

STRUCTURAL-LINGUISTIC APPROACH TO ASSESSMENT OF FUNCTIONAL STATES OF ORGANISM OF ELITE SPORTSMEN, WHO HAVE SYMPTOMS OF CHRONIC TIREDNESS

Abdulrahman Alwani

National University of Physical Education and Sport of Ukraine

Abstract. *Purpose:* assessment of functional states of sportsmen's, having symptoms of chronic tiredness, organism with the help of structural-linguistic approach. *Material:* Sportsmen of different kinds of sports participated in the research. For determination of degree of chronic tiredness questionnaire by Leonova was applied. For classification of functional states of sportsmen's organism structural-linguistic approach was applied. *Results:* in 41% of the questioned sportsmen chronic tiredness was found. Appearance of their not stable states can be caused by reduction of organism's resistance to loads and high risk of chronic tiredness syndrome. *Conclusions:* in sportsmen with chronic tiredness we observed functional tension of organism's regulatory systems in rest and over-tension – after loads. We determined types of functional states of sportsmen's with chronic tiredness organism.

Key words: sportsmen, chronic tiredness, ultra-stable system, heart rhythm, spectrum of power.

Introduction

In working out of assessment technology of human organism's functional state under influence of extreme factors it is important to choose basic physiological function, analysis of whose changes should be put in the base of this assessment. Such function shall meet at least two criteria: it should be easily registered in complex extreme conditions and it should not be influenced by regulating mind of the tested person [16, 2]. As per opinion of many researchers these two criteria are in the best way satisfied by heart rhythm [10]. However, in spite of rather great number of works devoted to analysis of heart rhythm's variability, its further interpretation is often realized by intuition, without consideration of laws of organism functional states' transformations.

To avoid this drawback, in our work we applied structural-linguistic analysis of heart rhythm's variability. It is based on three postulates, which consider fundamental properties of live organisms [4, 6]. First: in the process of live systems' development there exist certain laws of transformation of organism's functional states in dynamic of its life functioning. Secondly: organism's functional states can be sufficiently completely described with not great number of symbols, reflecting activity of different components and determining organism's functional state in different situations. Third: we considered principle, that live organism is an ultra stable system.

Purpose, tasks of the work, material and methods

The purpose of the work is assessment of functional states of sportsmen's, having symptoms of chronic tiredness (CT), organism with the help of structural-linguistic approach.

The tasks of the work:

1. Assess CT incidence among elite sportsmen in different kinds of sports.
2. Conduct spectral analysis of heart rhythm's variability (HRV) of sportsmen with CT and without it in rest and after functional load.
3. With the help of structural-linguistic analysis classify spectrums of power of HRV and, on this base, carry out comparative analysis of changes of organism's functional states of sportsmen with CT and without it.

Organization and methods of the research: the researches were conducted on the bases of scientific research institute of university of physical culture and sports of Ukraine, center of Olympic trainings (Koncha-Zaspa). In the researches 90 elite sportsmen (MS, IMS, CMS) from different kinds of sports participated (age of them was from 21 to 31 years old). For determination of degree of chronic tiredness (CT) questionnaire by Leonova was applied [9].

For determination of heart rhythm's wave structure we applied cardiography method [10]. In compliance with "International standard" [21] cardio-rhythm-gram was recorded before and after functional load for 5 minutes. Active orthostatic test (AOT) was used as functional load.

Spectrums of power KGR were determined with the help of spectral analysis of HRV. For classification of power spectrums and corresponding to them functional states of sportsmen's organisms we applied structural-linguistic approach [4].

Results of the research

Analysis of results of the conducted questioning showed that in 53 (59%) of the questioned sportsmen symptoms of CT were absent; in 37 (41%) they were found.

