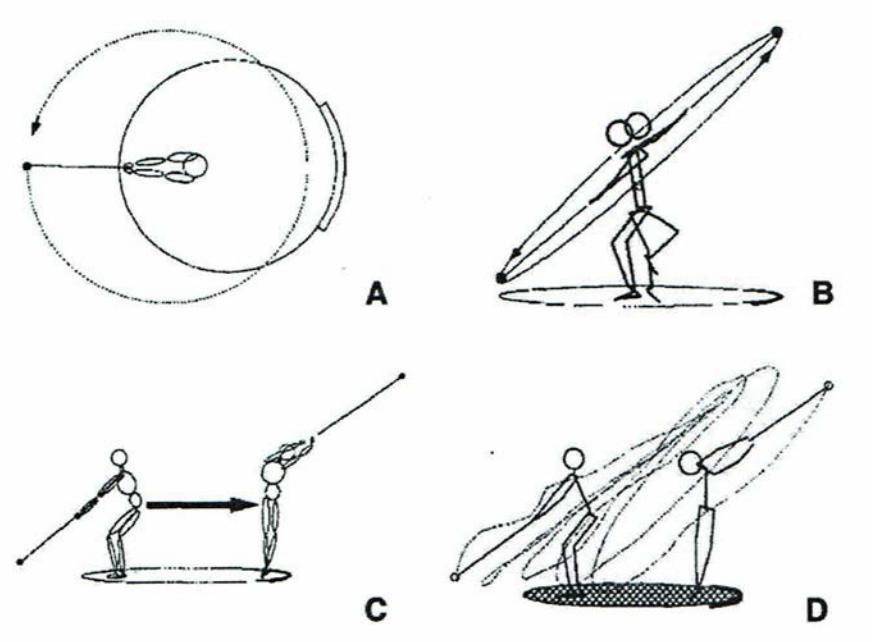

Figure 1. Graphic representation of the total movement (adapted from Gutierrez & Soto, 2001).

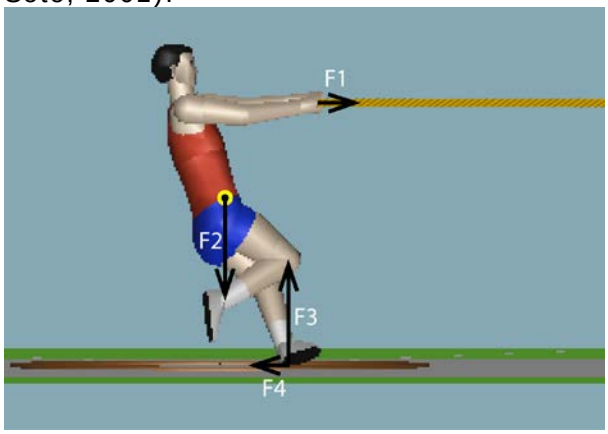

Figure 2: Forces on the athlete in a tug-of-war (adapted from: Dapena, 2007)

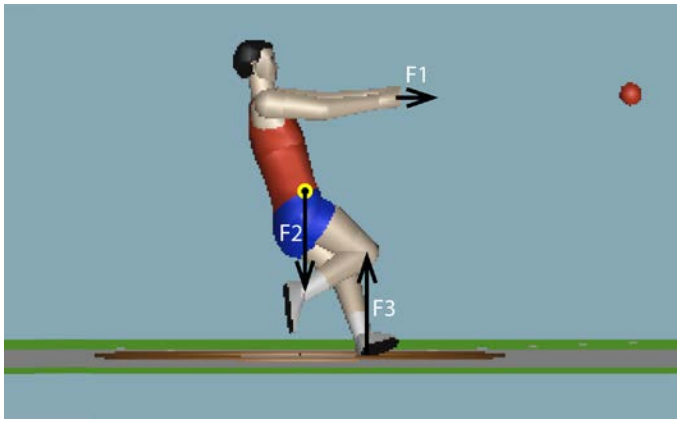

Figure 3: Forces on the thrower in hammer throwing (adapted from: Dapena, 2007)

