

Essentials of Sports Injury Prevention & Rehabilitation

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Lecture – 7

Lab Investigations

Good morning students, myself Dr. Atul, your faculty for injury prevention and rehabilitation. In this week, we have already studied about the various types of medical examination, and a few parts of the medical examination like history taking, general physical examination. Now this week, we are going to study about, or discuss about the lab investigations and, the human performance lab. So, let us start. The lab investigations, in the lab investigations, we do complete blood count, that is the blood examination, urine examination and the cardiac examination that is the ECG (electrocardiogram).

So, complete blood count is essential to rule out any kind of anemia, by which we can see the level of hemoglobin and by the graph, we can see which type of anemia it is; and the TLC that is the total leukocyte count, we can see is there any infection, is there or not or the body is that immunity level is good or not. And with the help of ESR, we come to know if there is any some chronic infection is there or not. So and then during the blood examination, we do liver function test for the health of the liver. It is a very important organ of that athlete, it plays a significant part for the health of the athlete and renal function test, it does the filtration of all the necessary or the wastage material of the body.

And the lipid profile whether the triglyceride levels or the cholesterol is in the normal level or it has increased because of diet or some other reasons. Then the optional examinations are vitamin D and other hormonal essays like thyroid, testosterone, testosterone, aldosterone and various ratios of those hormones and the urine examination. Urine examination is very important, the color of urine tell us about the hydration of the athlete, whether he is fully hydrated or not and in general when we talk with the athletes, we we ask about the color of the urine. If it is just pale or water color, it simply says the athlete is good hydrated, and if it is as the color of urine becomes darker, the level of hydration is reduced. So athlete is dehydrated or his kidney is not properly functioning, so he has to take extra water, and with the help of routine examination, we also come to know whether he is having some sort of infection or not and with the specific gravity, we come to know the whether his kidney is functioning well or not, and simultaneously we can rule out the very serious disease that is diabetes insipidus.

And the ECG has to be conducted in the cardiac lab and with the help of ECG, we can rule out any congenital or any kind of abnormality of the athlete like heart enlargement. So electrocardiography has to be conducted in the cardiac lab, or in the medical examination center. With the help of ECG, we come to know various heart elements, whether he is having any kind of arrhythmia, any kind of cardiac anomaly or his heart is absolutely fit and fine. A healthy ECG generally rules out all kinds of heart abnormality. So, abnormal ECG does not rule out heart abnormality but if ECG is normal, it simply says the patient or the athlete is healthy, and currently he does not have any abnormality. And now comes the human performance lab.

The human performance lab is some sort of lab where the performance analysis of the athlete is conducted. Here we do the body composition analysis of the athlete, field or lab aerobic capacity of the athlete. We do the anaerobic capacity of the athlete with the help of Wingate test on the cycle ergometer and the motor skill test, various field motor skill tests for the speed endurance, and the explosive power, the upper body power and the psychological assessment in the psychological lab. So, body composition analysis tells us about the lean body mass, how much fat that individual has, how much lean body mass he has, the body fat percentage and the muscle mass ratio, and the water content of the body. Accordingly we can adjust his nutritional planning and his diet also.

With the help of field or lab VO₂ max test, we know the fitness level and how much his VO₂ max, or his aerobic capacity is, and we can differentiate which player is better for that sport. And the anaerobic denotes, how much explosive power that individual athlete has. In the short sprinting activity, how efficiently he will utilize his energy; and how efficiently he can perform. With the help of motor skill test, we can judge about the athlete. His agility, how agile he is, how is his speed, how is his upper body power, how is his explosive power of lower limbs.

So all these tests has to be conducted during the motor skill test, and the psychological assessment where how correct he has a decision making power, the thought process of an athlete is good or he has some psychological issues, how he will perform during the stress situations, how he is going to perform during the competition or a stressful bout or in the final round like the like various shooters, they perform in the group test very well, but as soon as they reach in the final, they lose out fast. So, their psychology and where the sports psychologist has to work on them, it has to be examined during this assessment. So now comes the importance or drawbacks of the medical examinations. With the help of these examination, the athlete is aware about his health, and he is fully aware that I am fit and fine or where I have to work, or how I have to take my diet or nutritional advice, or which body part I have to work. Then with the help of this, one can detect the early injury when we do the musculoskeletal examination, we come to know the imbalance of the muscles, and is there any restriction of the motion of that particular joint.

So we can work on it, and we can also examine the mobilization of that joint and the flexibility or stretchability of that joint and accordingly we can monitor or we can modify his strength and conditioning program. So the injury can be averted or prevented. Then the progress of recovery, whether he is doing progress quite good, or he is doing his rehabilitation not correctly; and the medical examination built rapport between the doctor and the athlete. This time athletes ask so many questions about their health, why it is significant and it is just not a waste of time. So, they built up a strong bond between the doctor and the athlete.

