ANALYSIS OF ELITE AND NOVICE DISC GOLFERS PERFORMING DRIVES

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INTRODUCTION

In disc golf, the tee pad could find the golfer anywhere from 75 to 250 meters from the basket. Major demands are placed on the performer to produce the maximum amount of velocity. When the movement requires the maximal incorporation of segments, velocity, and/or involves an extremity moving freely through space, it is generally believed that the mode of timing would be sequential where the proximal segment starts its forward rotation prior to the distal segments, the next distal segment begins its forward rotation as the proximal segment reaches its peak angular velocity, and the proximal segment slows down before the distal segments reach their peak angular velocity (Bunn, 1972). The need for the distal segment to produce the maximum velocity possible is even more evident in the disc golf drive, for it has the added duty of causing the disc to spin. Of course the motor development principle of proximodistal where a person generally develops from the middle of the body out (Payne, 1991) could have an effect on the performance of the novice in a task requiring such distal movements. The purpose of the study was to conduct a descriptive kinematic analysis comparing elite and novice disc golfers performing drives.

METHODOLOGY

Four right-handed subjects (two elite, male and female and two novice, male and female) were videotaped performing ten drives in the sagittal, frontal, and transverse planes using a video camera engaging a 1/500 second high-speed shutter. The elite male disc golfer was ranked 17th in the world with a 12th place finish at the 1992 World Disc Golf Championships, and the elite female disc golfer was the 1992 Women's Rookie of the Year. Both of the novice performers were athletic, engaging in competitive tennis, cycling, and/or running, but they had little to no disc golf experience and limited frisbee throwing experience. The best of the ten trials for each performer in each of the planes was then analyzed using the PEAK Performance 2-dimensional movement analysis system interfaced with a Panasonic recorder, Sony monitor, and Zenith 486 microcomputer. The data were smoothed using a fourth order, zero lag, Butterworth digital filter. After selecting the best trial based on performance and clarity of the video, digitizing began in the sagittal plane when what would be the plant foot came off the ground for the last time before planting and ended after the release of the disc. Digitizing in frontal and horizontal planes began at the first forward movement of the subject and ended after the release of the disc.

RESULTS and DISCUSSION

The horizontal and vertical displacements of the center of mass in the sagittal plane are depicted in Figures 1 and 2. The elite female (EF) and elite male (EM) both had greater horizontal displacements (M=3.06 ± 0.30; M=2.91 ± 0.36, respectively) than did the novice female (NF) (M=2.59 ± 0.15) or the novice male (NM) (M = 2.85 ± 0.23). Both novice performers had greater vertical displacements than did the elite (NF, M=1.88 ± 0.03; NM, M=2.24 ± 0.04; EF, M=1.422 ± 0.03; EM, M=1.53 ± 0.02).

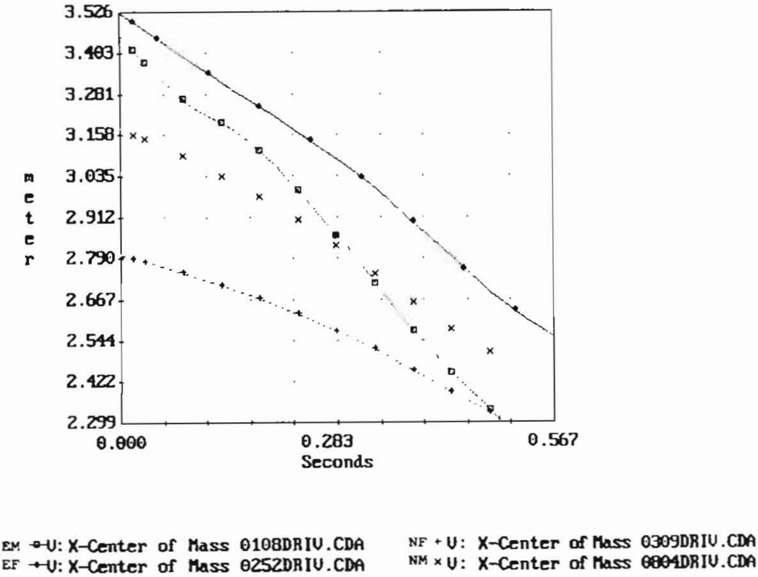

Figure 1. Horizontal displacement of the center of mass.

