Coaching implications in HMS

Hello and welcome to module 6. We are going to start with part 1 which is coaching applications for human movement science. So coaching science is a discipline in itself wherein you look at integration and application of different disciplines of sports science like biomechanics, physiology, psychology, nutrition and applying all of this to make athlete performance or to enhance athlete performance. Let us do that again. So coaching science is a very important field. So the learning outcomes of these modules, the first one is going to be introduction to coaching science.

So understanding what coaching science is, the field of coaching science and some of the principles within it that we study that are key for the coach-athlete relationship. We also going to be looking at importance of movement science in coaching wherein we will talk about skill, technique and style. So what is the definition? How are they different? And how we can use these different concepts to teach the athlete or to improve the athlete performance. We will also look at the characteristics of different types of skills.

How are skills divided across different sport and how do we teach them differently based on the characteristics. Furthermore, the skills are classified into phases, sub-phases and event of interest. All these concepts are to make an easier understanding. All these concepts are to have an easier understanding of the skill and for us to gain deeper insights into the underlying movement pattern. Lastly, we look at feedback and communication.

So when we study all of these different characteristics of movement, of skill, technique and style, it is very important that once we identify them to communicate it back to the athlete for performance enhancement. Feedback and communication approaches to communicate biomechanical findings are extremely important for the coaches to understand so that they can have effective communication with the athletes. So let us start with coaching science. So coaching science is a interdisciplinary field that combines principles from various domains of sports science as we looked at. For example, sports psychology, biomechanics and physiology.

So it is an application of scientific knowledge to facilitate skill development and improve athlete performance. So let us look at the importance of movement science in coaching. So movement science, particularly biomechanics which we have looked at in module 4, plays a vital role in coaching as it provides coaches with a deeper understanding of how athletes move. So we understand the mechanics behind movement. So we understand mechanics underlying the movement.

Make that same error. Movement. So coaches can use this biomechanical data to identify different patterns for improvement of technique that help in performance enhancement and

also identify patterns that help us reduce the risk of injuries. So technique optimization and reduction of, reduce the risk of injuries. Let us take an example.

So for example, a tennis coach can use the knowledge of underlying biomechanics or technique characteristics. For example, if a player serve, so they can use these assessing factors like racket speed and the positioning, body positioning to enhance their performance. So as you can see in this slide to maintain that position after you have served, so after your execution phase which we look at in a couple of slides, it is extremely crucial to reduce risk of injury and also ensures good direction to the serve. So let us look at the concepts of skill, technique and style and how it is important for us to understand the difference between these to be able to communicate that to the athlete and plan our coaching sessions. Skills are the fundamental blocks in sport.

So that is what a skill is. So it is athlete's ability to perform a specific action successfully. Whereas technique on the other hand is a defined execution of the sporting action. So that is the difference between a skill and a technique. Whereas style on the other hand is the individual's expression of the technique.

So these little nuances that each individual brings to the skill, to the technique which is their own little signature that adds to the individual style. So we understand the difference between skill, technique and style. These concepts are extremely important for the coaches to understand because when we are looking at performance enhancement, it is important to categorize whether the athlete has a difference in technique or has a different style. So let us look at the characteristic of a skill. So skills have several key characteristics that are extremely important for movement analysis.

Let us look at a few of them. So they need to be goal oriented with a specific purpose within the context of a sport. So it is very important that when you are doing movement analysis, you start with a goal in mind that has a specific purpose. So they require practice and precision to master. So initially the athlete learns the skill and then in order to master it requires practice and precision.

And they can be differentiated into close and open skill. These two categories of skill gives us a further understanding into the characteristics of what, scrape that, gives us an understanding into what open skills are, what close skills are and how do we teach these both skills based on their underlying movement patterns. Alright, so let us look at close skills. So close skills are executed in a stable and a predictable environment. So they are in a stable and a predictable environment.

For example, archery. It is performed in a stable and a controlled environment. So the environment is controlled and stable wherein the archer stands still and aims at the

stationary target. So there is no other movement here. The archer stands still and aims at the stationary target.

