ANALYSIS OF CHILDREN PUTTING AND DRIVING IN DISC GOLF

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INTRODUCTION

Two basic motor developmental principles are: a) that we develop proximal to distal; and b) that we develop gross motor to fine motor (Auxter, 1985). With regard to coordination, in particular intersegmental coordination, it has been postulated that the mode of timing would be sequential on tasks requiring maximal incorporation of the segments, has high velocities, or involves curvilinear movements and simultaneous when the movement has few segments involved, is slow, requires much accuracy or involves rectilinear movements (Kreighbaum and Barthels, 1981). If the task would best be performed in a sequential manner, it could be that the motor development principle of proximal to distal would factor in to whether a person indeed performed a coordinated movement; for if the person has yet to learn to control the most distal part, there will be a definite interruption in the chain of events. The motor development principle of gross motor to fine motor similarly has an effect on the slow, more accurate, rectilinear movements that might optimally have a simultaneous mode of timing. In disc golf, there are two skills that fit well into the afore mentioned types of tasks. The drive requires maximal incorporation of segments, high velocity, and is curvilinear. The putt in disc golf requires a great deal of accuracy and is a somewhat slow task although it also requires the distal movements of the wrist in order to put spin on the disc. The purpose of this study was to conduct a descriptive kinematic analysis comparing children's putting and driving in disc golf.

METHODOLOGY

Two skilled and two unskilled male subjects were videotaped putting 5 m away from the basket and then driving as far as they could. Two subjects had played disc golf approximately one year while the other two had little to no experience with disc golf and/or frisbee throwing. A Sharp video camera operating at 60 Hz and engaging a 1/500 second high-speed shutter was used to videotape each subject in the sagittal, frontal, and transverse planes. How close, whether the disc hit part of the basket, or if the disc fell in the basket was recorded for each putt. 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 AG-7350 recorder, Sony PVM-1341 monitor, and Zenith 486 microcomputer. The data were smoothed using a fourth order, zero lag, Butterworth digital filter.

RESULTS and DISCUSSION

The results of the trials trials putting and driving are presented in Tables 1 and 2, respectively. The horizontal and vertical displacements, velocities, and accelerations of the center of mass were calculated for each subject in sagittal and frontal planes while putting, and the horizontal and vertical displacements of the center of mass were calculated for each subject in the sagittal plane for driving.

Table 1. Putting results of ten trials at the basket from 5 m.

	Subject	Made	In/Out	Touched	Missed
Skilled	1	0	0	0	10
	2	5	0	5	0
Unskilled	3	1	0	1	8
	4	0	0	0	10

The skilled performers had greater horizontal and vertical displacement of their center of mass than did the unskilled while putting as viewed in the sagittal plane. Subject 2 had the least amount of horizontal velocity and vertical acceleration and greatest vertical velocity in the sagittal plane. In the frontal plane, Subject 2 exhibited the least amount of horizontal displacement whereas Subject 1 exhibited the most. When comparing these results to that of the elite performers' putting, Subject 2 most resembled the performance of the elite disc golfers.

In the sagittal plane, again Subject 2 most closely resembled the performance of the elite disc golfers while driving. His horizontal displacement was between those of the male adults, and he had the lowest vertical displacement score.

Subject 2 exhibited a great deal of angular velocity prior to the preparation of the release. Subject 2's drive indicated that sequential intersegmental coordination pattern of the shoulder and elbow is present; however, there was a longer time lapse between the peak angular velocities than that of the adult. It was also evident that release came after the wrist snap. Like Subject 2, Subject 1 exhibited peak angular velocities in the middle of the trial. In this case, the shoulder and elbow were almost simultaneous rather than sequential in their movements.

Subject 3 demonstrated twin peaks where the arms are being curled back during the first peak and extended during the second. Subject 4's drive indicated a great deal of extraneous movement throughout the trial. Figure 1 compares the graphs of the two unskilled children during the time just prior to and after release. Subject 3 exhibited a late sequential pattern of the shoulder and elbow; however, Subject 4's movements were very random.

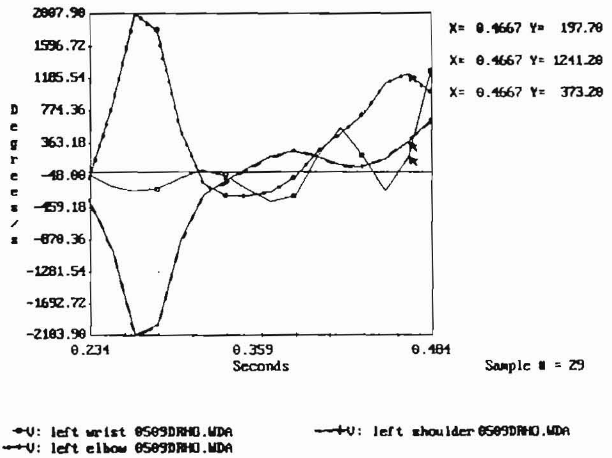

Figure 1. Angular velocities of subjects 3 (top) and 4 (bottom) at release of the drive.

Similar to the elite performer, Subject 2 utilized a simultaneous mode of timing. Subject 2 approached the skilled simultaneous intersegmental coordination of the shoulder and elbow with the distal movements of the wrist just prior to release. Neither Subject 3 nor Subject 4 approached the intersegmental coordination pattern.

CONCLUSIONS

In conclusion, with both tasks, Subject 2, one of the skilled performers and also the oldest of the children, demonstrated sequential intersegmental coordination in performing the drive and simultaneous intersegmental coordination in performing the putt. Subjects 1, 3, and 4 all performed more coordinated movements while driving than while putting. This is in agreement with most developmental elementary physical education experts who stress the need to work on process or form first and then product or performance (Gallahue, 1982).

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