Professional skillset development

Welcome back to week one of Human Movement Science. Today, we will be talking about the professional skill set development aspect of this course. So, to start with, let's first look at the professional areas of application of movement science. As you have seen in the introductory unit, there are a lot of areas for movement science to be applied. Human movement science, in particular, is applicable in sport science and performance optimization, in physical rehabilitation and therapy, clinical movement analysis, occupational ergonomics, and research in academia. So to give you a brief overview of these fields, sport science and performance optimization, of course, relates to the core of this course, where the movement of the athletes has to be quantified and studied in a definable framework.

Only then can we design their training programs for optimizing their performance. So an example of that is in strength training; for example, of athletes, we use something called velocity-based training, where you look at the explosiveness or the velocity of the movement, and you try to reach certain metrics for your training protocol. And that defines your progression through the training program. Physical rehabilitation and therapy, of course, after any injury, be it a neurological injury like stroke or even physical injuries like ACL tear and reconstruction, the person has to undergo rehabilitation for extended durations of time.

And one of the key factors in them returning to sport, for example, is how well they have been rehabilitated. To assess their level of rehabilitation, it is important to be able to understand their movement patterns, and, more importantly, even quantify those movement patterns in ways that will be beneficial for clinicians to give a green light for that athlete to go ahead and play, start playing professionally. Another use case, another area where movement science plays a very critical role, is clinical movement analysis. So doctors can use your walking and running gait, for example, to assess any neurological conditions, say a person has a sway towards one side or there are other physiological behaviors, we can study and quantify those behaviors. And then the efficacy of any clinical intervention can be assessed in terms of improvement in that particular metric or in a group of metrics that you will learn to quantify.

Occupational ergonomics is an up-and-coming field where you design workspaces and environments to work with the human anatomy and physiology and not cause long-term musculoskeletal damage or injuries in the process of working. This could be related to factory workers working on a production line, for example, where they have to lift heavy loads or do tasks that require them to be in extended, overreaching positions for longer durations of time. So, designing the task itself, one of the goals of occupational ergonomics where a person performing the task is studied, and then the task is redesigned, or tools are redesigned to assist the person doing the task to improve their performance or to help them overcome any fatigue or injury occurring because of poor ergonomics. And of course, last but not the least is the applications of research in academia. The frontier in sports science and movement integrates a lot of other allied fields.

Neuroscience to study the brain while a person is moving and identify patterns that correlate with movement are one of the new areas that we have started looking at to go beyond just the behavior and look at mechanistic understandings. And there are a lot of other areas in research and academia and movement science and clinical, which relate to all of the above areas of sports science and performance, rehabilitation, and clinical movement. So what are the specific skills that you can hope to develop while undergoing this course? First and foremost is quantification wherein comes biomechanics. So those of you who have a background in mechanics, this is just the application of those principles to human physiology and movement. Those who are from a different background, mechanics is the study of the movement and the cause of movement of bodies.

Biomechanics specifically will be the quantification of the movement of human body during a particular task. So, how does this translate to professional applications, Clinical applications? For example, would be assessment of gait of a person who is affected by stroke, and you're looking at the long-term recovery of that subject, and then you can quantify their gait patterns and gait behavior over time. In terms of sports science, an analysis would include the use of, say, biofeedback for training, which would rely on the movement of the athlete in real-time. In addition, you can look at the athlete's performance, say in terms of joint moments, identify whether the athlete has a propensity for injury or not. And design a training regimen for this athlete or a group of athletes to improve their biomechanical parameters, which then quantifies their performance.

Further, you'll look at kinesiology, functional anatomy, and the physiology. So functional movement patterns is something you'll have to explore for both clinical analysis, for rehab, and for ergonomics. For identifying the correct ergonomics of a task or of an environment where a good movement pattern like this one can be differentiated from a bad movement pattern like this. So this, for example, is an athlete doing a deadlift. So, this is an application in sports science where the correct posture is necessary to do the task properly and without the risk of injury.

So, you have to identify these optimal movement patterns. With regards to muscular anatomy, your knowledge on the skeletal system and how the muscles are used to move the individual bones and perform movements about joints. And how those muscles are recruited by the neuromuscular system are key areas that will help you design, that would help someone design a better training curriculum. Or identify if a person is over-training or under-training. It can also help you identify and quantify the injury risk in subjects and accordingly design their rehabilitation programs.

In terms of clinical movement analysis, the principles of biomechanics that you'll learn here will be applicable for gait analysis. And even within movement analysis without even doing full body movement analysis, you can look at things like step width and or step parameters to quantify a person's gait and get some preliminary ideas about any potential neurological disorders. In addition to looking and at least subjectively quantifying their gait patterns and behaviors. You will look at the function movements. So, things like range of motion of a particular joint can help you identify, can help you quantify a person's current capabilities.

Say after an injury and during the recovery period and design a progression or a loading pattern that will help them improve that particular metric. So, if it is the range of motion of a joint after injury, then what is the training and stretching that has to be prescribed for improving the movement or enhancing the range of motion. In terms of background resources, we are only looking at very basic mathematics, basics of trigonometry, geometry, and algebra. And in physics, very basic understanding of forces, how they act, and the planes of movement, for example, just the physical interaction of bodies with the world. That's where our understanding of physics will come in.

So I'll see you in the next one and best of luck, thank you.