NEURO-PSYCHOLOGICAL MATURATION FEATURES OF 
ONE-YEAR-OLD ORPHANS BORN BY DRUG-ADDICTED WOMEN

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Abstract

Drug consumption structure has been investigated recently and synthetic drugs, such as derivatives of JWH-018, -250, -317 and others, gain popularity. These drugs have stronger psychoactive and somatic effect on a human body than traditional opiates. The orphanage is a health institution for education and care of orphans, children left without parental care and children with mental and physical disabilities; their ages vary from birth to four years. The research is aimed to analyze neuro-psychological and behavioral maturation features of one-year-old orphans born by drug-addicted women, who took “synthetic” drugs during their pregnancy. The analysis of mental development of orphans of the first year of life, born by addicted mothers allows us to conclude that there is a significant retardation in levels of infants’ development. This retardation is heavier than the similar one of infants born by women who took opiates during their pregnancy. However, the researchers pay attention to the fact that the results were collected regarding a small number of children who were under the study.

Keywords: neuro-psychological maturation, infants, orphan, drug-addiction, orphanage, tutorage, adoption

Relevance

The abuse of all types of substances is a global problem for Russian population (Brun, 2016). The relevance of the problem is due to the spread of drugs among teenagers and

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The problem of consuming “synthetic” drugs, such as derivatives of JWH-018, -250, -317 and similar ones is becoming more relevant during the last few years. These drugs have stronger psychoactive and somatic effect on a human body than traditional opiates. The increasing popularity of the drugs among teenagers is due to their low price, accessibility and a spreading myth about their legality and lack of addiction (WHO, 2015 Primerova, 2015).

Therefore, the aim of this study is to detect the features of mental development of infants born by mothers who consumed drugs during their pregnancy (Tzur, Aslanov, Sheiner, & Levy, 2012; Pragst, Broecker, Hastedt, Herre, Andresen-Streichert, Sachs, & Tsokos, 2013; Nygaard, Moe, Slinning, & Walhovd, 2015; Neri, Bello, Turillazzi, & Riezzo, 2015; McGlone, & Mactier, 2015).

Materials and methods

The study was conducted in Krasnoyarsk state health facility “Krasnoyarsk regional specialized orphanage №3”. The orphanage is a health institution for education and care of orphans, children left without parental care and children with mental and physical disabilities, their ages vary from birth to four years. The reasons for the numerous disorders of orphans’ mental development are diverse and often they are due to congenital physical or mental abnormalities as a result of parents’ abuse of alcohol, drugs and toxic substances or tobacco smoking (Senchenko, 2014; Senchenko, 2013).

The study included 29 orphans under the age of a year, born by drug addicted women. Two groups of children were formed. The first group included children born in 2006-2007 by mothers who consumed opiates during their pregnancy (heroin) (n = 21). Taking into account the recent significant changes in the structure of drug consumption, the second group included children born in 2014-2015 by women who consumed “synthetic” drugs during their pregnancy (n = 8). Data on the use of drugs by mothers during pregnancy were taken from the accompanying documents.
The following research methods were used: direct observation method, young children mental development diagnosis according to the method developed by Frucht E.L., AksarinaN.M., Pechora K.L., and Pantyukhina G.V., observational analysis of nurses’ and carers’ notes, and mathematical statistics methods.

The monitoring of children’s development was carried from the moment of their arrival into the institution until their departure because of the adoption, a transfer to another institution or a foster family.

**Results and their discussion**

Children were being brought up in a closed institution of orphanage system. They had the same social conditions and had no deviant effects on their development from their birth mothers.

The average age of the children at admission was $5.71 \pm 0.59$ months old in group I, and $3.000 \pm 0.58$ months old in group II ($p < 0.05$). These differences are due to the optimization of the process of children’s transfer from hospitals to orphanages.

