Aggression in normal ranges is necessary to provide a survival of individual, but excessive aggression has negative consequences for both individuals and society. The research of aggression formation mechanisms is very important to understand excessive aggression manifestations. Monoaminergic brain systems have a great influence on the emotions and behavior, including aggression, in humans and animals. The thyroid system influences neurotransmitters (particularly serotonin and norepinephrine). According to scientific literature data, both high impulsive and premeditated aggressions are associated with high neuroticism.

Taking into account the above mentioned, the interrelation between blood serum levels of thyroid hormones and catecholamine, neuroticism and physical aggression in men with high and middle neuroticism levels was studied.

In total group of participants moderate positive correlations between neuroticism and T₄, between neuroticism and T₃, negative correlation between T₄ and norepinephrine were revealed. In men with high neuroticism level the significant positive correlations between neuroticism and T₄, between neuroticism and physical aggression were found. In men with middle neuroticism level only the significant negative correlation between T₃ and epinephrine was observed.

No significant differences in T₃, T₄, norepinephrine, epinephrine levels between individuals with high and middle neuroticism levels were found, although difference in T₄ level was almost significant. It was higher in men with high neuroticism than in individuals with middle neuroticism.

Obtained results indicate the involving thyroid hormones in such personality trait formation as neuroticism.

The absence of correlation between thyroid hormones and neuroticism in individuals with middle neuroticism level is possible due to the prevalence of different hormones or mediators in neuroticism development in men with high and middle neuroticism. It is confirmed by our early published results about existence of significant positive correlation between blood serum cortisol content and neuroticism in men with high neuroticism level and strong positive correlation between blood serum estradiol content and neuroticism in men with middle neuroticism level.

The existence of negative correlations between T₄ and norepinephrine in total group of participants, between T₃ and epinephrine in men with middle neuroticism level may be explained by influence of thyroid hormones on beta-adrenergic signaling system and by inverse correlation between the density of adrenoceptors and catecholamine levels.

So thyroid hormones participate in the formation of such personality traits as neuroticism, in particular, in the formation of a high level of neuroticism, which is confirmed by the existence of a reliable positive correlation between thyroid hormones and neuroticism in total group and in men with high neuroticism level. The absence of interrelation between thyroid hormone levels and neuroticism in men with middle level of neuroticism together with published data about an existence of correlation between cortisol and neuroticism in persons with high neuroticism and between estradiol and neuroticism in individuals with middle neuroticism indicates the predominance of different hormones in neuroticism development in men with high and middle neuroticism levels.

Keywords: thyroid hormones, men catecholamine, neuroticism, physical aggression.

Work was carried out within research topic “Biochemical mechanisms of dysmetabolic processes development under the influence of chemical factors of the environment” in Kharkiv National Medical University (state registration number 0115U000240).
emotions and behavior [1], including aggression [2, 3], in humans and animals. The thyroid system influences neurotransmitters (particularly serotonin and norepinephrine) [4]. Free T₃ level in the criminal Antisocial Personality Disorder (APD) group is found to be significantly higher than that in the noncriminal APD group, but in the criminal APD group, there is no significant correlation between thyroid hormone levels and aggression [5]. Connection between T₃ levels and violent/aggressive behavior is shown not only in males but also in females with borderline personality disorder [6]. According to scientific literature data, both high impulsive [7, 8] and premeditated [8] aggressions are associated with high neuroticism.

The purpose of the paper is the investigation of interrelation between blood serum levels of thyroid hormones and catecholamine, neuroticism, physical aggression in men with high and middle neuroticism levels.

Materials and Methods. The study involved 32 young men aged 18 to 22 years. Neuroticism and physical aggression were estimated using Eysenck Personality Inventory and Buss-Durkee Hostility Inventory, respectively. Physical aggression was assessed in a percentage of the maximum level. The level of neuroticism was estimated in points. After processing the answers to Eysenck Personality Inventory, we determined the level of neuroticism in each participant in the study. According to the results obtained, we divided the general group into three subgroups depending on the neuroticism level (low level of neuroticism – less than 7 points, middle level of neuroticism – 8–13 points, high level of neuroticism – more than 14 points).

Hormone levels in blood serum were determined by Testosterone, Estradiol, Cortisol ELISA kits (Italy), Norepinephrine and Epinephrine ELISA kits (China).

Statistical analysis of the results was carried out by methods of nonparametric statistics using the package “Statistica 6.0”. Mann-Whitney test was used to compare groups in pairs. Correlation analysis according to Spearman was used to reveal the relationship between different variables of the same group.

Results and Discussion. In total group of participants moderate positive correlations between neuroticism and T₄ (r=+0.49, p=0.029), between neuroticism and T₃ (r=+0.44, p=0.0506), negative correlation between T₄ and norepinephrine (r=-0.38, p=0.032) were revealed.

In men with high neuroticism level the significant positive correlations between neuroticism and T₄ (r=+0.78, p=0.0075), between neuroticism and physical aggression (r=+0.69, p=0.041) were found.