Another example of a close skill is weightlifting where it is performed in a control and a predictable environment. So the lifter knows the weight of the bubble he is lifting and the exact movements required. So both these skills are example of close skills wherein they are executed in a stable and a predictable environment. On the other hand, open skills are performed in an unpredictable environment with changing conditions. Now what these conditions are? Let us look at a few examples.

So soccer for example, it takes place in an unpredictable dynamic environment. So very important to know. So wherein the soccer players constantly adjust their movements to where the opponent is, where their teammates are and where the position of the ball is. So hence it being a dynamic environment, the skills are performed in a very unpredictable environment with changing conditions and hence these are open skills. Now we also look at types of motor skills in human performance.

Now why is that important? Because motor skills can be differentiated into discrete, continuous and serious skills based on their underlying characteristics. It is extremely important for us to understand the differentiation between these skill types of discrete, continuous and serial skills as they have different underlying characteristics and your coaching intervention depends on that. So let us start with discrete skills. So discrete skills are characterized by distinct start and stop points. So they have a distinct start and stop point.

So what are some of the other characteristics of these skills? Let us have a look at them. So these skills have clear and specific actions with defined endpoints. So they have specific actions within them. They also primarily feedback occurs when the skill is complete. So when the skill is complete, then the coach gives a feedback and these type of skills, precision and accuracy are quite critical.

Right? So they have a specific action. Hence precision and accuracy are quite critical. Now let us look at an example. For example, a basketball free throw has a clear start and end point. So we know where we are starting from and where we are ending.

So the objective here is to accurately shoot the ball into the basket. So hence this becomes a discrete skill. Another example is a golf swing. So it has distinct phases within the entire skill. So the entire skill can be divided into different distinct phases.

The concept of segmenting the entire skill into phases we look at in a few more slides to come. But each of these phase has a clear beginning and an end. Right? So within these phases, one of the phase which is the execution phase, the objective is to strike the ball accurately and achieve distance and accuracy. So based on the type of shot that we are

going for, the distance might be important. So distance might be quite far away or the distance might be merely 10 meters.

And it is very important to achieve accuracy with distance and direction. Another set of distinction for the skills is continuous skills. So these skills, they do not have a distinct start and a stop point. So they do not have necessarily a start and a stop point. So some of the characteristics of continuous skills are, they generally involve rhythmic and continuous movement.

So I would remind you of another sport where rhythmic and continuous movements are performed. Let us look at some of the examples. So let us look at some of the examples briefly. So for these type of skills, precision and timing are quite crucial. Right? Because we are talking about rhythmic activity, so there is timing and precision become quite critical.

And feedback during this skill, because it is a continuous skill, so the feedback during this skill is important for them to adjust the movements or the movement patterns that they are performing. So feedback during the skill is important as opposed to discrete skill, feedback is generally after the skill is. Right? So an example we can look at is the swimmers movements. So for example, the swimmers movements are continuous. Right? And they require rhythm and coordination.

Now why do we require a rhythm and coordination? That is to maintain a smooth stroke or a smooth technique. Right? So that is a continuous skill. Riders pedal continuously to maintain good speed and balance. So there is a constant un, sorry, let us do it again.

So another example is cycling. So in cycling, riders pedal continuously to maintain speed and balance. So there is a constant uninterrupted motion that is involved in cycling, making it a continuous skill. The last type of skills that we look at are serial skills. So serial skill is a subset of discrete skills but involves series of discrete movements. So it is all different kinds of discrete movements that are packed together or strung together in a specific order.

So that is categorized as serial skills. So some characteristics of serial skills are, like we said earlier, it is a sequence of discrete movements. So it is usually the timing and the order of the sequence for these movements is extremely crucial. So the order and timing. And feedback often occurs between or after the discrete actions. So these individual discrete actions, when they occur, you can give feedback during that time.