With analysis of cardio-rhythm-grams of elite sportsmen without symptoms of CT (recorded in rest and after functional load) we, with the help of structural-linguistic approach, found 8 from 16 possible power spectrums of heart rhythm: Sb, SmSb, SmSbSf, SmSfSb, SbSm, SbSmSf, SbSfSm (see fig.1). According to literature data [2, 4, 6] states with spectral formulas Sm, SmSb, SmSf, SmSbSf, SmSfSb are characterized by prevailing of sympathetic influences in vegetative balance; states with spectral formulas Sb, SbSm, SbSf, SbSmSf, SbSfSm – by prevailing of para-sympathetic influences. States with spectral formulas Sm, Sb, SmSb, SbSm, SmSbSf, SmSfSb, SbSmSf are stable. Organism can be in these states for long time and transition to other states is possible only under influence of external or internal factors

[2, 15]. These states are characterized by optimal tension of organism's regulatory systems (ORS) and are more frequent in relative rest or under little loads. States, described by spectral formulas $SmSfSb$ и $SbSfSm$, are quasi stable. In them organism can be for indefinitely long time, but transition to other states happens either under influence of external or internal factors or spontaneously [2, 15]. These states are characterized by functional tension of regulatory systems (SFT) and appear under loads (see fig. 2).

Ion sportsmen with symptoms of CT we registered 10 from 16 possible spectrums of power of heart rhythm in rest and after physical load: Sm , Sb , $SmSb$, $SmSf$, $SfSm$, $SmSbSf$, $SmSfSb$, $SfSmSb$, $SbSm$, $SbSmSf$, $SbSfSm$ (see fig. 3). Presence of periodical component in heart rhythm's wave structure with spectrum $SmSfSb$ of sportsmen with CT witnesses about functional tension of organism's regulatory systems. Spectrums $SfSm$, $SfSmSb$, which were recorded after AOT, correspond to not stable functional states with over tension (SO) of organism's regulatory systems [2, 6]. In these states organism can be for short time and transition from these states to other happens spontaneously (see fig.4).

