

Crack and motor development of babies living in an assistance shelter

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ABSTRACT

Introduction: The baby motor development happens naturally with the complex interaction of the body, performing tasks in its context. When the body suffers negative external influence, such as the use of drugs by the mother during pregnancy, and develops in an environment different from home, such as shelters, it is questionable how the motor development would be. **Objective:** To evaluate the motor development of babies living in welfare shelters, children of crack users during pregnancy; to verify if there is an association of motor delay in these babies; and to describe the environment in which they were inserted. **Methods:** This is a cross-sectional study, with a convenience sample. There were 29 babies between three and 16 months old. Twenty-two of them were exposed to crack during pregnancy (Crack Group) and the remaining seven were not (Non-Crack Group). All were living in a specific shelter. To assess broad motor development, the Alberta Infant Motor Scale (AIMS) was used. The Affordances in the Home Environment for Motor Development - Infant Scale (AHEMD-IS) was used to assess home environment opportunities. **Results:** In the crack group, the developmental delay was confirmed in 36.4% cases and suspected in 18.2%. Most babies in the crack group were typical (45.5%). There was no statistically significant association between crack group and developmental delay, nor with age and sex. **Conclusion:** The development of babies in the crack group was similar to the non-crack group and the opportunities in the environment were reasonable for the baby development.

Keywords: crack; child development; physical therapy specialty.

INTRODUCTION

Motor development happens throughout the subject's life, through changes in the body's complex systems, interacting with the environment where he/she is inserted and the tasks he/she needs to perform^{1,2}. Depending on the context, typical motor development is represented by periods of adjustment and variability of motor activities performed by this subject and his/her context³. In current studies, the important influence of this environment on infant development is emphasized⁴.

The development of this subject is influenced from very early on, while still in the gestational phase, especially with regard to the Central Nervous System (CNS). However, risks of alterations to the CNS can occur when the fetus suffers, for example, from hypoxia, cerebral ischemia or hemorrhage, exposure of the developing brain to environmental toxins, nutritional deficiencies, and prematurity. This can damage the gray

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matter or disrupt the neural tracts of the white matter, leading to a development with negative cognitive, behavioral and/or motor outcomes⁵. Drug use during pregnancy can bring consequences to babies. Recent studies show babies with smaller than normal head circumference, lower birth weight, premature birth, congenital malformations, and future problems such as neurobehavioral problems in childhood and adolescence⁶⁻⁸.

Crack, one of the focuses of this study, is considered a stimulant drug of the CNS, causing a state of wakefulness in the user. The symptoms are related to the inhibition (caused by cocaine) of norepinephrine, dopamine, and serotonin receptors. Besides these aspects, crack generates pleasure, excitement, euphoria, feeling of power, self-confidence, lack of appetite, reduction of cold and sleep⁹. A survey conducted by Fiocruz and commissioned by the Brazilian secretariat for drug policy¹⁰, reported that there are about 370 thousand crack users in Brazil.

When the drug user is a woman, discrimination by society and health services seems to be greater, which ultimately contributes to her secret use and not seeking help, thus increasing vulnerability and risks to other health problems¹¹. Pregnant women and crack users experience feelings similar to any other woman, such as insecurity, responsibility, and concern, but they live with guilt, helplessness, and embarrassment. They do not feel able to take care of their babies, abandoning them in shelters.

The Childhood and Youth Report¹² stated that approximately 29 thousand children and adolescents were in institutional care in Brazil, mainly due to parents/guardians being chemical/alcohol dependent (81%) and negligent (81%). Several studies have shown results of alterations in children whose mothers have used drugs during pregnancy⁶⁻¹², because the drug metabolism is delayed due to the decreased expression of plasma and liver cholinesterases¹³, alterations such as: placental abruption, congenital malformation, premature birth, low birth weight, smaller head circumference, among other alterations¹⁴⁻¹⁶. In older children and teenagers, the most commonly found problems are behavioral and cognitive¹⁷. In the case of abandoned babies, they experience, in addition to organic problems, living in shelters, far from their families and family ties. The bond, especially with the mother, provides the self-regulation of the baby's nervous system, in other words, the ability of the CNS to adapt to changes in the environment^{3,18}. The baby's brain matures as the nervous system is shaped by neurochemical processes and neural activity produced by the environment^{3,19,20}.

