The Physics of Triple Jump: Take-off Angles
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Introduction
I looked at the take-off angles of the triple jump and how they affect the rest of the jump by analyzing some of my own triple jump videos and comparing different take-off angles to see whether or not the take-off angle would affect the rest of the jump.

Background
• Triple Jump started in early Ancient Greek Olympics.
• In 1896 triple jump was officially a modern Olympic event for men while women were finally able to compete in the 1996 Atlanta Olympics.
• The current male world record is 18.29m (60ft) by Jonathan Edwards of Great Britain.
• The first modern world record in triple jump for women was 10.32m (33ft, 10in) by Elizabeth Stine of USA until the 1980s, which due to a change in technique, led Inessa Kravets of Ukraine (pictured below) to break the record with a jump 15.50m (51ft, 7in), and is the current record holder.

Technique
• The triple jump is a “hop, step, and a jump”. The hop and step are on the same foot, while the jump you switch to the opposite foot.
• The athlete sprints down they runway until they reach the take-off board to start their jump.
• All three jumps are executed in one continuous sequence, either left-left-right or right-right-left.

Analysis of Jumps
• I used the program Quintic Biomechanics v21. This program allowed me to find the angles shown below for my triple jump videos. With research I have found that the ideal take-off angle is between 15-18°.

Examples(Above)
• Jump on the left: 10.56m (34ft, 7.75in) with a take-off angle of 19.33°
• Jump on the right: 10.45m (34ft, 3.5in) with a take-off angle of 19.89°

The angles of my take-off jumps are pretty close to the ideal take-off angle. The jump on the left has a smaller take-off angle with a farther jump while the one on the right has a larger take-off angle with a shorter jump. The jump below has an even shorter jump than those above.

Example(Above)
• Jump: 10.31m (33ft, 10in) with a take-off angle of 20.70°

Discussion
• The best angle for projectile is 45° since both the initial horizontal and vertical velocities are at the best ratio to cover the furthest distance.

• Triple jump also focuses on the maximum horizontal displacement, however a take-off angle cannot be 45° because the angle coming into the step would be too steep.
• All three jumps are important, but due to the mechanics of the body, a 45° angle would not be possible, so the ideal range is a lot less than 45°.

Conclusion
My take-off angles for the three analyzed jumps are not in the ideal range, but the jump closest to the ideal range was the furthest. This correlates to having a shallower hop phase to lead to a better angle to execute the step phase and then jump phase. Under ideal conditions, my velocity would be the same at the point of take-off for each successive jump with a take-off angle of 15-18°, then proceeding to the other 2 phases. My research has led to a higher understanding of the importance of angles in the triple jump as well as the physics behind it.

Works Cited