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ASSESSMENT OF RECOVERY IN ATHLETES' TRAINING

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Abstract

Sport is one of the most important and diverse forms of reaching the full potential of an individual, at any age. Recovery from sport training is a component of the overall training program and it is important for optimal performance. We started from the most important assumptions: the athletes are partners in the training process, aware and accountable for their own training and recovery. We wanted to answer the questions: 1. Is the recovery process an important component for athletes' consideration 2. Do the athletes succeed in obtaining complete recovery, which might assure the best training potential? The studied subjects were 15 athletes (track and field, and gymnasts, average age 21). The subjects were administered Recovery Cue Inventory Questionnaire (7 items) (Kellmann et al. 2002). Basic statistical mathematical calculation was performed for each question. For the first question, we found athletes try to recover, but without being particularly concerned about this process. As for the second question, we found that the way in which athletes recover has less favourable effects in the overall condition of the subjects.

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Keywords: Athletes, training, effort, performance, recovery.



1. Introduction

Sport is one of the most important and diverse forms of reaching the full potential of an individual, at any age. High sport performance is the consequence of the science-based management of the training process. “Contemporary training has become a research field where specialists join together, to gain a deeper understanding of the multiple aspects of the training process in order to increase its efficiency” (Ghitescu & Moanta, 2017).

The most important feature of sport is competition, which capitalizes on the accumulation of trainings (Gheorghe, 2008). Sport training is the process of preparation for a sport performance. Top level sport practice means to attain maximum personal best (Mihailescu, 2011).

It consists of some parts as: general conditioning training, special conditioning training, technical preparation, tactical preparation, artistic preparation, mental preparation, theoretical preparation and biological preparation (preparation for effort and recovery after effort). Any successful training programme had a main goal and several objectives. In order to fulfil the goal the coach had to evaluate athletes’ physical, technical (specific skill), and mental abilities and propose some sets of objectives.

The most important mean of sport training is physical exercise. It is the biological stimulus that improves athlete performance in all trainings rank. Sport training and physical self-education involves voluntary effort, self-imposed action, which are based on inner motivation, and personal abilities (Popescu, Porfireanu & Cristea, 2016).

Fundamental athletes’ preparation follows improving motor skills muscle strength, speed of movements, endurance and cardiovascular fitness. Natural motor skills are indispensable components of human physical activity, providing the possibility of specific efforts and, harnessing the functional potential of the body. Motor skills and are perfectible through practice (Butu, Teodorescu & Catuna 2017).

The best way to improve each sport specific skills, with best influences in neuromuscular coordination is sport specific training. Positive adaptations in athletes’ state are formed by applying an overload and/or stimulating effort or exercise. A better state of athletes’ fitness takes place if the measure of the effort load is higher than the habitual level. Essentially, that means to increase the volume, intensity and to practice different drills, providing new or complicated situations, which athletes are not accustomed to them.

Alternating effort and recovery determinates better physiological adaptation, meaning athletes developing higher physical capabilities. Workout practice must avoid and prevent specific injuries, follow the training rules, reach a complete and deep recovery, and use suitable sport equipment.

2. Problem Statement

Pleka & Kellman, (2017) described recovery as a crucial part of any performance system. To be able to produce optimal performances, individuals have to (be prepared to) respond to bio-psycho-social demands adequately as these demands affect a person’s health status.

Recovery is a component of the overall training program and it is important for optimal performance. When the athletes have been repeatedly stressed too high by training effort to the point where the rest is not enough to allow for recovery, the athletes get tired. This fatigue can be stressed if the coach or the team

training does not notice the athletes' state. So, the overtraining appears with a set of several physiological, physical, emotional, behavioural symptoms that persist for 3-4 weeks to some months. Overtraining as pathological fatigue has effects in all trainings sections: specific skills are not accurate, physical fitness is not adequate, the rate of heart remains increased after effort, the body temperature is higher.