And the sports body with the help of these data make a prevention program like FIFA had made the 8 point ACL prevention program. For the researchers, significant data is available for that particular sport or for the athletes. So betterment of the sports, or the so less number of injuries will be there and more and more number of athlete can participate or play, and they are well aware that the parents allow their kids to participate in those games. When the importance is there so few drawbacks will be there. So, first is; these medical examinations are time consuming and athletes, elite athletes, if they do not do their regular training they think it is a wastage of time. So for these medical examinations they have to miss either one or two session of their regular trainings so they think it is a wastage of their two training sessions, two sessions than the inconvenience of the athlete.

Inconvenience obviously it has to be there, because he has to come to the hospital or the human performance lab or the medical examination area where all these test has to be conducted, his blood has to be drawn, his urine has to be collected and if they think or he reveals something which require further examination so that has to be examined. And the very strange part in the human body is fitness overall athlete who is best in the fitness or the health examination it is not necessary he will perform on the top. So sometime it is not like that it is not a linear relationship the very fit person will be the champion. So lots of athletes thoughts it just when these examination cannot or if I am perfectly well why I would not be champion. So this is the one can say drawback the most significant drawback of this examinations. The last one is it is costly though some the rich sports body, they bear the examination and few of time if athlete has to bear or their money has to be reimbursed by the governing body but initially that athlete has to pay all these expenses.

Here our medical examination part is over so what is the significance, what are the types of medical examination, what is the sequence of medical examination, and how the medical examination progress, what are the part of medical examination we have discussed. So now we will discuss about the conditioning or the other part of the lecture.

What do you understand by the warm up program? So, everybody is saying one has to do warm up just before your any game or any kind of activity. So we will discuss about the warming up. So what is the benefit of warm up, how it is has to be conducted and what are the portions of the

warm up program. Generally, warm up takes an initial 5 to 10 minutes of any sporting activity or any kind of resistance exercise or any kind of gym activity, and it has various components also.

So, first the importance of the warm up. The most significant part of warm up is performance enhancement. The injury reduction, it increases coordination, major part of training and build coach athlete bonding; because athlete and coach they interact and they do lot of discussion during this time. The performance enhancement; various studies have been conducted and they found those who did proper warm up, the performance in the competition has increased and the injury reduction has also been reported, because their hand eye coordination, their own body awareness has increased quite a bit. They are fully aware about their body. So the injury is quite less.

The coordination is also increased. So for the warm up, this is the initial exercise we do before starting any major activity or any kind of exercise, like before early morning jog or before early morning any gymming activity, we do 5 to 10 minutes of little bit of exercise that comes under warm up. So, as you will come to know today, what are the different parts of warm up and how it has to be conducted. So, first is aerobic part, then the stretching part and then comes the sports mimicking activity. There are three parts of any warm up session.

So, it is a properly organized chain event, in which the aerobic part divides into two parts under which body temperature is elevating and the second part, it is non-temperature related changes in the body part. Then the flexibility or the stretching part, and the last is the sports mimicking activity. So, when we do some kind of exercise, our body temperature increases and the benefit of increased body temperature is it increases muscle temperature, it increases our core body temperature, it enhances the neural function of our body, and disrupts the transient bonds which have formed between the joints. So, these are the temperature related effects of doing warm up. The non-temperature related are the increased blood flow, elevation of baseline oxygen consumption, and the post activation potentiation. So, the first part is aerobic exercise.

These are the slow aerobic activities in which the heart rate reaches up to 100 beats per minute, and the body starts to lightly sweat and there is no exhaustive; but we have to keep in mind it should not be very exhaustive or energy training because the main part is different. Here we are just making our body do all those exercises. These are not the actual exercises, we are just preparing. Like we go in the kitchen, we arrange everything, we do our chopping but it is just for our convenience. The major part is the cooking.

So, same in the exercise or when we do training, these warm up are basic arrangements where the body and the joints and our central nervous system, the energy process got started and, the better result will be available. And this aerobic component of warm up lasts for 3 to 5 minutes and it also depends on the ambient environment of the area. If you are in the hot and warm

climate, you might require 3 minutes, and when you are in the cold area or in winter, you might require more than 5 minutes also; when you start having a light sweat, your body temperature increases a little bit. Then the stretching, stretching exercise or stretching is a measure of range of motion, whether his joint is fully in range of motion or not. And stretching exercises are two kinds, two types, static and dynamic.

Both of these stretching exercises are beneficial, but it depends which kind and which type of exercise or stretching you have to do. It depends on the type of sports and the time of your warming up or your session. And the third and most important part is the sports mimicking movements. They resemble the main activity which you are going to conduct after warming up. So these portions of warm up include the sports mimicking activity by which the major joints which are going to involve are prepared and the, mental conditioning also be done by doing these activities.

So today we have discussed about the balance portion of medical examination under which we have studied about, discussed about the lab investigations, the importance of lab examinations, the human performance lab, what comes under human performance lab and what is the significance of human performance lab, then the importance of the medical examination and the drawbacks of the medical examination. We have also discussed about the warm up, why it is important and what are the, what is the science behind the warming up techniques, and what are the various components of warming up session. And now in the next session we will discuss about the flexibility and the techniques of flexibility exercises.