of these areas is very high. The objective of this study is to determine the age of psychomotor development of the Congolese child using the BSID II. ***Methods:*** Descriptive, observational study of apparently healthy infants in Kinshasa (BOMOI Health Center, Center Hospital of Kingasani II) and Idiofa City in Kwilu Province during the period January 2010 to January 2012. The variables of interest were socio-demographic characteristics (age, sex, living environment), Psychomotor Development Index (PDI) and Mental Development Index (MDI) and behavioral scale (BRS) assessed using of the Bayley 2nd Edition Scale (BSID-II). ***Results:*** Of 366 infants retained, 51.9% were female (sex ratio 1H / 1F). The median chronological and developmental age was 16.8 and 17 months respectively. Mean PDI and MDI values were 104.0 ± 17.4 and 100.5 ± 15.0 respectively. The severe mental and motor retardation noted in these infants was 4.9% and 4.1%, respectively. In all components of psychomotor development, rural infants had a significant median age ($p < 0.05$). ***Conclusion:*** Urban children are ahead in terms of motor skills, cognitive skills and behavior better than those in rural areas.

Keywords: *Psychomotor development, Congolese child, BSID II, Urban environment, Rural*

The years of infancy, especially the period from birth to 8 years, are now recognized as a crucial period for the development of young children, both in terms of their physical health, as well as their motor development, socio emotional, cognitive and linguistic [1].

This is particularly a critical period for brain development. The first years of life are thus the key to building the health of an individual. They are characterized by great plasticity in the

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development of the fetus and the child, particularly sensitive to nutrition, pollution, infections and the emotional state of relatives [1-4].

Different environmental factors are all stimuli capable of influencing the expression of genes and thus the development of the being in the making, and will leave positive or negative marks for the whole of life [5, 6, 7]. Given the importance of the early years and to guide the development of the brain, every child has the right to live in a rewarding and supportive environment to reach his full potential.

Studies from all over the world indicate that in resource-poor countries, there is a high risk of delay in all 4 areas of development and that the rate of disability in one of these areas reaches around 20.4%. (3.1% to 45.2%); these studies also showed that language disorders were more common, followed by motor, cognitive and sensory disorders [8, 9].

In the Democratic Republic of Congo, according to UNICEF criteria, 66 per cent of 36-59-month-olds are on their way to development (early childhood development index score) in at least three of the following areas: literacy / calculation, physical, emotional and / or learning [10]. As for learning support, only 7% of children aged 36-59 months attend school at preschool level. This proportion varies considerably depending on whether one is in rural areas (4%) or in urban areas (14%) [10]. Data related to early development, before the age of 24 months are almost non-existent. Since child development occurs along a continuum, the most effective and comprehensive way to evaluate it is to observe it. The objective of this study is to determine the age of psychomotor development of the Congolese child using the BSID II.

PATIENTS AND METHODS

It is a descriptive, observational study, based on two groups of apparently healthy Kinshasa infants recruited from the BOMOI Health Centers, Hospital of Kingasani II, and rural children in the Pre-School Consultations (SPC) departments apparent good health recruited in the outskirts of the city of Idiofa in Kwilu province. The study ran from January 2010 to January 2012. We included all apparently healthy infants, 1 to 42 months of age, with a normal neurological examination at enrollment and the ability and willingness of the mother or legal guardian to give written informed consent and to introduce themselves regularly for follow-up.

Children with congenital malformations that could interfere with their psychomotor development, those with a disrupted neurological examination at enrollment, and those whose mothers under the age of 15 were not included in the study.

The convenience and completeness sample based on inclusion criteria was 366 infants. The variables of interest consisted of socio-demographic characteristics (age, sex, living environment), Psychomotor Development Index (PDI) and Mental Development Index (MDI) using the Bayley scale 2nd edition (BSID-II) and Behavioral Scale (BRS) using the Bayley 2nd Edition Scale (BSID-II).