The athletes may lose the competitive desire and enthusiasm for sport and became depressed or easily irritated. In the same time they have poor sleep, decreased appetite, digestive disorders, liable to injuries. Coaches have to notice this state and interact with the athletes and medical staff to understand and action in order to change the athletes' health condition, created by serious fatigue.

The complexity of the recovery process depends on the extent of the effort and of subsequent fatigue. The recovery of energy reserves will restore first the biochemical homeostasis prior to effort. The athletes' need for recovery refers also to the discharge of the tensions installed in the loco-motor system: joints, muscles, tendons. The installed wellness is due also to spontaneous or targeted physical and emotional recovery.

3. Research Questions

3.1 Is the recovery process an important component for athletes' consideration?

3.2 Do athletes succeed in obtaining complete recovery?

4. Purpose of the Study

The field of the study is sports training, where the main purpose is the assessment of the importance of recovery as perceived and applied by the athletes. This study was based on the following assumptions:

- Top level athletes are partners in the training process, aware and accountable for their own training.
- High performance sport is a practical activity where human potential expresses itself through specific physical exercise.
- High performance training is characterized by two parts of practice: exercises by which the effort capacity is processed to extreme limits and the competitions by which the higher potential is capitalized;
- Sports effort is planned according to specific variables;
- The structure of training includes the process of recovery of the athletes' performance capacity;
- Well established principles determine the orientation and content of the recovery process;
- The degree of recovery influences the effort capacity required to resume the sports training;
- The coach organizes, controls, and assesses the recovery process.

5. Research Methods

The Recovery Cue Inventory Questionnaire (Kellmann, Patrick, Botterill, & Wilson, 2002). Was used for the data collection. The studied subjects were 15 top level athletes (6 runners and jumpers, and 9 gymnasts). Their level of performance is of national ranking, category I, and participants in national championships. The average age of the athletes is 21.

The Recovery Cue Inventory Questionnaire was administered to the sample. This is a standardized recovery protocol with 7 items. The first three items refer to the athletes' perceptions of the effort made in training. The next items investigate aspects related to the degree of recovery: physical recovery, quality of sleep, social recovery and self-regulation of effort. Every item has a scale of perception with values from 0 to 6. At the lower limit, there are the negative states of the athletes, and at the upper limit there are the positive aspects related to the item. Basic statistical mathematical calculation was performed for each question: average, amplitude and coefficient of variability of values. The data analysis was graphically represented, for each item.

For Item 3 with reference to the degree of recovery achieved by rest and other means, we introduced a supplement by which the subjects should select the recovery means they used. The following means were listed: specialized diet and hydration according to the effort, hydrotherapy, massage, muscle relaxation methods, other means. The data from the questionnaire referred to a week of training, in March, Monday to Sunday, in one stage of basic physical training. These stages usually contain general and special exercises. For the athletes the content refers to aerobic resistance, dynamic force, speed. For the gymnasts, the training emphasizes on specific resistance, dynamic and static force, coordination and joint mobility.

6. Findings

The findings are presented according to the questionnaire items.

6.1. Item 1 How much effort was required to complete your training last week? (Figure 01)

Modern training implies systematic repetition of physical exercise. "Systemic training results in the improvement of the effort adjustment functions, which distinguishes the athlete from the non-athlete" (Bratu & Gherghel, 2011). The positive effects of training consist in anatomical, physiological and biochemical adaptations, which determine the increase of athletic performance capacity. The training programs must be structured with a correct dosing of the effort specific for the sports branch. The effort required in the sportsmen training is dosed by volume and intensity. These parameters depend on the age, experience, type and most of all level of sports training. The effort produces adaptive effects, which mean the stress on the body to the upper limits of supportability. Moreover, the training effort induces a certain degree of physiological fatigue. The most perceptible form of fatigue is the muscle fatigue. The athletes feel the general weakness, determined by the obvious reduction of energy resources which support muscle contraction. Therefore, the athletes have the capacity of assessing both the degree of effort, and the resulting fatigue.