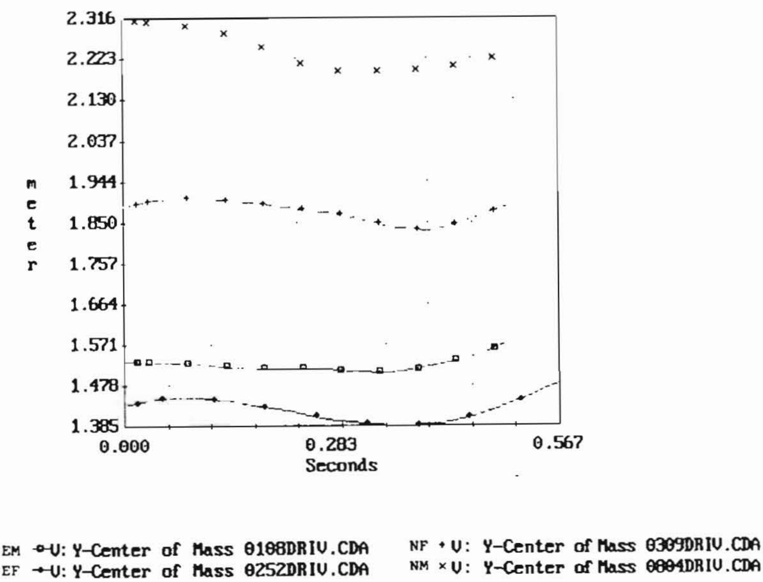

Figure 2. Vertical displacement of the center of mass.

The angular velocities of the right shoulder, right elbow, and right wrist are depicted for each subject as filmed in the horizontal plane. The complete trials of the elite performers are shown in Figure 3. Figure 4 depicts the angular velocities of the EM just prior to and after release. The arrows indicate the point of release (0.98 s) which is at the peak angular velocity of the elbow and simultaneous with the wrist snap. The sequential intersegmental coordination of the shoulder to elbow should also be noted.

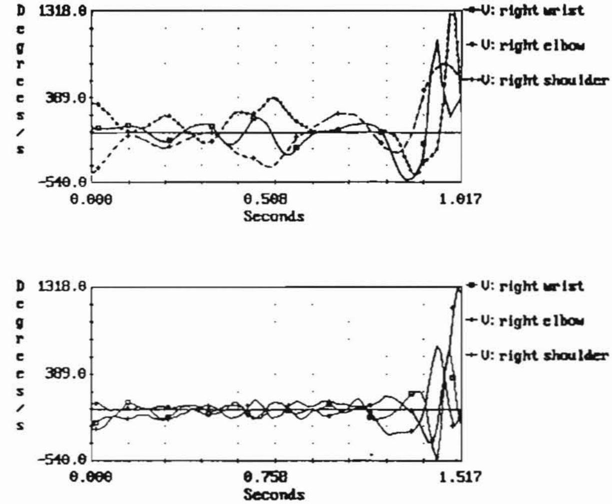

Figure 3. Angular velocities of elite male (top) and female (bottom).

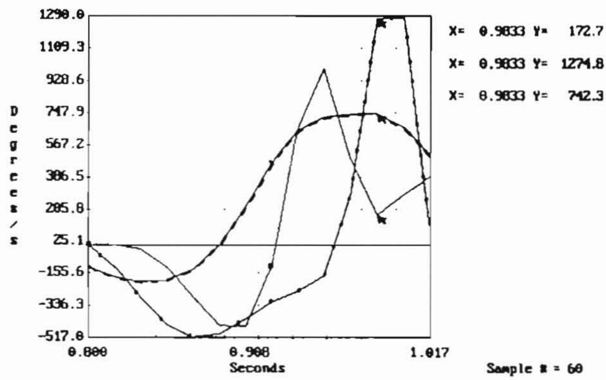

Figure 4. Angular velocities at release of elite male.

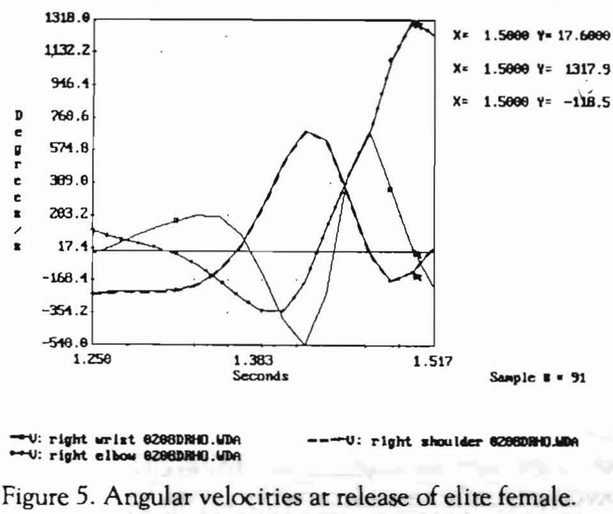

Figure 5. Angular velocities at release of elite female.

The angular velocities of the EF are represented in Figure 5. She also releases the disc at the elbow's peak angular velocity but prior to her wrist snap. As with the EM, she demonstrates the sequential intersegmental coordination of the shoulder to elbow.

Figure 6 compares the complete trials of the EM (on top) with the NM. Note the twin peaks in the trial of the NM. The first peak occurs when he brings his shoulder, elbow, and wrist back prior to release. The release of the disc is shown in Figure 7. His release is after the peak velocity of his elbow has already been reached, although the angular velocities of his shoulder and elbow are sequential.

