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JUDGEMENT OF TRAINING LOAD

Lecture – 176
JUDGEMENT OF TRAINING LOAD

INTRODUCTION

The word 'Training', in its broad sense, refers to any organised and systematic instructional process which aims to enhance man's ability with regard to physical, psychological and intellectual aspects. In the field of sports, training is a process which involves preparation of sportsperson to attain highest level of sports performance. To improve sports performance, one has to, regularly and systematically, perform a variety of exercises. Mere execution of an exercise does not ensure improvement of performance. Actual effect of exercise depends upon several factors of which the important ones are training load, means of recovery, assessment of loading and performance capacity, sports equipment, nutrition, psychological characteristics and methods adopted for imparting theoretical instruction.

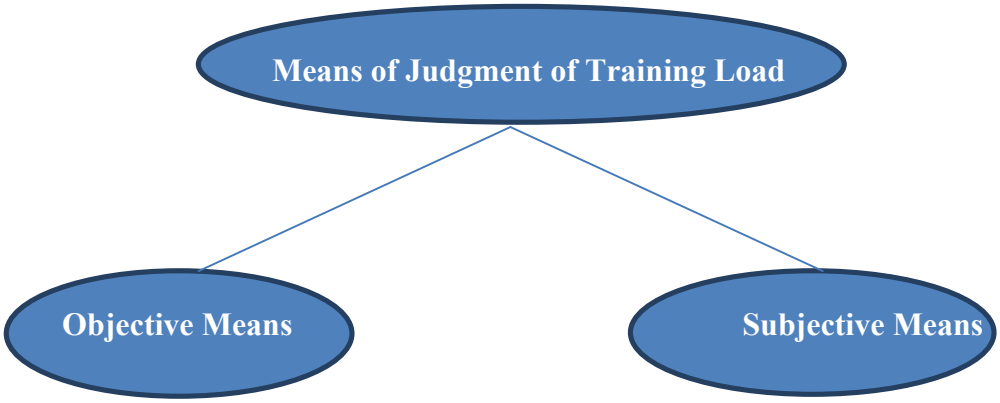
Performance of a sportsperson improves as a result of application of training load. The frequency of training of sportsperson depends upon the training age and performance level. A beginner trains 3 to 5 times per week whereas a high performer trains 8 to 12 or even more times in a week. In order to ensure that the load of training in a training unit guarantees development of performance, the load has to be properly controlled and regulated. Today, it is possible to correctly plan training load for a sportsperson by working out 'Target Training Zones' keeping in mind his age and resting heart rate.

It is very important for the coach to know how much load he is giving to the sportsperson during a training session. The external load (type, intensity and volume of exercise) can be measured and controlled and it should be only that much amount that it results optimum internal load (bodily response to exercises) on the sportsperson. Only in this way the best result can be achieved. Unlike external load, the internal load is not easy to determine

because the coach must find out at what level the organs and systems of the body are working, and what is the degree of fatigue.

Means of Judgment of Training Load:

The judgement of training load can be done by using the following means



OBJECTIVE MEANS OF JUDGEMENT OF TRAINING LOAD

These means are scientific, are more accurate and do not depend upon the subjective judgement of the coach. The objective means of judgement of training load involve assessment of physiological and bio-chemical variables during and immediately after the training schedule. Some of the objective means of judgement of load which can be effectively used by a coach are as follows:

1. Body weight
2. Heart rate
3. Intensity of training load (the rate of doing work in a training session)
4. Volume of training load (total amount of work done in a training session)
5. VO_2 max (maximum volume of oxygen)
6. Blood lactate
7. Blood urea
8. Ion concentration (Acid-base balance)
9. Electrolyte concentration
10. PO_2 and PCO_2 in blood
11. Blood enzyme (SGOT and SGPT)
12. ATP (Adenosine tri-phosphate), CP (Creatine phosphate) concentration
13. Glucose and fatty acids
14. Hormonal level e.g. glucagon, insulin and thyroxin.

Measurement in respect of some of the variables can be done by the coach, however, in respect of others the coach has to depend upon the specialist. Due to the following reasons, the objective means for judgement of training load are cautiously used.

1. Most of the objective means indicate effective pressure produced by the load on a specific organ or a system and not the whole body.
2. Most of the objective means are associated with speed and endurance training.
3. As on date reliable objective means for judging the psychological aspects of load are not available.

Pulse rate and body weight are the two means which the coach himself can use independently. For the use of other means, he has to take the help of a bio-chemist or an exercise physiologist.

