

PSYCHOLOGICAL ASSESSMENT AND BIOFEEDBACK MITIGATION OF TENSION-TYPE HEADACHES IN CHILDREN

Pop-Jordanova N., Zorcec T.

Paediatric clinic, Faculty of Medicine, University of Skopje, R. Macedonia

Abstract: The research concerned a group of 59 children, 22 girls and 37 boys, mean age 12.5 ± 1.24 years, with tension type headaches. Their clinical results (neurological, neuropsychological, radiological and laboratory) were normal, suggesting psychosomatic etiology. The characteristics of the headache correspond to a nosologic entity known as tension-type headache. The aim of this study was to evaluate the psychological characteristics of these children and their families, especially the profile of the mothers. The psychological assessment, consecutively applied, comprised: Eysenck Personality Questionnaire (EPQ), Emotions Profile Index (EPI), General Anxiety State (GAS) and Human Values Rank (HVR). The mothers were examined by Family Inventory Life Events (FILE) and Minnesota Multiphasic Personality Inventory (MMPI) and also checked with the Child Behavior Check List (CBCL).

The results obtained showed a non-negligible level of actual anxiety in all the children, who were mostly the first-born and lived in families with accentuated stress. The emotional profile of the children was characterized by impulsiveness, a feeling of fear, moderate aggression, but still with a great level of acceptability. The EPQ confirmed their extroversion, moderate neurotic manifestations and a need for social acceptance. These results suggest that in preadolescents emotional stress, combined with a "model" for somatization, could provoke specific involuntary contraction of the head and neck muscles causing local ischaemia, which may be the pathophysiologic cause of a tension-type headache. The therapy comprised EDR and EMG biofeedback, applied once per week, of 50-minute duration. The results obtained after 20 sessions are very satisfactory. In addition, some response-measures involving a change and adjustment of family relations and school environment are recommended.

Key words: headache, children, biofeedback, psychophysiology.

Introduction

Headache is a common type of somatization phenomenon in children. The evaluation of the patient with a headache must be very careful because of the great number of etiologic moments. Most small children cannot communicate the characteristics of the headache and become rather irritable. Therefore, the anamnesis and clinical evaluation are very important [1, 2].

Diagnostics of migraine-like headaches in childhood differs. In 1988 the International Headache Society (IHS) gave new criteria for diagnostics, mainly based on the presence of aura [3].

Table 1 presents diagnostic criteria for two main types of headache in children and Table 2 presents the classification of migraine syndromes. Criteria for tension-type headache are presented in Table 3.

Table 1 – Табела 1

Diagnostic criteria for migraine *Дијагностички критериуми за мигрена*

Migraine without aura	Migraine with aura
Five attacks	Two attacks
Duration of 4 to 72 h	
<i>Characteristics (two)</i>	<i>Characteristics (three)</i>
– unilateral – pulsating – moderate to severe – aggravated by physical activity – nausea and/or vomiting – photophobia/phonophobia	– aura indicating focal cerebral or brain stem dysfunction – aura developing gradually over 4 min. or several in succession – aura lasting < min. – headache appearing before, with or within 60 min of the aura

Table 2 – Табела 2

Classification of migraine syndromes *Класификација на мигренозни синдроми*

I. Migraine without aura

II. Migraine with aura

a. classic

b. complicated

- hemiplegic migraine
- ophthalmologic

- basilar artery (Birckerstaff)
- acute confusional state
- Alice-in-Wonderland syndrome

III. Migraine variants

- abdominal
- benign paroxysmal vertigo
- paroxysmal torticollis
- ocular migraine

Table 3 – Табела 3

Criteria for tension-type headache
Критериуми за тензионен тип главоболка

Episodic type

10 episodes, fewer than 15/month

Duration: 30 min to 7 days

Characteristics:

- pressing/ tightening (non-pulsating) quality
- mild or moderate intensity
- bilateral localization
- not aggravated by physical activity

Both of the following:

No nausea or vomiting

Either photophobia or phonophobia, but not both

Chronic type

More than 15/month for 6 months

Characteristics as above

Both of the following: No vomiting

May have only one of the following: nausea, photophobia, phonophobia

Tension-type headache is one of the most diffuse disorders. It is thought to affect about 3% of the general population almost every day, and about 10% once a week [4]. It is estimated that in about 78% of the general population a tension-type headache occurs once in the life cycle. The onset of this type of headache is often related to acute or chronic stress.