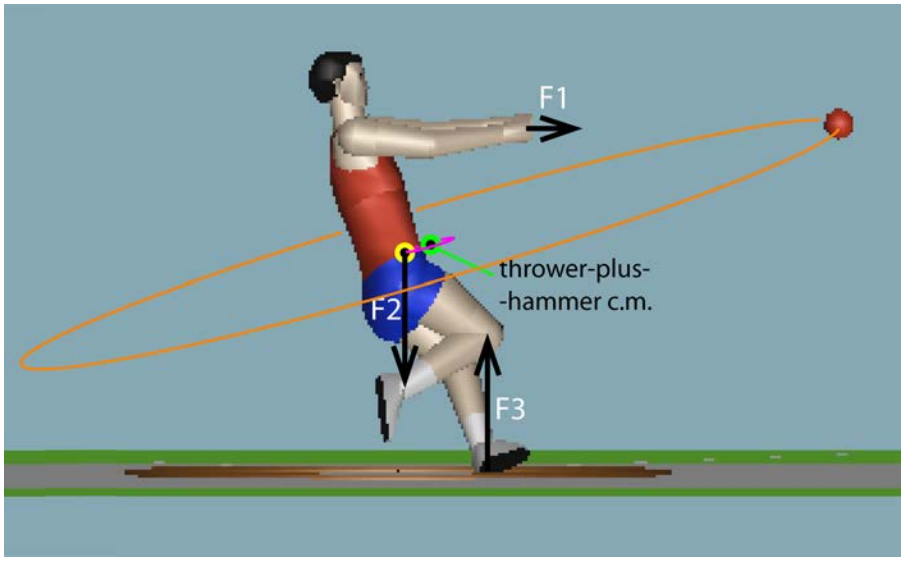

Figure 4: The combined centre of mass of the thrower-plus-hammer system (adapted from: Dapena, 2007).

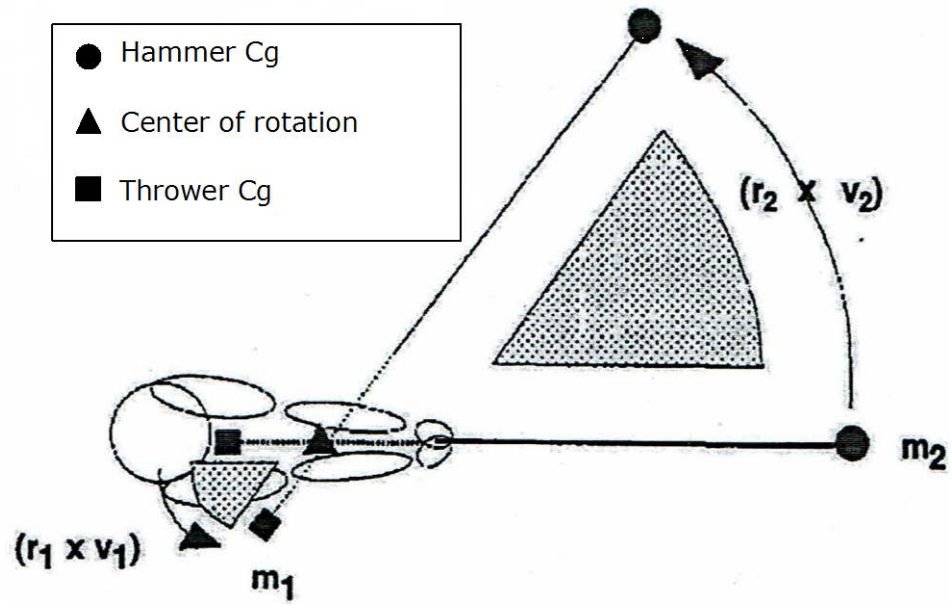

Figure 5. Representation of the hammer+thrower system as it rotates around the vertical axis (adapted from Gutierrez & Soto, 2001).

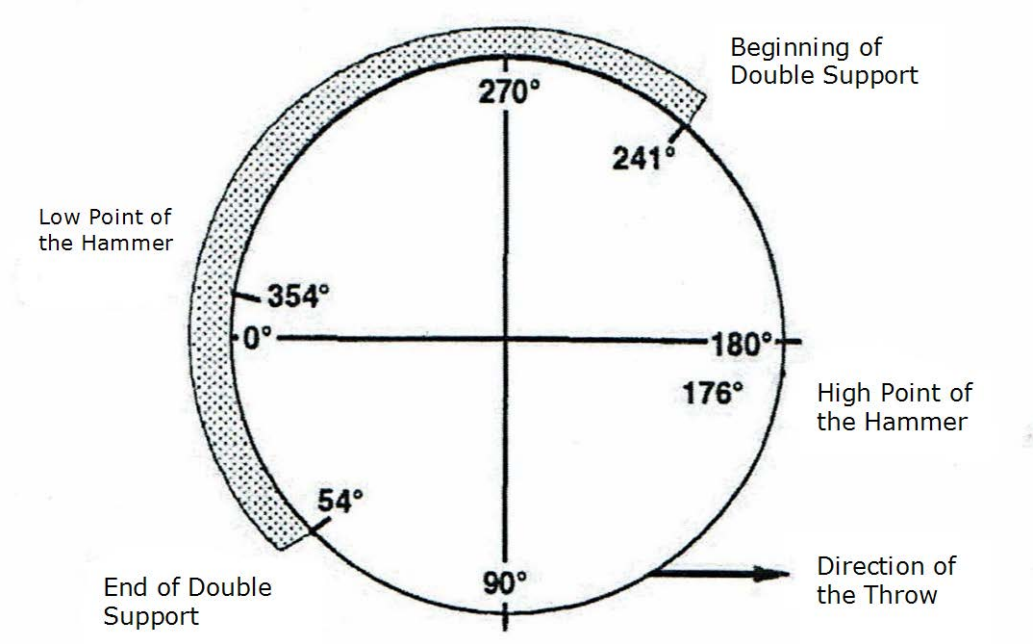

Figure 6. Critical points in the course of a hammer throw.