Pulse Rate: The pulse can be easily measured during and after the activity to assess the internal load during the activity and to assess the rate of recovery after the activity. In endurance training, the intensity zones have been made for the control of internal load. To a certain limit, the rate at which the organ works and the heart rate have linear relationship, but for activities of short duration (Anaerobic activities), the response is not linear and hence the heart rate is not a very good index for the judgement of load. For short duration activities and also for very long duration activities, for judgement of load and fatigue caused by the activity, lactic acid concentration and other bio-chemical changes taking place in blood, muscle, liver etc. are more helpful.

Body Weight: This is another objective means for judgement of load which, though not very reliable, is used to assess the degree of load of a number of training sessions. It is advisable to take the body-weight on a weekly basis and then to conclude whether the load in the previous weekly cycle was optimum or not. If other conditions are normal and the load was optimum, then the body-weight should not decrease or increase after a weekly cycle. The decrease in body-weight signifies a load which is more than optimum. The increase or decrease of body-weight for the judgement of load should always be considered in view of certain factors, e.g. type of training (Strength or Endurance), age, training state, health, diet etc.

SUBJECTIVE MEANS OF JUDGEMENT OF TRAINING LOAD:

Since objective means of judgement of load need specialised equipment/apparatus and scientific procedures, the coach has to invariably rely on the subjective means. The accuracy with which subjective means can be used for judgment of training load depends upon:

a) Observational ability of the coach,
b) Knowledge of the coach with respect to various sports science,
c) Knowledge of coach with respect to likely-effect of various training means and method,
d) Experience of the coach,
e) Thorough knowledge about sportspersons behaviour
f) Knowledge about the personality of sportsperson.

These means are subject to the personal judgement of the coach and hence may not always give exact information. Nevertheless, these means are very pragmatic, required no equipment and advanced techniques of measurement and analysis except a good amount of experience from the coach. These means help in assessment of fatigue as fatigue is direct result of load. The fatigue is characterised by various symptoms. The coach has to simply look for these symptoms in order to find out the degree of load. It must be borne in mind that a single symptom of fatigue alone is not enough for the correct judgement of load. Secondly the coach must have enough experience to correctly interpret the symptoms of fatigue. The coach must be in a in a position to differentiate between different levels of expression of the various symptoms.

Sometimes, the sportsman, due to his strong personality and will power, does not let the coach know about his feelings and fatigue. Precaution should be taken because these symptoms depending upon the personality of the sportsman, can find expression in different forms and to varying extent in different sportsmen. For correct interpretation of these, a coach must:

i) Have adequate experience
ii) Understand the personality of the sports person.
iii) Remain vigilant during and after the training activity.

In current years, subjective self-assessment of the load by the sportsman for regulation of load dynamic has also been recommended. The sportsman's ability to correctly perceive the training load improves with accumulation of training experiences. Further research, however, is needed to clearly formulate the ways and means of using subjective self-assessment of the sportsman in the sports training process.

The amount and type of training load depends upon the desired effects. Administration of optimum load causes fatigue and if fatigue can be correctly measured during and after training, the degree of load can be correctly assessed. Since fatigue cannot be directly assessed, the effect of training load has to be judged through its symptoms which are as follows:

Table
Symptoms of Fatigue

Symptoms	Less Fatigue (Low Load)	High Fatigue (Optimum Load)	Very High Fatigue (Critical Load)	Symptoms after Critical Load
Sweating	According to temperature high to medium.	Professed sweating especially of upper body.	Too much sweating, also of lower extremity.	Sweating during night.
Movement execution	Proper movement execution according to the learning stage.	Beginning of errors, decreased accuracy.	Poor coordination, weak movements, persistent inaccuracy and errors in the movement execution.	Poorly coordinated and weak movement for next 24-48 hours.
Concentration	Normal, no nervousness, able to follow instructions, able to concentrate on demonstration etc.	Un-attentive to explanations, decreased perception ability, unable to differentiate between finer point.	Strongly decreased concentration ability, nervousness, slow reaction, absent mindedness.	Unattentive and unable for movement correction for the next 24-48 hours.
General feeling	Good, no difficulty in fulfilling the training demands.	Muscular weakness, breathing difficulty, decreasing performance.	Pain in muscles and joints, dizziness, feeling of vomiting, vomiting, burning feeling in the chest.	Disturbed sleep, persisting muscle and joint pain, weakness, reduced physical ability, higher pulse even after 24 hours.
Motivation and mood, performance, readiness	Good motivation, wants to continue the training, pleasant mood, happiness.	Reduced activity, desire for long recovery pauses, reduced motivation but still wants to	Wants to stop, tendency to isolate, obstinate, aggressive towards coach and colleagues.	No desire for coming to training again, indifferent, resists demands of the coach, depressed, doubt the value of

		continue the training		training, finds excuses to avoid training.
Colour of skin	Slightly red	Strongly red	Very strongly red or occurrence of paleness.	Persisting paleness for several days.

