participated separately on an "off day" post competition and again 3 days following. During the follow-up data collection sessions, we assessed hydration status, VAS-F, and AUDIT.

RESULTS: We identified no significant or strong relationships between our dependent variables (Spearman's rho correlation range=0.003-0.079, p range=0.192-0.973). We identified significant differences in hydration status over time ($F_{2,269}=5.226$, $p=0.006$, $\eta^2=0.037$) between baseline hydration status (1.017±0.001) and follow-up day 1 (1.021±0.001) as well as follow-up day 3 (1.020±0.001). We also identified a significant difference between sports on the AUDIT score ($F_{4,86}=4.279$, $p=0.003$ $\eta^2=0.166$) with significant differences between this highest risk athletes from softball (9.73±1.22) and the lower risk athletes in soccer (4.36±0.81) and baseball (4.36±0.81).

CONCLUSIONS: Although we were unable to identify strong correlations between dependent measures, our results may indicate alcohol consumption has an impact on hydration status and ultimately performance. Although other factors may have influenced hydration, we did identify significant dehydration following alcohol consumption.

B-40 Free Communication/Poster - Sports Biomechanics

MAY 30, 2012 1:00 PM - 6:00 PM
ROOM: Exhibit Hall

1906 *Board #314* MAY 30 3:30 PM - 5:00 PM
The Relations Between sEMG and Knee Angles Of 24 Style Tai Chi (TC)

Dong Zhu[1], Li Li, FACSM[2], Hongguang Hua[1], Shan Luo[1], Song Wang[1], Guohai Cheng[1]. *[1]Shanghai University of Sport, Shanghai, China. [2]Louisiana State University, Baton Rouge, LA.*
(No relationships reported)

Many studies indicate that the TC practice has the positive effect on participants' health. However, a few studies have negative reports for Taichi practitioners' knee health after TC practice. These reports focus on incorrect skills might cause practitioners' knee pain. One of incorrect skills is excessive knee internal rotation when TC practitioner shifts their center of gravity.

PURPOSE: To investigate the relationship between knee angles and surface electromyography (sEMG) among TC practitioners' lower extremity muscles.

METHODS: Sixteen female subjects participated in 24 styles TC practices (age: 21.3±1.9 yrs, height: 162.6±4.2 cm, mass: 53.6±4.4 kg). Subjects were divided into two groups, advanced (AL) and beginner (BL) levels, respectively. Surface electromyography (sEMG) was collected from vastus medialis (VM), rectus femoris, vastus lateralis (VL), and tibialis anterior at 1500Hz. Electric goniometer (2D) was attached to subjects' right knee. sEMG signals were rectified and smoothed using the root square mean with a 50ms smoothing window. Independent-Samples T test was used for statistical analysis.

RESULTS: Mean knee joint flexion-extension range of motions (ROM) were 48.7±7.2 and 48.6±8.6 deg, for AL and BL, respectively. Mean knee joint internal-external rotation ROMs were 2.8±8.8 and 0.4±8.6 deg, for AL and BL, respectively. Meanwhile, the peak knee joint flexion angle for AL group was 99.9±24.6 deg, 22 degrees higher than that in the BL group. The peak knee joint internal rotation angle was 23.7±14.2 deg for AL, and 14.6±14.2 deg for BL. There was significant correlation ($r=-0.39$, $P<0.01$) between mean sEMG values of VL and knee internal-external rotation ROM with AL group. In comparison, there was significant correlation ($r=0.42$, $P<0.001$) between mean sEMG values between VM and knee internal-external rotation ROM with BL group.

CONCLUSIONS: The knee joint ROM and peak angles were different between groups. Moreover, knee joint internal-external rotation was correlated with VL activity among the AL group whereas with VM among the BL group. Further investigation should focus on the differential effect of knee rotation on different muscle groups among different TC practice levels.

Supported by Shanghai Key Discipline Construction: S30803

1907 *Board #315* MAY 30 3:30 PM - 5:00 PM
The Evaluation Of Active Drag: A New Proposal

Bruno Mezêncio[1], João G O Claudino[1], Pollyana P. Takao[1], Rafael Soncin[2], Jacielle C. Ferreira[2], Leszek A. Szmuchrowski[2], Rudolf Huebner[2], Alberto C. Amadio[1], Júlio C. Serrão[1]. *[1]USP, São Paulo, Brazil. [2]UFMG, Belo Horizonte, Brazil.*
(No relationships reported)

The active drag has a strong influence on swimmers performance, but it is a controversial issue because of complexity of the flow around the swimmer. Used methods for estimating this variable need greater specificity or accuracy**.**