The athletes in the study consider that the intensity of the effort in the previous week are below the scale average, at the average degree of 2.86 on the perception scale, which means quite close to excessive effort. The most intense perceived stress is of an athlete at grade 1. At the opposite pole, there is only one subject who assesses the degree of stress at value 6. In general, the effort made by the subjects is perceived differently, which statistically indicates a great variability ($Cv=34\%$) of the group.

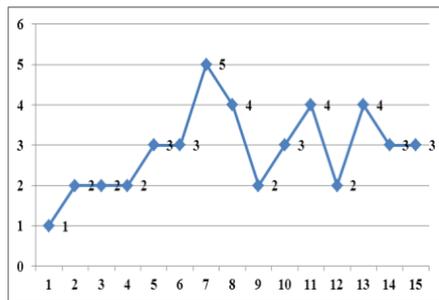


Figure 01. Item 1

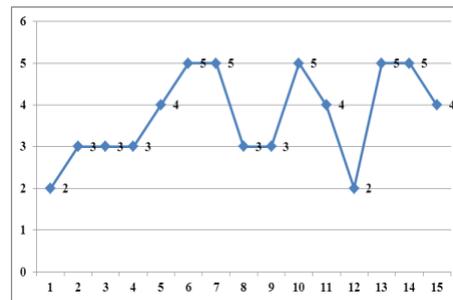


Figure 02. Item 2

6.2. Item 2 How recovered did you feel before your trainings last week? (Figure 02)

The adaptive effect of the athlete's body to effort refers also to the post-effort degree of fatigue. Fatigue is a transitory state caused by sports effort which exceeds the potential of the body during training. "During sports training, fatigue comes in two phases: latent fatigue which can be overcome by psycho-physical mobilization and manifest fatigue, which no longer allows the effort to continue" (Dragnea & Bota, 2002). In order to return to the state which enables to resume sports effort, a period of biological and mental recovery of the body is required. Recovery is the effect of anabolic processes which restore all the systems of the body. Recovery is a section of sports training which should be managed. Athletes must take special recovery measures, which might complete and accelerate the biological and mental recovery of the body. The degree of recovery is mainly assessed as compared to the health condition and the desire to resume training.

The subjects included in this study assess the degree of post-effort recovery, slightly over the average of the scale, at the average value of 3.73 on the perception scale. The amplitude of individual values of the degree of recovery is between 2 and 5. Most of the subjects place themselves towards the upper end of the value scale. The value of the variability coefficient ($Cv=37\%$) indicates one non homogeneous group.

6.3. Item 3 How successful was I and at rest and recovery activities? (Figure 03)

The recovery activities are mainly natural and compulsory for all athletes: food and rest (rest and sleep). Other means are also used to hasten recovery. Nutrition is very important natural recovery mean for all athletes. Athletes must have a special concern for their diet. Currell (2014) underlines the role of nutrition for athletes in prevention of illness and injury, training adaptation, and competition performance. Athletes' nutrition is within regular proportions, but depending on the nature of the effort, proteins, carbohydrates and lipids have slight deviations. For athletes, as tennis players, optimal nutrition is essential to increase performance. Tennis players, as all, need to recover fast to play again the next day or very soon. "Optimal nutrition plays an integral role in every professional tennis player's daily routine and proper recovery" (Teodor, 2017b). Shirreffs (2009) emphasises the need for rehydration both during and after exercise, the need for water, sodium, and small amounts of carbohydrate in rehydration solutions. "Tennis players need to perform their own studies to gain individual knowledge of their sweat rates during different environmental conditions and should be on an individualized hydration schedule" (Teodor, 2017a).