In order to correctly and reliably judge load the coach should rely on more than one symptom of fatigue. Some of the symptoms namely sweating and colour of the skin are not very reliable because they may depend upon the temperature and colour of the skin of the sportsperson and, therefore, are to be cautiously used.

Recovery:

Both, training and competition loads enhance sports performance. In the process of long term training, the quantum of load is gradually increased and this leads to improve performance. A beginner adapts to training load faster whereas with the increase in training age, higher loads are administered and this results in slower increase in performance.

Sportspersons cannot effectively undertake high loads of training unless proper means are adopted to accelerate the process of recovery. Administering appropriate means can ensure quicker recovery and make a sportsperson capable of undertaking more frequent loads.

Recovery from training and competition loads requires considerable amount of time. Recovery can be divided into following three phases:

Phase I:

In this phase the onset of fatigue and recovery go on simultaneously i.e. when the training or competition is in progress. This process occurs because of resynthesizing of ATP (Adenosine tri-phosphate), CP (Creatine phosphate), glycogen and to some extent because of neutralisation of lactic acid. Those activities which continue for a long duration and those sports which are played for a considerable period, the pace of recovery in this phase plays an important role. Recovery during this phase, to a large extend, depends upon functional capacity and efficiency of different systems and their organs.

Phase II:

This phase commences with the completion of the training schedule (cessation of physical activity) and ends with the restoration of homeostasis of the body. This phase lasts from few minutes to 2 to 3 hours.

The following active recovery means can be adopted to make the recovery process faster.

1. Deep breathing exercises
2. Intake of drinking containing carbohydrate, vitamins, salts and minerals.

Phase III:

The duration of this phase of recovery can last from many hours to several days. In this phase, the recovery is facilitated by the anabolic process. Substances such as enzymes and proteins which get depleted in the process of undertaking the load get resynthesized.

Factors Affecting Pace of Recovery:

The pace of recovery is affected by the following factors:

1. Stimulus Intensity and Stimulus Volume (Factors of Load)
2. Type of Training Load
3. Health and Fitness Status
4. Rest and Sleep
5. Good Diet
6. Daily Routine
7. Total Load of the Day

1. Stimulus Intensity and Stimulus Volume (Factors of Load):

Recovery after loads dominated by intensity is quicker whereas it takes longer time when extensive load (load dominated by volume) is administered. Intensive loads lead to quicker onset of fatigue but after the cessation of load, recovery is also faster.

2. Type of Training Load:

In order to improve different aspects of sports form, different types of loads are administered. Recovery is faster in the case of those loads where ATP (Adenosine tri-phosphate) and CP (Creatine phosphate) are used for energy production. Loads which involve depletion of glycogen stores, recovery may take almost 10 hours to 2 days. Recovery after strength loads may take 1-2 days or even longer.

3. Health and Fitness Status:

In order to attain faster recovery, health and fitness of a sports person are important factors. Healthy and physically fit persons recover faster from fatigue caused by the training loads.

4. Rest and Sleep:

Proper rest and sound sleep of 7 to 8 hours ensures complete recovery. In addition to physical and physiological recovery, sleep also helps in psychic recovery.

5. Good Diet:

Good diet containing all important nutrients namely carbohydrates, fats, proteins, vitamins, minerals and water in required quantities is essential for faster recovery. Intake of nutrients such as carbohydrates, vitamins and minerals (sodium and potassium) in liquid form can facilitate quick recovery. Intake of good food at fixed hours and proper eating habits also ensure faster recovery.

6. Daily Routine:

Proper control has to be exercised on daily routine so as to ensure recovery from fatigue. If the biological clock is disturbed by making frequent changes in the daily routine, the recovery process is adversely affected.

7. Total Load of the Day:

In addition to training and competition loads, there are many other factors namely academic pursuits (in case sports person is studying), professional work (in case sports person is employed), sharing household work, meeting weather and environmental stresses, injury etc. which increase the total load of the day. In case the total load goes beyond the loading capacity, the recovery process gets delayed.

