

Performance production measures

7. We often measure strength, power, endurance, balance, coordination, related to the skills individuals want to learn, or optimally improve. It can be possible or effective to predict the level of performance or a potential injury risk during the practice from the perspective of injury prevention.
 - 7.1. How should we decide the measurements?
 - 7.1.1. Should we decide it based on evidence from research found?
 - 7.1.2. Should we consider the level of the skill the individual achieves or age groups, such as adolescence?
 - 7.1.3. Should we consider specificity of motor ability or just general motor ability?
 - 7.2. The type of measurements can be dependent on devices available in your facility.
8. The theory of motor control is to explain the capability of individual or coordination and the intervention you provide to improve the outcome of measurement.
 - 8.1. Coordination implies the degree of performance or motor skill the individual has acquired, such as a movement pattern associated with the motor skill.
 - 8.2. Is there anything that influences the coordination of movement patterns, such as movement speed, weight load, rhythm?
 - 8.3. Motor control can be defined as the neuromuscular control of movement. It is how our body can be controlled by the higher center, such as brain, brainstem or the cerebellum, and the final commands emerge (come out) in the spinal cord?
9. We must identify the performance problems through the measurements, such as strength, flexibility, mobility or stability, postural balance, and coordination of upper and lower body.
10. We need to develop interventions that help improve the outcome of the measurement you conducted.
 - 10.1. What kind of interventions should we include in the training sessions?
 - 10.2. Interventions must be relevant to the outcome of the measurement.
 - 10.3. How can we progressively develop the intervention program?
 - 10.3.1. This strategy must be dependent on the goal of achieving the level of performance.
 - 10.4. When or how often should we re-measure the outcome tests?
 - 10.4.1. The frequency of measurement depends on the content of outcome test, such as maximum force, power, or speed. It can depend on the course of the season.
 - 10.5. What about a self-outcome assessment sheet, which is subjectively to answer each of the questions using a Likert scale or visual analogue scale?
11. What kind of strategies should we apply for the outcome test next time?

12. Is there any other way in which we can measure the level of performance, instead of the current one we used?
 - 12.1. It is time to develop systematic approach to help measure the motor skill which the individual engaged in. The systematic approach includes the set of production measurements.
13. Once we develop the set of production measurements, we create a new strategy to improve capabilities individually.
 - 13.1. We need to evaluate the new set of production measurements.

Open-loop and closed-loop control systems

14. We discussed the types of motor skills, such as closed motor skills and open motor skills.
 - 14.1. Closed motor skills are individuals who can arbitrarily initiate the motor skill, such as a baseball pitcher, tennis and volleyball serve, or dirt.
 - 14.2. Open motor skills are much more like team sports in which all the individuals must react to opponents, teammates, or a ball. Athletes cannot initiate their motor skill. Instead, they can apply their motor skill for any of the situations that emerge in a competition or game.
 - 14.3. An open-loop control system is a motor skill which does not include feedback during the performance, such as closed motor skills. Athletes must have a recall schema, which they are imagining, planning, and strategizing their next performance. Sometimes they recall their past mistakes in their performance, which helps them being aware of errors in their performance, also known as a recall schema.
 - 14.4. A closed-loop control system is the motor skill which allows Athletes to have feedback during the performance, using visual, proprioception, or any other sensory systems.
 - 14.4.1. Proprioception is the sensory receptors which tell us to be aware of where our upper or lower extremities. However, this awareness depends on movement speed. If the movement speed is too fast. We cannot be aware of proprioceptive information although the information still helps coordinate through the cerebellum.
 - 14.5. For the open-loop control system, athletes can also recognize sensory information how they moved their extremities even as a series of movements through the memory system of their sensory perception after their performance, also known as a recognition schema.

Generalized Motor Program

15. Any of the motor skills has a certain movement pattern, such as throwing a ball, kicking a ball, or dribbling a ball. All the segments or the joints involved in motor

skills must be moved in a certain pattern. These characteristic movement patterns are called invariant features.

15.1. The term invariant means that we cannot change to achieve the goal of motor skills, such as throwing a ball, in which for instance the shoulder must be abducted up to 90 degrees before the leading leg is landed on the ground. Immediately after landing, the thrower must rotate the shoulder externally as much as possible. Once they reach the maximum external rotation of the shoulder, they internally rotate the shoulder while extending the elbow. This throwing mechanics must be consistent with any type of throwing balls, regardless of four-seam fastball or braking balls.

15.1.1. Characteristics, even walking, do not vary (or cannot be changed) across performances of a skill within class of actions (motor skills.)

15.1.2. Motor program is a memory representation that stores information to achieve the goal of action.

15.2. However, we can change force, speed, or rhythm for any of the actions or motor skills, which does not change invariant features, also known as variant features.

Self-organization

16. We must adapt to the task and environment to achieve the goal of the action or motor skill, such as a postural position, even though we maintain the invariant features. For instance, when we need to escape from the situation in a bunker while rounding golf, we sometimes bend the knees and hips separately or awkwardly. But we most likely maintain the golf swing pattern especially for the upper body as the invariant feature. This is inferred as self-organization.