SKILL ANALYSIS
SAMPLE F
MOTOR SKILL: SOCCER SHOT (BALL STATIONARY)
Aim/Purpose:
The aim of this experiment is to record and analyse the movement process and technique required when kicking a soccer ball using video. The video footage will help break down the skill into subroutines and will show where errors are made if any are.

Method:
- Use a video camera to record multiple video clips of motor skill
- Choose the clip which is best filmed, performed and easy to analyse
- Use program Kinovea to analyse and break down the skill

Background Research (Incomplete):

Biomechanics:
Biomechanics in sport is the analysis and study of an athlete’s activities, movements or skills used in their particular sport. It is used to gain a greater understanding of an athlete’s performance as well as the level they’re at for particular skills. Another way biomechanics can be described is studying or looking at the methods of mechanics/how stuff works.

Motor Program:
A Motor Program is a series of subroutines organized into their correct sequence to perform a movement. A Motor Program is stored in the long-term memory, and retrieved when we need to perform the skill. The level that the motor program is performed at is based on the stage of learning the performer is at.
For example: The motor programme for a soccer shot stores the subroutines in the correct order (run up, swing leg back, landing, swing leg forward, bending foot, follow through, jump, land)
http://www.teachpe.com/sports_psychology/motor_programmes.php

Relevant Steps in Biomechanical Analysis:
The sporting skill I have chosen to analyse is a soccer shot starting with the ball in a stationary position.

The objective of the skill/movement:
The objective of the skill/movement is to kick the soccer ball with power and placement. Being able to do this skill/movement efficiently and autonomously adds a large advantage during game with the objective to score.

Identify movement patterns:
The movement patterns associated with a soccer shot are based on the run up and leg swing. These can be varied in many ways but some change the style of the shot completely. The shot style I have focused on is with a slightly curved run up behind and to the left of the ball and a with leg swing going slightly across the body. This causes the ball to move straight with the direction the leg and foot were aimed when the ball was hit, often with some inwards curve or bend but very little this is due to the curve in run and swing across the body. To perform this skill the player starts their run up slightly to the side of their non-preferred leg. For example my run up
begins slightly to the left as I am right footed. Then the run is made towards the ball which should would take at least 5 medium-large sized steps. On the final step the player begins to swing their kicking leg backward to gain power and places their non-preferred foot around 30cm beside the ball as the kicking leg then begins to swing forward and make contact with the ball. As the player kicks the ball their opposite arm is swung forwards and across the body while momentum from the swing and run up continues to move them forward therefore the leg that was placed beside the ball comes off of the ground and after being completely in the air for a split second the kicking leg is then landed upon with the knee slightly bent but in a stable position prepared to take force.

**Classify and justify the sporting skill/movement:**
Open: Receiving the ball during a game and having a shot at goal with the objective to score. Factors causing this to be open are Opponents/Defenders, Goalkeeper, Team-mates, noise of crowd and players, weather condition, type of field/grass.

Closed: Being alone at a soccer pitch with the ball stationary and with out any distracting factors or factors applying pressure

In-between: Having a Free kick during game because you aren’t under any physical pressure and can use selective attention to zone out.

This is a gross motor skill because it involves large muscle movement. Most of the body plays part in the motor skill as the legs and arms both have to move and swing. The hips and upper body also play a part by having to twist.

**Sub Routines:**
The subroutines in a soccer shot broken down according to sports injury bulletin (http://www.sportsinjurybulletin.com/archive/biomechanics-soccer.htm) are.

**The Approach:**
- The Approach for a soccer shot is the run up towards the ball. The run is never usually straight and involves some angle or curve in movement. A curved run up helps create greater leg swing velocity which improves the speed and power behind the ball which involves Newton’s second law proving the more force applied = greater the acceleration. It also helps gain greater body position for the strike and follow through.

**Support Leg/Plant-Foot Forces:**
Just before swinging your leg towards the ball your opposite foot is planted on the ground around 30cm away from the ball this makes it the supporting leg as it in the only part of the body connecting with the ground supporting it upright. This subroutine is important because depending on what way your foot is facing depends a lot of where the ball is going to go. On top of increasing aim planting the foot is vital to keep balance and also when planted with more force it helps add force to the leg swing there for giving the ball greater acceleration/speed (Newton’s second law).

**Swing Limb Loading:**
The next phase within the biomechanics of a soccer kick is the swinging or cocking of the kicking leg. This prepares the leg to move with force in a downward motion in
preparation to strike the ball with adjusted force and accuracy. The leg is swung backwards in-line with the ball and then gradually swung forwards in a fast motion directed at helping the foot make contact and apply force to the ball.

**Hip Flexion and Knee Extension:**
During the phase of the leg swing the hip of the swinging leg is flexed as the leg is swung backwards then forwards at a rapid pace. The Knee on the kicking leg is also flexed during the backwards swing but is later extended on the forwards swing. The opposite hip is not flexed during the swing although the knee is slight bent/being flexed.