When they were asked about nutrition management, 8 subjects said that they eat according to the effort made. The others are careful with the food to be healthy and they prefer food made from scratch. Almost the same number of subjects consumes beverages containing electrolytes, while the other prefers

plain water. In the analysed interval of time, no athlete resorted to hydrotherapy. An important recovery mean is massage. According to Buhociu (2017) “massage applied after high training efforts has recovery effects and it is applied on the most stressed limbs.” Massage has different effects according to the training moment. Recovery massage is a means of recovery used by 5 athletes.

The pharmacological means of recovery are food supplements and are used by 10 subjects.

“After a hard workout, the muscles are depleted of glycogen and the body feels fatigued. In this situation it is important for athletes to recover, but not lying for the rest of the day” (Humphrey, 2012). Practicing easy and agreeable efforts, other than those specific for the practiced sport, are another recovery activity. These practices fight the fatigue induced by effort, but easy effort, with remedial effects for the most demanded muscle groups. The effort made is at the level of the aerobic threshold, with an approximate 70% stress in the maximum capacity of performance. Among the studied subjects, only 5 practice other recovery activities, of the cross-training type.

Concerning the means of mental recovery, the subjects of the study used only complementary means of recovery, and most of them declared they relax listening to music. According to Gheorghe & Ivan (2015) “in sport’s practice coaches use specific training methods, but they did not get expected performance, because they neglect psychological component”.

The athletes assess the degree of efficiency of the means used at degree 3.13 on the assessment scale. The degree of assessment of recovery covers almost the whole extent of the scale, but no athlete attained the extreme values of the scale. The studied group expresses great variability of perception of the recovery process, statistically with a coefficient of variability of 43%.

Psychological preparation and recovery are some of the basic components of sports training in order to participate successfully in sport competitions. “The competitions have a very high emotional load, competitive anxiety representing one of the psychic factors of contest” (Petreanu et al., 2017).

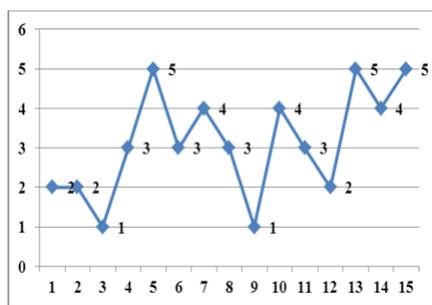


Figure 03. Item 3

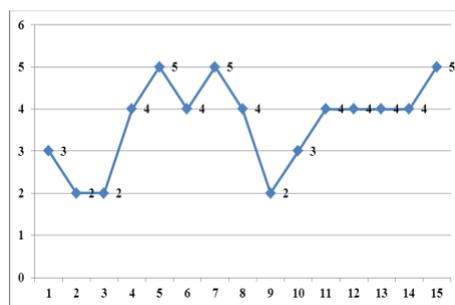


Figure 04. Item 4

6.4. Item 4 How well did I recover physically last week? (Figure 04)

According to Mojiou (2017) general physical training includes a unitary system of means and requirements regarding the performance of the athlete in training and competition. It enriches the general background of driving skills, ensures harmonious development without which no team sport can be practiced. “Physical training is the base for getting high quality in specific skills and further on reaching superior performance in competitions” (Cojocaru & Cojocaru, 2016). The athlete’ body must be adequate prepared to deal with the training requirements. Post effort and pre-effort physical comfort is mainly determined by the condition of the muscles. Muscle fatigue installed as a result of sports effort, is the result

of reducing glycogen and enzymes resources in the muscles. The deficiency of oxygenation of the muscles is also a reason of muscle fatigue. Under such conditions, the mechanism of muscle contraction is affected by reducing the force and elasticity of the muscles.

The degree of physical recovery is assessed differently by the subjects of the study. The average value of the degree of assessment of recovery is of 3.66. The perception of physical recovery on the assessment scale ranges between 2 and 5. The group under analysis is not homogeneous and at the value of the coefficient of variability of 28% the scattering of values is wide. Athletes know the importance of training for great performance.