This study is one of the pioneers in the evaluation of motor development of homeless babies whose mothers used crack during pregnancy. When following the motor development of babies awaiting adoption in shelters, it was found that there was a large demand for babies born to homeless women who had used crack during pregnancy. It was questioned, then, how the motor development of these babies would be in the first 18 months of life.

Thus, the objective of this study was to evaluate the motor development of babies living in shelters, children of crack users during pregnancy, to verify the association of motor delay in these babies, as well as to describe the environment in which they were inserted.

METHODS

Design and participants

This is a cross-sectional study. The sample was by convenience. Twenty-nine babies between three and sixteen months were included. There were 22 children of crack users during pregnancy (Crack Group) and seven whose mothers did not use the drug (Non-Crack Group), all residents of a specific shelter. The shelter was composed of five houses on the same lot, plus a central building for administration. The houses contained bedrooms (four), kitchen, bathroom, and the residents were babies, children, and adolescents (an average of five babies per house, four children, and three adolescents).

The ages of the infants in the Crack Group ranged from three to sixteen months, with the average age being 6.55 months. Only one baby was premature (35 weeks), but his age was corrected to enter the study. Birth data (weight, height, head circumference), although important, were not computed because they were incomplete. The environment variables were controlled.

The inclusion criteria established were: a) to be in the institution for more than two weeks (adaptation time); b) age range of at most eighteen months of age (age that the scale makes it possible to assess); c) of both sexes (female and male); d) no participation in early motor intervention previously; e) no process of withdrawal (constant crying, lack of appetite, probable body pain, and on medication to sleep)²¹. The exclusion criteria established were a) babies with lung, heart, syndromic, genetic or neurological damage; b) severe respiratory dysfunctions; c) babies whose mothers did not use crack during pregnancy. In accordance with resolution 466/12, the research was approved by the ethics committee, under number 20854.

Collection Instruments and Procedures

The team for data collection was composed of Physical Therapy professionals, trained to perform the assessment and with a blinded analysis regarding the prenatal conditions of the babies. The evaluations were tailored to the babies' routines and implemented over a one-week period. These babies were evaluated in a room of the institution, specific for this purpose, with furniture that allowed their spontaneous and safe movement. Information about the mothers and babies was collected through medical records provided by the shelter itself.

Then, to assess motor development, the Alberta Infant Motor Scale (AIMS) was used, an observation instrument translated,

adapted, and validated for the Brazilian population²². The AIMS measures the development, specifically the motor development, of newborns, both full-term and preterm, from 38 weeks of gestational age to 18 months of corrected age; it allows measuring the spontaneous movements and motor skills of the child based on 58 items divided into prone, supine, sitting and standing. The items performed by the baby are summed in the four postures, obtaining a total gross score, a percentile score (compared in a table, the total raw score with its age) and, finally, a classification of typical baby (if percentile above 25%); risk of delay (if percentile between 5 and 25%) and baby delay (if percentile less than 5%)²².

This test was kindly offered by the research group: Motor Evaluation and Intervention of the Escola de Educação Física da Universidade Federal do Rio Grande do Sul. The average time for the evaluation was 20 minutes and it was filmed for later analysis of the baby's motor performance in the four postures. After the evaluations, the babies returned to their routines at the institution. Two independent evaluators examined the free movement of the infant, focusing on aspects such as body surface, posture, and antigravitational movements within the four postures of the Scale.

