

QUANTIFYING THE HAND-CURVE AND OARLOCK FORCES FOR DETERMINING THE DIFFERENCE BETWEEN EXPERIENCED AND ELITE MALE SWEEP ROWERS

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INTRODUCTION: Rowing lends itself well to biomechanical research given that it is a closed, cyclic skill that is technically demanding. While a relatively large number of papers have been published on the force profile of the rowing stroke and its effect on performance (DalMonte and Komor, 1989; Millward, 1987), very little research has been conducted into describing specific technical points which may lead to undesirable force characteristics. To allow a more knowledgeable feedback to an athlete's technique, such that improved performances result, it is necessary to isolate the critical factors that can discriminate between performance levels. Angst (1980) prepared a paper in which he subjectively described a relationship between the path that the handle of the oar described (hand-curve) and the shape of the force profile. The hand-curve is one method that could be used as a more direct feedback to the rower, with observable adjustments in technique having direct implications to the force applied. The current project involves determining those hand-curve and force profile variables that can be used to effectively differentiate between performance levels in sweep rowing.

METHOD: Twelve male sweep rowers will be used in the study. Six of the sample will be experienced rowers in the state talent identification program (TID) and six will be senior elite rowers. A pair rowing shell fitted with instrumented oarlocks will be used to collect on-water data, consisting of oarlock force, hand-curve and average boat velocity. The instrumented oarlocks comprise a unidirectional load cell to quantify the force exerted by the oar on the oar gate. Static load testing of the oarlocks using an instrumented load press indicates that the oarlock set-up can accurately and reliably measure the loads applied to the system. Attached to the oarlock are two potentiometers, which measure the 2-D path of the oar. Previous studies have demonstrated that this system can effectively be used in developing hand-curves for the rower (Doyle, 1999). Boat velocity is calculated using an impellor attached to the bottom of the rowing shell. McBride (1998), using similar apparatus, found only a 1.04% error in measured distance over 500m. Testing will involve a maximal effort 500m from a rolling start in the instrumented pair. The Coefficient of Multiple Determination (CMD) will be used to determine whether there are significant differences between the repeatability of the hand-curves of the TID and the senior elite rowers. CMD's will also be used to indicate the degree of variability of the hand-curves within each of the two groups. The force profiles obtained from the instrumented oarlocks will undergo further processing to quantify various kinetic variables, including peak force and impulse, as well as timing of events during the drive phase. These will enable the two groups to be statistically compared using the average velocity as the criterion variable. The shape of the force profiles will also be compared between groups using CMD's.

CONCLUSION: This study will be the first to combine the kinetic profile with the rower's handcurve during sweep rowing. In addition, the project promises to deliver important information on variables that can be used to discriminate between experienced and elite level rowers. This information will further the understanding of rowing biomechanics into areas of technique diagnosis and athlete servicing.

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