According to Swartzendruber, (2013) “recovery is an important aspect of an exercise program because it allows the body to repair and strengthen itself in between workouts. It also allows physically and psychologically recovery”. Recovery after exercise workout is needed to restore intramuscular blood flow for oxygen delivery, to replenishment of phosphocreatine stores, to restoration intramuscular pH and regaining sodium/potassium balance.

6.5. Item 5 How satisfied and relaxed was I as I fell asleep in the last week? (Figure 05)

Sleep is important mean of recovery after sports training. Athletes who don't have a healthy sleep risk of lost performance capacity. Sleep has effects on the whole body of the athletes. Moreover, sleep is the natural means that cannot be replaced by any other means. The most important effects are on the central nervous system, and on the anabolic components of the body. An unhealthy sleep has effects on the motor capacity of the athletes. Those motor actions which are strongly conditioned by the central nervous system such as: reaction speed, general and specific coordination, precision, mobility, resistance and so on... Sleep hygiene must be in the attention of the athletes, with reference to the sleep duration and quality but also to the specific sleep habits.

The athletes assess sleep quality on the scale of satisfaction at the average value of 4.86. Only 2 subjects attain the scale of assessment at the maximum value of satisfaction of sleep quality. The range of individual values the athletes cover is limited from degree 4 to degree 6. In this case, the group has a good homogeneity, with the coefficient of variability of 20%. It seems that athletes were close to a proper sleep.

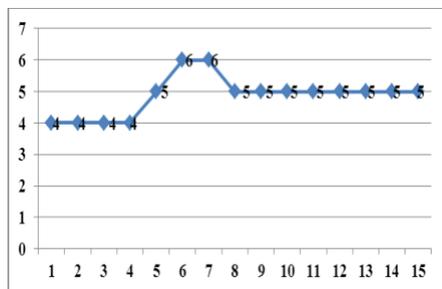


Figure 05. Item 5

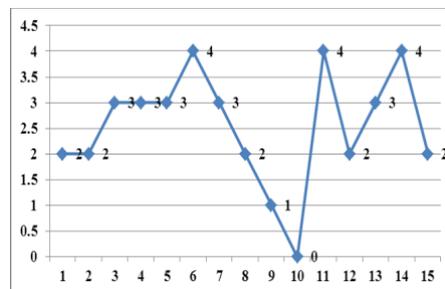


Figure 06. Item 6

6.6. Item 6 How much fun did I have last week? (Figure 06)

Sport practice can be an enjoyable activity, involving special experiences. Lupu, (2015) emphasized that the intense feeling named peak experience may be obtained in different manners, occasions, situations,

but the situations created within a sports game or a competition determines intense experiences that outside the sports game these experiences would not even exist.

Concerning the last week's possibilities of socialization, according to the given answers, the degree of socialization is at the average value of 2.53 on the assessment scale. It is a low level of the way in which the subjects succeeded in relaxing by socialization. The lowest level of assessment of the experience of socialization is at the individual value 0. The highest degree of assessment of experimented socialization is 4. Most of the subjects are in the lowest half of the assessment scale, in the area of minimum recovery by this item. At this item the group is deprived of homogeneity by the statistic parameter (Cv)=35%. It seems that the subjects are not too interested on other activities of socialization, in order to get away from routine.

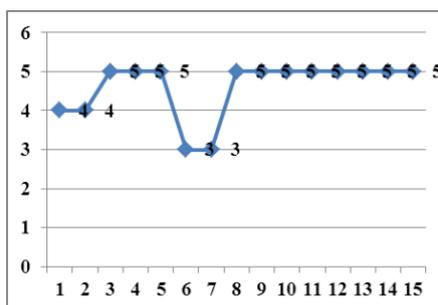


Figure 07. Item 7

6.7. Item 7 How convinced was I that I could achieve my goals during performance last week? (Figure 07)

The assessment of the extent of accomplishment of the objectives targeted in training for the week ended indicates an average level of 4.60 on the assessment scale. The individual values of assessment include almost the whole scale, from 3 to 5. The individual values are less diverse, which gives the group a good homogeneity, with the value of the coefficient of variability of 16%. Optimism and self-confidence are reflected at an optimistic level. The previous perceptions seem less associated with the confidence in the potential progress in the analysed interval.