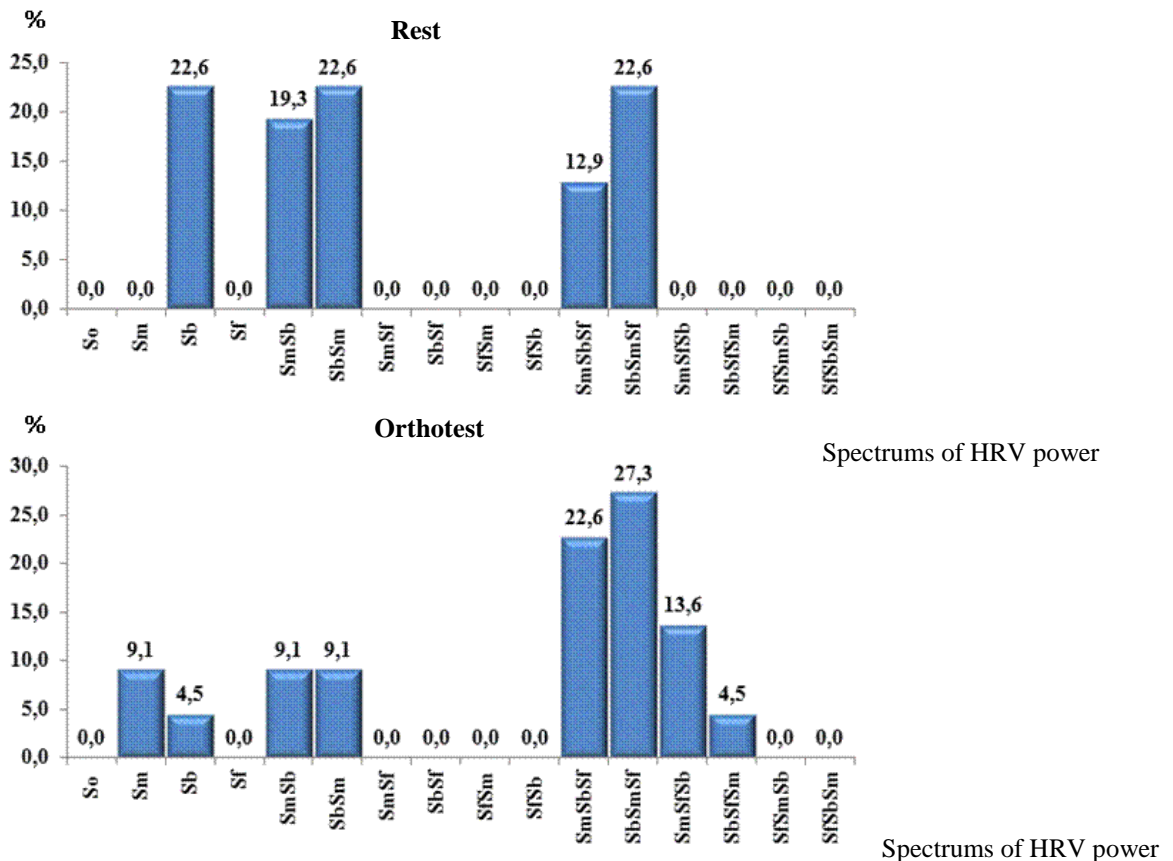


Fig. 1. Distribution of types of power spectrums of HRV in rest and under functional loads (AFL) of sportsmen without CT symptoms:

On axis X – power spectrums of HRV, classified with spectral-linguistic approach; on axis Y – percent correlation of states with certain power spectrum of HRV.

Discussion

Modern elite sports are a sphere of activity, in which sportsmen's organism suffers from extreme physical and psychological influences [7, 13, 14]. According to fulfilled researches elite sportsmen, in conditions of durable training and competition loads, can get syndrome of chronic tiredness (SCT) [1, 11].

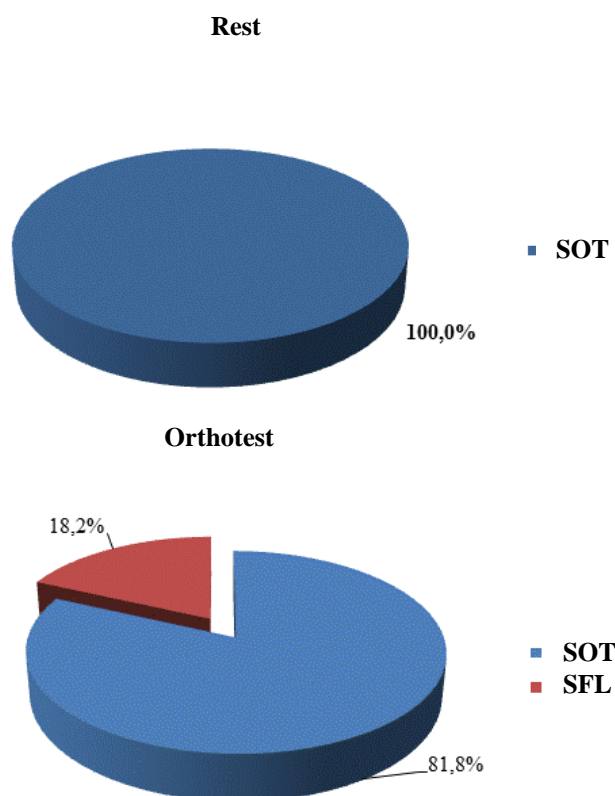


Fig.2. Distribution of states of optimal (SOT - Sm, SmSb, SmSbSf, Sb, SbSm, SbSmSf), functional tension (SFT - SmSfSb, SbSfSm) of regulatory mechanisms in rest and after AFL of sportsmen without CT symptoms.

With the help of questioning we found that 41% of elite sportsmen had CT of different degree. This fact agrees with literature data, according to which SCT can be preceded by early changes of functional, psycho-physiological and psychic status of sportsman, by development of acute and chronic forms of tiredness of different degree, when tiredness becomes frequent or constant “satellite” [3, 7, 12, 19].

Appearing of quasi stable and not stable functional states in sportsmen with CT is characterized by over tension of regulatory mechanisms and spontaneous transition to lower energy levels. It can be connected with reduction of organism’s resistance to high physical and psychological loads and high risk of SCT formation [8, 17, 18].

Conclusions:

1. In 41% of sportsmen we found symptoms of CT.
2. In wave structure of heart rhythm of sportsmen with CT there appeared periodic components, which witnessed about functional tension of organism’s regulatory systems in rest and about their over tension after functional loads.
3. With the help of structural-linguistic approach we carried out classification of power spectrums of HRV and determined types of organism’s functional states of sportsmen with CT symptoms and without them.