A tension-type headache is currently described as a form of recurrent episodic form of headache lasting from a few minutes up to days with a compressive-constrictive type of pain, non-pulsating, of mild to moderate intensity, bilateral, not worsened by physical activity. Nausea, photophobia and phonophobia may also co-exist.

We evaluated a group of children manifesting tension-type headaches.

The aim of this study was:

- to evaluate the psychological characteristics of children with headaches
- to correlate their characteristics with their mothers' personalities
- to evaluate their family environment
- and to investigate the effect of the application of EDR and EMG biofeedback.

Methodology

The investigated group comprised 59 children, 22 girls and 37 boys, mean age 12.5 ± 1.24 years, with tension-type headaches. The diagnosis was made according to the diagnostic criteria of the International Headache Society [3]. Clinical and radiological evaluations were performed for the exclusion of possible neurological diseases. All children completed the Headache assessment questionnaire, adapted from Biondy [4], at the beginning and during the treatment. In this way, the changes in frequency, intensity and localization of the headaches were followed.

The psychological evaluation comprised the Eysenck Personality Questionnaire (EPQ), Emotions Profile Index (EPI), Individual Value Rank (IVR) and General Anxiety Scale (GAS) for children, as well as the Child Behavior Check List (CBCL), Minnesota Multiphasic Personality Inventory (MMPI) and Family Inventory Life Events (FILE) for mothers [5–14].

EDR and EMG biofeedback assessment and therapy was performed by Biograph ProComp. Thought Technology, Ltd., Canada, and Inner Tunner Professional 2.1 software from Ultramind Ltd. (London, UK). Statistical analysis was performed with a Student *t*-test between the first and the last biofeedback sessions.

Results

The data obtained from the questionnaire, checked by patients, showed that most of them were first-born, headaches were bilateral, with primary frontal localization, or diffuse. The frequency was 2–3 times monthly, almost always in the afternoon or evening, with a duration of about 30 minutes to one hour; the intensity score was 3–4 (on a scale of 0–5). The rhythm of the headache was continuous and the quality of the pain was described as stretching or burning. Children confirmed that only emotional stress might be supposed as the triggering factor. Physical activity did not influence the headache. Only 6% of children confirmed associated nausea and vomiting, 45% had photophobia. In

the family anamnesis, the most important data was that 80% of the mothers also suffered from headaches. We believe that headache may be related not only to biological disposition, but that the children had a "model" for symptoms of somatization.

EPQ is a self-reported scale that assesses four dimensions of the personality such as extraversion, neuroticism, psychoticism and level of honesty. Results obtained from EPQ (Fig. 1) were as follows:

$P = 6.81 \pm 3.06$	$t\text{-test } 1.49 \text{ } p > 0.05$
$E = 15.23 \pm 2.7$	$t\text{-test } 1.49 \text{ } p > 0.05$
$N = 13.52 \pm 2.7$	$t\text{-test } 0.43 \text{ } p > 0.05$
$L = 14.52 \pm 3.81$	$t\text{-test } 0.41 \text{ } p > 0.05$

These EPQ results confirmed that the children who suffered from headaches did not differ from the "normal" sample in the four personality traits. The "normal" sample represents primary school pupils without any somatic or psychological problems examined for validation of the EPQ in the Macedonian population.

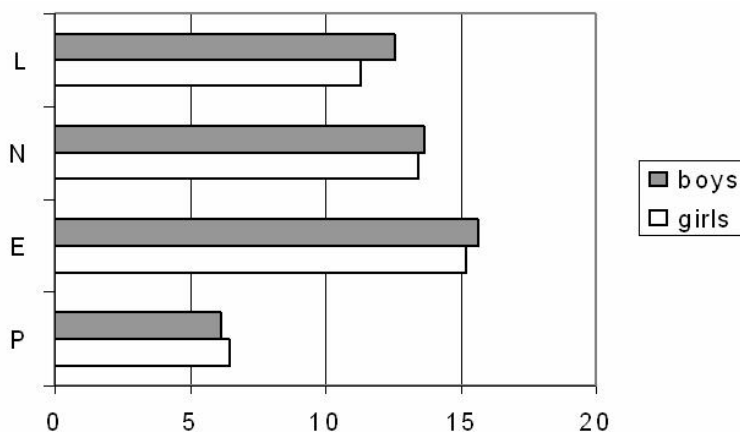


Figure 1– EPQ for children with headaches

Слика 1 – EPQ од децата со главоболка

Generally, children with headaches are extroverts, expressed moderate neurotic characteristics; they were without psychopathologic traits, and had a great need for social acceptance.