In order to be an active and aware athlete in high sport performance, all the sections of sports training must be well prepared. A weak link in the training system, may affect the capacity of performance.

7. Conclusion

Concerning the training conducted during a week of the preparatory period, we may say that the athletes were subject to obvious stress. Top level athletes are accustomed to strenuous effort that means they are always close to fatigue. The proof is how the athletes felt during the training and they assessed the degree of effort predominantly towards excessive effort. This situation is the result of higher training objectives. Planning demanding training is correct at this time, but they should be harmonized with the degree of recovery and the potential of resuming effort.

Following the effort made, the athletes felt partially recovered. The degree of recovery is a little above the average level of the perceptive scale, towards the favourable limit. This condition may have two explanations: incomplete recovery or over exhausting training. A recovery with objectification closer to the maximum positive level would have been desirable.

We should emphasize that the recovery means were mainly the natural means. At high demands, more complex measures of recovery are required, which our athletes have not experimented. Nutritional status is an important factor in athletes' performance. Nutrition for recover should be more carefully oriented towards the resources that support the specific effort. Nutritional specific needs of the athletes must be corresponding to their physical activity and the goals.

Nutrition, sleep and rest were the basic means of recovery of the athletes.

Physical recovery is also perceived at the average level. With an incomplete recovery fund it is hard to believe that the body can durably prepare. Muscle mass supports efforts, irrespective of the specifics of the sport, but the muscles must be trained safely and correctly. Muscle fatigue limits performance in all sports.

Recovery through sleep has come closest to the favourable level of the perception scale. Sleep is obviously above the average level, with several individual values to the permanent satisfaction of recovery through sleep. A careful hygiene of sleep, determines spectacular effects in the depth and constancy of recovery.

The athletes had less opportunities or options to spend their spare time in an enjoyable way. The level of such activities obviously inclines towards a low degree of socialization in the physical training week. We suspect several explanations, among which fatigue may be a reason of decrease of the mood for socialization. On the other hand, the opportunities associated with the season and the unpleasant weather conditions may have an influence on this mood. Most of the subjects have a high interest for the use of modern devices which 'cover' socialization.

The general condition of the subjects indicates optimism and confidence in attaining the training objectives of the week. The training objectives proposed are well received, with confidence in the success of their sport activity.

When we answer the first question of the study, we find that the athletes used recovery means, without being particularly concerned about the process. As for the second question, we find that the way in which athletes recover, has less favourable effects in the overall condition of the subjects.

8. Implications

This study can help coaches and those responsible for athlete recovery to plan effective recovery methods for athletes as the findings imply that athletes used recovery means, without being overly concerned about the process. It has been mentioned that planning demanding training is appropriate, but such training should be harmonized with the degree of recovery and the potential of resuming effort instead of inducing burnout which would be detrimental to both the athletes and the sport they represent.

References

- Bratu, M., & Gherghel, C. (2011). Bazele generale ale refacerii. București: Editura Discobolul.
- Buhociu, E. (2017). Masaj si tehnici complementare. Bucharest: Fundatia Romania de Maine.
- Butu, I.M., Teodorescu, S.A., & Cătună G.C. (2017). Importance of motricity development of schoolchildren. *The European Proceedings of Social & Behavioural Sciences icH&Hpsy* 2017. 358-363.

