

2012

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This article was originally published as: Coyne, J. O., & Sheppard, J. M. (2012). Assessing sprint paddle ability in competitive surfers. Proceedings of ASCA International Conference on Applied Strength and Conditioning. (pp. 58-60). Gold Coast, Australia. Original article available [here](#)

This Conference Proceeding is posted at Research Online.

<https://ro.ecu.edu.au/ecuworks2012/232>

Poster 6

**ASSESSING SPRINT PADDLE ABILITY IN COMPETITIVE SURFERS**

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**INTRODUCTION**

Competitive surfing typically involves 20-30 minute duration competitive heats consisting of 2-4 surfers. A subjective judging criterion evaluates the surfer's ability to catch the best waves and perform radical maneuvers on the wave, resulting in a score given for each wave surfed. Normally, each surfers top 2 scoring waves are combined to determine placing within each heat and thereby determining which surfer(s) advance to subsequent rounds of the competition. In surfing competition, successful surfers advance through the competition heats until quarter, semi, and final rounds are completed, and final placings are determined.

Surfing competitions are held in a variety of environmental conditions that have a considerable influence on activity levels and patterns during competitive heats. The primary activities are simply time spent riding waves and time spent paddling, as well as timing at rest (sitting on the board waiting for waves) (3, 5, 6). Although the nature of each type of wave-break (e.g. beach, reef, point), and changing conditions such as wind, swell, and tide conditions all influence surfing activity levels and patterns, some generalizations can be made. From previous competitive and recreational surfing studies, it is suggested that surfing can be accurately described as a sport that requires multiple intermittent sprint paddle efforts (3, 5). During competition heats, wave riding duration was found to be only 3.8% of total time compared to paddling taking up 51.4% of total time (5). Meanwhile, nil activity (i.e. floating/sitting on board) represented 42.5% of total time (miscellaneous activities 2.2%)(5). Around 60% of paddling bouts were no longer than 20 seconds (~25% <10 seconds, ~35% 10-20 seconds). These results highlight the importance of shorter bouts of intense sprint paddling during competitive surfing (4, 5).

Previous research has established that neither oxygen uptake nor endurance paddling measures are valid in differentiating between competitive and recreational surfers (1). However short-duration paddling power may be a valid differentiator (1). Sprint paddling seems to be a very important feature of competition in order to gain an advantageous position for wave selection, but also to ensure fast entry speed into waves. The greater the entry speed (up to a certain point) optimizes position on the wave face so the surfer can execute maneuvers in the most critical part of the wave. This in turn maximizes judges' scores (1, 4, 7). Because of this, sprint paddling ability is considered to be a significant factor in determining the competitive outcome.

Measuring sprint paddle ability in surfers therefore becomes an important aspect of athlete selection and determining how surfers should structure their individual training. For a measurement to be useful, it must have low variability, so that the strength and conditioning practitioner can be reasonably confident that changes observed are in fact due to training, and not accountable to the poor reliability of the measure. To assess the reliability of sprint paddle testing, the present study evaluated a group of competitive surfers (n=16). Anthropometric measures, time taken to paddle 5, 10, 15 meters along with peak velocity were measured from two bouts of sprint paddling to investigate the reliability of the testing methodology.

**METHODS**

To assess the reliability of sprint paddle assessment, this study employed a within-subjects repeat measures analysis within a group of adult male competitive surfers. Sixteen competitive male surfers (23.9±6.8 years, 174.5±8.1 cm, 70.4±8.8 kg) participated in this study. At the time of the study, the subjects had competed, as a minimum standard, in domestic 'open' competition, with the majority of subjects having competed at International Surfing Association World Junior Championships, or the Association of Surfing Professionals World Qualifying Series events.

All subjects received clear explanation of the study. This included risks and benefits of participation. If after the explanation, the individual decided not to be included in the analysis it would not negatively affect any current or future competitive opportunities or team selection. All tested subject's provided a written informed consent for testing and

data analysis. Approval for this investigation was granted from the Institutional Human Ethics Committee. Alongside this, the study conformed to the Declaration of Helsinki for medical research involving human subjects.

The sprint paddle testing was conducted in an outdoor 50 m swimming pool. This allowed for easy display of distances for the subjects and control for any effect of tides and currents experienced in most local marine environments. This environment also was under professional supervision by lifeguards and eliminated any potential dangers from marine creatures. Subjects performed a progressive warm-up, consisting of 200m low-intensity paddling, followed by a specific sprint paddling warm-up of 4 x 15m sprint paddling efforts at 60, 70, 80, and 90% volitional effort on ~2 minute time intervals. After 3-4 minutes rest, the subjects then performed 2 maximal effort sprint-paddling time-trials of 15 meters (i.e. 2 x 15 m) to determine maximum sprint paddling performance. The sprint paddle efforts were initiated from a stationary, prone lying position, with the two times to 15 m retained and used for analysis of reliability.

Using a purpose-built horizontal position transducer (I-REX, Southport, Australia) attached to the rear waist line of each subjects' board-shorts, kinematic data was obtained and stored for analysis on a personal computer. The position transducer recorded a time-stamp for each 0.02 m of displacement, thereby allowing for determination of sprint time from the start to each interval (5m, 10m, and 15m) and by differentiation to determine peak sprint paddle velocity (2) for both time trials.

From the two trials, the Intra-class Correlation Coefficient (ICC), Typical Error (TE) and Percentage Co-variance (%CV) were calculated for the 5m, 10m, 15 m intervals, & peak velocity, to help determine the reliability and reproducibility of repeat sprint paddle testing.

## RESULTS

The intra-class correlation coefficient for the 5m, 10m, 15m time splits and peak velocity were calculated at 0.82, 0.91, 0.95 and 0.99 respectively. Typical error between the two trials for the 5m, 10m, 15m and peak velocity was 0.11, 0.13, 0.14 and 0.01. Lastly, the percentage co-variance was 2.99%, 1.89%, 1.38% and 0.52% for the 5m, 10m, 15m and peak velocity, respectively.

**Table 1** - Intra-class correlation coefficient (ICC), Typical Error, and Percent Co-Variance (%CV) of sprint-paddle time trials to 5, 10, 15 m and peak velocity (PeakV) in competitive surfers.

Measures	Time Trial 1	Time Trial 2	ICC	Typical Error	%CV
5m (s)	3.75	3.77	0.82	0.11	2.99
10m (s)	6.71	6.69	0.91	0.13	1.89
15m (s)	9.64	9.63	0.95	0.14	1.38
PeakV (m/s)	1.77	1.78	0.99	0.01	0.52

## DISCUSSION

The purpose of this investigation was to examine the reliability of assessing sprint paddle ability in competitive surfers. This investigation is valuable because sprint paddle ability is believed to be an important aspect of competitive surfing and being able to reliably test this quality is important for the selection and training of athletes. For the strength and conditioning practitioner working with high level athletes, having measurement protocols with low variability is imperative, as high level athletes generally make only small improvements in performance (as they are already well trained). This ensures that if variation does occur between tests of a surfer's sprint paddle ability, athletes and testers can be confident that the changes observed are true training (or detraining) induced changes. Further, athletes and testers can be confident that these changes are not due to poor methodology.

From the data, the high intra-class correlation coefficient between the time trials for the 5m,10m, 15m and peak velocity suggests the assessment of the surfing paddle ability can be consistently reproduced between different bouts of sprint paddling. There was also a low typical error for all measures (Table 1). The data from the present study suggest that using a horizontal position transducer to assess sprint paddle ability in competitive surfers can be achieved with high reliability.

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