The subjects of the study were divided into 7 groups of intervals of 6 months each for the urban environment. Each child underwent a neurological examination, neurodevelopmental assessment tests using the Bayley 2nd Edition scale for the index of motor and mental

development and for adaptive behavior. Gross scores for motor and mental scales were used to determine the developmental age of each infant.

Assessment of the child's verbal, perceptual, intellectual, mnemic and psychomotor skills was conducted and the test that was found to be the most appropriate was the 1993 Bayley Scales of Infant Development - Second Edition (BSID-II). This test was used previously for an evaluation of infants affected and / or infected with HIV in the DRC and was found to be feasible in our socio-cultural conditions [9].

BSDI-II includes

A mental scale that determines: perceptual abilities; the first notions of quantity and number; problem solving Memory; language (receptive and expressive slopes) and spatial constructions. All these grouped items give a mental development index called MDI.

A driving scale that evaluates: overall engine control (jumps, running, balance, climbing and descending stairs); the control of fine motor skills and the ability to imitate gestures All these items together allow to give a motor development index called PDI.

Scale of behavior that determines: the orientation and commitment of the child during the test; emotional regulation and the quality of movement. The behavior can be categorized as "within the limits of normal", "questionable", "not optimal".

The data was captured on a computer with the EPI INFO 7 software and then analyzed with the SPSS for Windows version 22 software. The results obtained were expressed as percentages for the categorical and median data accompanied by the interquartile space (EIQ) and extremes (abnormally distributed data). The illustrations were in the form of tables. The chi-square test was used for the comparison of proportions. We used the Man Whitney U-test to compare the medians of two groups. Statistical significance was considered to be reached for values of $p < 0.05$.

The three principles of research ethics were respected namely respect for the human person, beneficence and justice. Respect for the human person was ensured by the anonymity of the collection cards replaced by a code known only to the investigator; the charity was ensured by the confidentiality of the data, no information of the newborns or the mothers was disclosed to the third person. Respect for justice was ensured by the free consent of patients to participate in the study and the right of withdrawal if it bore the newborns. Before initiating the present research, his protocol was presented and approved by the medical ethics committee of the School of Public Health of the University of Kinshasa with the reference: No. ESP / CE / 031.

RESULTS

General characteristics of children

The median chronological and developmental age was 16.8 and 17 months respectively, 51.9% of recruited infants were female (sex ratio 1H / 1F). Mean PDI values were 104.0 ± 17.4 for PDI and 100.5 ± 15.0 for MDI. Severe mental and motor retardation of 4.9% and 4.1% respectively in these infants. Comparing children in two settings, rural children were found to have a median developmental age significantly lower than their chronological age, and their average PDI and MDI were lower ($p < 0.05$) (Table 1).

Table 1. General characteristics of children

Variables	Over all n=366	Urban n=316	Rural n=50	p
Age chronological	16.8 (14.9-19.3)	15.3 (13.2-18.1)	30.4 (24.5-32.0)	<**0.001**
Age developmental	17 (14.1-19.4)	17 (14.1-19.3)	23 (19.2-25.7)	**0.001**
Sex				0.444
Male	179 (48.1)	151 (46.8)	25 (50.0)	
Female	190 (51.9)	168 (53.2)	25 (50.0)	
PDI	104.0±17.4	107.6±13.6	81.5±21.9	<**0.001**
Normal	326 (89.1)	300 (95.0)	26 (52.0)	<**0.001**
Anormal				
Significantly delayed performance	18(4.9)	1(0.3)	17(34.0)	<**0.001**
Mildly delayed performance	22(6.0)	15(4.7)	7(14.0)	<**0.001**
MDI	100.5±15.0	103.0±12.4	84.8±20.0	<**0.001**
Normal	219 (87.2)	291 (92.1)	28 (56.0)	<**0.001**
Anormal				
Significantly delayed performance	15 (4.1)	2 (0.6)	13 (26.0)	<**0.001**
Mildly delayed performance	32 (8.7)	23 (7.3)	9 (18.0)	<**0.001**

