Student 2: High Merit

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Torque is created when the force is applied. In the student's case this is the magnitude of the force generated by the use of her muscles and the acceleration of the body parts during the swing (f = m x a). The student ensured she has created long levers for herself by extended her elbow joint (tricep being the antagonist and the bicep being the agonist) to ensure the lever is at its maximum length. We know that the longer the lever (arms and club) the greater the speed of the club head will be at the point of contact with the ball. You can see from the student's performance that she is using the principles of torque, Newton's laws, and levers to effectively influence her performance. **1**

…projectile motion acts upon any object that is released into the air. Once in the air, the object has two forces acting upon it at release. These are horizontal and vertical. They determine the flight path and are affected by gravity, air resistance, angle of release, speed of release, height of release and spin (Pg. 3 of *sport biomechanics ppt.)* Speed of release is relevant in this part of the swing as the momentum lost by the golf club is equal to the momentum gained by the golf ball at impact. This means that the momentum that is being gained by the golf ball is equal to the momentum that is lost by the golf club. To ensure maximum momentum (Mo = m x v) is gathered to then transfer to the ball (name removed) has concentrated on also applying the principles of force summation. Larger body parts/muscles, which have the most inertia are used to begin the movement, through to smaller body parts/muscles last. The gluteals, hamstrings and quadriceps of the lower body are employed first, through to the muscles of the trunk (erector spinae, rhomboids, rectus abdominus) through to the arms (deltoids, biceps, triceps) and lasting the wrist (extensors and flexors). As the student's swing looks smooth you can tell she has used the muscles sequentially, with correct timing, ensuring the previous muscle group has contributed fully before the next muscle group begins. The student realised she could not change her mass, but she could change the amount of force generated by using her muscles effectively. This coupled with the arm swing (acceleration) affects the speed of release aspect of projectile motion. In this part of the golf swing, the factors that affect the projectiles (ball) flight path are speed of release, force summation and transfer of momentum. **2**

Strengths: The club head has made impact with the ball at a good speed of release to allow the ball to gain loft and gain good distance.

Weaknesses: The shot does not go straight. This is where the application of biomechanics has not worked in the student's favour. Because she concentrating on gathering maximal momentum to aid speed of release/impact the accuracy of the shot has been effected. **2**

She needs to adjust her body position and lever length. Firstly she needs to move her grounded feet further forward so that the ball is within her BOS. This then will make her more stable as she does not have to move her LOG so far out of her BOS. **3**

To get maximum force applied onto the ball, this performer needs to straighten her arms out to make the lever length longer than it originally was (through extension at the elbow via contraction of the agonist – tricep and relaxing of the antagonist – bicep). She also needs to make sure this arm length does not change in the process of the swing otherwise it will affect the velocity of the club which then affects the accuracy of the shot. **3**

Newton's 1st law is also applied here as the golf ball will remain at rest until another force has acted upon it. The amount of momentum and force behind the golf club will determine the acceleration and speed that the ball will travel at.

…come to the conclusion that the aspect holding the greatest impact on performance for my student from their performance analysis is the preparation phase. The preparation phase is extremely important in beginning to master the golf swing as it involves setting up the stability and balance, the levers and the control of the club. … The stability and balance considers both base of support and centre of gravity which prevent the player from overbalancing and toppling over when trying to get good rotation to increase momentum and force, which will need to be generated on the downswing through to impact. This is important as force behind the ball is important to get distance and speed behind the ball.

4

Levers are important in the golf swing also as they are what creates the power at impact and torque which is the turning force. Torque is required for a successful golf swing as it is the maximum rotation that is gained within the swing and the power that is gained by the rotation. But as mentioned before, I believe that levers are the most important part of the golf swing as it is what produces torque, rotation and power. All of these are what a golf swing requires to get maximum distance and a controlled golf swing with good rotation. However, to be able to use levers successfully, good stability and balance is required, to prevent over balancing. These two biomechanical principles are the foundations of the golf swing as they make it possible for other biomechanical principles to be used. This is why I believe that preparation phase is so important as it is the set up at which all of the important components are considered and are intertwined within the set up.

However projectile motion is also very important as it determines the flight path of the ball and this is important as the flight path is what determines the score that the player will get. Projectile motion is considered at impact because the angle and speed of release at impact affects the projectile (the ball) and its motion. The impact of the ball begins the process in which gravity and air resistance begins to act on the ball and its speed. These biomechanical principles within these two parts of the skill, I consider the most important biomechanical principles in a golf swing.