- Cojocaru, A., & Cojocaru, M. (2016). Functional training in maintaining the physical preparation volleyball player. *Science, Movement and Health*, 16(2), 370-376. <http://analefefs.ro/anale-fefs/2016/i2s/pe-autori/15.pdf>. doi: <http://dx.doi.org/10.15405/epsbs.2017.09.35>.
- Currell, K. (2014). Diet of an Olympian: food with a purpose. *Nutrition Bulletin* 39: 213–7. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/nbu.12091> doi.org/10.1111/nbu.12091
- Dragnea, A., & Bota, A. (2002). Teoria sportului. București: Editura Fest.
- Gheorghe, G., & Ivan, P. (2015). Comparative study of somatic and motor characteristics on high jumpers participants at the last four Olympic games. Craiova: *Journal of Sport and Kinetic Movement*, 1 (26), 141-145.
- Gheorghe, I. (2008). Teoria activitatilor motrice. Bucuresti: Editura *Romania de Maine*.
- Ghitescu, I.G., & Moanta, A. (2017). The individualisation of basketball players' training, a condition for achieving sports performance. *The European Proceedings of Social & Behavioural Sciences*. XXXVI ICPEK <http://www.futureacademy.org.uk/files/images/upload/2017icsep06.pdf>
- Humphrey, L., & Hanson, K. (2012). Hansons Marathon Method. Colorado.
- Kellmann, M., Patrick, T., Botterill, C., & Wilson, C. (2002). The recovery-cue and its use in applied settings: Practical suggestions regarding assessment and monitoring of recovery. In *Enhancing Recovery: Preventing Underperformance in Athletes*; Kellmann, M.,(Ed.) Human Kinetics: Champaign, IL, USA, 2002; pp. 219–229.
- Lupu, E. (2015). A study regarding the connection between sports games and peak experiences for students. *Science, Movement and Health*, XV(2), 402-408. <http://www.analefefs.ro/anale-fefs/2015/i2s/pe-autori/v2/27.pdf>.
- Mihailescu, P.D. (2011). Refacerea in sportul de performanta. Editura Universitatii din Pitesti.
- Mojoiu, M.C. (2017). The importance of physical training in team sports. *Science, Movement and Health*. XVII,(2),397-401.http://analefefs.ro/anale-fefs/2017/i2s/pe-autori/Mojoiu%20_Din_%20Mihaela%20Claudia%20.pdf.
- Pelka, M., & Kellman, M. (2017). Relaxation and recovery in sport and performance. *Oxford Research Encyclopedia of Psychology*. online July 2017 <http://dx.doi.org/10.1093/acrefore/9780190236557.013.153>
- Petreanu, M., Petreanu A., Buțu I. M., & Mezei M. (2017). Analysis of the competitive anxiety level in basketball and aerobic gymnastics. *The European Proceedings of Social & Behavioural Sciences icSEP, XXIV*, 43-50. doi: <http://dx.doi.org/10.15405/epsbs>.
- Popescu, F. Porfireanu, C., & Ristea, C. (2016). The interest of young in sport activities. *Science, Movement and Health*, XVI (2), 641-646. <http://analefefs.ro/anale-fefs/2016/i2s/pe-autori/55.pdf>.
- Shirreffs, S.M. (2009) Hydration in sport and exercise: water, sports drinks and other drinks. *Nutrition Bulletin* 34, 374–9. <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-3010.2009.01790.x> doi.org/10.1111/j.1467-3010.2009.01790.x
- Swartzendruber, K. (2013). The importance of rest and recovery for athletes. Michigan State University Extension. http://msue.anr.msu.edu/news/the_importance_of_rest_and_recovery_for_athletes.
- Teodor, D.F. (2017a). Hydration in Tennis Performance – Water, Carbohydrate or Electrolyte Sports Drink? *Science, Movement and Health*, XVII (2), 514. <http://analefefs.ro/anale-fefs/2017/i2s/pe-autori/Teodor%20Dragos-Florin%201.pdf>.
- Teodor, D.F. (2017b). Nutrition Guidelines for Competitive Tennis. *Palestrica of the third millennium – Civilization and Sport*, 18(4), 228. <http://www.pm3.ro/palestrica-of-the-third-millennium-civilization-and-sport-vol-18-no-4-october-december-2017/nutrition-guidelines-for-competitive-tennis/>.