To assess the opportunities of the home environment, the Affordances in the Home Environment for Motor Development - Infant Scale (AHMED-IS) was used. Through the report of those responsible, it qualitatively and quantitatively assesses factors (provisions and events) present in the home environment that are fundamental in promoting motor development in children¹⁹. The review steps confirmed that the AHMED-IS is a valid and reliable instrument for the assessment of children aged three to eighteen months. It includes a section on the characteristics of the infant and the family (15 questions); characteristics and dimensions of the internal and external physical space (10 questions), daily activities (11 questions) and materials and toys that promote the infant's fine and gross motor skills (20 questions)²³. It uses three types of questions: simple dichotomous (yes/no), in *Likert* format (four levels of response), and descriptive questions using illustrations as examples of the different types of toys. At the end, a calculator is offered, suggesting if the environment is very poor, poor, good, or very good. The maximum score for each questionnaire is 20 points, and this refers to a classification: low, less than nine points; medium, between 10 and 16 points; and high, from 17 to 20 points. The person responsible and knowledgeable about the daily life of the shelter answered the questionnaire²³.

Regarding the inter-rater reliability, the Kappa coefficient results showed values between 8.1 and 1.0 in the posture scores. These values reveal a good agreement between the raters²⁴.

Statistical Analysis

Data were retained in the software Statistical Package for the Social Sciences (SPSS) version 22.0. Quantitative variables were described by mean and standard deviation or median and

interquartile range. The comparison of means between groups was performed by the t-student test. In case of asymmetry, the Mann-Whitney test was applied. Fisher's exact test was used to see if there was an association of the Crack Group and motor delay. The significance level adopted was 5% ($p \leq 0.05$).

RESULTS

Since it was an analysis by convenience and only seven babies were part of the Non-Crack Group, it was understood as a limitation of the comparison between the groups. The results presented in Table 1 describe data from the infants regarding gender and age. Data from the child's health booklet, although important, were incomplete.

Table 2 refers to the postures of the babies, as well as the classification of development through AIMS. In 36.4% of crack babies had developmental delay, 18.2% suspected and most were typical babies (45.5%). There was no statistically significant association in AIMS classification of Crack babies with developmental delay ($p=0.704$), neither with age group ($p=0.283$) and gender ($p=0.823$).

The shelter was analyzed according to the AHMED-IS instrument. In general, in the environmental aspects, it was observed that the caregivers were five per house, divided into shifts (two to three children/adolescents per caregiver), the houses had four

Table 1: Characterization of the sample.

Features	Crack Group (n=22)	Non-crack Group (n=7)	p-value
Sex – n (%)			0.215*
Female	9 (40.9)	5 (71.4)	
Male	13 (59.1)	2 (28.6)	
Age (months) – mean ± SD	6.55±3.88	8.14±2.67	0.323**

*Fisher's exact test; **Student's t-test.

Table 2: Evaluation of the AIMS scores of the infants according to the study group.

Features	Crack Group (n=22)	Non-crack Group (n=7)	p-value
	median (P25-P75)	median (P25-P75)	
Postures			
Prone	8 (3-12)	8 (4-13)	0.600*
Supine	6 (4-9)	7 (6-9)	0.381*
Sitting	4 (1-8)	4 (4-8)	0.636*
Standing	2 (1-3)	3 (2-9)	0.469*
Total Gross	18 (12-30)	20 (19-36)	0.469*
Total Percentile	19.5 (2.8-53.5)	12 (<1-33)	0.217*
Classification – n (%)			0.704**
Delay	8 (36.4)	3 (42.9)	
Suspicion	4 (18.2)	2 (28.6)	
Typical	10 (45.5)	2 (28.6)	

*Mann-Whitney test; **Fisher's exact test. AIMS: Alberta Infant Motor Scale; P25: 25th percentile; P75: 75th percentile

bedrooms and all the caregivers had higher education level (by requirement of the public tender). Even though the outdoor space was rated as very good, the babies did not go outside to play; the indoor space was small but offered the babies great opportunities to develop. The variety of stimulation was good, as the babies played with other children and adults, but they had nowhere to store their toys; caregivers were instructed not to hold them on their laps so as not to allow the baby to get used to being on their lap; the babies stayed in their cribs for a long time when awake, almost never went to the floor, and the provision of fine and broad motor skills materials was rated very poor. The Total AHMED-IS rating (13 points) was average.

