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Title of the Doctoral Thesis: **Training Optimization in Performance Volleyball through Stress Management**

Key words: performance, stress, volleyball, Penicilina Iași

Our present paper, entitled *Training Optimization in Performance Volleyball through Stress Management*, represents a unique endeavor in this research field and aims to identify and analyze the ways in which stress can be positively managed, in order to support performance. The research is structured as a case study focusing on Penicilina Iași Women's Volleyball Team during the 2011-2012 competitive season.

In time, studying the relationship between stress and performance sports became necessary, mostly due to the harsh nature of performance sports, and to the many requirements sportsmen have to comply with when living in this highly-pressurized environment. The main goals behind the various practical and theoretical approaches towards the matter were identifying stress particularities and finding efficient solutions to decrease the effects of competitive stress, through specific methods. In other words, specialists' theoretical and empirical endeavors came to fulfill the need of an efficient management of competitive stress. Most studies focused on performance athletes, and their conclusions were afterwards generalized to suit other sport disciplines, less prone to scientific analysis. Nevertheless, in contemporary sports, athletes have, quite often, similar performance levels, the difference being made only by the way they succeed in managing competitive stress and controlling their emotions. From this perspective, our present study proves its importance and practical applicability, even more so if considering that our conclusions are based upon information collected, for the first time in Romanian specialized research, by using the DDFAO device.

The impact of stress upon performance sports has already been studied abroad from a large variety of perspectives, but in Romania the subject has yet not been thoroughly discussed. Such research is essential, as the psychological component of training and the efficient management of competitive stress are both extremely important in obtaining the desired results and in fulfilling individual and collective goals. Outside Romanian borders, research concerned with this particular problem began half a century ago. In Romania, though, such tendencies only appeared after 1989, when Romanian scientists could encounter the ideas already spread worldwide. In this context, our paper comes to fill in a gap in the specialized Romanian literature, and it also brings to the volleyball

professionals new methods of testing and improving the players' stress levels, so important in obtaining results.

Our present study is structured in three parts, including eight chapters, accompanied by a series of annexes and the bibliography.

Part 1 establishes the **Theoretical Framework of the Research Theme**. The first chapter is dedicated to introductory information focusing upon the importance of this specific topic, the up-to-dateness of the theme and the reasons behind choosing it. Chapter 2 represents a theoretical incursion into the study of stress, starting with the first attempts of the 19th century pioneers of the field. The analysis of the etymology and the evolution of the word "stress" itself are accompanied by a series of definitions of the phenomenon, such as:

- ✓ "stress or, more exactly, the stress reaction represents the set of manifestations (both physical and psychological) which take place within us, as a reaction to stress factors";
- ✓ "an unspecific response given by the organism to all external requirements or demands";
- ✓ "the name given to all environmental factors or set of factors which cause an abnormal reaction to the organism, and to the negative effect upon the human organism caused by an environmental factor";
- ✓ "the organism*s (or, better still, the individual's) physiological and psychological reaction of panic, mobilisation and defence against aggression, threat or towards some unusual event".
- ✓ "the organism's psycho-physical reaction generated by stress agents acting through the senses upon the brain, which trigger – due to the corticolimbic connections with the hypothalamus – a series of neurovegetative and endocrine reactions affecting the entire organism" (A. von Eiff).

The interdisciplinary study of stress favoured the emergence of a series of distinct theories concerning its cause and its manifestation, among which we considered the following: the theory of the individual's interaction with the environment or the cognitive theory, the psychoanalytical theory, the behavioural theory, the personality theory and the theory of occupational stress. The last one is important to the present doctoral thesis because, for the volleyball players, the training hall/sports field represents their workplace; therefore the type of stress they develop can be considered occupational stress.

Recent research studies tend to deny the existence of a distinction between physical stress and psychological stress, considering that they are both facets of the same phenomenon; foreign literature on the subject also discusses the antagonistic pairs eustress/distress and hyperstress/hypostress. We mentioned the biochemical and physiological indicators used in the quantitative assessment

of stress, too, together with the physical, psychological and behavioural components of stress. Special attention was given to the analysis of the stress evaluation methods and instruments, and to the ways to fight against it, such as: relaxation, breathing, mental training and the Wild Divine device.

The third chapter is dedicated to the analysis of stress within the context of performance sports, focusing on volleyball. The steady development of this particular sport in recent times makes it also more physically and psychologically demanding for the sportsmen. Their training for competitions must take into account the huge transformations affecting the sport itself, the technological innovations worldwide and the individual potential of each and every athlete. In performance volleyball, most teams are sensibly equal in the level of their training, which is why victory belongs to the sportsmen best suited to positively manage the emotions inherent to all competitions and, inevitably, stress. The extremely important task of coordinating the efficient management of competitive stress, of improving or at least keeping it under certain parameters favourable to the victory goes to the coach and the technical staff. Unfortunately, unlike what happens in the Western world, Romanian teams do not benefit from the help of psychologists specialized in the management of competitive stress.