PURPOSE: Measure the mean drag active of swimmers through the difference between the net force in dynamometry testing with (WD) and no displacement (ND)**.**

METHODS: In a ND test the active drag is approximately zero due to drag-speed relationship. Thus, the strength difference between ND and WD tests is the drag active experienced by the swimmer on test speed with displacement. Twelve tests were conducted to measure the propulsive force ND and WD, the minimum time of rest between attempts was five minutes. A unidirectional load cell, with sampling rate of 1000Hz, measured net force in both situations. The sequence of tests was randomized and balanced. The study included eight swimmers with performance equivalent to 81.9 ± 6.4% of the world record of 50 meters freestyle and height of 1.74 ± 0.06 m. The stroke rate and kick count, per cycle, was used to evaluate the technical differences between the tests. A camcorder with 1000 fps was used to recorder the underwater motion of swimmer. The measurement errors were calculated by the method of propagation of uncertainties considering the individual variability and characteristics of the measuring equipment**.**

RESULTS: There was no significant difference between the technique evaluated from the stroke rate (ND = 1.083 ± 0.069 and WD = 1.088 ± 0.075 s, $p> 0.05$), and kick count (ND = 6 ± 0 and WD = 6 ± 0, $p> 0.05$) of the different tests. The mean drag active was evaluated 153.74 ± 9.75 N with associated error estimated at 12.44%**.**

CONCLUSION: The estimated active drag values are within the range of values previously reported for swimmers of similar performance (42 to 167 N). However, the associated error of estimate was lower than was showed in other methods (30%). Thus, the proposed method is a practicable alternative to assess the active drag of swimmers.

1908 *Board #316* MAY 30 3:30 PM - 5:00 PM
Kinematic Comparison Of Different Step Lengths In A Swimming Incremental Protocol

Ricardo J. Fernandes[1], João Ribeiro[1], Ana Sousa[1], Marisa Sousa[1], Arturo Abraldes[2], Carmen Ferragut[3], Pedro Figueiredo[1], J. Paulo Vilas-Boas[1]. *[1]CIFI2D and LABIOMEP, University of Porto, Porto, Portugal. [2]Faculty of Sport Sciences, University of Murcia, Murcia, Spain. [3]Faculty of Physical Activity and Sport, University of Alcalá de Henares, Madrid, Spain.* (Sponsor: Carlo Baldari, FACSM)
(No relationships reported)

Swimming incremental protocols are frequently used for swimming aerobic performance assessment. Nevertheless, different step lengths might impose differences in swimming technique**.**

PURPOSE: To determine and compare the stroke rate (SR) and length (SL), arm coordination (IdC) and propelling efficiency (ηp) during an intermittent incremental protocol with different step lengths.

METHODS: Eight long distance swimmers (25.6±8.8yrs, 69.9±5.5kg, 1.78±0.49m) performed 7x200, 300 and 400m (0.05m/s increments; 30s rest between steps and 24h between protocols) in front crawl until exhaustion; the velocity of each step was common to the three protocols. Two arm stroke cycles of the last 50m lap of each step were digitized (APASystem). SL was assessed using the right hip point, and SR was measure as the ratio of velocity to SL. ηp was considered as: (velocity*0.9/2π*SR*shoulder to hand distance)*2/π. IdC was determined by the lag time between propulsive inter-arm phases. Comparison between protocols was done using Friedman test ($p\leq.05$).

RESULTS: In Table 1 it is possible to observe a SR increase and a SL decrease throughout the protocols, with a tendency to lower SL values in the last steps of the 400m protocol. The IdC values expressed a catch-up coordination mode, similar in all step lengths, increasing at higher velocities. The ηp decreased throughout the steps of each protocol, without significant differences between protocols.

Table 1. Mean (±SD) values of the kinematical parameters in 7x200, 7x300 and 7x400 protocol