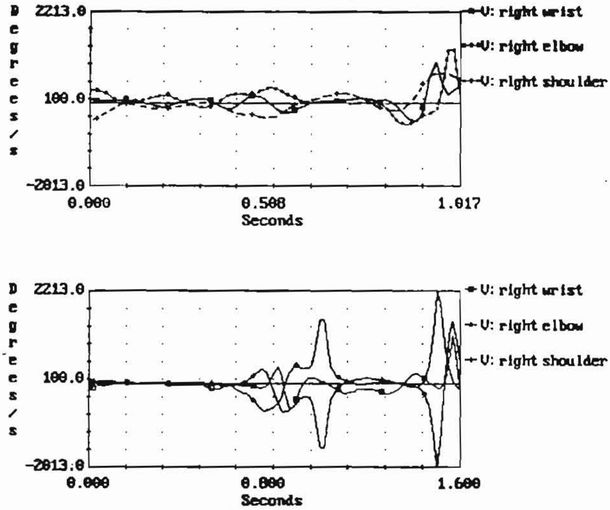

Figure 6. Angular velocities of the elite male (top) and the novice male (bottom).

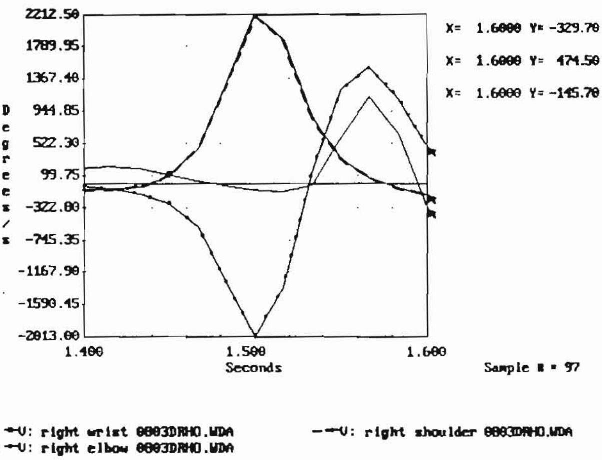

Figure 7. Angular velocities at release of the novice male.

In Figure 8, the complete trials of the EF and NF are presented. As shown, both are similar prior to the release. However, as indicated by the arrows in Figure 9, the NF releases the disc prior to reaching the peak velocity of the elbow and after the wrist snap. Again, as with each of the other subjects, the shoulder to elbow sequential intersegmental coordination is represented.

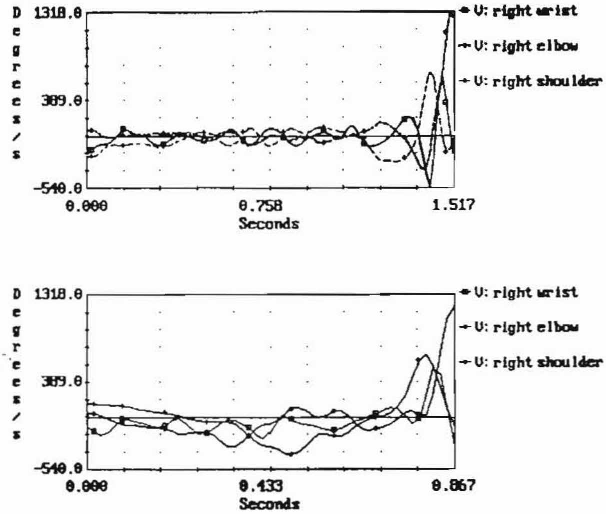

Figure 8. Angular velocities of the elite female (top) and the novice female (bottom).

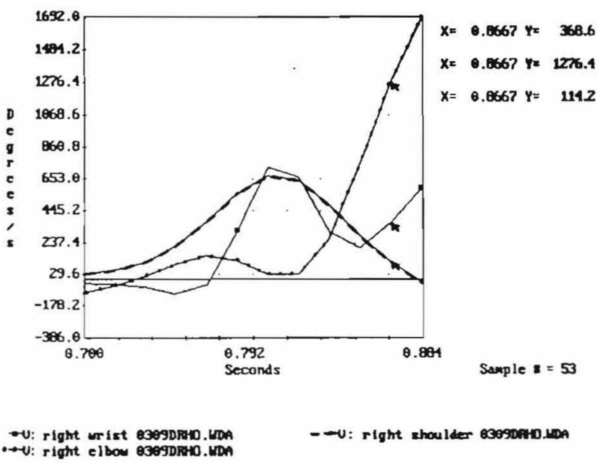

Figure 9. Angular velocities at release of the novice female.

CONCLUSIONS

In conclusion, the elite performers demonstrated greater horizontal displacements in the sagittal plane as well as smaller vertical displacements of their center of mass than did the novice performers; this indicates greater efficiency of movement on the part of the elite. All subjects demonstrated a sequential intersegmental pattern of the shoulder and elbow; however, only the two elite performers released the disc at peak elbow velocity and only the elite male released at wrist snap.

REFERENCES

Bunn, J. W. (1972). Scientific Principles of Coaching (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Payne, V. G. and Issacs, L. D. (1991). Human motor development: A Lifespan Approach (2nd ed.). Mountain View, CA: Mayfield Publishing.