Part II of our thesis focuses upon the **Stress Manifestations in Volleyball Players. The Methodological Framework of the Research** is presented within **the fourth chapter**. The purpose of our present doctoral thesis is that of optimizing volleyball training within performance volleyball teams, by controlling stress levels. The subjects of our study were the players of Penicilina Iași Women's Volleyball Team, during the 2011-2012 competitive season. The work hypothesis we based our research upon are the following:

1. The stress levels of the 10 athletes playing for Penicilina Iași Women's Volleyball Team differ, and it is low during the training period;
2. The players' stress level dynamics during the training period and the competitive period shows a decrease;
3. If during the training period, the players are subject to interventions aiming at the physical, technical, tactical and psychological components of training (through mental training, relaxation and breathing exercises), their stress levels improve;
4. If, during the competitive season, the specific physical training is accompanied by mental training, the stress levels as recorded by the Maslach Burnout questionnaire remain unchanged;
5. If, during the competitive season, the specific physical and mental training continue, than the values of health indicators: blood glucose, serum urea,

cholesterol, mineral ions (Sodium, Potassium, Chloride, Magnesium, Phosphorus, Iron), interstitial gases (Ph, PCO₂, PO₂), neurotransmitters (serotonin, catecholamine, dopamine, acetylcholine) and hormones (insulin, cortisol, TSH, FSH and DHEA) do not reach high levels;

6. If, during the competitive season, the specific physical and mental training continue, than the values of the lab tests stay within normal limits (platelets, erythrocytes, leukocytes).

Our study's main three goals were the following:

- ✓ Knowing the way the topic was previously discusses in specialized literature;
- ✓ Knowing the physical and psychological stress levels of the Penicilina Iași players;
- ✓ Realizing an applicative intervention for the efficient stress management

Our goals took into consideration Penicilina Iași players' levels of physical and psychological stress during three different moments of the competitive season, within the national women's volleyball championship season. In order to reach our objectives, we identified the following tasks:

- ✓ Choosing the trials and the evaluation tests;
- ✓ Realizing the evaluations, according to the stages of the research;
- ✓ Interpreting the values obtained after applying the Maslach Burnout questionnaire;
- ✓ Analyzing the players' stress levels, as shown by the cellular analysis during the three distinct DDFAO tests. The indicators taken into consideration are: blood glucose, serum urea, cholesterol, mineral ions (Sodium, Potassium, Chloride, Magnesium, Phosphorus, Iron), interstitial gases (Ph, PCO₂, PO₂), neurotransmitters (serotonin, catecholamine, dopamine, acetylcholine) and hormones (insulin, cortisol, TSH, FSH and DHEA)
- ✓ Analyzing the players' stress levels, as shown by blood samples taken during the three distinct lab tests. The indicators are: platelets, erythrocytes, and leukocytes;
- ✓ Identifying and implementing the most effective methods to improve stress levels, according to the specific moment in the competition and the results of the tests taken: relaxation; mental, technical and tactical training, breathing exercises, control of the diet, the use of the Wild Divine device etc.
- ✓ Analyzing the efficiency/inefficiency of the methods used for improving stress levels between the tests, which directly affected the team's participation to the championship;

- ✓ Correlating the data obtained with the DDFAO device with the general performance of the team and with the results of the other tests (psychological evaluation, blood tests etc.)

The methods we used to further our research are the following: the study of the specialized literature, the questionnaire method, the statistical mathematical method, the graphic method, and the experimental method, all of them facilitating the fulfilment of our goal. The subjects we used are the 10 athletes playing for Penicilina Iași Women's Volleyball Team, aged from 20 to 47 years old, representing the sextet, the libero and the first three reserves frequently used in competitions. Our subjects gave their consent to participate to our experimental study in writing. The research was conducted during five distinct stages, and the players were subjected to three different types of tests, aiming at distinguishing stress, both at the psychological (by using the Maslach Burnout Inventory) and the physical (by using the DDFAO device and the various blood tests taken in a specialized lab in Iași) levels. The tests were taken during three key-moments of the 2011-2012 competitive season, Romanian A1 national volleyball division: 19.07.2011-20.07.2011 – the return from the summer break; 19.09.2011-20.09.2011 – return from the mountain training camp; 27.03.2012-28.03.2012 – before the most important game of the season, that of avoiding relegation.

Chapter 5 contains a **Preliminary Study on Stress Manifestations in Penicilina Iași Volleyball Team Players**. The purpose of this research is that of identifying the players' levels of physical and psychological stress at the beginning of the training period, immediately after the break. The objectives of our study are: realizing elaborate tests, both physical (lab analysis, tests using the DDFAO device) and psychological (the application of the Maslach Burnout questionnaire), learning the way players' stress levels manifest themselves. The preliminary study, realized with the help of the three main work instruments: Maslach Burnout Inventory, the DDFAO device and the blood lab tests, aimed at measuring the subjects' physical and psychological stress levels at the beginning of the training season. The results obtained allow us to draw the following conclusions:

- ✓ The players returned from the summer break physically and emotionally charged, as the scores resulting after filling-in the Maslach Burnout questionnaire show above-the-norm stress levels. Quite surprisingly, if taking into account the fact that the holidays have just ended. 7 out of 10 players manifested high levels of emotional exhaustion, while all of them registered high scores in depersonalization.