The results obtained on EPI (Fig. 2) showed that those children were social, communicative, obedient and suggestible. On other hand, they expressed moderate anxiety, fear and compulsiveness. There was no open aggressiveness in their characters.

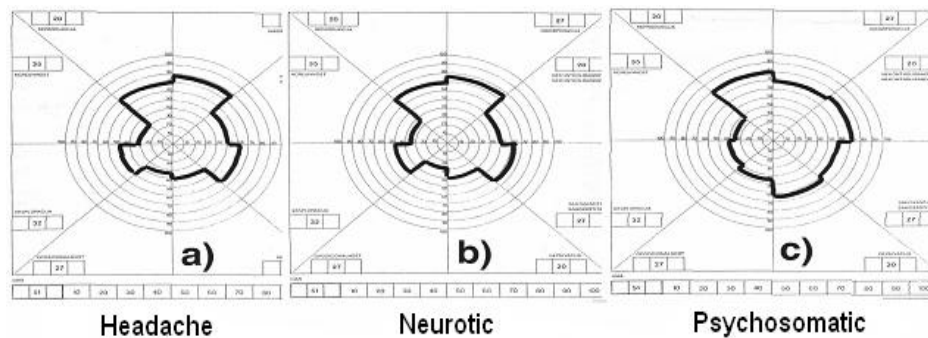
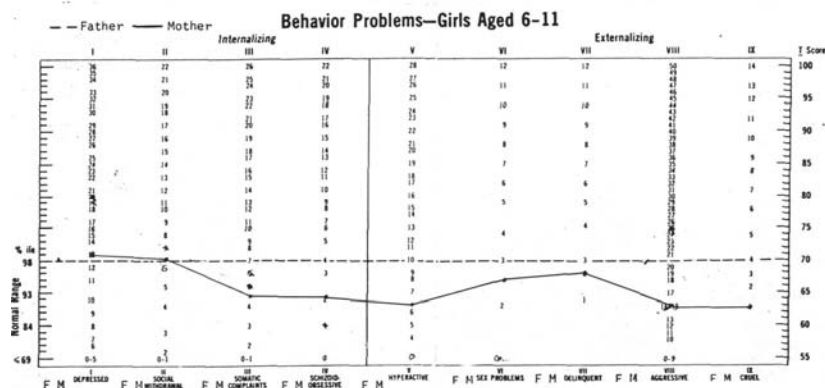


Figure 2 – EPI-comparison between three groups of children

Слика 2 – EPI-споредено кај три групи деца

The EPI obtained for the headache group is very similar to the profile obtained for other neurotic patients (tics, stuttering and enuresis) and differs from the profile of the psychosomatic group (asthma, peptic ulcer and rheumatoid arthritis). The obtained striking similarity to the neurotic profile indicates the stress-related mechanism of the tension-type headache.

The CBCL scale assesses a child's behavioural problems such as depression, social withdrawal, somatic complaints, schizoid-obsessive complaints, hyperactivity, sex problems, delinquent and aggressive behaviour and cruelty reported by their parents. Fig. 3 shows the profiles obtained for CBCL girls and boys, showing peaks in depression and social withdrawal in girls and somatization in boys.



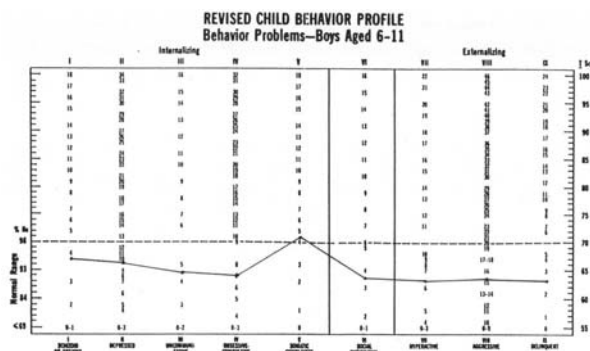


Figure 3 – CBCL obtained for girls and boys with headaches

Слика 3 – CBCL добиена за девојчиња и машки со главоболка

GAS is a self-reported scale that assesses the general level of a child's anxiety. GAS confirmed elevated scores for actual anxiety (27 ± 1.5 from max 35).