The study of children’s past medical history showed that all children from group II were premature, whereas in group I the number of premature children was $38.1 \pm 10.6\%$ ($p<0.05$). The average gestational age in the study groups was $33.14 \pm 1.32$ and $36.69 \pm 0.74$ weeks, respectively. Moreover, $19.05\%$ of children in group I were born by cesarean section, and in group II cesarian section was used in half of the cases. This indicates a more severe impact of synthetic drugs on mother’s organism that required a medical intervention at earlier stages.

When children were examined in a hospital, different neurological symptoms were detected. Prenatal encephalopathy was diagnosed in all children regardless the group. The increased neuro-reflex excitability was observed in $9.5\%$ of children from the first group and all the children from the second group ($p < 0.05$). Hypertensic-hydrocephalic syndrome was also more common in children of group II: $75\pm15.3\%$ vs. $52.4\pm10.9\%$. Only one child from the first group was observed to have a locomotor disorder syndrome ($4.8 \pm 4.6\%$), whereas the same syndrome was diagnosed in $62.5 \pm 17.1\%$ of children whose mothers took synthetic drugs during the pregnancy. Every fourth child from the second group was identified to
have a pyramidal insufficiency. Also a toxic-metabolic encephalopathy was diagnosed in all children whose mothers took synthetic drugs. The same diagnosis was established only in 28.6±9.9% of cases in children whose mothers took opiates during pregnancy (p < 0.001).

All above may be the confirmation of the hypothesis that synthetic drugs have more dramatic effect on the nerve system of the unborn child during pregnancy.

The children of the first year of life in the orphanage are monthly examined to check the level of mental development, with the help of specially designed diagnostic system based on observation and survey in artificially created conditions based on specially selected materials. This allows diagnosing of a developmental disharmony on time, reducing the influence of the orphanage’s specific conditions, identifying children with developmental delays, determining the actual level of a child’s development and distinguishing norm from pathology.

The results of the level of mental development assessment of one-year-old orphans, born by mothers who had used drugs during pregnancy, are represented below (see Table 1). On the basis of psycho-physiological aspects of the development of infants, the emotional and personal contact with the child’s close relatives plays the leading role in the infants’ development. For cognitive development visual and auditory orienting reactions development is important, as a way to develop perception in general, the latter being the basis for the development of mental processes during the first three years of life. As it was stated above, considerable amount of children was born prematurely that suggests the increase of risk for cognitive and motor development. Our analysis of levels of children’s mental development born by drug addicted women shows a substantial backlog of development of age-related norms.

According to the purpose of our study, we compared the levels of development between the two groups. The children from the second group were diagnosed to have significant difficulties in the formation of visual-orientation reactions, specifically the reduction of the degree of concentration on the stimulus and adult’s face. The retention time of the sight also had a decreasing tendency. Later recognition’s reactions and formation of a “revival complex” had an unexpressed character and only children from the first group of age around 5-6 years old had them, and in the second group after 7-8 months, at the rate of - 3 months.
Table 1.

Levels of the development of children’s neuro-psychological development (in months)