In the future it is supposed to further research incidence of CT in elite sportsmen of different kinds of sports and determination of criteria for CT diagnostic on the base of assessment of sportsmen’s physical fitness, physiological and psycho-physiological status.

Acknowledgement

The present researches have been conducted in compliance with “Combined plan of scientific research works in sphere of physical culture and sports for 2011- 2015”, № 2.22 “Working out of complex system of determination of sportsmen’s individual-typological properties on the base of genome’s manifestation” (state registration number 0111U001729).

Conflict of interests

The author declares that there is no conflict of interests.

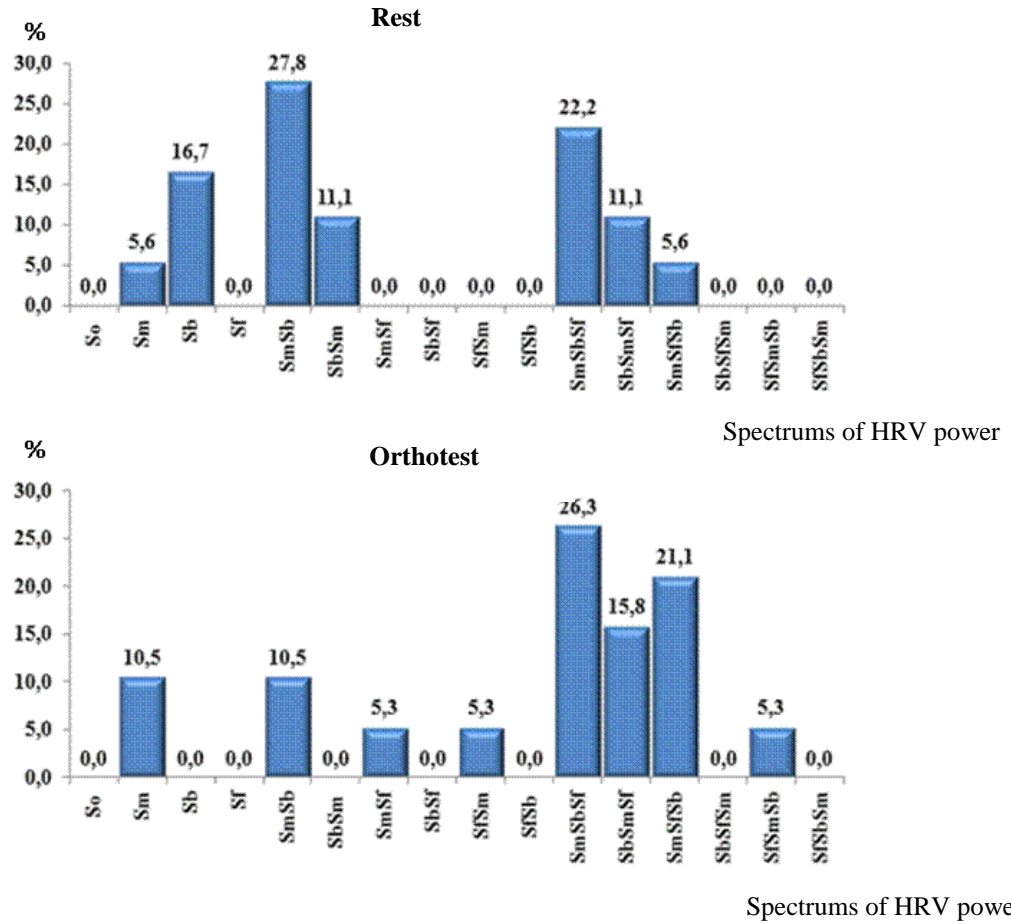


Fig.3. Distribution of types of power spectrums of HRV in rest and after functional loads (AFL) of sportsmen with CT symptoms.

Legend on axis X and axis Y is the same as in fig. 1.

