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## ACQUISITION OF MOTOR SKILLS IN 784 BENIN INFANTS UNDER ONE YEAR

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### ABSTRACT

Infant motility is not only the product of the operation of an informational machine of great complexity, but it is also the instrument of its development, its internal organization and its evolutionary development. And thanks to the many studies carried out in this field, several theories have been developed and it seems clear that the development of motor skills is no longer attributed solely to the effects of neurological maturation. This does not preclude that factors such as the environment, the socio-economic level of the family and traditional bodily practices influence the age of acquisition of motor skills of children. This is precisely why this study was conducted to verify the effect of these factors on the development of children in southern and northern Benin. Our goal is to study the motor development of 784 children under one year old from the cities of Dangbo, Copargo, Kouandé and Comè. Our results show that children can sit at 4 months, crawl at 5 months, stand with help and walk on all fours at 7 months, stand at 9 months and walk at 11 months. These averages of skill acquisition dates are within the time frame defined by the WHO development standards.

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## INTRODUCTION

Motor development is usually described as ordered sequences with cerebral-caudal progression with chronological markers (Bril, 2000). It is a process of change in motor behavior caused by the interaction between heredity and the environment (Ammar et al., 2013 et Miquelote, 2012). That of the child goes through various motor stages of increasing complexity allowing him to finally stand up and walk without help (Mehu, 2012). In addition, infant motor development is strongly influenced by culture and social context (Karasik, 2011). Indeed, if the first motor behaviors, very strongly dependent on endogenous factors (innate, maturation, genetically pre-wired program ...), appear for all children almost at the same age, as the environment plays an important role. in the acquisition of motor behaviors, their acquisition duration varies more significantly according to the child's experience,

thus increasing the period of appearance of this behavior on the age scale (Thèveniau, 2013). A comparative study at this time of life when the role played by the post-natal influences is still minimal makes it possible to appreciate with less chance the influence of the family environment on the motor development of the child (Venetsanou, 2010). Our goal is to study and analyze the motor development of 275 infants under 12 months of age.

## MATERIALS AND METHODS

**Framework and type of research:** It is a longitudinal study that was conducted in the cities of Kouandé, Dangbo, Comè and Copargo (Republic of Benin). It was conducted in the departments of Atacora, Donga, Oueme and Mono. The Laboratory of Biomechanics and Performance at the National Institute of Youth, Physical Education and Sport (INJEPS) and the Center for Sport-Health-Service served as a support framework for experimentation.

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**Sample size:** The study size was determined according to the Schwarz formula as follows:

For a proportion (p):

Z: Confidence level (95% will be 1.96); P: Estimated proportion of the population is 0.5; d: margin of error: 3.5%;

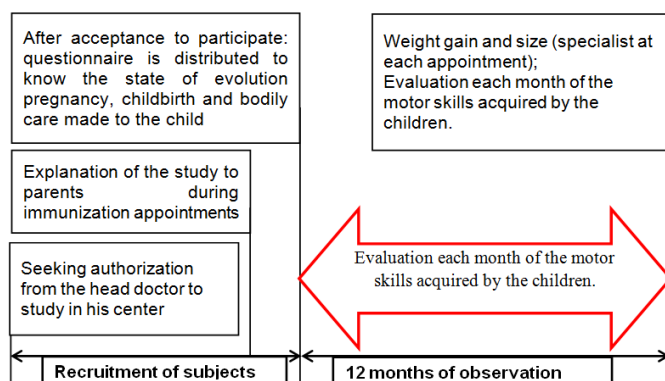
$$q = 1 - P$$

n the sample size

$$n = (1,962 * 0.5 * 0.5 / 0.0352) n = 784$$

So, to have the same number of subjects in each city, we will take  $n' = 196$

### Experimental protocol



The first step in our investigation was the recruitment of the subjects. To do this, we approached health centers in these cities to give us permission to carry out the investigations in their centers. Once this authorization was obtained, we presented the objectives of our study to the women who came to these centers for the vaccination of their children. Women who met the inclusion criteria received a questionnaire that allowed us to know the evolution of pregnancy, childbirth and follow-up after birth. After a record of data collection on stages of motor development of children was given to women. On this card, women marked the days when their children acquired the various motor skills (sit alone, crawl, stand up by clinging to a support, walk on all fours, stand up without help and walk alone). It was concluded with the women an appointment by month so that we collect on our file the motor development of the children during the month. For example, in Kouandé for example, every last Wednesday and Friday of each month is met at the health center after the immunization session to collect data on children's motor development during the month.

### Variables studied

- Independent variables: Body mass index, BMI = MC / T2 (in kg / m<sup>2</sup>); age (years); socio-professional activity; bath massage.
- Dependent variable: Motor skill acquisition age.

