Factors related to neuropsychological deficits in ADHD children

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Abstract
According to specific guidelines, ADHD diagnosis is usually based on standardized rating scales, parent and teacher reports and observing the child’s behavior in various settings (school, family, peer relations). However, giving that ADHD is a neuro-developmental disorder consisting of impaired attention and working memory skills, poor impulse control and different behavioral problems, neuropsychological assessment might be useful for a more comprehensive understanding of the child’s difficulties (language processing, learning disorders, sensory problems, social and emotional difficulties etc).

Neuropsychological studies conducted in children with ADHD offered a comprehensive view of neurocognitive development and have shown poor executive functioning, visual and selective attention problems, poor performance in terms of language and motor processing, poor planning, deficits in visuospatial processing and visuomotor integration, set shifting and working memory difficulties, deficits in inhibiting impulsive reactions.

Key words: ADHD, neuropsychological assessment, executive functions.

Purpose
The present paper aims to identify correlations between biological, social and psychological factors and certain neuropsychological deficits in ADHD children.

Clinical sample and method
We analyzed medical history and psychomotor development of the child, pregnancy and delivery factors, social and familial environment, parenting skills, academic performances and their relation with neuropsychological deficits (attention/executive functions, memory and learning, language,
visuospatial and sensory-motor functions) in 46 patients who were referred to clinical psychiatric and psychological assessment over the last year. Patients were 6 to 14 years of age, their IQ was higher than 80 and they didn’t suffer from other psychiatric and neurological disorders.

All the patients received a complete psychological and psychiatric evaluation which involved parent, teacher and child interview, functional behavior analysis in school, peer relations assessment. They met DSM-IV criteria for ADHD. We used Child Behavior Checklist for ages 6-18, Stony Brook inventory (for parents) and tests included in the neuropsychological assessment battery - NEPSY.

Results of NEPSY assessment tests were expressed as follows:

**Above Expected Level** - scores that fall within this range shows that the child has skills that are more developed than 75% of his peers.

**At Expected Level** - patients whose scores fall within this range have skills that are equal to 26-75 % of their peers.

**Borderline** - patients whose scores fall within this range have skills that are developed as 11-25 % of their peers.

**Below Expected Level** - children whose scores fall within this range have skills that are equal to 3-10 % of their peers.

**Well Below Expected Level** Children whose scores fall within this range have skills that are not as developed as 98% of their peers (≤2).

The data were statistically processed using Chi-Square test for qualitative variables.

We didn’t consider eligible individuals with IQ < 80 and severe somatic or neurological comorbid conditions.

We also obtained signed informed consent of their parent or legal guardian for using the assessment results in our study.

Data were statistically processed performing Chi-Square test for qualitative variables.

Descriptive statistics were performed for socio-demographic factors.

**RESULTS**

α) *Descriptive statistics*

The clinical sample consisted of 46 patients, with a sex distribution of 41 boys (89.13 %) and 5 girls (10.87 %).

The mean age of the patients was 8.02 (age range 6 to 14 years) with a standard deviation of 2.816.

89.13 % of the patients were living in a city and 10.87 % were from the countryside.

Analyzing the data about personal history (pregnancy, delivery and
birth circumstances) we found that 15.22 % of patients had a positive history of severe birth injury (Apgar score < 8), 19.57 % had mild birth injury and 4.35 % of them had pregnancy disturbances (bleeding or painful contractions during pregnancy, threatened abortion) and 60.87 % had normal birth and pregnancy outcome.

Developmental milestones in our patients sample were normal in 52.17 % of cases, 6.52 % had mild motor developmental delay recovered without exercise or kinetotherapy (started to walk independently after the age of 1 year 2 months but before 1 year 7 months of age), 34.78 % had expressive mild language developmental delay (difficulties organizing words and simple sentences before 3 years of age) and 6.52% had both motor and expressive language developmental delay.

Academic performance was good in 17.39% of patients while 56.52% had medium academic achievement and 26.09% had poor academic performance.

We also studied school behavioral problems and we found that 56.52 % of patients presented moderate oppositional defiant behavior, uncooperative and hostile behavior toward authority figures (parents, teachers), 13.04% of patients had severe conduct and defiant problems with frequent tantrum outbursts, often breaking rules, revengeful and initiating conflicts with their peers. 26.09% had no problematic behavior and 4.35 % showed low interest in school activities and performances and high school absenteeism (truancy).
80.43 % of our patients had a stable family environment, living with both their biological parents, continuously married, 15.22 % were living in monoparental family (divorced, separated parents, death of one parent) and 4.35 % of children were adopted or were in foster homes.

The data about relations between family members in the sample found that 36.96 % of subjects had a nonconflictual and supportive family relationships, 26.09 % had tensive relations and intense conflicts between family members, 4.35 % of all the children in our sample were neglected, emotionally abused or exposed to family violence while 32.61% had overprotective parents and inconsistent family rules.

Sensory-motor functioning in our sample was at expected level in 47.83 % of patients, below expected level in 13.04 %, well below expected level in 15.22 % and fall within borderline scores in 21.74% of the patients.
We also made an analysis on treatment used in this clinical sample. Most of the patients (60.87%) received only behavioral interventions along with family counseling for controlling problematic behavior and supporting learning deficits and sensory-processing disturbances.

\[ \beta \) Statistically significant correlations between the studied factors

In the present study there were significant statistical correlations (p-value < 0.05) between sensory-motor functioning (movement coordination, the ability to organize a series of sequences and movements, motor planning, tactile and kinesthetic information processing) and educational level of both parents (p= 0.046).
We also found statistical significant correlations between sensory-motor functioning and socioeconomic status of the family ($p=0.02$) and also with school behavioral problems of the child ($p=0.0006$).

Visuospatial processing (mental representation of objects, reproducing three-dimensional spatial relationships, understanding directionality, the ability to understand and interpret symbolic representations, solving non-verbal tasks) was well statistical correlated ($p$-value $<0.05$) to environmental factors (rural/urban areas, $p=0.026$) and academic performances ($p=0.0006$).
No significant data shows correlations between medical problems, pregnancy circumstances, motor, language or cognitive developmental factors, ADHD severity and neuropsychological deficits in our clinical sample.

**Conclusions**

Our findings may help to consider preventive interventions in children with ADHD or other neuropsychiatric condition associated with visuospatial and sensory-motor impairment taking into account their socioeconomic background and school functioning. These neuropsychological functions are strongly related to learning disabilities and further studies should be performed in order to identify executive deficits in young pre-school children and initiate psychosocial intervention for improving social and educational functioning.

**References**