Age of acquisition of gross motor skills

The children sat at 5 months with extremes ranging from 3 to 7 months. Walking occurs at 13 months with extremes ranging from 8 to 23 months, the infant walks backwards at 16 months and the infant can walk up and down the stairs with help at 15 months. Infants run with balance at 23 months. The balance on one foot occurs between 27 and 28 months on average. Children can swing their feet to shoot the ball at 27 months and jump on a rope at 38 months (Table 2).

Table 2. Age of acquisition of gross motor skills

Variables	N	Over all	Urban	Rural	p
Hold head erect and steady for 15 seconds	11	2.1 (1.1- 2.2)	2(2-3)	3(2-4)	0.082
Turns from side to back	7	2.2 (2.1- 2.6)	3(2-4)	3(2-5)	0.218
Sits alone momentarily	39	5.2 (5.1- 5.3)	6(3-8)	4(3-9)	<**0.001**
Sit alone while playing with a toy	26	5.3 (5.2- 6.1)	7(4-8)	7(5-9)	0.128
Stands up alone to standing position	41	9.2 (9.1- 9.7)	9.6 (9.2-9.9)	9.0 (8.4-9.5)	0.349
Walks up the stairs with help	55	15.1 (14.2-15.3)	16(13-20)	14.1 (7-18)	0.081
Climb the stairs with help	78	15.3 (15.1-16.2)	17(12-24)	17(7-26)	0.073
Walks backwards	73	16.1 (15.1-16.3)	17(13-24)	18(12-26)	0.108
Walks down the stairs with help	77	15.3 (15.1-16.2)	14(13-24)	18(7-26)	**0.014**
Runs with coordination	76	23.0 (20.3-24.1)	22(17-32)	21(17-34)	0.221
Walks the stairs alone by placing both feet on each step	49	25.2 (23.8-27.1)	27(18-31)	34(24-35)	<**0.001**
Walks down the stairs placing every 2 feet on the step	47	25.1 (23.3 ; 26.7)	27(16-31)	34(30-35)	<**0.001**
Stands alone on the right foot	41	27.2 (25.2-28.3)	27(21-38)	29(22-35)	**0.012**
Stands alone on the left foot	44	28.1 (26.0-30.0)	27.5 (22-38)	29(22-35)	0.085
Swings leg to kick ball	53	27.3 (26.0-30.0)	28(22-40)	28(22-35)	0.589
Jumps distance of 4 inches	46	26.6 (25.1-28.1)	28(24-40)	33(29-35)	<**0.001**
Walks up the stairs	49	34.3 (33.2-37.1)	33(33-37)	37(25-42)	**0.012**

Variables	N	Over all	Urban	Rural	p
alternating feet					
Stops from a full run	33	36.0 (34.2-37.2)	35(33-37)	42(30-43)	**<0.001**
Jumps over rope	23	38.2 (36.0-42.1)	37(36-38)	42(33-43)	**0.021**
Sits down with support	23	3.1 (1.1-5.3)	3.3(1-5)	3.0(2.1-4.6)	0.821

Data are expressed as ME (1st; 3rd percentile) (months)

Difference in the development of gross motor skills between urban and rural areas Rural children acquire the sitting position before those in urban areas. Rural children perform less in climbing and descending stairs, jumping rope and running. Age of acquisition of fine motor skills children retain the ring at 3 months, keep their hands open at 3 months, turn the wrist at 3 months and bring the objects to the median line at 7 months. Infants laced 3 beads at 26 months, mimic hand movements at 32 months, use eye - hand coordination, and distinguish forms with the hand at 36 months (Table 3).