<table>
<thead>
<tr>
<th>Development line</th>
<th>Age 3 months old</th>
<th>Group I n = 5</th>
<th>Group II n = 5</th>
<th>p</th>
<th>Group I 6 months old</th>
<th>Group I n = 10</th>
<th>Group II n = 7</th>
<th>p</th>
<th>Group I 9 months old</th>
<th>Group I n = 16</th>
<th>Group II n = 5</th>
<th>p</th>
<th>Group I 12 months old</th>
<th>Group I n = 11</th>
<th>Group II n = 0*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>visual-orientation reactions (VOR)</td>
<td>2.2±0.2</td>
<td>0.6±0.3</td>
<td>&lt;0.001</td>
<td>4.7±0.2</td>
<td>2.4±0.3</td>
<td>&lt;0.001</td>
<td>7.0±0.3</td>
<td>5.2±0.2</td>
<td>&lt;0.001</td>
<td>9.8±0.6</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>hearing-orientation reactions (HOR)</td>
<td>2.2±0.2</td>
<td>1.0±0.1</td>
<td></td>
<td>4.7±0.2</td>
<td>2.4±0.3</td>
<td>&lt;0.001</td>
<td>6.8±0.3</td>
<td>5.0±0.4</td>
<td>&lt;0.001</td>
<td>9.4±0.7</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Emotions and social behavior (E)</td>
<td>2.0±0.0</td>
<td>0.2±0.2</td>
<td></td>
<td>3.9±0.4</td>
<td>1.7±0.5</td>
<td>&lt;0.01</td>
<td>6.4±0.4</td>
<td>4.8±0.4</td>
<td>&lt;0.05</td>
<td>9.0±0.7</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
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<tr>
<td>Active speech (AS)</td>
<td>1.2±0.2</td>
<td>0.2±0.2</td>
<td>&lt;0.01</td>
<td>3.4±0.3</td>
<td>1.4±0.3</td>
<td>&lt;0.001</td>
<td>4.5±0.3</td>
<td>3.4±0.2</td>
<td>&lt;0.05</td>
<td>7.2±0.4</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speech understanding (SU)</td>
<td>Not diagnosed at the age</td>
<td></td>
<td></td>
<td>5.1±0.3</td>
<td>3.6±0.4</td>
<td>&lt;0.01</td>
<td>7.6±0.5</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Development of hand movement and actions with objects (DH)</td>
<td>1.8±0.4</td>
<td>0.2±0.2</td>
<td>&lt;0.01</td>
<td>4.6±0.2</td>
<td>2.3±0.3</td>
<td>&lt;0.001</td>
<td>6.6±0.2</td>
<td>5.2±0.6</td>
<td>&lt;0.01</td>
<td>9.2±0.4</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td>Common movements development (MD)</td>
<td>2.2±0.2</td>
<td>0.4±0.3</td>
<td>&lt;0.001</td>
<td>5.2±0.1</td>
<td>2.7±0.3</td>
<td>&lt;0.001</td>
<td>7.0±0.3</td>
<td>5.2±0.4</td>
<td>&lt;0.01</td>
<td>9.6±0.4</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and abilities (SA)</td>
<td>2.6±0.4</td>
<td>0.4±0.3</td>
<td>&lt;0.01</td>
<td>5.4±0.2</td>
<td>2.6±0.3</td>
<td>&lt;0.001</td>
<td>6.7±0.2</td>
<td>5.4±0.3</td>
<td>&lt;0.01</td>
<td>9.2±0.5</td>
<td>-</td>
<td>-</td>
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</table>

* n – the number of children of this age group who were at orphanage at the time of survey

** at the time of survey the children of the second group dropped out for various forms of adoption and tutorage

The second group children’s hearing-orientation reactions were characterized by a significant increase in the period of formation of the recognition of their names and the understanding from a group of other children’s names. It is paradoxical that a child’s response to the non-speech stimulations (sound or noises of different etiology) was much stronger than his/her response to the voice. This trend is often the evidence of disorders in the formation of affection between an adult and a child, which subsequently can lead to the formation of autostimulation.
Also, children whose mothers took “synthetic” drugs during their pregnancy, had a significant lag in the formation of the observation ability in different positions (on the back, on the side, on the stomach, on an adult hand - in a vertical position) (5 months instead of the standard 3). Alternatively, this lag was not observed in the children from the first group.

Children from the first group were more emotional and contacted an adult easier. The differences in emotions are known to be more evident in the first 6 months. Children showed a higher interest in an adult as a source of pleasure and safety. In the hands of adults, such children settled down, normalized their behavior faster and were active in maintaining eye contact.

On the contrary, the second group of children being on the hands of an adult might show no reaction, continued to cry for a long time and did not calm down. They had a more detached view, reduced response to a tactile touch. Contact “eye to eye” was not generated and tended to be avoided. Emotional response in the form of smiles much longer stayed as “social”, i.e. if there were several adults a child will smile to everyone, without singling out the one who is in contact with him more frequently (“close” adult). This leads to a later development of differentiated vivid emotions, difficulties in distinguishing “my” and “not my” adults.