So one such example, a good example rather, is the gymnastics routine. So you know in a gymnastics routine, you have a series of different discrete movements performed in a specific sequence. So what do they perform? They perform a series of jumps, there is flips, there is different kind of balance maneuvers. So there is flips, balance maneuvers within each movement. It has its own start and end point, making it a serial skill.

So the overall routine is a serial skill. Let us understand the skill for movement analysis. So segmenting the skills into phases is a foundational concept. Now it is a very important concept in coaching because the entire skill as a whole is a complex way of analysis. So generally the skills are divided into phases for efficient skill development and proficiency. So to understand the underlying concepts and the underlying patterns within the skill, it is usually broken down into phases.

Now these phases are the building blocks upon which technique is constructed. And understanding and mastering these phases is essential for overall skill proficiency. So what is the importance of skill segmentation for movement analysis? Let us look at some of the importance of skill segmentation for movement analysis. So the detailed analysis involves identification of critical movements within the skill.

So it helps us identify critical movements. So it is quite key for providing specific feedback. So again dividing this entire skill into smaller manageable segments allows us to get into the detail of providing specific feedback. Designing coaching interventions. So if there is a little tweak that is required in one of the phases, you can design the coaching interventions accordingly to improve athlete performance. So it also helps us identify error and corrections accordingly.

Because the skill is divided again, it helps us identify errors quite easily. And it promotes easier understanding as well of complex skills. So certain skills, for example the gymnast routine, imagine understanding the entire routine at once. So breaking it down into phases and smaller components even further, which we will see in the next couple of slides, promotes easier understanding.

And it also allows for targeted learning. So if there is a particular phase in the skill that requires attention of the coach or is at a risk, the technique is at a risk of injury, it allows for targeted learning and correction as well. So let us take an example. So in swimming, breaking down the freestyle stroke into phases, example entry, pull and recovery and sub-phases, like for example hand entry, allows coaches to focus on specific aspects of the stroke to enhance technique. What allows the coach here is to look at those finer and minute patterns or finer and minute events in time where technique is happening and correct only those techniques if need be for performance enhancement.

So let us look at skill segmentation into phase. So what is a phase? So every skill or movement is comprised of multiple phases, each with a specific purpose. So each phase has a specific purpose and a function. So this approach forms the core framework for skill analysis, segmenting into phases. Segmenting is dividing. So dividing the skill into phases is a core framework for skill analysis.

So it provides a structured way to approach the breakdown of skills into smaller segments. So the primary skill phases are preparation, execution and follow through. Generally the skill is divided into these three phases. Let us look at these into detail.

So the first phase which is the preparation phase. So as the name suggests, preparation phase involves preparing for the actual or the main part where you execute the skill. So the preparation phase is where the groundwork is laid. So this is where you prepare for the main action. So it is quite crucial in that sense to set a good foundation. So you set a good foundation right at the beginning during the preparation phase and a good position during the preparation phase that enhances the overall outcome of the skill or the skill proficiency.

So for example, a sprinter that starts from the sprinting blocks. So if he has a precise preparation or a precise or a good technique to start off the blocks, it results in a faster time of the block gaining a competitive advantage. Let us look at the execution phase. So the core action of the skill is executed in the execution phase.

So that is the main action that is in the execution phase. So this as we look at this picture over here, we have a tennis backhand that is in play. So that is the end of the preparation phase frozen in time. So it is an event in interest and that is exactly where your execution phase starts. So it is crucial to have a good technique executed with precision and timing for a good outcome. So your coordination, precision, timing, all of these are important nuances to look at for a good outcome.

So for example, tennis players backhand in the execution phase, the player strikes the, a successful outcome would be to achieve high speed or more spin on the ball or give it a particular direction. So which is why a good technique and timing while executing or striking the ball is extremely important. The last phase is the follow through phase. So the follow through phase is where the skill concludes. So post execution where the skill concludes is where the follow through phase starts.