- ✓ The DDFAO test indicated slightly elevated levels of stress in certain subjects. For instance, S8 and S10 registered Magnesium values below the normal, which translated into muscular weakness, low physical capacity and, implicitly, physical stress;

✓ The initial hypothesis, stating that the players' stress levels vary, and are rather low during the training period was only partially confirmed. What is true is that stress levels differ from one athlete to another, that their responses to stress agents change considerably, depending on individual characteristics.

The high levels of psychological stress, as resulting after the application of the Maslach Burnout questionnaire, demand the creation of an applicative intervention, based on the parallel use of mental training and physical-technical-tactical training, which should diminish its negative effects. The team's physician, together with the coach, composed individual evaluation sheets for all the players, containing personalized recommendations to be taken into consideration during the following centralized training period.

The IIIrd part of our thesis discusses the Personal Contributions to Training Optimization in Performance Volleyball through Stress Management (Penicilina Iași Women's Volleyball Team, A1 National Division, 2011/2012 Competitive Season).

Chapter 6 was designed as a **Study on Improving Stress in Volleyball Players during the Training Period**. The goal of this study is to identify, analyze, interpret and improve the values obtained after a training period focusing on the physical, technical, tactical, and psychological aspects. The tests taken at the end of the centralized and un-centralized training, before the start of the competitive season, targeted stress as depicted at the psychological, cellular and blood levels. We also surveyed the way in which the applicative intervention created for diminishing stress levels individually functioned for each player. The analysis and interpretation of the results of the three types of tests led to the following conclusions:

1. For all the subjects, the lack of negative entourage, the centralized training and the appropriate amount of rest contributed to diminishing the values depicting emotional exhaustion. Breathing and relaxation exercises were successfully used to improve stress levels;
2. The tests taken at the end of the training period highlighted the fact that the players who strictly followed the guidelines of the physician (S2, S3, S5 și S9), those who trained according to the specific training stage they were in and strenuously practiced the recommended breathing, relaxation and mental training exercises also registered average stress scores in all the three tested subscales. The above-mentioned players entered the sextet in the championship games and gave excellent results;
3. The methods employed for stress management proved their efficiency: breathing exercises, mental training, relaxation kept stress levels under control, at average scores;
4. With very few exceptions, the scores of the indicators taken into discussion were within normal ranges, which can also be associated with the players' good health, essential to performance sports.

Since our study showed that, by taking certain steps, stress levels diminish, we decided to include in our experiment the competitive period, too.

Chapter 7 is a Study on Stress Improvement in Players during the Competitive Period. Its purpose is that of verifying the efficiency of the applicative intervention used in our second research. We also considered the way the applicative intervention individually functioned for each athlete. The data gathered after the three tests meant to identify stress at the psychological, cellular and blood levels at the end of the pre-competitive period allowed us to draw the following conclusions:

1. During the three distinct moment when the MBI questionnaire was applied (at the return from the summer break, at the end of the centralized training period and before the decisive Play-out game), the players' psychological stress levels registered different values;
2. We can assess that the high levels of psychological stress, which did not reach alarming scores and the subjects found easy to cope with was a positive type of stress, which favours sports performance, not inhibit it;
3. The applicative intervention we used for stress management proved its efficiency, since all tested indicators did not show alarming stress levels, but a slight increase, compared with the non-competitive period;
4. The cumulated results obtained after applying the questionnaire, the DDFAO testing and the blood lab tests indicated that stress was efficiently kept under control, by using the applicative intervention previously described;
5. In the equation of the team's relegation after the Play-out game, psychological stress was not a determining factor.

The analysis and the interpretation of the results obtained after the three studies mentioned above led us to the following **general conclusions**:

1. The test taken by applying the Maslach Burnout questionnaire indicates high stress levels, though within normal range for the first study, improved scores for the second and a significant increase for the third one. This suggests the efficiency of the applicative intervention during the training period.
2. The DDFAO test indicated slightly high stress levels in some subjects, with low Magnesium values, which demonstrates muscular weakness, reduced physical capacity, thus physical stress during the initial evaluation, and an improvement at the evaluation at the end of the training period, determined by centralized camp training, the use of breathing and relaxation exercises, mental training; high levels were depicted for the evaluation at the end of the third study, too.
3. Blood lab tests show high stress levels, the second test registered slightly increased scores, while at the last one the lowest scores indicated cellular-level imbalance. The ionic imbalance is normal at the end of the competitive season, after many official games, when the rest and recovery period is very short, and the physical effort is intense.

4. From the perspective of the sport results, during and at the end of the competitive season, A.C.S. Penicilina Iași occupied a rank which allowed it to avoid relegation and further compete in the Romanian Volleyball Cup. The disastrous Play-out games caused the relegation to the A2 Division with three consecutive defeats. In consequence, stress was efficiently managed during the pre-competitive and competitive season.