IVR is a list comprised of 22 individual values. The child is asked to rank the values in order of significance to her/himself. The children with headaches gave the following order for individual values:

Social welfare	1
Friendship	2
Children	3
Belief	4
Creativity	5
Freedom	6
Understanding with parents	7
Profession	8
Self-security	9
Understanding with partner	10
New-experience	11
Relaxation	12
Love	13
Wisdom	14
Enough food and drink	15
Social respectability	16
Self-security	17
Respect social rules	18
Property	19
Comfortable life	20
Beauty	21
Power	22

The rank of chosen values confirms the extroversion of these children and their need for safety and belonging, as well as a need for affirmation. It is interesting that property, a comfortable life, beauty and power had the lowest score on the human values scale.

The results obtained from the FILE showed a moderate stress score level ($M = 11.17 \pm 8.16$). Finances and the parents' jobs emerge as the most stressful. The work-family conflicts are in second place among the items of family problems. The results confirm that these children lived in the atmosphere of an accentuated anxiety in their parents, which may relate to somatization.

The MMPI profile for mothers is presented in Fig. 4. The two peaks in the Hs and Hy scales may be because of hypersensitivity and hysterical behaviour on the part of the mothers. In other words, anxious mothers react either with somatization or with verbal complaining, creating an atmosphere of insecurity, stress and tension. Eighty percent of the mothers evaluated themselves as suffering from headaches. This is very important as a model of somatization symptoms in children. This type of atmosphere may be "disease-prone" for children.

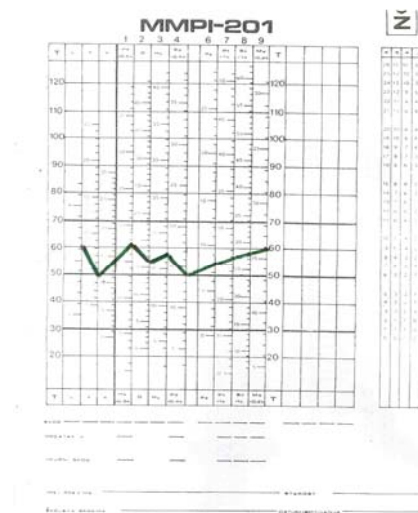


Figure 4 – MMPI personality profile obtained from the mothers
Слика 4 – MMPI профил на личност за мајките

Generally, the psychological characteristics of preadolescents with tension-type headaches may be defined as follows: extroversion, moderate neuroticism, an accentuated need for social acceptance and a raised level of actual anxiety. The emotional distress combined with a "model" for somatization in the family (mainly the mother) provoke specific involuntary contractions of the head and neck muscles causing local ischaemia and subsequent

headache. This suggests the use of both EDR and EMG biofeedback [15]. This therapeutic methodology is based on electrodermal resistance, as well as having muscular electrical potential, both correlated with the emotional state of the person involved. Children with headaches underwent treatment of 50 minutes' duration once a week. The aim was to increase electrodermal resistance and to diminish muscular electricity due to tension. The statistical analysis was made after 20 sessions.

The changes of electrodermal resistance in $k\Omega$ during the initial and final sessions are presented in Fig. 5. Statistical analysis showed significance at the level $p < 0.01$ (t -test = 6.19; $df=58$). The placement of the electrodes for EMG biofeedback was on the *m. frontalis* as well as on the *m. trapezium*. The training aimed to lower the amplitude of the muscle waves below 1.4 mV. The obtained clinical outcome of all the children was very satisfactory. EDR biofeedback was combined with cognitive-behavioral psychotherapy.