Means of Recovery:

The means which can be effective in accelerating recovery can be divided into following groups-

1. Training Methodology Related Means
2. Nutritional Means
3. Physio-therapeutic Means
4. Psychological Means

1. Training Methodology Related Means

Among all the four above groups, this means are the most important means for ensuring quick recovery. In fact other means of recovery should support the training methodical means. The following methods of training are used during training of different games and sports:

i. Session of Training

A training session should be carefully worked out for ensuring recovery. The following factors should be kept in mind.

a) Warm up

A good session of warming up is essential for avoiding earlier onset of fatigue. Stretching exercises which form an essential part of a warm up session are effective in preventing stiffness and soreness of muscles.

b) Exercise Sequence

The exercises to be performed should be arranged in a sequence so that different muscle groups, organs and systems are stressed in rotation. This sequence can help in delaying the onset of fatigue and guarantees quick recovery.

c) Sequence of performance task

In addition to exercises, the performance tasks should also be arranged in a sequence. In a training session the speed, coordinative ability and technique should be developed first followed by strength. The endurance training should be at the end of the session.

d) Phases of rest between repetition of load

Between repetitions of load, measured rest periods should be provided in order to make the load effective and also make the sportsperson capable of completing the training schedule. Active rest pauses (doing low intensity exercises during rest pauses) ensure faster recovery.

e) Limbering down

Every training session shall end with limbering down (cooling down) which should be done for 10 to20 minutes in order to recover and bring the body back to normal level of functioning. During limbering down, low intensity continuous exercises should be performed so as to quickly remove the metabolic products from muscles and blood.

ii. Cyclic Process of Training

The year is divided into cycles of training of varying durations.

Macro cycle is the longest cycle and its duration is from 3 to 12 months. It is divided into preparatory, competition and transition periods. Transition period of 4 to 6 weeks ensures recovery because during this phase training loads are of low intensity and volume. This phase provides recovery and relaxation of the sportsperson after strenuous training during preparatory and competition periods.

The duration of meso cycle is 3 to 6 weeks. The last week of the meso cycle is devoted for recovery. During the last week the training load is low and general exercises dominate.

Micro cycle is the shortest of the three cycles and its duration is normally one week. On the last day of the week complete rest is provided to ensure recovery.

During these cycles the training load fluctuates and is applied with certain rhythm. During these cycles the training tasks should be tackled in a way that speed and technique comes in the beginning and endurance comes at the end.

2. Nutritional Means

During and after training and competition nutritional means taken in proper form and required quantity can help in ensuring faster recovery. The sportsperson should take balanced diet, according to the requirements of the body and the sports for which one is training. After every training session light liquid diet containing carbohydrates, vitamins and minerals (sodium and potassium) should be consumed. Intake of drinks with salt added are also recommended if during training session the sportsperson had profuse sweating. It is also advised that meals should be consumed at fix hours.

3. Physio-therapeutic Means

These means are being effectively used for accelerating recovery. Different massage manipulations, sauna, ultrasound therapy, hydrotherapy, electrotherapy etc. are helpful in quick recovery. For these means help of a specialist should be taken in order to avoid problems. These means should be used in addition to means related to training methodology. Avoid using them as substitute means for training methodical means.

4. Psychological Means

Over the years, the psychological means have become important in helping sportsperson in attaining faster recovery. Physiological evidence show that the recovery process is controlled by the nervous system of the body and the psychological means help in voluntary control of this system for attaining quick recovery. Psychological means, like other means can be used during and after training sessions for relaxation and ensuring sound sleep. Some of the important means which are being commonly used by the sportspersons are: i) different form of yoga, ii) autogenous training, iii) auto-suggestion and iv) progressive relaxation technique.

In order to learn and use these means to the best advantage, the sportsperson may take help of a specialist. After having learnt them correctly, he may independently use them.

Conclusion:

It is very important for the coach to know how much load he is giving to the sportsperson during a training session. Performance of a sportsperson improves as a result of application of training load. The frequency of training of sportsperson depends upon the training age and performance level. The objective means of judgement of training load involve assessment of physiological and bio-chemical variables during and immediately after the training schedule. The objective means of judgement of training load need specialised equipment/apparatus and scientific procedures; the coach has to invariably rely on the subjective means. The subjective means are subject to the personal judgement of the coach and hence may not always give exact information. Nevertheless, these means are very pragmatic, required no equipment and advanced techniques of measurement and analysis except a good amount of experience from the coach. These means help in assessment of fatigue as fatigue is the direct result of load. The fatigue is characterised by various symptoms. The coach has to simply look for these symptoms in order to find out the degree of load.

Sportspersons cannot effectively undertake high loads of training unless proper means are adopted to accelerate the process of recovery. Administering appropriate means can ensure quicker recovery and make a sportsperson capable of undertaking more frequent loads. Recovery from training and competition loads requires considerable amount of time.