DISCUSSION

The objective of the study was to evaluate the motor development of babies living in shelters, children of crack users during pregnancy, to determine whether there was any association of motor delay in these babies, as well as to describe the environment in which they were inserted. For these babies, most of them were classified as typical babies in terms of broad motor development, and there was no association of developmental delay with a history of crack. The number of delayed infants in the Crack Group was similar to the Non-Crack Group in proportion. Compared to previous studies, not in a sheltered setting, Gasparin *et al.*²⁵ found no difference in global performance when groups of infants born to crack and/or cocaine-using mothers when compared to groups of infants born to non-drug-using mothers. However, when compared to a specific task, there was a difference. The babies born to drug users were more delayed. On the contrary, in the study by Lima *et al.*²⁶, the development in the broad motor area of the group of infants born to drug-using mothers at six to nine months was mostly atypical. Therefore, it is difficult to state that the delayed infants in the present study were influenced by the use of drugs during their mother's pregnancy.

In a meta-analysis with children of crack users who lived with their mothers, ten studies were evaluated, being nine cohort studies and one case-control study, indicating high quality and a "low risk of bias". The results of alterations in babies most commonly found were association with low birth weight; premature birth; small for gestational age (SGA); smaller head circumference; congenital malformation; fetal death; and placental displacement. On the other hand, there is no clear correlation between long-term effects, such as broad motor development. Other studies report that the long-term problem is not linked to motor development but to cognitive and behavioral issues¹⁴⁻¹⁶. Van Baar *et al.*¹⁷ evaluated two groups (group in which the mothers were drug users during pregnancy and control) for 5.5 years from their births. They observed that children in the group of drug-using mothers showed damage in behavioral and cognitive aspects, while in motor development there was no significant difference.

The effects of crack on mothers and their children exposed to crack in utero are very divergent^{7,8} and this manifestation may continue after birth, both through breastfeeding and passive inhalation, resulting in long-term effects of the drug in the child's organism. Research have observed that newborns exposed to crack in utero express neuroprotectors and increase the levels of neurotrophic factors, while their mothers do not^{7,8}. Although there is the possibility of presenting protective factors, children exposed to crack during the prenatal period have a high probability of identifying language and presentation difficulties, in addition to behavioral problems¹⁴⁻¹⁶.

Early motor intervention can be an ally for this population. A study with early motor intervention²⁷ carried out in shelters reported that babies whose mothers were crack users were more delayed in terms of broad motor development than babies whose mothers did not use the drug. After two months of motor intervention, the infants born to crack users achieved a *catch-up* effect, in other words, improved motor performance. When developmental conditions become favorable again, delayed subjects develop at an accelerated rate, benefiting from the expansion of opportunities, going better to the new family²⁷. Similar to this study, Miller-Loncar *et al.*²⁸ observed in their sample, that *in utero* drug exposures impaired infant motor development. But that with a treatment program accompanied by cognitive and motor stimuli, there is a positive increase in motor skills in the long term.

In the evaluation of the shelter environment, a previous study showed a weakness in stimulation opportunities for infants, agreeing with the present study. The home environment has been established as a crucial factor for motor development, especially in infants²⁹. The infant's home is part of a set of subsystems that contribute to the motor development of infants^{21,22}. In the present study, the home environment was represented by the welfare shelter, which cares for infants removed from their biological families.

Socioeconomic conditions (parents' education and family income) are the best indicators of influence on children's motor development, showing that families with low socioeconomic status have children with below average development¹⁴. One of the environmental facilitators that were found in this study refers to the caregivers' level of education. All of them had higher education level due to a public contest requirement. Studies show that fathers and mothers with a low level of education can be determinant in the negative outcome in the development of a child^{30,31}.