**Ethical considerations:** At the beginning of this study, we required and obtained the authorization of the gynecologist or the midwife in charge of the subject. After sensitizing subjects to the objectives and interests of the study, written informed consent was obtained from each subject to express their participation agreement.

**Statistical analysis:** The collected data was compiled and then analyzed using the IBM SPSS version 21 software. It allowed

us to do the descriptive analysis of the variables studied. We performed non-parametric tests. The Wilcoxon rank test was adopted for the comparison of variables within a group at the beginning and at the end of the study. The threshold of significance was set at  $p < 0.05$ . The Kruskal-Wallis test was used to compare the variation in motor skill acquisition periods between the four groups.

## RESULTS

### Presentation of the motor development of the children of our sample

Almost all (96%) of the subjects studied walked before their first birthday (Table 1)

**Table 1. Periods of acquisition of motor skills of subjects**

HM	N	Minimum (months)	Maximum (months)	Means (months)	Standard deviation (months)
Sit	784	4,00	7,00	4,63	1,26
Crawl	784	5,00	8,00	5,88	1,00
Walking on all fours	784	6,00	10,00	7,53	1,07
Stand with help	784	6,00	10,00	7,96	1,45
Stand without help	784	8,00	11,00	9,98	1,16
Walk	784	9,00	12,00	11,05	1,06

HM: Motor skill; N: total number; Minimum is the means of early skill acquisition; Maximum represents the final date of acquisition of the skill; Means is the date on which half acquires the skill.

### Comparison of motor development of children according to the city of origin

The motor development of children is not the same depending on the city of origin (Table 2). Indeed, the Kruskal-Wallis test used to compare the variation in motor skill acquisition periods to sit alone between the four groups, yielded 0.0001. A comparison of the two-by-two groups shows that there is a significant difference between the group of Comè children and the other three groups of children from Copargo, Kouandé, and Dangbo. With respect to comparing the period to stand alone between the four groups of infants, the p of the Kruskal-Wallis test is 0.000. The comparison of groups in pairs reveals that there is no significant difference between Copargo and Comè children ( $p = 0.12$ ). The same observation is made after the comparison of Birni and Dangbo children ( $p = 0.77$ ). On the other hand, there is a significant difference between the Copargo group and the Comè group (0.03). This difference is also significant between the Copargo group and the Kouandé group (0.0000). The comparison of the Copargo and Dangbo children's groups also yielded 0.0000. There is no significant difference ( $p = 0.41$ ) in the periods of acquisition of walking between the four groups of children of Copargo, Comè, Kouandé and Dangbo.

### Comparison of the motor development of children according to the socio-professional activity of the mother

Children of housewives have early motor development compared to other children in our sample (Table 3). So the average of the housewives' childrenour study can sit at  $3.75 \pm 0.34$  months; crawl at  $5.14 \pm 0.17$  months; stand up holding a support at  $8.47 \pm 1.05$  months; walk on 4 legs at  $7.23 \pm 1.13$  months; Stand up alone at  $9.18 \pm 0.73$  months and walk at  $10.57 \pm 0.92$  months.

**Table 2. Comparison of dates of acquisition of motor skills by city of origin**

Acquisition date	Copargo (months)	Kouandé (months)	Dangbo (months)	Come (months)
Sit	4,87 ± 1,04**	05,10 ± 0,85	05,25 ± 1,05	03,82 ± 1,07***
Crawl	5,90 ± 1,19*	06,20 ± 0,91	06,02 ± 0,97	5,60 ± 0,74**
Walking on all fours	7,22 ± 1,14	7,27 ± 1,35	7,50 ± 1,32	06,47 ± 1,01**
Stand with help	8,10 ± 1,10*	8,35 ± 0,86	8,15 ± 1,14*	8,05 ± 0,76
Stand without help	09,17 ± 1,03**	10,25 ± 1,03	10,27 ± 1,35	09,25 ± 0,92**
Walk	11,02 ± 0,85*	11,21 ± 1,01	11,37 ± 1,07	10,95 ± 1,00*

\* p< 0.05; \*\* p<0.01; \*\*\*p<0,001 ; the numbers represent the means of acquiring skills ± standard deviation. And all these means are expressed in months

**Table 3. Comparison of the dates of acquisition of the skills according to the socio-professional activity of the mother**

