



# The correlation between the subjective perception of health and the characteristics of cardiovascular function in swimmers and non-swimmers

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## Abstract

**Objective of the study** was to discern the characteristics of the connection between the state of health and the control of heart rate in older preschoolers who participate in swimming classes and those who do not engage in sports activities.

**Methods and structure of the study.** The study involved 44 participants aged between 5 and 7 years old, with an average age of  $6,29 \pm 0,7$  years. To assess the internal picture of health, we employed the Rapid Diagnosis of the Child questionnaire and the Attitude to Health questionnaire. To analyze the cardiac rhythm variability, we utilized the OMEGA-M software and hardware complex.

**Results and conclusions.** The characteristics of the internal health status vary between children who participate in swimming activities and those who do not. Children who participate in swimming activities exhibit a lower level of internal health compared to their peers who do not participate. The level of internal health is linked to the specific features of heart rate variability. Preschoolers who participate in swimming activities demonstrated an increase in the activity of the sympathetic division of the autonomic nervous system during cardioregulation, suggesting a moderate stress on the body's regulatory systems.

**Keywords:** *internal health picture, heart rate variability, autonomic nervous system, preschoolers.*

**Introduction.** It is known that motor activity from the earliest stages of ontogenesis participates in the formation of various functions of the body, which is due to the connection of the motor zones of the central nervous system with the centers of the autonomic nervous system, providing neurohumoral regulation of vital functions [4]. A number of studies have shown that the activity of proprioceptors is associated with the tone of the ANS, while the greatest role in the structure of motor activity is given to organized movements, which in preschool children are most intensively formed during swimming lessons [8, 11]. In turn, the body's resistance to various external influences is ensured by adaptive processes, among which one of the key roles is played by the circulatory system, and the features of its regulation by the ANS, manifested in heart rate variability (HRV) indicators, are informative for studying the adaptive capabilities of the body

[2, 3, 7, 10]. At the same time, the features of adaptation to external factors, including the preservation and strengthening of health, are included in the construct of the "internal picture of health" (IPH), which is currently defined as a dynamic representation and attitude to one's health, expressed in the awareness of the value of health and in the desire to preserve and improve it [6].

It has been established that one of the most effective means of health formation in preschoolers is swimming, which affects the child's body, promoting healthy growth and development, increasing its resistance to pathogenic factors [1, 8, 9, 11]

All of the above indicates the need for a more detailed study of the features of heart rate variability and IPH in swimming and non-swimming children.

**Objective of the study** was to discern the characteristics of the connection between the state of health



and the control of heart rate in older preschoolers who participate in swimming classes and those who do not engage in sports activities.

**Methods and structure of the study.** The study involved 44 subjects of senior preschool age (average age  $6,29 \pm 0,7$  years).

The features of the internal picture of health were identified using the following methods: "Express diagnostics of a child" [5], the questionnaire "Attitude to health" by R.A. Berezovskaya, adapted by E.E. Ruslyakova [6].

The "Express diagnostics of a child" method is a conversation with the subject, during which the experimenter asks to name as many actions as possible that contribute to maintaining health. The questionnaire "Attitude to health" consists of 10 questions, to which from 5 to 10 ready-made answer options are offered. In our study, we used a simplified and age-adapted questionnaire text for children, as well as an adapted response ranking system.

The study of the features of heart rate variability was carried out using the OMEGA-M software and hardware complex. The registration of children's heart rate variability was carried out in two different conditions: at rest and during a conversation about their health. The indicators of the time analysis of HRV, the indicators of the spectral frequency analysis, and the degree of centralization of heart rhythm control were assessed [2].

**Results of the study and discussion.** At the first stage, the level of formation of the internal picture of health in preschoolers was analyzed. It was found that in both subgroups the average level prevails (70,4% among those attending and 59,3% among those not attending the swimming section). Among children involved in swimming, the low level is in second place – 29,4%, and among children not involved in swimming – a high level – 29,6%.

Next, we compared the level of the internal picture of health in swimming and non-swimming children. It was shown that there are differences in both the overall level of the internal picture of health and its individual components at a significance level of  $p \leq 0,05$  (Mann-Whitney U-test).

It was found that the overall level of attitude to health and the levels of components of the internal picture of health ( $1,38 \pm 0,75$  not attending and  $0,94 \pm 0,74$  attending the section) are significantly higher in children who do not attend the swimming section. That is, children who do not attend the section value

health more. The next stage was to search for the relationships between systematic swimming lessons, the characteristics of cardioregulation and the level of the internal picture of health of older preschool children. It was found that both the level of the internal picture of health ( $-0,387$ , at  $p \leq 0,05$ ) and its individual components, such as behavioral ( $-0,526$ , at  $p \leq 0,05$ ) and motivational-value ( $-0,402$ , at  $p \leq 0,05$ ) have an inverse correlation with the parameter "attendance at the swimming section".

Thus, the more children attend the swimming section, the lower their level of the internal picture of health and its components. In addition, an inverse correlation was found between the attitude to health and children's swimming lessons ( $-0,366$ , at  $p \leq 0,05$ ). The analysis of the relationship between the characteristics of heart rate variability and the components of the internal health picture in children showed that in the group of those who do not attend the section, there is an increase in the activity of the sympathetic part of the autonomic nervous system during a conversation about health in children with a high level of the behavioral and motivational-value components of the internal health picture.

In turn, in children who attend the swimming section, but at the same time have a high level of the internal health picture and its individual components, during a conversation about health, there is a decrease in the centralization of heart rate control and an increase in the parasympathetic influences on the heart rate from the autonomic nervous system.

**Discussion of the results.** As noted above, according to research in the field of physical education, sports and medicine, swimming has a positive effect on children's health, and children who regularly play sports have fewer health problems, and, thus, less often experience emotional reactions associated with illness [8, 11]. The absence of negative emotions from experiencing an illness does not actualize the need for health preservation, since physical education and, in particular, swimming, forms a health-preserving model of behavior [3]. This is confirmed by the results of the analysis of the variability of the heart rate of preschoolers, which showed that in children involved in swimming, a high level of the internal picture of health positively correlates with the level of the spectrum power of the very low-frequency component of the HRV. Consequently, the higher the internal picture of health, the stronger the influence of the sympathetic, suprasedgmental parts of the autonomic nervous sys-



tem on the heart rate in a situation of a conversation about health and, as a consequence, moderate stress of the regulatory systems of the body.

**Conclusions.** The features of the internal picture of health differ in children who attend and do not attend the swimming section, and children who attend the section demonstrate a lower level of the internal picture of health compared to their peers who do not attend the section. The level of the internal picture of health is associated with the features of the variability of the heart rate, while in preschoolers who attend the swimming section, during a conversation about health, an increase in the activity of the sympathetic part of the ANS in the process of cardioregulation was found, which indicates a moderate stress of the regulatory systems of the body.

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