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ORIGINAL RESEARCH

ASSESSMENT OF THE INFLUENCE OF THE HAMMOCK ON NEUROMOTOR DEVELOPMENT IN NURSING FULL-TERM INFANTS

Ingrid Fonsêca Damasceno Bezerra[1], Vanessa Braga Torres[1], Johnnatas Mikael Lopes[2], Marina Pegoraro Baroni[3], Silvana Alves Pereira[3]

Abstract

Objective: to evaluate the influence of the hammock on neuromotor development in full-term infants. **Method**: the study included 26 infants born at normal gestational age, of single-births and birth weight > 2500g, 19 of them constituting the group of hammock-users and seven the group of non-hammock-users. All the 26 infants had their neuromotor development assessed using the Alberta Infant Neuromotor Scale, at six months of age. The assessments, undertaken in the infants' homes at times convenient to both mothers and children, were recorded on video and two other observers evaluated the infants' performance. **Results**: the neuromotor development of the hammock-using infants obtained a lower score than did that of the non-hammock-using infants ($p \leq 0.03$). Among the four postures evaluated by AIMS, the upright position was the only one that showed a statistically significant difference between the two groups ($p \leq 0$; 01). In the correlation analysis, maternal age showed a negative relationship (($r = -0.42$; $p \leq 0.03$;) and the value of the Apgar score at 1 minute a positive relationship with neuromotor development ($r = 0.49$; $p \leq 0.05$;). **Conclusion**: hammock-using infants present slower neuromotor development than the non-hammock-users of the same age.

Key words: child development, infant, risk factors, patient position, term birth.

INTRODUCTON

The environment in which the suckling child is brought up can give diverse formats to or mould aspects of its neuromotor behavior. This is a dynamic, universal and individual process, capable both of influencing and being influenced by the external context (physical and social environment) and internal ones (proper to the organism) in the dimensions of time and space[1-5].

The insertion of a suckling child into a positive setting will facilitate its normal development thus making possible the exploration of and interaction with the environment to which it is exposed[1,6]. When it encounters an unfavorable climate the pace of development becomes slow, thus restricting its learning possibilities and exercising a negative influence on its neuromotor abilities.

Studies show that the types of space existing in homes, the kind of flooring, the variety of toys and other objects, as also the clothes the child uses, the presence of other people within the setting and the practice of maternal care can all interfere in the process of the acquisition of neuromotor advances during infancy[1,6-8]. However, there are also various factors which can put a child's normal process of development at risk [6], among them being the maternal care dispensed in the northeastern region of Brazil.

The practice of maternal care in certain regions of the north-east is peculiar to them and much older than that of other regions of Brazil. Peculiar, because many families in this region still use the hammock as the only place available for the baby to sleep [9], whereas it is slung as a merely decorative object in other regions of the country[9,10].

Much older, because the use of the hammock is a custom inherited from the indigenous population of Brazil. It has been used since the time of the Discoveries by settler farmers and Jesuit priests. It has been used as a means of transport on long journeys, as a bed, and also as a litter to carry the dead [10].

Its shape (a rectangle of cloth suspended by the two extremities) favors the curved position with the alignment of the members and the head, contributes to the neuromotor and cognitive organization, favors the breathing system, makes feeding easier, improves the posture, facilitates social interaction and contributes to oral-neuromotor, visual and hearing abilities[11-13].

1 Fisioterapeuta, concluinte da Residência Integrada Multiprofissional em Saúde Materno-Infantil, Hospital Universitário Ana Bezerra, Universidade Federal do Rio Grande do Norte, Brasil.
2 Fisioterapeuta, Mestre em Saúde Pública, Professor Convidado da Residência Integrada Multiprofissional em Saúde Materno-Infantil da Universidade Federal do Rio Grande do Norte, Brasil.
3 Docente do Curso de Graduação de Fisioterapia da Universidade Estadual do Centro-Oeste (Unicentro).
4 Docente Adjunto do Curso de Fisioterapia e da Residência Integrada Multiprofissional em Saúde Materno-Infantil da Universidade Federal do Rio Grande do Norte – FACISA/UFRN, Brasil.
Corresponding author: apsilvana@gmail.com

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The objective is the assessment of the influence of the use of the hammock on the neuromotor development of the suckling infant born at term.