So it is crucial to maintain control and balance post execution. Now why would it be crucial to maintain, you know, control and balance? This is specifically important for injury prevention to complete the skill effectively with good balance and control. So for example, a badminton player smash the follow through phase post execution may affect the direction and accuracy of the shot played. Also it helps in quicker recovery and maintaining a good position so that when you are initiating the next skill to be performed, you are in a good position or you can start quicker. So from phases, sometimes if the skill is too prolonged or it is too complex, the phases are further broken down into sub phases. The sub phases also have a distinct role that aid deeper understanding of the skill.

So that again, so sub phases as well have a distinct role that aid in deeper understanding of the skill. So now that we have looked at phases and sub phases, let us look at event of interest which refers to a key moment within a phase or a sub phase. So these occur at a

given point in time and provide valuable insights regarding technique, specifically finer details of technique that might be associated with performance or risk of injury. So usually when you are looking at performance characteristics or risk of injury characteristics, you always look at what is the position of the body at a particular given point in time. So for example, a javelin thrower's release point is a key event of interest.

So at release, when the javelin is leaving the athlete's hand, the position influences the trajectory, distance and speed. So we have learnt about this in the earlier module which is module 4 about distance and speed and how they are an important characteristics for the javelin. We have learnt how they are important characteristics for an javelin thrower. So, feedback and communication of biomechanical findings are extremely important to deliver all of this information that the coach analyzes, the biomechanist analyzes to the athlete because here is where the change or the adoption of all those changes happens.

Let us do that again. So effective communication is an important skill that a coach possesses for successful coaching. It is extremely important. It is crucial to convey movement analysis data, specifically complex biomechanical data to the athletes in a structured way. So the nature and approach of providing movement feedback to the athlete depends on different type of skills, different forms. It also depends on the type of athlete and it depends on the type of sport as well.

So when it comes to giving feedback, there are usually two major types of feedbacks. Let us look at that in the next slide. So feedback describes the information that the athletes receive about their performance from the coach or from the sports scientist during or after the performance and hence it is extremely important how we communicate, what we communicate. So there are two different major types of feedbacks that we study.

One is knowledge of results and knowledge of performance. So all both these type of feedbacks depend on who you are giving it to, what kind of a skill that you are giving it for, what are the outcomes that you want to achieve and the type of sport as well. So let us look at these two different types of feedbacks. So the first one being knowledge of results. So knowledge of results is a knowledge about achieving the goal. So it is about achieving the goal of the performance or externally presented information about the outcome.

So this is where you give the knowledge of outcome. So whether or not the serve is in or whether it is out, whether the smash or the stroke played is inside the court or out is the knowledge of the result which is knowledge of the outcome. On the other hand, knowledge of performance is the information about the movement. So in certain scenarios where the coach wants to, let us do that, let us do it again. So knowledge of performance is the information about the movement characteristics that lead to the performance outcome. So

this feedback usually is, sorry let us do that again, the feedback of technique utilized to perform the skill, let us do that again.

So generally athletes, sorry let us do that again. So generally a coach gives the feedback about movement characteristics or the technique that was incorrectly performed or correctly performed to the athlete.

Let us do it again. So let us do the entire slide again actually. So K.P. is knowledge of performance. So knowledge of performance is the information about the underlying movement characteristics that lead to the performance outcome. So the coach would give a feedback of the technique that was utilized to perform the skill, for example in sprinting, highlighting the flaws. So you can also highlight the flaws, you can also give a positive reinforcement to the athlete saying this is what you did well, this is what you did not do well, and this is how it can be corrected which falls under the feedback of knowledge of performance.

So let us summarize some of the learnings from this module. So coaching science as we know is an interdisciplinary field that combines principles from various domains such as sports psychology, biomechanics and physiology. Coaches can use the biomechanical data to optimize technique to look at injury risk patterns and to further develop coaching interventions. Skills are the fundamental building blocks in sport and athletes ability to perform a specific action successfully. We also looked at how these skills are categorized, the type of skills as well and every skill or movement is comprised of multiple phases that have, that each have a specific purpose and a function and is done so for an easier understanding or a finer understanding of the underlying technique. Thank you.