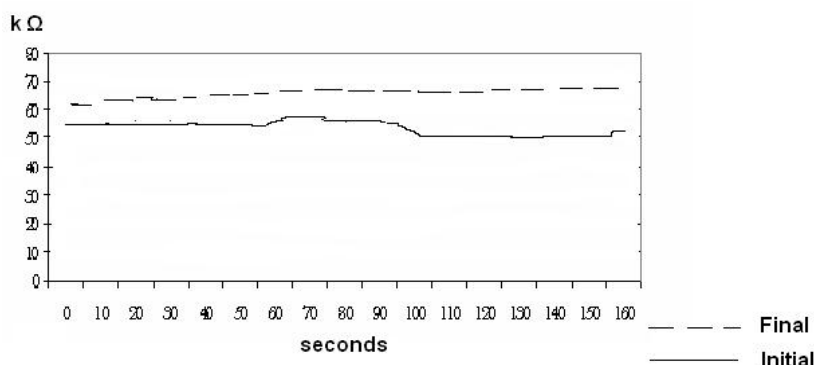


Figure 5 – Changes of EDR for children with headaches
Слика 5 – Промени на EDR кај децата со главоболка

Our experience with biofeedback applied in other different pediatric disorders is very satisfactory [17–22]. We have applied biofeedback in neurotic syndromes (enuresis/encompresis, stuttering, tics, and different types of somatisation) but also in anorexic girls and chronic diseases such as cystic fibrosis. In children with ADHD generally, we started with peripheral biofeedback (EDR, HR or EMG) and as second step we used the neurofeedback protocol depending on qEEG analysis. The ten years experience of this methodology is very satisfactory.

Conclusion

The psychological characteristics of children with tension-type headaches may be defined as follows: extroversion, moderate neuroticism, a strong

need for social acceptance and an emotional profile very similar to neurotic patients. The level of actual anxiety is not negligible. The children have an accentuated need for belonging and social affirmation. In general, these characteristics correspond to neurotic personalities.

Stressful living conditions correlated with these personality characteristics may be the basis for complex physiological changes in preadolescents leading to headache. Our results suggest that in preadolescents emotional distress combined with a "model" for somatization provoke specific involuntary contractions of the head and neck muscles causing local ischaemia and subsequent headache.

The 20 sessions of EDR and EMG biofeedback of 50 minutes duration applied once a week showed very satisfactory results. The aim of biofeedback was to reduce electrodermal activity and to diminish the muscle tension in the forehead. In addition, some psychological response measure was performed.

REFERENCES

1. Barlow CF., Headache and Migraine in Childhood, in: W Nelson (2002): *Textbook of Pediatrics*, 16 editions, WB Saunders Company, Philadelphia, London, Toronto, and Tokyo.
2. De Ajuriaguerra J., Marcelli D. (1989): *Psychopathologie de l' enfant*, Masson, Paris.
3. Headache Classification Committee of the International Headache Society: Classification and diagnostic criteria for headache disorders, cranial neuralgia and facial pain. *Cephalgia*; 1988; 8 (Suppl 7): 9–96.
4. Biondi M., Portuesi G. (1994): Tension-Type Headache: Psychosomatic Clinical Assessment and Treatment, *Psychoter Psychosom*; 61: 41–64.
5. Eysenck HJ. and Eysenck SBG. (1975): *Manual of the Eysenck Personality Questionnaire*; London, Hodder and Stoughton.
6. Hathaway SR. (1965): Personality Inventories in: *Handbook of Clinical Psychology*; NY Editor: Wolman R.
7. Plutchnik R., Kellerman H. (1974): *Emotional Profile Index*; West-Psychol. Services., LA California.
8. Bozinovski S., Martinovska C., Pop-Jordanova N. (1991): MEXYS 2 A Fuzzy reasoning expert system based on subject emotions consideration, MIE 91, Wien, 423–6 in Adlassing KP, Grabner G., Bengtsson S., Hausen R. (Eds), *Medical Informatics Europe*; Springer-Verlag, Wien.
9. Pogacnik V. (1988): *Human Value Rank*; Ljubljana, (Manual).
10. Rokeach M. (1967): *The Nature of Human Values*; New York, The Free Press.
11. McCubbin IH., Patterson JM., Wilson LR. (1983): *Family Inventory of Life Events and Changes*; Univ. of Wisconsin-Madison, Madison.