METHOD

This transversal study was undertaken on suckling infants born in the Maternity Department of the Ana Bezerra University Hospital (HUAB) after its approval by the Committee on Ethics in Research on Human Beings of the Onofre Lopes University hospital (77081/2012 - HUOL/UFRN). Suckling infants born at full term, with weight > 2500g, of single births, with Apgar score > five at the fifth minute, whose parents had signed the free and informed consent form (TCLE), were studied at six months of age. Suckling infants included in intervention programs were excluded as were those who presented any disturbance associated with intellectual deficiency, neurological pathology, orthopedic problems, genetic syndromes, sensorial disturbances (loss of hearing and/or sight) and congenital malformations.

A retrospective analysis was undertaken of the case-notes of the suckling infants born between September 2011 and February 2012 for selection of the criteria of inclusion. In this phase, the case-notes of 180 children were analyzed, of which 95 were selected. The data collected from these case-notes included: date and type of delivery, Apgar score, cephalic circumference, birth weight and length of the child; data relative to the mother (age of mother, marital status and occupation) and obstetric data (gestational age, parity, complications during the pregnancy).

After the analysis of the case-notes and approximately six months after the date of birth, a first contact was made with those responsible for the infant by telephone and/or home visit, to offer guidance about their participation in the research project and to fix the date for the assessment of the neuromotor performance. The date and time were fixed by the researcher according to the convenience of the mother and baby.

The Alberta Infant Neuromotor Scale (AIMS), prepared by Piper and Darrah[14], was used for the assessment of the acquisition of the neuromotor abilities. AIMS consists of 58 items grouped on four sub-scales which describe the development of spontaneous movement and of the neuromotor abilities, these sub-scales being determined by the four basic positions: prone, supine, seated and standing[1,7,15-19].

In each item of the sub-scales are included the detailed descriptions of the support of weight, posture and anti-gravitational movements observed in each position. After the assessment was concluded, a total score (of 0-60 points) and a percentile score, varying from 5 to 90%, were attributed. To determine the baby's final score, the score attributed to it on each sub-scale was calculated. The percentile presented together with the sum of the four sub-scales classifies the neuromotor performance as: normal/expected, percentile above 25% on the percentile curve; suspect, between 25% and 5%, and abnormal, below 5%[5,17,20]. After the assessment, the mother and/or person responsible answered a closed questionnaire asking for information on the infant's sleeping and eating habits.

One and the same examiner, trained to use the scale, assessed all the suckling infants. The assessments were recorded on video and the neuromotor performances were re-assessed and a mark attributed by two assessors – trained, and blind to the study. The two observers included in the study had no knowledge of the clinical information relating to the babies and no information regarding the analysis was discussed by them. A test of the agreement between the two scores of the assessment was undertaken and as there was no statistically significant difference between the frequencies ($p > 0.05$, Chi-Squared Test), the results attributed by observer number 1 were taken as a reference in the statistical analysis of the data.

The data collected were stored in the *Statistical Package for Social Sciences for Personal Computers* (SPSS-PC) version 17 and grouped in accordance with the variables studied. The Shapiro Wilk test was used for the analysis of normality, Student's t-test and the Mann-Whitney test for the comparison between averages, the X^2 test for the comparison of frequencies and Pearson's test for the correlation analysis. A significance level of d" 0.05 was adopted and the null hypothesis was taken to be that the use of the hammock exercised no influence on the neuromotor development of the suckling full-term infant.

RESULTS

Of the 95 suckling infants previously selected 26 were assessed at six months of age (average 6.3m ± 1 day) and included in this research project (it was not possible to localize 69 of them, either by phone or previous visit).

Of the 26 suckling infants included in the research project, 19 used the hammock and constituted the hammock-using group and seven did not use it and constituted the non-hammock-using group. Table 1 gives a characterization of the groups and their homogeneity ($p>0.05$).

In the light of the fact that the higher the score related to each posture the better the neuromotor performance was compared with the average of the scores attained in each of the four postures assessed on AIMS for both the groups studied. In this analysis it was observed that the babies who used the hammock presented lower values than those of the non-hammock-using group and the standing posture was statistically significantly different from the other groups studied (p d" 0.01). Table 2 gives the result of this analysis.