Table 3. Age of fine motor skills

Fine motor variables	n	Me (1^{th} ; 3^{th} percentile) (months)	Min-Max (months)
Oculomotor coordination			
Retains ring	14	3.2 (3.1 ; 3.2)	2.2-4.2
Keeps hands open	13	3.2 (2.7 ; 3.2)	2.1-3.2
Rotates wrist	6	3.2 (2.7 ; 3.7)	2.2-4.2
Reaches unilaterally	36	5.2 (5.1 ; 5.5)	3.2-7.4
Grasps foot with hands	29	6.3 (6.1 ; 7.2)	5.1-8.0
Brings spoons or cubes to midline	34	7.2 (7.1 ; 8.1)	4.1-10.3
Places 10 pellets in bottle in 60 seconds	40	25.1 (23.7 ; 30.0)	19.2-37.0
Laces three beads	14	26 (24.1 ; 30.5)	23.2-37
Imitates hand movements	103	32.1 (31.2 ; 33.1)	23-42.2
Tactilely discriminates shapes	34	36.1 (34.3 ; 37.2)	24.1-42.2
Use hand-eye coordination in tossing ring	94	36.1 (33.6 ; 37.6)	26-42.9
Imitates positions	91	37 (35.6 ; 38.1)	29.2-42.9
Buttons 1 button	25	41.2 (38.1 ; 42.1)	33.1-42.9
Prehension			
Use whole hand to grasp rod	42	5.2 (5.1 ; 5.3)	3.1-7.4
Uses partial thumb opposition to grasp cube	41	5.2 (5.1 ; 5.3)	3.2-7.4
Uses pads fingertips to grasp cube	44	6.3 (5.9 ; 7.2)	5.1-8.8
Uses partial thumb opposition to grasp pellet	65	8.2 (7.9 ; 9.1)	5.2-17.5
Uses whole hand to grasp pellet	57	9.7 (9.2 ; 10.2)	7.2-17.5
Grasp pencil at furthest end	57	9.9 (9.2 ; 10.2)	7.2-22.9
Uses pads of fingertips to grasp pencil	79	17.5 (16.2 ; 18.6)	10.3-34.0
Graphics			
Copies a circle	56	38.2 (37 ; 40.3)	28-42.9
Copies plus sign	55	38 (36.2 ; 41.0)	29.3-42.9
Traces designs	33	40.2 (37.2 ; 41.2)	32.1-42.9
Copies square	6	42.2 (42.1 ; 42.9)	42-42.9

Children use fingertips to hold a cube at 6 months and take a small patty at 9.7 months. Children can copy forms from 38 months old (Table 4).