**Foot Contact:**
According to sportsinjurybulletin.com the foot only makes contact with the ball for around 16 milliseconds, this shows why the positioning of the foot is so important as practically when the ball is struck is when it leaves. During a soccer shot aiming to kick the ball straight the athlete’s foot should be pointing downwards and the ball should be struck with the inside of the foot on the edge of the laces, this causes the ball to travel at a fast pace with little curve.

**Follow Through:**
The follow through is important because based on how well you follow through can affect how well your accuracy is or how well the ball travels because it helps the foot have contact with the ball for longer. After contacting the ball the leg it was struck with should continue swinging forwards and the standing leg should lift off the ground resulting in the whole body being air born after contact. The follow through is also key in helping prevent injury because of trying to go against the momentum of the movement.

**Video:** below contains the footage of my shot from a behind and side on angle.

![BEHIND.MTS](BEHIND.MTS)
![SIDE.MPG](SIDE.MPG)
Discussion:
The first subroutine being the approach is the starting point and the run up leading to the initial motor skill being the kick. As shown compared to soccer superstar Cristiano Ronaldo’s approach my approach starts Approximately 5 metres away from the ball with a 75-degree angle to the left of the ball. Very similar to Ronaldo’s approach being 5 metres away and on a 70-degree angle from the ball. After standing flat footed my run up approach then starts with the left leg coming forward followed by 6 more steps. Ronaldo’s run up consists of only 4 steps with his right leg coming forwards first. The difference in step count could be due to difference in body composition between him and I as well as difference in the fact that his starting point is calculated by taking 5 steps backward and 1 to the left where mine is at random.

https://www.youtube.com/watch?v=2z6MrmKXOLw
https://footballkickbiomechanics.wordpress.com/
After the approach has been completed the next step of the motor skill and next sub routine is based on the supporting leg and the plant foot forces as well as the extension, flexion of both knees and the cocking of the kicking leg. As soon as the run up is complete, for me on the seventh step, for Ronaldo on the fourth the leg opposing to the kicking leg is planted on the ground 30 cm besides the ball taking all of the body’s force and mass. Whilst in the mean time the kicking leg is being extended/cocked in preparation for the body’s force and mass to be transferred to the ball applying newton’s second law. After the cocking process of the leg is complete and all force and mass has been put into the supporting leg the kicking leg then begins to swing forward whilst the arm on the opposite side of the body is abducted on a 75-degree angle.
After completion of the leg swing the ball is then struck by the foot transferring the body’s momentum and leg’s force into the ball applying Newton’s first law (the law of inertia). Both my foot and Ronaldo’s are pronated outwards from the body and strike the bottom of the ball. On top of that our bodies are both almost completely upright apart from a slight lean to the left. After all of the body’s force is put into the ball momentum then takes the full body off of the ground for a split second before landing again this time on the kicking leg.
**Kinematics:** Kinematics being the study of motion in biomechanics outlines how consistent the movement of an object is, how far it moves and how fast it moves. In a soccer shot the movement involved is Angular and Linear. Angular during the approach/run and the follow through and Linear in the motion of the body’s movements, e.g. swinging the legs arms and torso in a straight/forwards direction. During a soccer shot or anything involving an object being launched in the air is a projectile. The projectile is the object being launch. In this routine that object is the soccer ball after force is applied from the body the the ball and it is sent aerially with velocity.

**Kinetics:** kinetics is mainly the study within forces of motion in which all three of Newton’s laws of motion are very relevant to as they describe and explain the processes of motion. Newton’s first law being that an object will stay at rest unless acted upon by an external foot relates well to the soccer shot as if it wasn’t for the
foot making contact with the ball as an external force the ball would lay at rest. Newton’s second law talks about the greater the mass of an object the greater the force need for it to move. For example, a 10kg ball being kicked at 20kmp/h would need to have much more force applied than a 1kg ball being kicked at 20kmp/h. This is very relevant in my kicking process as I need to apply force to an object with a certain mass. Finally, Newton’s third law of motion. This is for every action there is an equal action opposite. This applies to a soccer shot because the force in the plating foot applies an opposite force coming from the ground. Same with when kicking the ball an opposite force comes from the ball to strike the foot.

**Results:** My Video analysis results show that the majority of my technique is very similar to that of a professional calibre. The only difference noticeable were in the approach and follow through. My approach compared to Cristiano Ronaldo’s consisted of more steps in my run up which I broke down to being due to mine vs his body composition and his adjusted run up approach. During the follow through Ronaldo didn’t get or have as much air time as me or move as high off the ground. This I feel is also due to body composition in him being a lot heavier in weight and also due to the fact that his body is strong enough to control the power he is applying whereas mine is not.

**Conclusion:** Overall, I am happy with the result in my technique broken down although I defiantly feel improvements could be made in my run up/approach. If I gather a set approach or a routine similar to Cristiano Ronaldo’s rather than running up from a random distance at a random pace my results could become much greater than they currently are. Other than the approach I feel not to much else needs a lot of work other than continues practice and training overload to try and gain better accuracy and shot placement than I already have so that I am even more in the autonomous stage of a soccer shot than I currently am. Gaining a better technique and accuracy would help me majorly from set pieces in game to open situation shooting in game as well as even improving the accuracy of my passing and crossing.