## CAN WE PERFORM THE 60 METRE JUMP?

MORRISON, Bill
Biomechanics Laboratory
Victorian University of Technology
Footscray, Victoria
Australia

During the Moomba Festival of 1990 in Melbourne, Australia each of the internationally ranked water ski jump competitors was video taped for a Kinematic analysis. The system used for data recording was a S-VHS camera and power supply from Panasonic. For the analysis of the video taped trials a PEAK 2D MOTION MEASUREMENT SYSTEM was used. A framing rate of 50 fps; at an exposure time of 1/1000 second; was used to obtain the trial record.

Kinematic parameters employed in the analysis of the Jumps were height of take-off, take-off velocities (horizontal and vertical), maximum velocity and the angle of take-off. All subjects represented jumps in excess of 59.0 meters. Yet no one was capable of obtaining the 60 metre distance. The analysis illustrated significant differences and technique considerations which could yield the 60 metre jump.

## USING MUSCLE ELECTRICAL STIMULATION FOR PERFORMANCE IMPROVEMENT OF AN ATLETE IN PROPULSION PHASE

ROSTOVSTEV, V.L.
All Union Scientific Research Institute of Physical Culture
Moscow
USSR

The main trait of an athletes' qualification during the leg propulsion phase is the angular velocity of the leg flexion in the knee joint. It was discovered in cross country skiing for classic style (Komi et.al. 1982),skating skiing (Rostovstev and Krjazev,1988),and speed skating (Schenay et.al.,1985).

One of the ways for performance improvement is to have direct influence on to the mentioned parameter. Major muscle-flexion by electrical stimulation during the propulsion phase was first suggested by I.P.Ra (1967) and was used in this study.

Experimental results from m.quadriceps femoris, under electrical stimulation (EMS),during the propulsion phase on skier performance are presented in this study. It was determined that during 6 degrees of ascending EMS for the skating stride the angular velocity of knee joint increased to 17 deg/sec (9,4%); mechanical work in the propulsion phase increased to 7 J, and mechanical work in total cycle is decreasing. The standard velocity pulse was 2,4 str/min lower than in ordinary case than when EMS was used.

## ENERGY EXPENDITURE STRATEGIES DURING MAWIMAL ERGOMETER ROWING

SMITH, R.M.
Cumberland College of Health Sciences
The University of Sydney
Lidcombe
Australia

*Rowing regattas are usually conducted over a 2000 m course and, depending on the nature of the event and* the environmental conditions, take from five and a half minutes to eight minutes to complete. During this time the rower must expend energy to overcome the drag of the water and the air and to maintain the oscillatory motion of the rower's body and the boat. Major factors in a crew's success will be the total amount of energy which they have available and the overall efficiency with which that energy is delivered.

Some controversy exists over the best energy expenditure strategy to use during a race (Klavora, 1977; Klavora, 1978). Physiologically and biomechanically speaking there is support for an even-paced or slightly negatively sloped strategy. (Townsend, 1982; Sanderson and Martindale, 1986). Psychologically speaking it may be better to make an initial sprint and try to stay out in front. Clarifying the mechanisms which are at work during the course of the rowing event will help the athletes to select the most effective strategies.

The purpose of this study was to examine the time history of selected biomechanical variables during the performance of six minute maximal ergometer rowing to determine their effect on power production at different stages during the effort.

The average power output onto the oar handle was selected as the variable representing energy expenditure and can be found as the product of the average power per stroke and the stroke rate.

Peak force is one of the main factors determining the average power per stroke, (Schneider, Angst and Brandt, 1978), thus peak force and stroke rate were chosen as the other two variables for this study. The manipulation of stroke rate and peak oar force in the provision of what the rower considered was an appropriate energy expenditure strategy during six minutes of maximal ergometer rowing was, then, the focus of this study.

## KINEMATIC ANALYSIS OF U.S. DECATHLETE SHOT PUT PERFORMANCE

SMITH, S.L.; SNOW, R.E.
USOC Sports Science Division
Colorado Springs
USA

The purpose of this study was to analyze selected kinematic parameters describing shot put performances of elite U.S. decathletes. The obtained information would provide baseline data of decathlete shot put performance in the initial year of the current quadrennium upon which subsequence performances of these same decathletes could be evaluated. A secondary purpose was to correlate the selected kinematic parameters with put distance.

During the 1989 TAC Championships, the trials of 13 decathletes in the shot put event were videotaped by an AG-160 Panasonic camcorder positioned perpendicular to the movement path of the athlete across the ring. Mean height and weight values for the group were 1.87 m and 83.92 kg, respectively. The best put for each decathlete (mean distance = 13.66 m) was analyzed on the Peak Performance Motion Measurement system at 60 Hz using a 15 segment model. The glide technique was used by 11 athletes with the spin move being preferred by the two other decathletes.

The digitized data were smoothed; selected temporal, linear displacement, and angle measurements were calculated. Mean values for shot velocity, angle of projection, and height at the time of release were 9.35 m/s, 42.5 degrees, and 1.97 m, respectively. None of these three variables describing projectile motion was significantly related to shot put distance.

Both shot horizontal displacement during the propulsion phase and the total movement sequence correlated negatively with distance (-.47 and -.52, respectively). Times for the drive phase and total movement of the put sequence also correlated negatively (-.50 and -.55, respectively) with put distance.

These findings suggest that (1) the lack of significant statistical relationships between put distance and projectile motion variables are not surprising considering the small, homogenous sample, and (2) the observed negative correlations between temporal measures with put distance reflect the importance of the force component in the impulse-momentum relationship in this event.