The speech development is one of the most difficult development lines of orphans located in orphanages. It is caused not only by the prevalence of somatic and neurologic pathology, but also by the influence of deprivation factors of “closed” institutions, as well as the consequences of an unhealthy way of life of mothers during pregnancy.

Children born by mothers who used “synthetic” drugs had a significant delay in the development of active and passive speech. These children were characterized by a reduced rate of formation of speech skills. Certain sounds appeared to the 4th month, singing in the 8th month. Their singing was characterized by scarcity and tuneless and the absence of “melodiousness” and had short intervals. One child did not listen to the sounds of other children and did not pick up another child’s singing. It was difficult for these children to support and hold the voice contact with adults.
The children of the first group showed more interest in peers and adults as an object of communication. They had significantly higher imitative skills, which contributed to more rapid accumulation of passive vocabulary and expanded their means of communication. Despite the higher performance of the group, speech delay of all the examined children remained the most evident.

Locomotor skills of children are divided into two lines of development: gross and fine motor skills and game action with objects. Children were more active in the first group, the formation of the physiological movement phases had been retained, but had a certain tendency to delay. In the first months of life it was expressed with the difficulty of forming the primary motor skills.

Children from the second group were characterized by a more evident delay in the development of motor skills. These infants were not active, most of the time they slept. Their movements were scarce, greased and unproductive. Arms’ movements had no direction to objects, and were characterized by a great degree of reflex action: the subject grips after stimulation. Also, due to lack of interest in the subject, it was weakly held. Primary game actions were difficult and had a delayed character of formation. These children have an elongated phase of the horizontal body position in space, with minimal change in body’s position in space. The examined children were observed missing the stage of crawling on all fours. Stages of formation of motor skills were not missed for children from the first group, this helping them to start walking upright with the support.

Neuro-developmental disability contributes to a change in the timing of formation of the child’s skills and abilities. The more is the delay, the more time is spent on the skills’ formation. Children in the first group were more successful in skills’ forming despite the psycho-motor retardation. Children from the second group were characterized with difficulties with feeding from a bottle (choking, high fatigue), could not start drinking from a cup for a long time. During the feeding with a spoon it was hard for children to learn to open their mouth before the spoon touches the lips and take food with his lips. Further terms of the development and formation of skills were difficult to assess due to the disposal of the children under observation.

Analyzing the notes of observing the behavior of children in the daytime and at night, it was noted that the children of the first group had more difficulties falling asleep, they had
a restless day and night sleep (wincining, waking up, crying during sleep), while crying
the scream was loud, modulated. At the same time, the children of the second group were
characterized as passive, but restless (quiet weeping, long, monotonous).

Conclusion

The analysis of mental development of orphans of the first year of life, born by
addicted mothers allows coming to the following conclusions:

1. Prenatal period of infants born by women who took synthetic drugs during pregnancy
is characterized by a very high proportion of premature births (100 %), low gestational age
(33.1±1.3 weeks), 50% of the deliveries were carried out by caesarean section.

2. The neurological status of these children was characterized by severe neurological
symptoms. All children were diagnosed to have prenatal encephalopathy, toxic- metabolic
encephalopathy, increased nervous excitability, hypertensive-hydrocephalic syndrome occurred
in 75±15.3% cases, a syndrome of motor disorders - in 62.5±17.1%, pyramidal insufficiency -
25.0±15.3%.

3. Analysis of mental development of children born by drug addicted women who
consumed synthetic drugs during pregnancy showed a substantial retard of their level
of development, not only concerning the age standards, but also subject to the level of
development of children born by mothers who used opiates during pregnancy. However, we
need to take into the account the fact that the results were collected regarding a small number
of children who were under the study.

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