Table 4. Age Development Mental

Variables	n	Over all	Urban	Rural	p
Looks at pictures in book	87	8(8 ; 9)	9(5-16)	8(6-16)	**<0.001**
Turns pages of book	33	11(9 ; 12)	11(7-16)	14(12-16)	**<0.001**
Builds tower of 2 cubes	50	23(22 ; 31)	17(12-32)	16,5(11-24)	0.546
Retrieves toy in Clear Box II	47	18(46 ; 19)	17,5(14-26)	21(11-24)	**<0.001**
Follows directives doll	30	19(18 ; 21,5)	19(13-27)	19(11-24)	0.058
Point to 3 parts of doll's parts	24	19(18 ; 21)	19(16-27)	19(11-24)	0.084
Identifies objects in a photograph	24	20,5(19 ; 23)	24(19-34)	23(11-25)	0.854
Builds tower of 6 cubes	40	26,5(22 ; 31)	24(16-42)	23(11-29)	0.490
Matches pictures	46	26(24 ; 27,5)	27(20-42)	24(23-29)	**0.001**
Matches three colors	32	27(25; 33)	24(23-29)	27(27-30)	**0.016**
Displays verbal comprehension	33	26(25 ; 28)	30(21-42)	35(11-39)	**0.035**
Builds tower of 8 cubes	30	30(22 ; 31)	29(22-42)	25(11-39)	0.056
Builds train of cubes	80	32(30 ; 33)	30(23-42)	36(11-39)	**<0.001**
Matches 4 colors	55	33(28 ; 33)	32,5(30-35)	36(29-39)	0.702
Recalls geometric forms	30	34,5(31,5-38,3)	33(27-42)	36(25-39)	**<0.001**
Compares sizes	74	33(28,8-37)	33,5(24-42)	36(29-39)	**0.021**
Compares masses	114	34(29,8-40,0)	36(23-42)	36(29-39)	0.077
Builds bridge	66	32(31-33)	36(24-42)	36(29-39)	0.132
Builds wall	67	32(31-33)	36(24-42)	36(29-39)	0.562
Identifies gender	81	36(32-41)	37(25-42)	36(29-39)	0.216
Identifies 3 incomplete drawings	7	37,0(33-42)	36(29-39)	39(29-42)	**0.023**
Name 4 colors	34	39(33- 42)	37,5(36-39)	40,5(38-42)	0.170
Builds a T **	2	25,5(21-30)	25,5(21-30)	-	-
Builds stairs **	8	41(40-42)	41(40-42)	-	
Head follows ring **	22	3(2,9-3,1)	3(2,9-3,1)	-	-
Discriminates novel visual pattern **	22	3(3-3)	3(3-3)	-	-
Prefers novelty **	5	4(3-8)	4(3-8)	-	-
Eyes follow ball rollings across table **	5	4(3-8)	4(3-8)	-	-
Fixateson disappearance of balloon for 2 seconds **	2	6(4-8)	6(4-8)	-	-
Looks for fallen spoon**	47	7(6-7)	7(6-7)	-	-

Data are expressed as ME (1st; 3rd percentile) (months)
*** variables no comparable because data observed only in a group of children (urban environment))*

The median age of development of vocalization when the examiner smiled, repetition of vowel-consonant combinations, participation in a story, asking questions, and understanding of 2 propositions, was significantly earlier in infants compared to rural areas ($p < 0.05$) (Table 5).

Table 5. Language development age

Variables	N	Over all	Urban	Rural	p
Vocalizes when the examiner speaks	22	3(3 ; 4)	3(1-4)	3(2-3)	0.053
Vocalizes two different vowel sounds	23	3(3 ; 4)	3(2-4)	3(2-3)	0.899
Vocalizes when the examiner smiles	29	3(3 ; 4)	3(2-5)	4(3-6)	**0.001**
Repeat vowel-consonant combination	52	8(7 ; 8)	10(5-16)	12(7-16)	**0.034**
Vocalizes 4 different consonant vowel combinations	28	14,5(14 ; 15)	11(8-24)	12(8-16)	0.193
Use words to make wants know	43	19(17 ; 20)	18(13-26)	18(11-24)	0.184
Combines words and gestures	27	19(18 ; 20)	20(16-27)	19(11-24)	0.111
Say eight different words	27	20(19 ; 20)	23(18-34)	22,5(11-25)	0.074

Variables	N	Over all	Urban	Rural	p
Imitates the word	59	7(7 ; 8)	16(12-32	14(12-16)	0.364
Use 2 different words appropriately	28	15(14 ; 15)	17(12-25)	16(11-24)	0.103
Use a two-word utterance	63	23(21 ; 24)	22(18-34)	23(11-25)	0.149
Imitates a two-word sentence			22,5(18-34)	23(11-25)	0.593
Uses pronouns	37	24(23-25)	24(19-34)	23(11-29)	0.205
Names three objects	67	24(24 ; 26)	25(18-42)	24(11-29)	0.184
Uses a three-word sentence	60	25(24 ; 27)	26(19-42)	23,5(11-29)	0.119
Attends to story	64	30(27 ; 31)	30(21-42)	34(24-39)	**<0.001**
Names five pictures	47	31(30 ; 33)	30,5(25-42)	29(11-39)	0.055
Asks questions	80	32(30 ; 34)	32(22-42)	36(25-39)	**0.041**
Understands 2 prepositions	63	33(32 ; 35)	33(23-42)	36(11-39)	**0.026**
Produces multi-word utterances in response to picture book	62	34(32 ; 36)	35(24-42)	36(25-39)	0.432
Uses past tense	108	36(36 ; 38)	36(27-42)	36(29-39)	0.992

