8. ABSTRACT

Introduction: The idea of the paper emerged from observations of children and adolescents suffering from psycho-physical limitations, with particular focus on the relations observable in the context of integration between the function of senses and mental resources of young people.

This is the holistic type of study, as it shows an attempt to deepen the knowledge concerning psycho-physical functioning of deaf teenagers. It responds to the challenge of learning the body and the psyche without invasive intervention into developmental resources of adolescents [1,2].

The review of the literature from the 1970s to contemporary times concerning the issue of emotional and behavioural problems among the population of deaf and hearing-impaired youth indicates the lack of a uniform and clear research model in this population [3].

The population of hearing-impaired people is a heterogeneous group at the centre of interests of education and psychology researchers. Significant variables include: the age at which the hearing impairment appeared and the aetiology of deafness, the age of the diagnosis, the type and degree of hearing loss, access to and acquisition of phonic language and/or sign language, early specialist therapeutic intervention, hearing aid devices, and parent – child interaction. All of the above-mentioned factors affect both cognitive and socio-economical functioning [1.2,3].

The most common and general definition of deafness is described by the term *hearing impairment*, which in the Polish language corresponds to the notion covering the whole category of persons with any hearing loss [4,5,6].

Aim of the paper: The main aim of the paper was to verify the effect of a visual effective stimulus on the postural stability of hearing-impaired adolescents. One of the challenges undertaken by the author was to answer the following question: How does the body of a young person in the adolescence period, deprived of one of the most important senses – hearing, reflect affective stimuli reaching their body? For the purpose of the study, the area of the research was narrowed to the affective static expression of human face mimics presented in the photos.

Material: The studied group consisted of deaf teenagers aged 13–17, while the control group consisted of hearing adolescents. The total number of respondents was 120. Clinical studies were conducted at the Department of Rehabilitation of the Faculty of Medicine, Collegium Medicum of the University of Warmia and Mazury in Olsztyn. In order to ensure coherent

bases for statistical analyses, the materials used were varied. The study used psychological questionnaire tests describing emotion resources: The scale for measuring mood and six emotions – by Wojciszke B, Baryła W, Emotion Questionnaire [133], Emotional Intelligence Questionnaire [134], photographs of faces with specific emotional affect, photographs from the Set of *Facial Displays of Emotion* (MSFD) database [139] and Stabilometric Computer Platform, two-plate posturograph, verifying the visual and movement coordination – postural stability.

Results: In order to answer the research questions posed, statistical analyses were carried out for the condition of the research – eyes closed – using the IBM SPSS Statistics 23 package. Using this software, descriptive statistics were analysed with the Kolmogorov-Smirnov test, three-factor analyses of variance were performed in the mixed model and an analysis of the correlations was conducted with Pearson's coefficient *r*. The classic threshold of α=0.05 was assumed as the level of significance, but the results of probability of the test statistics at the level of $0.05<p<0.1$ were interpreted as significant at the level of a statistical trend. Body stability was verified in the studied group and in the control group, and a statistically significant main effect for the group was obtained: $F(1,116)=4.65$; $p=0.033$; $\eta^2=0.039$. A higher level of Romberg coefficient was found in the control group, which proves that a change in body stability occurs in adolescents with hearing disorders as compared to the control group. In addition, the effect of visual exposure of positive emotions in relationto body stability was verified in the studied group and in the control group. In the variantof positive emotions, no difference was recorded even at a statistical trend level ($p=0.476$). This indicated the need to accept H_{0-2} – *Visual exposure to positive emotions in adolescents with hearing disorders does not result in changes in their body stability in relation to adolescents from the control group.* Additionally, the effect of negative emotions on postural stability was analysed. In the variant of negative emotions, differences were recorded at the level of a statistical trend between the adolescents with hearing disorders, who again obtained lower results, and the adolescents in the control group ($p=0.082$). For this reason, the hypotheses H_{0-3} or H_{A-3} cannot be explicitly accepted or rejected. The coefficient of symmetric distribution of load on lower limbs (right minus left) was analysed depending on the type of exposure to emotional stimuli, the group of the research subjects and their sex. The effect of interaction between factors of the exposure type and the research group proved not to be statistically significant or even close to statistical significance: $F(2,232)=0.63$; $p=0.524$; $\eta^2=0.005$. Consequently, there was no reason

to perform an analysis of simple effects. Therefore, hypotheses $H_{0\text{-}1}$ and $H_{0\text{-}2}$ – *Visual exposure to positive / negative emotions does not affect the even distribution of load on lower limbs in hearing-impaired adolescents* – should be accepted. It was verified whether the level of the asymmetry factor for the distribution of load on lower limbs, examined in three variants of emotion exposure (a control condition, positive and negative emotion) is related to the level of mood scales. A series of correlation analyses with Pearson's coefficient *r* was performed. Three statistically significant correlations were recorded. The level of asymmetry in the distribution of load on lower limbs in the control condition variant negatively correlated with the level of anger, i.e. the subject demonstrated more load on the left lower limb. It was a low strength correlation. On the other hand, the level of the coefficient of asymmetry in distribution of load on lower limbs in the positive emotion variant positively correlated with the level of the positive mood scale, i.e. the subjects demonstrated more load on the right lower limb**.** Therefore, $H_{0\text{-}A}$ should be accepted: In hearing-impairment adolescents during exposure to a visual stimuli of a positive emotion, a higher intensity of right-side asymmetry of load on lower limbs occurs along with an increase in the level of the positive mood scale r=0.281; p=0.029. This correlation again demonstrated low strength. In turn, the level of coefficient of asymmetry for distribution of load on lower limbs in the variant of negative emotions negatively correlated with a sense of guilt. This correlation demonstrated moderately high strength. It was observed that during the exposure to a visual stimulus of negative emotions, hearing-impaired adolescents show higher intensity of left-sided asymmetry of lower limbs with an increase in the level of the negative mood scale r=-0.222; p=0.089, but it is a relation only at the level of statistical trends, and consequently, $H_{0\text{-}2A}$ should be accepted.

Conclusions: The obtained results point to the need for an in-depth analysis of variables during the process of rehabilitation that might affect postural stability in the adolescent period, both among hearing-impaired teenagers and among teenagers without hearing loss. The group of hearing-impaired adolescents should be provided with continuous rehabilitation in order to obtain the best possible vestibular system compensation. Stimulation should be based on alternate activation of senses to compensate them. During rehabilitation, multimodal stimuli should be used, particularly with regard to hearing-impairment adolescents, including static and dynamic affective stimuli. Rehabilitation of the vestibular system of hearing-impaired persons should be based on visual stimuli, strengthening the role of the visual

feedback, and the need of priming through the visual stimuli should be taken into account, to subsequently start stimulation consisting
in activation of the vestibular system through exercises excluding the sense of sight and based on affective stimulation. The results prove the effect of mood, which generates tendencies to demonstrate various patterns of load distribution on lower limbs.

Therefore, the process of rehabilitation should take into account the state of emotions
and mood of hearing-impaired adolescents. During rehabilitation, it is necessary to apply psychological tests, determining the spectrum of the personal and emotional sphere
and the cognitive reserve.