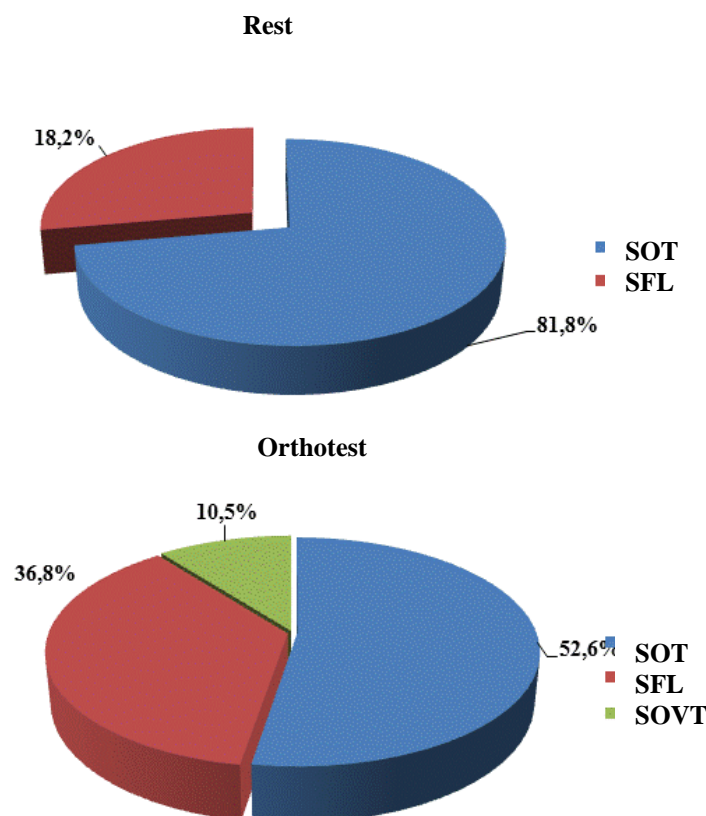


Fig.4. Distribution of optimal (SOT - Sm, SmSb, SmSbSf, Sb, SbSm, SbSmSf), functional (SFL - SmSfSb, SbSfSm) tension and over tension (SOVT - SfSm, SfSmSb) of regulatory mechanisms in rest and after AFL of sportsmen with CT symptoms.

References:

- Gordon NF. *Khronicheskoe utomlenie i dvigatel'naia aktivnost'* [Chronic tiredness and motor functioning], Kiev: Olympic Literature; 1999 (in Russian)
- Il'in VN, Batyrbekova LM, Kurdanova MKh, Kurdanov KhA. *Ritmokardiograficheskie metody ocenki funkcional'nogo sostoianiia organizma cheloveka* [Rhythm-cardiographic methods of assessment of human organism's functional state], Moscow, Ilekxa. Stavropol: Servisshkola; 2003 (in Russian)
- Il'in VM, Zhila RS, Cherkes LI, Rassokha GV, Medvidchuk KV. Osoblivosti funkcional'nogo i psikhofiziologichnogo statusu sportsmeniv visokoi kvalifikacii z oznakami khronichnogo stomlennia [Specific features of functional and psycho-physiological status of elite sportsmen with symptoms of chronic tiredness]. *Sportivna medicina* 2007; 1: 42-45 (in Ukrainian)
- Il'in VM, Kal'nish VV, Kurdanov KhA. Strukturno-lingvistichnij pidkhid do ocinki funkcional'nogo stanu organizmu liudini [Structural linguistic approach to assessment of human organism's functional state], *Dopovidi NANU* 2001;6:185-189 (in Ukrainian)
- Il'in VM, Koval' SB, Cherkes LI. Chastota proiaviv oznak khronichnoi vtomi u visokokvalifikovanikh sportsmeniv u riznikh vidakh sportu [Frequency of chronic tiredness manifestations in elite sportsmen of different kinds of sports], *Fizichne vikhovannia ta sport u konteksti derzhavnoi programi rozvitku fizichnoi kul'turi v Ukraini: dosvid, problemi, perspektivi* 2014;1:29-32. (in Ukrainian)
- Il'in VN, Filippov MM, Alvani A. Ocenka funkcional'nogo sostoianiia organizma cheloveka v ekstremal'nykh usloviakh na osnove teorii ul'trastabil'nykh sistem [Assessment of human organism's functional state in extreme conditions on the base of theory of ultra stable systems], *Ul'ianovskij mediko-biologicheskij zhurnal* 2014; 3: 94-100 (in Russian)
- Korniakova VV, Konvaj VD, Rejs BA. Utomlenie posle chrezmernykh fizicheskikh nagruzok: mekhanizmy razvitiia, korekciia [Tiredness after excessive physical loads: mechanisms of progressing, correction], *Teoriia i praktika fizicheskoi kul'tury* 2009; 3: 23-25. (in Russian)
- Lebedev MA, Palatov SIu, Kovrov GV. Uсталost' i ee proiavlennia [Tiredness and its manifestations], *Russkij medicinskij zhurnal* 2014; 4: 282-287. (in Russian)

