

## **BIOMECHANICAL DIAGNOSIS AND ANALYSIS OF TOP CHINESE HIGH JUMPERS**

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**KEY WORDS:** high jump; approach; takeoff; bar clearance, biomechanics; center of mass (CM)

**INTRODUCTION:** In preparing for the 1996 Atlanta Olympic Games, the athletes of the Chinese Track & Field Team went to Hong Kong Sports Institute for one month of training. During this period we analyzed the video materials of top Chinese high jumpers, Yang Xu and Jian Niu using biomechanical methods. The purpose of this study is to analyze their technique and find their characteristics and deficiencies so that their result could be improved.

**METHODS:** A first video camera was fixed at the side of the bar, and the second one was fixed at a place, that was 120 degrees with the first camera. The data were converted to 3D with DLT. The motion of the high jumpers was filmed. The video materials were analyzed applying PEAK Performance System. The data were then compared with the top 8 positions in the high jump events during the 1988 Olympics in Seoul.

### **RESULTS AND ANALYSIS:**

1. Approach: From 4 tables, we found that the approach was not efficient.
2. Takeoff: The horizontal velocity of world class athletes is around 7--8m/s and remains almost constant. The horizontal velocity of Xu and Niu was around 4--5 m/s, which was further decreased by about 1m/s within the last two strides.
3. Bar Clearance: During the flight, the CM heights of Xu and Niu were around 0.75--0.89m, while the average of the world class athletes is 1.11m.

### **CONCLUSIONS:**

1. During the approach phase, the decrease in velocity within last two strides was 15--20%. However, there was almost no decrease in world class athletes and their CM at touchdown of last stride also showed no decrease.
2. During takeoff phase, Xu's vertical component was relatively large with reference to the training at that time. However, the short supporting time within the last stride led to a large takeoff angle. Both the vertical and horizontal velocities of Niu should be increased.
3. Failure of bar clearance was due to the large horizontal distance between the CM and the bar at maximum height.