A statistically significant difference in behavior against children in rural areas was noted, our results show that 18.8% of rural children had emotional mismanagement, 12.5% a defective motor quality, 6.3% a non-optimal orientation and commitment (Table 6).

Table 6. Assessment of the behavioral scale of children

Variables	Over all n=279	Urban n=263	Rural n=16	p
Orientation/ Engagement factor				**0.004**
Within normal limits	269(96.4)	257(97.7)	12(75.0)	
Questionable	8(2.9)	5(1.9)	3(18.8)	
Non-optimal	2(0.7)	1(0.4)	1(6.3)	
Emotional regulation				**0.006**
Within normal limits	271(97.1)	258(98.1)	13(81.3)	
Questionable	5(1.8)	2(0.8)	3(18.8)	
Non-optimal	3(1.1)	3(1.2)	0(0.0)	
Motor quality				**<0.001**
Within normal limits	318(96.4)	310(98.7)	8(50.0)	
Questionable	10(3.0)	4(1.3)	6(37.5)	
Non-optimal	2(0.6)	0(0.0)	2(12.5)	

Data are expressed as absolute and relative frequencies (%) in parenthesis

DISCUSSION

This study evaluated infants from different backgrounds (urban and rural) and highlighted the differences between them in their neurodevelopmental skills.

Development of motor skills

The motor development of preschool children is unique, as this period is characterized by the emergence of fundamental motor skills that form the foundation for learning more complex skills in the years to come. In this study, it was discussed to determine the developmental age and to look for the age of acquisition of the different items of the Bayley scale.

Motor age

The mean neurodevelopmental age of the study subjects was 18 months for a chronological age of 17 months. Infants in urban areas had a neurodevelopmental age slightly higher than normative children, unlike those living in rural areas who had a very clear difference of at least 10 months, in 20 months of neurodevelopmental age compared with 30 months of

chronological age. The results of urban children are similar to those of Nguefaack [11] who has worked on a different scale, and found that Ivorian children were ahead of the motor age compared to children in the Denver cohort. He found no delay compared to Denver. These findings support the fact that African children are ahead in motor skills; it is a fact that infants in rural areas are disadvantaged and that the risk factors are mainly malnutrition and lack of stimulation from a trusted adult.

Motor development index

Average IDPs were 107 ± 13.6 for urban areas and 81.5 ± 21.9 for rural areas. Comparing younger and older infants, our study shows that the PDI of infants younger than 24 months was lower (97.0 ± 20.3) than that of children over 24 months (104.1 ± 17). , 4), our results are similar to those of Augustyniak et al, who also found better results for girls over 12 months [12] and those of Black [13]. Parajuli et al., In studying the differences between castes, found that the negative impact of caste on neurodevelopment disappeared with the growth of children [14]. Mc Donald et al in their Tanzania study found a decline in development indexes during follow-up. Severe motor delay is present in 4.9% of the total population of the study. Our results show that 34% of children in rural areas have severe motor delays; it was noted that there was a moderate delay in 6% of cases and this delay was 4.7% in urban areas and 14% in rural areas. Yaghini et al. in Iran found similar proportions of delay in fine and coarse motor function [15]. This clearly shows that one-third of rural children have severe motor retardation [13].