In men with middle neuroticism level only the significant negative correlation between T₃ and epinephrine (r=+0.78, p=0.0075) was observed.

No significant differences in T₃, T₄, norepinephrine, epinephrine levels between individuals with high neuroticism levels.

Figure 1. T₄ (nmol/L) level in blood serum of young men with high and middle neuroticism levels (Me [25%; 75%], min and max; p=0.079)
and middle neuroticism levels were found, although difference in T4 level was almost significant (p=0.079). It was higher in men with high neuroticism than in individuals with middle neuroticism (Figure 1).

Obtained results indicate the involving thyroid hormones in such personality trait formation as neuroticism.

The absence of correlation between thyroid hormones and neuroticism in individuals with middle neuroticism level is possible due to the prevalence of different hormones or mediators in neuroticism development in men with high and middle neuroticism. It is supported by existence of significant positive correlation between blood serum cortisol content and neuroticism in men with high neuroticism level and strong positive correlation between blood serum estradiol content and neuroticism in men with middle neuroticism level [9].

The existence of negative correlations between T4 and norepinephrine in total group of participants, between T3 and epinephrine in men with middle neuroticism level may be explained by influence of thyroid hormones on beta-adrenergic signaling system [10] and by inverse correlation between the density of adrenoreceptors and catecholamine levels [11].

Conclusions
1. Thyroid hormones are involved in the formation of such personality trait as neuroticism, in particular, in the formation of a high level of neuroticism, which is confirmed by the existence of a reliable positive correlation between thyroid hormones and neuroticism in total group and in men with high neuroticism level.

2. The absence of interrelation between thyroid hormone levels and neuroticism in men with middle level of neuroticism together with published data about an existence of correlation between cortisol and neuroticism in persons with high neuroticism and between estradiol and neuroticism in individuals with middle neuroticism indicates the predominance of different hormones in neuroticism development in men with high and middle neuroticism levels.

Prospects. The research of interrelation between blood serum levels of thyroid hormones, catecholamine, neuroticism and physical aggression in women with different neuroticism levels.

References


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ВЗАЄМОЗВ'ЯЗОК МІЖ ТИРЕОІДНИМИ ГОРМОНАМИ ТА КАТЕХОЛАМІНАМИ, НЕЙРОТИЗМОМ ТА ФІЗИЧНОЮ АГРЕСІЄЮ У ЧОЛОВІКІВ З ВИСОКИМ ТА СЕРЕДНИМ РІВНЯМИ НЕЙРОТИЗМУ
Попова Л. Д., Васильєва І. М., Наконечна О. А.

Резюме. У молодих чоловіків з високим та середнім рівнями нейротизму було досліджено взаємозв'язок між тиреоїдними гормонами та катехоламінами, нейротизмом і фізичною агресією. У загальній групі чоловіків було виявлено позитивні зв'язки між нейротизмом та Т₄, нейротизмом та Т₃ та негативний кореляційний зв'язок між Т₄ та норепінефрином. У чоловіків з високим рівнем нейротизму виявлено позитивні зв'язки між нейротизмом та Т₄, нейротизмом та фізичною агресією. У чоловіків із середнім рівнем нейротизму виявлено тільки негативний зв'язок між Т₃ та епінефрином. Результати роботи свідчать про залучення тиреоїдних гормонів до розвитку нейротизму, зокрема у чоловіків з високим рівнем нейротизму та з високим рівнем нейротизму, та про переважання різних гормонів при формуванні середнього та високого рівнів нейротизму.

Ключові слова: тиреоїдні гормони, катехоламіни, нейротизм, фізична агресія, чоловіки.

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ВЗАЙМОЗВ'ЯЗЬ МІЖ ТИРЕОІДНИМИ ГОРМОНАМИ І КАТЕХОЛАМІНАМИ, НЕЙРОТИЗМОМ І ФІЗИЧКОЮ АГРЕСІЄЮ У МУЖЧИН С ВИСОКИМ І СЕРЕДНИМ УРОВНЯМИ НЕЙРОТИЗМА
Попова Л. Д., Васильєва І. М., Наконечна О. А.

Резюме. У молодих людей з високим і середніми рівнями нейротизму була ісследована взаємосвязь між тиреоїдними гормонами і катехоламінами, нейротизмом і фізичною агресією. В оберізі групах мешканці були обнаружено чако-позитивні кореляційні зв'язки між нейротизмом і Т₄, нейротизмом і Т₃ та отримана кореляція між Т₄ і норепінефрином. У мешканці з високим рівнем нейротизму були виявлені положительні кореляційні зв'язки між нейротизмом і Т₄, нейротизмом і фізичною агресією. У мешканці со середнім рівнем нейротизму були виявлені чако-отрицателю кореляційні зв'язки між Т₄ і апінефрином. Результати роботи свідчать про вовчання тиреоїдних гормонів в формуванні нейротизму, в частності у мешканці з високим рівнем нейротизму, а також про пребладання різних гормонів в формуванні середнього і високого рівнів нейротизму.

Ключеві слова: тиреоїдні гормони, катехоламіни, нейротизм, фізична агресія, чоловіки.

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