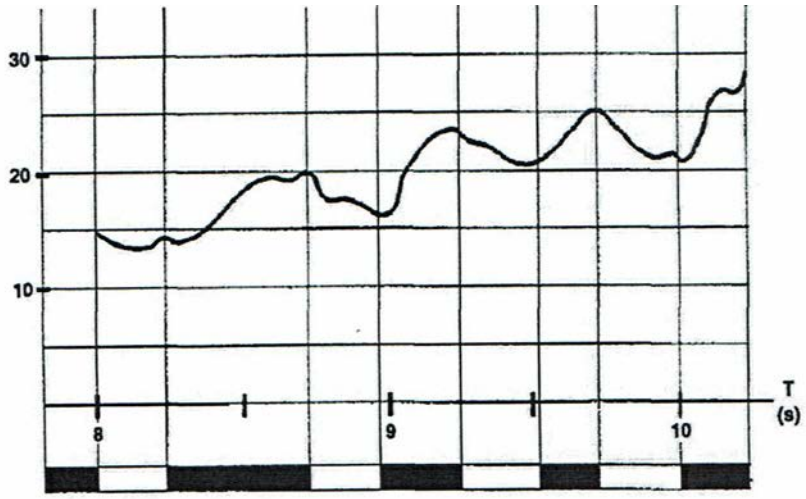

Figure 7. Typical raw hammer speed fluctuations. Dark intervals double support, clear intervals single support.

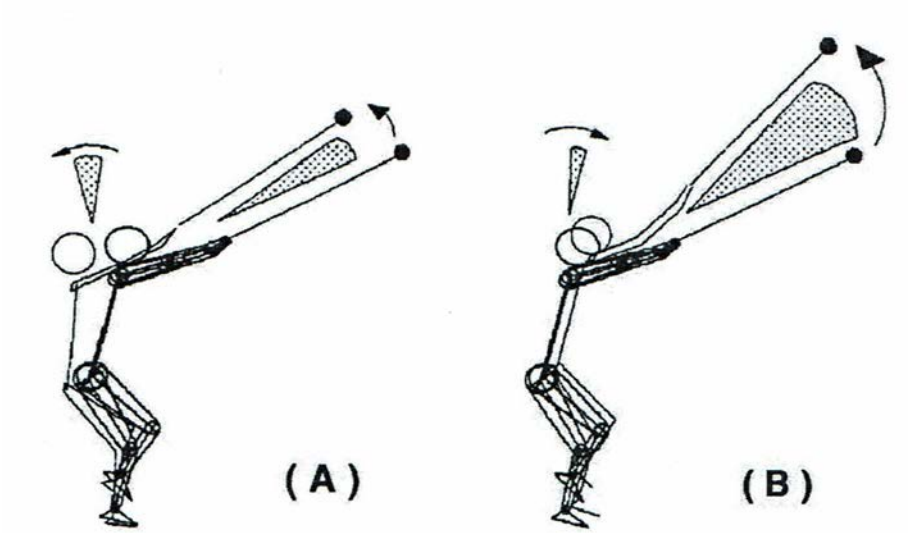

Figure 8. Graphic description of the transfer of the angular momentum of the thrower+hammer system (adapted from Gutierrez & Soto, 2001).

