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.
matter or disrupt the neural tracts of the white matter, leading to a development with negative cognitive, behavioral and/or motor outcomes. 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 adolescence.

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 sleep. A survey conducted by Fiocruz and commissioned by the Brazilian secretariat for drug policy, 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 problems. 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 Report stated that approximately 29 thousand children and adolescents were in institutional care in Brazil, mainly due to parents/guardians being chemical/alcohol dependent and negligent. Several studies have shown results of alterations in children whose mothers have used drugs during pregnancy, because the drug metabolism is delayed due to the decreased expression of plasma and liver cholinesterases, alterations such as: placental abruption, congenital malformation, premature birth, low birth weight, smaller head circumference, among other alterations. 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 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). 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.

**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.

**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 population\textsuperscript{22}. 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%)\textsuperscript{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 (AHEMD-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 children\textsuperscript{19}. The review steps confirmed that the AHEMD-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)\textsuperscript{22}. 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 questionnaire\textsuperscript{23}.

Regarding the inter-rater reliability, the Kappa coefficient results showed values between 0.8 and 1.0 in the posture scores. These values reveal a good agreement between the raters\textsuperscript{24}.

**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≤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 AHEMD-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

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### Table 1: Characterization of the sample.

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

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

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

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

*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 AHEMD-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, Gasparini 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 divergent7,8 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 not7,8. 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 infants30-32. 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 development33. 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 child33-35.

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 gains35-34.

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\textsuperscript{23,26}.

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 play\textsuperscript{27}, 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 functions\textsuperscript{29}. 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 being\textsuperscript{28}. 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 system\textsuperscript{41}. The baby’s brain reaches maturity as nervous system modeling takes place, driven by neurochemical processes and neural activity, produced by the environment\textsuperscript{20}.

Gabbard et al.\textsuperscript{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 them\textsuperscript{27}.

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 facilitate or be unfavorable, restricting the pace and limiting the possibilities of learning and motor acquisition of the same\textsuperscript{25}. 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 growth\textsuperscript{39}.

**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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**REFERENCES**