Table 1: Characterization of the 26 suckling infants assessment as from March 2012 in Santa Cruz city, interior of Rio Grande do Norte State, Brazil, 2013

Variables	Hammock-using infants	Non-hammock -using infants	p
Total	**19 babies**	**7 babies**	**-**
Perinatal			
Mother's age (years) – Average (SD)	30 (±6.46)	26 (±1.48)	0.30
Type of Delivery – f (%)			0.93
Normal 11	4		
Cesarean 8	3		
Number of Pregnancies	3(±2.25)	3 (±2.50)	0.75
Neonatal			
Sex – f (%)			0.97
Masculine	11	4	
Feminine	8	3	
Gestational Age (weeks) – Average (SD)	40 (±1.22)	40 (±0.78)	0.25
Birth-weight (g) – Average (SD)	3453(±383.81)	3474(±406.01)	0.51
Length at birth (cm) – Average (SD)	49 (±2.20)	49 (±1.71)	0.54
Cephalic circumference (cm) - Average (SD)	33 (±1.01)	35 (±1.52)	0.23
APGAR at 1st minute (score) - Average (SD)	8 (±0.83)	8 (±0.48)	0.83
APGAR at 5th minute (score) – Average (SD)	9 (±0.40)	9 (±0)	0.14
Exclusive breast-feeding			0.69
Yes	12	5	
No	7	2	
Age on day of assessment	6.45 (±0.40)	6.44 (±0.24)	0.08

Where: SD: standard deviation; f: frequence; g: grams; cm: centimeter; p: < 0.05: statistically significant values.

Table 2: Presentation of the scores attained in each of the four postures assessed by the AIMS. The assessment was undertaken at home with the suckling infants at six months of age in Santa Cruz city, RN/Brazil

AIMS Posture Average (± SD)	Hammock-using Infants	Non-hammock-using infants	p
Prone	10,31 (±2,96)	12,71 (±4,92)	0,82
Supine	7,1 (±1,91)	8,28 (±0,75)	0,87
Seated	6,57 (±2,03)	6,28 (±2,87)	0,35
Standing	2,52 (±0,61)	2,85 (±1,21)	0,01

SD: Standard Deviation.

The percentile presented by the AIMS with the sum of the four sub-scales classifies the neuromotor performance in three categories: expected, suspect and abnormal. Within this frame of reference, none of the babies, in either of the two groups studied, presented abnormal neuromotor development (percentile below 5%) but 21% of the suckling infants who used the hammock presented percentiles of between 25 and 5% and were classified as of suspected development for their age. In this analysis the hammock-using group presented a worse value than the non-hammock-using group (p d" 0.03). The average percentile of our sample was of 28.30 (26.46 in the hammock-using group and 30.14 in the non-hammock-using group). Figure 1 presents the average scores attained, by group.

In the analysis of the correlation with the variables gestational age, birth-weight, cephalic circumference, length at birth, exclusive maternal breast-feeding up to six months of age (AME) and the Apgar score at the 5th minute, none of them presented any correlation with neuromotor development; the only variables which presented some correlation were; mother's age (r = - 0.42; p d" 0.03) and Apgar score at the first minute (r = 0.49; p d" 0.05).

DISCUSSION

This study showed that the hammock-using suckling infants presented slower neuromotor development than did the non-hammock-using infants of similar biological conditions. The results showed that 21% of the infants of the former group are classified as being of "suspect" neuromotor development and that no suckling infant, in either of the groups assessed, presented abnormal neuromotor development, according to the appraisal of the AIMS.