12. Sarason IG., Johnson HJ., Siegel JM. (1978): Assessing the impact of life changes: Development of the Life Experiences Survey. *J. Consult Clin Psychol*; 46: 932–46.
13. Gilberstadt H., Duker J. (1965): *A Handbook for Clinical and Actual MMPI Interpretation*; Philadelphia, WB Saunders.
14. Achenbach T.M. & Edelbrock C. (1983): *Manual for the Child Behavior Checklist and Revised Behavior Profile*; Burlington, VT: Thomas Achenbach.
15. Berger J. (1978): *Psihodijagnostika*, Nolit, Beograd.
16. Schwartz M., Andrasik F. (2003): *Biofeedback, A Practitioner's guide*; Third Edition, The Guilford Press, New York, London.
17. Zorcec T., Pop-Jordanova N., Avramovska V. (2005): Psychological profile and treatment with EDR biofeedback of children with headaches, 9th Annual BFE meeting, Hasselt Belgium.
18. Pop-Jordanova N. (2003): Eating disorders in the preadolescent period: Psychological Characteristics and Biofeedback mitigation, Chapter III in *Focus on Eating Disorder Research*; Editor P. Swain, Nova Biomedical books, New York.
19. Pop-Jordanova N. (2000): Biofeedback mitigation for eating disorders in preadolescents, *International Pediatrics*, 1: 76–82.
20. Pop-Jordanova N., Pop-Jordanov J. (2002): Psychophysiological comorbidity and computerized biofeedback, *The International Journal of Artificial Organs*, 25: 429–433.
21. Pop-Jordanova N., Zorcec T., Child trauma, attachment and biofeedback mitigation, *Contributions*, MANU, Sec. Biol. Med. Sci., XXV, 1–2: 103–114.
22. Pop-Jordanova N., Markovska-Simoska S., Zorcec T. (2005): Neurofeedback treatment of children with attention deficit hyperactivity disorder, *Proceedings*; MANU, Sec. Biol. Med. Sci., XXVI, 1: 71–80.
23. Pop-Jordanova N., Zorcec T., Demerdzieva A. (2005): Electrodermal Biofeedback in treating psychogenic nonepileptic seizures, *Contributions*, Sec. Biol. Med. Sci., MASA, XXVI, 2: 43–51.

Резиме

ПСИХОЛОШКА ПРОЦЕНКА И БИОФИДБЕК ТРЕТМАН НА ТЕНЗИОНИ ГЛАВОБОЛКИ КАЈ ДЕЦА

Поп-Јорданова Н., Зорчец Т.

Клиника за дејски болести, Медицински факултет, Скопје, Р. Македонија

Истражувањето беше насочено на група од 59 деца, од кои 22 девојчиња и 37 момчиња со тензиони главоболки, на средна возраст од $12,5 \pm 1,24$ години. Клиничките резултати (невролошки, невропсихолошки, радиолош-

ки и лабораториски) беа во границите на нормалата и сугерираа психосоматска етиологија. Карактеристиките на главоболките кореспондираа со нозолошкиот ентитет познат како тензионен тип на главоболка. Целта на оваа студија беше да се проценат психолошките карактеристики на овие деца и на нивните семејства, особено профилот на личност кај мајките. Психолошката проценка беше спроведена преку Eysenck Personality Questionnaire (EPQ), Emotions Profile Index (EPI), General Anxiety State (GAS) и Human Values Rank (HVR). Мајките беа проценувани преку Family Inventory Life Events (FILE) и Minnesota Multiphasic Personality Inventory (MMPI), а пополнија и Child Behavior Check List (CBCL).

Добиените резултати сугерираат значајно високо ниво на актуелната анксиозност кај децата, кои во најголем број беа првородени деца и живеаа во семејства кои се под стрес. Емоционалниот профил на децата се карактеризира со импулсивност, чувство на страв, умерена агресивност, но сè уште со голем степен на прифатливост. EPQ ја потврди нивната екстраверзија, умереното присуство на невротски манифестации, како и потребата за социјална прифатеност. Резултатите сугерираат дека преадолесцентниот емоционален стрес во комбинација со „модел“ на соматизација, може да испровоцира специфични, неволеви контракции на мускулите на главата и вратот, што предизвикува исхемија која може да биде патофизиолошка причина за појава на тензионата главоболка. Терапијата беше составена од ЕДР и ЕМГ биофидбек, еднаш неделно, во траење од 50 минути. Добиените резултати по 20 сесии беа задоволувачки. Дополнително, се препорачуваат интервенции кои вклучуваат промена и регулирање на релациите во семејството и училиштето.

Клучни зборови: главоболка, деца, биофидбек, психофизиологија.

Corresponding Author:

Pop-Jordanova Nada, prof.
Paediatric clinic, Faculty of Medicine,
University of Skopje,
1000 Skopje, R. Macedonia

E-mail: npopjordanova@gmail.com