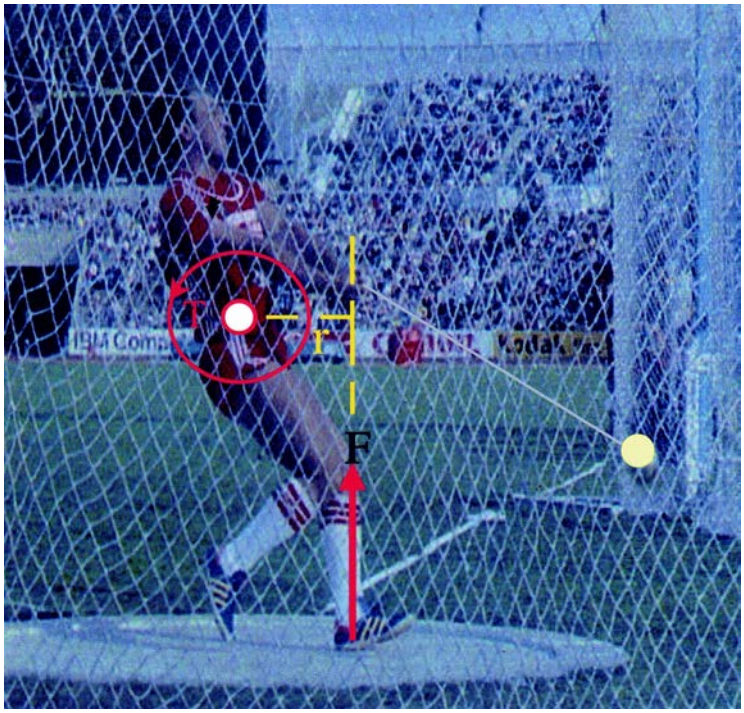

Figure 9: Vertical force (F) made by the ground, and anticlockwise torque (T) produced around the longitudinal Y-axis during single-support (adapted from: Dapena, 2008).

Note: This axis would be perpendicular to the page and is passing through the centre of mass (white dot at the right hip area). The torque about the centre of mass would be the product of (r) x (F), and the torque itself would be as indicated by the curved red arrow. The torque vector would be pointing along the Y-axis, from the page toward the reader.

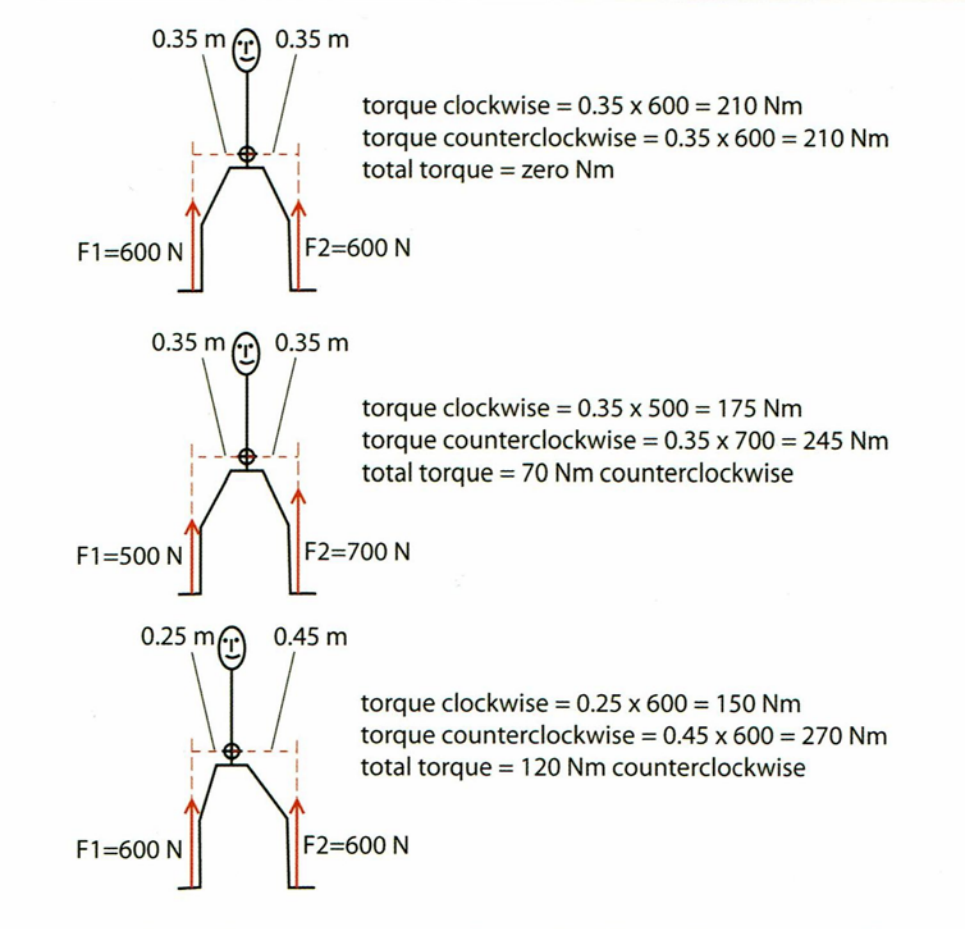

Figure 10: Torque generation during double-support (adapted from: Dapena, 2007),

Note: The terms “torque clockwise” and “torque anticlockwise” refer to those directions from the reader’s point of view not the thrower’s point of view. Therefore, a “clockwise torque” refers to a tendency for a rotation towards the thrower’s own left and “anticlockwise torque” refers to a tendency for a rotation towards the thrower’s own right.