The varieties of stimulation in the houses were positive, as the babies played with other children/adolescents and with the caregivers. In addition to the babies, older children and adolescents lived in the house. They all played and interacted daily with the babies. Some authors talk about the importance of siblings for interpersonal relationships, helping in developmental gains³²⁻³⁴.

On the other hand, in the weaknesses or barriers issue, the babies' lack of opportunity to explore the outside environment was

detected. The external environment observed was an excellent stimulator of wide motor skills, with different floors, ramps, stairs, and a playground; however, the babies did not go outside, probably because of the weather and the small number of caregivers. It is from the broad motor development that new actions emerge, and the baby learns to move around and explore the environment^{35,36}.

Another barrier, perhaps due to lack of guidance from the caregivers, the babies had nowhere to store their toys. Places to store toys are necessary in the organization of the child's daily life. He knows where to find them and what to look for. It stimulates their cognitive and their relationship with the environment. This can start very early for the baby. There was also little variability offered in fine and broad motor skills toys. A previous study highlighted the importance of the baby choosing toys, an appropriate place for the baby to play²⁷, staying less in the crib when awake and more on the floor. Actions such as these brought positive effects on their motor development.

The shelter studied in this study was public and with few conditions to offer a great variability of toys. Previous research describes this economic relationship with the acquisition of toys of various types and functions¹⁹. It is understood that more important than the great variability of toys is to offer them to the baby and the opportunity to play.

Another barrier encountered was the fact that the caregivers were told not to pick them up on their laps so as not to allow the baby to get used to being on their laps; to stay long enough in the crib when awake and almost never to go on the floor. First of all, the baby needs affection and "eye-to-eye". Institutionalized babies may lose their reference figures, which consequently can affect their language and ability to bond and attach to another human being³⁰. The sooner babies go to their new adoptive family, the less damage they may experience throughout their lives. The family bond provides the autoregulation of the nervous system¹³. The baby's brain reaches maturity as nervous system modeling takes place, driven by neurochemical processes and neural activity, produced by the environment²⁰.

Gabbard et al.³⁷ reported that development is optimized when stimulation of the environment occurs, generating greater opportunities for adaptation and exploration. The adult needs to offer toys to the baby, even at a young age. The toys, in addition to being

offered, should have a stimulating quantity so that the baby can choose the toy he wants to play with. A previous study reported that the shelter babies did not choose their toys pre-intervention, and these were not within their reach. After the intervention program, they began to choose their toys and play with them²⁷.

If the environment is healthy, the phenomenon of interaction between subject and environment (*affordances*) improves over time. The *affordances* will be established from the experience and perception of the baby in relation to the context and with human beings. Thus, the environment in which the baby is inserted can be facilitating or unfavorable, restricting the pace and limiting the possibilities of learning and motor acquisition of the same³⁸. It is suggested the implementation of a stimulus-rich environment in shelters, regardless of their lives in the fetal stage. Motor experiences can potentiate their development, so that they can go to the adoptive family better developed. It is important that the professional makes sure that the baby goes through all the stages of development properly and enables healthy growth³⁹.

Limitations

Overall, the most limiting factor of the present study was that it did not assess the infant's cognitive issues or fine motor skills, which may have a different outcome than the broad motor ones. Other limitations found in this study were: (a) small sample size; (b) scarcity of information regarding biological issues at birth such as head circumference, weight, and height, because they were incomplete in their health booklets, often not being filled out by the hospital of origin or primary care center.

Conclusion

It was concluded that it was possible to verify that the babies in the crack group were not more delayed in their motor aspects than the non-crack group for this sample, there was no association of the broad motor delay with the mothers' use of crack. Although not used, the external and internal spaces were considered as positive potential to help provide opportunities for the babies; the variety of interpersonal stimulation (children, adolescents, and caregivers) was good; needed to decrease the babies' time in the crib when awake, to stay more time on the floor, to have a place to store toys, as well as contact with variations of broad and fine motor skills toys.

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