Development of gross motor skills

Our results showed that the median age of head retention was 2.1 months, sitting 5.2 months and walking 13.2 months. Walking backwards occurs at 16 months, climbing up and down stairs with help at 15 months. Infants run with balance at 23 months. The balance on one foot occurs between 27 and 28 months on average. Children can swing their foot to shoot the ball at 27 months and jump on a rope at 38 months. Results similar to those of Renata M et al. [12] who compared the acquisition of infants under 3 years of age using BSID II and a questionnaire administered to mothers that show that their responses are sufficiently reliable and can be used clinically. Our results are also close to those of Abessa et al. who adapted the Denver to their medium [16]. Valla et al. found that special attention should be paid to premature infants and boys with regard to fine motor skills before the age of 12 months [17].
Development of fine motor skills

Infants retain the ring at 3 months, keep their hands open at 3 months, turn the wrist at 3 months and bring the objects to the median line at 7 months. Infants lace 3 beads at 26 months, mimic hand movements at 32 months, use eye - hand coordination and distinguish forms using the hand at 36 months. Infants use fingertips to hold a cube at 6 months and take a small patty at 9.7 months.

Children can copy shapes from 38 months. These activities will help to describe the signs and forms, to put them in words too; thus they are precursors of language, writing and visual art.
Mental development.

Mental age

Our study found that the mental developmental age of urban children does not differ from their chronological age. On the other hand, rural children were significantly behind their chronological age, about seven months late.

Index of mental development

The mental development index is 100.5 for the entire group, 103 for urban children and 84 for rural children with a statistically significant difference. Our results are close to those of Renata et al., Who found better scores with growth and in girls [12], and those of Black et al. [13]. Studies from around the world note that infants living in resource-limited countries have mental scores in standards and these will be low in preschool age, which is not observed in middle-income countries; BSID II scores reflect the influence of the environment [13]. Some studies talk about the Flynn effect, which actually notes an improvement in cognitive development scores related to a stimulating environment, good nutrition and a secure family environment. The majority of children, 92.1% in urban areas, have normal mental development compared to 56% of children in rural areas ($p < 0.001$); we also note a severe delay respectively in 4.1% of all children but it is significantly higher in rural areas (26% of children, $p < 0.001$).

Mental development the infant of our study follows the ring at 3 months, prefers novelties at 4 months and the permanence of objects settles at 6 months. Infants can point the body parts; perform certain instructions at 19 months: feed the baby, comb the baby's hair ...; they identify the objects on a photo at 20 months and match the images to 26 months. Infants match 3 colors to 33 months and name colors at 39 months. The construction of the cubes is effective at 23 months and continues until 30 months with a tower of 8 cubes. Rural children have a delay in building a train of cubes. They have a delay in acquisitions related to the comparison of sizes, the recollection of geometric shapes and the identification of incomplete drawings. The same delay is observed in the identification of colors.

Language development

Infants vocalize at 3 months, repeat vowel-consonant combinations at 8 months, associate words with gestures at 19 months, make an utterance of 2 words at 23 months, designate 3 objects at 24 months, name 5 images at 31 months, and includes prepositions between 33 and 40 months. They use the past participle at 36 months. The fact that girls reach maturity faster than boys is a well-known concept of physical maturity. The literature suggests that this is also true, at least for some areas of psychomotor development such as language, but this has not been noted in our study [18].

Behavior

It was noted that 100% of children had normal attention, behavior against children in rural areas, it shows that 18.8% of children in rural areas have emotional mismanagement, 12.5% of children in the same environment have a defective motor quality, 6.3% of children in rural areas orient and engage in a non-optimal way.

CONCLUSION

This study shows that children in urban areas are a head of the rest in terms of motor skills, cognitive skills and behavior better than those in rural areas. Infants in our study have a lead over normative children in gross motor skills. Rural children have a high rate of neurodevelopmental delay.

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Conflict of Interest
The author declared no conflict of interests.

Contributions of the authors
MMA and NNA designed collected and analyzed the statistical data of the study. PDC, NNC and TMBBP B supervised the study. All the authors contributed to the drafting of the document and approved the final document.

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