	Sit (months)	Crawl (months)	Walking on all fours (months)	Stand with help (months)	Stand without help (months)	Walk (months)
household	3,75 ± 0,34**	5,14 ± 0,17**	7,23 ± 1,13**	8,47 ± 1,05*	9,18 ± 0,73**	10,57 ± 0,92**
shopping	3,81 ± 0,7**	6,03 ± 1,3	7,71 ± 0,82*	9,03 ± 0,57	10,27 ± 1,07	10,82 ± 1,1*
Dressing	4,08 ± 1,23	5,24 ± 0,97*	8,61 ± 0,97	8,61 ± 0,83	10,43 ± 1,14	11,27 ± 1,07
seamstresses	4,74 ± 0,91	5,37 ± 0,84	7,03 ± 0,57**	8,55 ± 0,48*	9,67 ± 0,8**	10,79 ± 1,14**
teachers	5,81 ± 1,57	6,46 ± 0,88	8,46 ± 1,04	9,16 ± 0,77	10,06 ± 0,85	11,36 ± 1,10
Students	5,64 ± 0,12	6,61 ± 1,07	8,20 ± 0,37	8,68 ± 1,11	10,20 ± 1,03	11,62 ± 0,94
Nurse	5,37 ± 0,96	6,13 ± 1,14	8,48 ± 0,71	9,16 ± 0,92	9,71 ± 0,42*	11,64 ± 1,27

\* p< 0.05; \*\* p<0.01; \*\*\*p<0,001 ; the numbers represent the means of acquiring skills ± standard deviation. And all these means are expressed in months.

## DISCUSSION

**Children's motor development of the study and scientific standards:** The results of this study show that infants studied could average sit alone at 4.63 months, crawl at 5.88 months; stand with help at 7.93 months; walk on all fours at 7.86 months; stand alone at 9.98 months and walk alone at 11.05 months. These dates of onset of motor skills confirm data from the literature on early motor development of African children in their first year (Super, 1976). This author, considering six populations in East Africa, found a correlation of 0.77 between education and the average age of acquisition of a particular motor act (crawling), and the predictability becomes almost perfect (0.97) by adding exercise opportunities. We noted a high level of motor skill development among the children in our sample because the most widely used scientific scale of development is Bayley and there is a clear difference in the averages of motor skills. It's the same for the start date and the dates limits of each motor skill. This proves that the subjects studied have an early motor development.

In addition, a comparison of the age limits (beginning and end) of the motor skills of the subjects in our sample and those of the WHO growth standards that include six stages of development (sitting without support, standing up) with help, crawling, walking with help, standing and walking alone), which are developed through the results of multicentric studies conducted from 1997 to 2003, shows that children in Benin have early motor development. These results are consistent with the work of Vouilloux (1959), Gerber and Dean (1957), Yaker (1975), and Falade (1955). Similar patterns of accelerated dates of appropriation of sitting, standing, and walking have been found in infants of African descent living in Jamaica (Chugani, 1998) and living in the United States (Fall, 2003). Many other studies have resulted in the results of early motor skill acquisition dates in African infants (Iloeje, 1991).

**Justification of early motor development of children in our sample:** Following several detailed studies (Super, 1976; Leiderman, 1973), there is no doubt that many of the daily practices of African mothers are involved in promoting and supporting infant motor development.

For Gerber (1962) the attitude of the African mother during her pregnancy and her acceptance of birth as a happy, natural event, may condition the attitude, reflexes of the newborn, in a word its precocity. As soon as the child is born, he finds an intimate physical contact with his mother: he is lying on the belly of his mother, who keeps tight against his body, skin against skin, just covered with a fabric avoiding to perceive currents air or be dazzled by the light (Baganda women prefer to give birth in a dark room). The mother massages the back, the nape, the belly, the limbs; these are mobilized in extension and flexion (Yaker, 1975).

**Comparison of the children studied according to the localities of residence:** Our study shows that Comè's children grow faster than those in the other three cities. This observed difference may be due to the degree of influence of globalization on bodily cultural practices performed on newborns today. This development undoubtedly is caused by the different body care of the mother vis-à-vis the newborn. We want to talk here about the daily bath that includes the massage of the whole body of the child and the mechanical manipulations (stretching and manipulation of the joints) of the body of the child. Added to this is the carrying on the back (Bril, 2000). Moreover, the African mother literally fills her child anyway, during this primitive time. A black infant does not cry, he is breastfed at the request and any source of annoyance is immediately avoided. He lives astride on his mother's back, skin to skin. He sleeps with her.

### Comparison of the motor development of children according to the socio-occupational activity of the mother

The children of employed women have a lag in motor development compared to the children of unpaid women. In addition, it should be noted that the children of housewives have an early motor development compared to others whose mothers are traders, seamstresses, hairdressers and teachers. These results are consistent with the results of the work of Bril (1989) and Zelazo (1983) who found that children from institutional settings are exposed to more or less serious emotional, educational, social and material deprivation situations, can influence their motor development.

## Conclusion

Our results show that children can sit at 4 months, crawl at 5 months, stand with help and walk on all fours at 7 months, stand up at 9 months and walk at 11 months. These averages of skill acquisition dates are within the time frame defined by the WHO development standards. However, there is an advance of the dates of the beginning and end of the motor skills acquisition. The same is true of Bayley's standards. The analysis of the motor development of the children in our sample reveals a slight advance in the development of children in the regions of Copargo and Comè. In addition, it has been found that the children of housewives have experienced early motor development.

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