- 9 Leonova AB, Kuznecova AS. *Psikhologicheskie tekhnologii upravleniia sostoianiem cheloveka* [Psychological technologies of human state control], Moscow: Meaning; 2009 (in Russian)
- 10 Mikhajlov V.M. *Variabel'nost' ritma serdca: opyt prakticheskogo primeneniia metod* [Variability of heart rhythm: practical experience, method], Ivanovo: Igma; 2002 (in Russian)
- 11 Oknin VIu. Problema utomleniia, stressa i khronicheskoi ustalosti [Problem of tiredness, stress and chronic tiredness]. *Russkij medicinskij zhurnal* 2004; 12(5): 276-279. (in Russian)
- 12 Pizova NV. Utomliaemost', asteniia i khronicheskaia ustalost'. Chto eto takoe? *Consilium Medicum* 2012; 14(2): 61-64. (in Russian)
- 13 Platonov VN. *Sistema podgotovki sportsmenov v olimpijskom sporte* [The system of preparation of sportsmen in Olympic sport], Kiev: Olympic Literature; 2004 (in Russian)
- 14 Poliaev BA, Makarova GA, Vykhodec IT. Sindrom khronichnoi utomi. [Syndrome of chronic tiredness]. *Zbirnik statej zi sportivnoi medicini*. 2010; 4(1): 29-31. (in Ukrainian)
- 15 Solodkov AS. Osobennosti utomleniia i vosstanovleniia sportsmenov [Specific features of tiredness and recreation of sportsmen]. *Uchenye zapiski universiteta im. P.F. Lesgafta* 2013; 100(6): 130-143. (in Russian)
- 16 Eshbi UR. *Konstrukciia mozga* [Construction of brain], Moscow: Foreign Literature Publishing House; 1962 (in Russian)
- 17 Iabluchanskij NI, Martynenko AV, Isaeva AS. *Osnovy prakticheskogo primeneniia nein vazivnoj tekhnologii issledovaniia regulatornykh sistem cheloveka* [Principles of practical application of non invasive technology of human regulatory systems' studying], Kharkiv: Basis; 2000 (in Russian)
- 18 Axe EK, Satz P, Fawzy I. Cognitive Function and Major Depression in Chronic Fatigue: The Apathy Construct. *Journal of Chronic Fatigue Syndrome* 2007; 14(4): 19-38.
- 19 Fain O. How to manage asthenia and fatigue? *Rev. Prat.* 2011; 61(3): 423-426.
- 20 Jaffee MS, Winter WC, Jones CC, Ling G. Sleep disturbances in athletic concussion. *Brain Injury* 2015; 29(2): 221-227.
- 21 Knoop H, Prins JB, Moss-Morris R, Bleijenberg G. The central role of cognitive processes in the perpetuation of chronic fatigue syndrome. *J. Psychosom. Res.* 2010; 68: 489-94.
- 22 Task Force of the European of Cardiology and the North American Society of Pacing and Electrophysiology. Heart Rate Variability. Standarts of Measurements, Physiological Interpretation, and Clinical Use. *Circulation* 1996; 93: 1043-1065.

Information about the author:

Abdulrahman Alwani: <http://orcid.org/0000-0002-4783-426X>; aloo38@yahoo.com; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine.

Cite this article as: Abdulrahman Alwani. Structural-linguistic approach to assessment of functional states of organism of elite sportsmen, who have symptoms of chronic tiredness. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2015;8:3-8. <http://dx.doi.org/10.15561/18189172.2015.0801>

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 01.07.2015

Accepted: 15.07.2015; Published: 20.07.2015