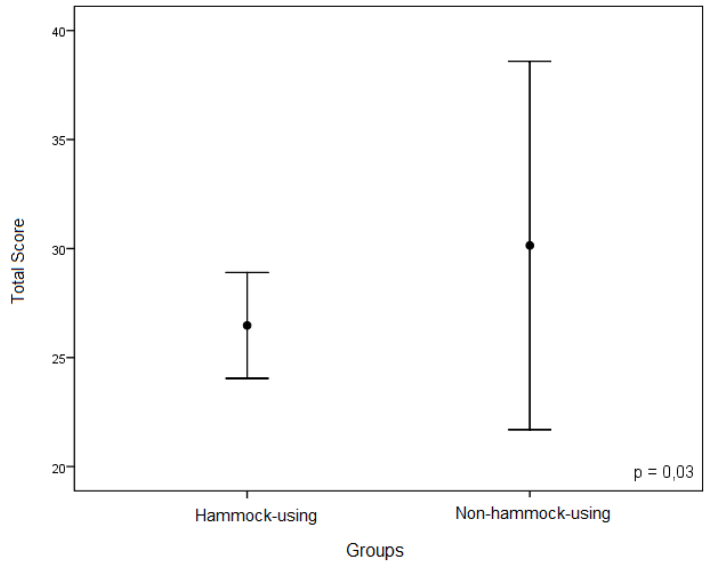

Figure 1: Presentation of the final percentile of the AIMS for the classification of neuromotor performance in three categories: expected (above 25), suspect (between 25 and 5) and abnormal (below 5). The hammock-using group, consisting of 19 suckling infants, presented a value between 25 and 5% and was classified as suspect for their age and the non-hammock-using group, of 7 suckling infants presented a value greater than 25 and was classified as of normal development for their age. All the assessments were undertaken at six months of age.

The results set out in this study are corroborated by the studies of Saccani R & Valentini[21]; Lopes, Lima & Tudella[22] and Campos et al[23]. These present authors believe that the acquisition of these neuromotor abilities occurs according to a non-uniform rhythm, is not universal and is affected by cultural alterations - showing that neuromotor acquisitions related to the majority of tasks take place slowly [21-23].

The hypothesis raised by the results of this study is that the position adopted in the hammock is supine and limits possible variation in posture while the body is at rest and that this characteristic may have influenced the rate of the neuromotor development of these children.

The study by Davis et al[24] Dewey et al[25] and Majnemer & Barr had to evaluate the mental development of children in different positions while sleeping, and claim that the supine posture was associated with a delay in the acquisition of some neuromotor milestones such as rolling, dragging, crawling and standing up, when compared to the prone position[24-26]. The position in which the child is placed to sleep is related to positions adopted when the child is awake, children who sleep supine prefer to remain in this position when awake [24-26]. The supine posture offers the infant little opportunity of learning tasks which call for an effort against the force of gravity and does not favor the adoption of certain some postures such as sitting and standing.

The interactions which exist between the various factors, whether of risk or of protection, which may influence infant development more pronouncedly, must be examined together and not separately. It was within this perspective that all the variables of this study were correlated with neuromotor development and the results presented demonstrate that the age of the mother exercises a negative influence on neuromotor development while the Apgar score at the first minute influences it positively.

The vital conditions of the newborn are assessed by the Apgar score at birth and this constitutes an important biological indicator for the surveillance of the child's neuromotor development. Thus, suckling infants with a low Apgar score are more likely to present delay in their neuromotor development [4, 27], corroborating the findings of this study.

The infants assessed did not present any biological risk, all of them were born at above 37 weeks with birthweight > 2500 gramas. According to Souza & Magalhães[28], biological factors exercise great influence on development during the first year of life.

Zajonz et al[7] show that breast-feeding might also be a possible positive factor contributing to good development. The authors conclude that breast-feeding provides a daily approach to the maternal body, which acts as a facilitator of the child's cognitive, emotional and social development. This approximation promotes, further, physical contact with the mother, becoming a rich source of stimulation, resulting in greater neuromotor stimulation, which, in its turn, triggers off adequate responses in these children[7]. In this present study, it was found that 73% of the suckling infants were exclusively breast-fed up to six months of age and that this variable presented no correlation with development.

Another relevant datum to be discussed in this study relates to the difficulties met in attempting to include in it suckling infants who do not use the hammock. The use of the hammock is a constant and indispensable part of northeasterners' life, especially in the poorer areas

of the Northeastern region –such as the region of the agreste (arid zone) of the State of Rio Grande do Norte [9,10]. Its use has recently been extended to Intensive Neonatal Care Units[12,13]. It has not, however, been possible to find articles which correlate the use of the hammock in the Intensive Care Units to the development of the new-born children. The existing studies direct study of its use to behavioral variables and make no reference to neuromotor or neurological variables[11-13]. Literature is still scarce when dealing with neuromotor development, postural assessment and the use of the hammock among healthy children, despite its frequent use in this region.

Apart from the limitation of the sample size of the non-hammock-using group, we also believe a longitudinal study of hammock-using children essential, in terms of gait and postural assessment - which should be investigated at different ages because the typical development is non-linear, there being periods of little neuromotor acquisition or of other moments marked out by behavioral advances[21,29], known as the period of quiescence.

Thus, suckling infants who use the hammock present slower neuromotor development than do those of the same age who do not.

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