Variables	Protocol/Steps	1 (Mean±SD)	2 (Mean±SD)	3 (Mean±SD)	4 (Mean±SD)	5 (Mean±SD)	6 (Mean±SD)	7 (Mean±SD)
SR (HZ)	7x200	0.35±0.04	0.40±0.03	0.41±0.05	0.43±0.05	044±0.04	0.54±0.08	0.68±0.09
	7x300	0.35±0.05	0.38±0.06	0.40±0.06	0.44±0.07	0.46±0.06	0.54±0.09	0.67±0.10
	7x400	0.37±0.06	0.38±0.04	0.39±0.06	0.43±0.06	0.48±0.10	0.56±0.07	0.65±0.08
SL (m.cycle-1)	7x200	2.55±0.14	2.47±0.21	2.49±0.20	2.36±0.22	2.44±0.23a	2.27±.0.34	2.00±0.22
	7x300	2.58±0.23	2.49±0.17	2.59±0.14	2.39±0.15	2.42±0.16a	2.24±0.25	2.12±0.26
	7x400	2.51±0.06	2.45±0.07	2.41±0.15	2.38±0.10	2.24±0.12b	2.05±0.14	1.94±0.13
IdC (%)	7x200	-16.42±0.75	-16.30±6.38	-17.25±6.06	-15.65±5.86	-16.66±5.27	-10.48±5.26	-5.42±3.90
	7x300	-15.05±0.95	-19.82±5.27	-17.34±5.64	-14.00±5.10	-14.77±5.06	-11.32±5.64	-8.26±4.56
	7x400	-18.42±1.25	-16.85±3.66	-17.29±2.69	-14.91±3.98	-14.41±4.77	-7.56±3.95	-5.59±2.22
ηp	7x200	0.44±0.08	0.39±0.09	0.41±0.09	0.35±0.03	0.38±0.08	0.34±0.05	0.31±0.03
	7x300	0.41±0.05	0.40±0.04	0.37±0.02	0.36±0.03	0.36±0.04	0.33±0.03	0.32±0.04
	7x400	0.43±0.02	0.38±0.07	0.39±0.07	0.36±0.03	0.33±0.05	0.33±0.04	0.30±0.04

a-significant different from 7x400
b-significant different from 7x200 and 7x300

CONCLUSIONS: The different step lengths of progressive swimming steps seem not to significantly affect the swimming technique, reinforcing the use of the 7x200m in training diagnostics due to pragmatic reasons.

Supported by PTDC/DES/101224/2008 (FCOMP-01-0124-FEDER-009577).

FREE COMMUNICATION/POSTER

CONCLUSIONS: The knee joint ROM and peak angles were different between groups. Moreover, knee joint internal-external rotation was correlated with VL activity among the AL group whereas with VM among the BL group. Further investigation should focus on the differential effect of knee rotation on different muscle groups among different TC practice levels.

Supported by Shanghai Key Discipline Construction: S30803

1907 *Board #315* **MAY 30 3:30 PM - 5:00 PM**

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Bruno Mezêncio[1], João G O Claudino[1], Pollyana P. Takao[1], Rafael Soncin[2], Jacielle C. Ferreira[2], Leszek A. Szmuchrowski[2], Rudolf Huebner[2], Alberto C. Amadio[1], Júlio C. Serrão[1]. *[1]USP, São Paulo, Brazil. [2]UFMG, Belo Horizonte, Brazil.*

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RESULTS: There was no significant difference between the technique evaluated from the stroke rate (ND = 1.083 ± 0.069 and WD = 1.088 ± 0.075 s, p> 0.05), and kick count (ND = 6 ± 0 and WD = 6 ± 0, p> 0.05) of the different tests. The mean drag active was evaluated 153.74 ± 9.75 N with associated error estimated at 12.44%**.**

CONCLUSION: The estimated active drag values are within the range of values previously reported for swimmers of similar performance (42 to 167 N). However, the associated error of estimate was lower than was showed in other methods (30%). Thus, the proposed method is a practicable alternative to assess the active drag of swimmers.

1908 *Board #316* **MAY 30 3:30 PM - 5:00 PM**

Kinematic Comparison Of Different Step Lengths In A Swimming Incremental Protocol

Ricardo J. Fernandes[1], João Ribeiro[1], Ana Sousa[1], Marisa Sousa[1], Arturo Abraldes[2], Carmen Ferragut[3], Pedro Figueiredo[1], J. Paulo Vilas-Boas[1]. *[1]CIFI2D and LABIOMEP, University of Porto, Porto, Portugal. [2]Faculty of Sport Sciences, University of Murcia, Murcia, Spain. [3]Faculty of Physical Activity and Sport, University of Alcalá de Henares, Madrid, Spain.* (Sponsor: Carlo Baldari, FACSM)

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	7x300	-15.05±0.95	-19.82±5.27	-17.34±5.64	-14.00±5.10	-14.77±5.06	-11.32±5.64	-8.26±4.56
	7x400	-18.42±1.25	-16.85±3.66	-17.29±2.69	-14.91±3.98	-14.41±4.77	-7.56±3.95	-5.59±2.22
ηp	7x200	0.44±0.08	0.39±0.09	0.41±0.09	0.35±0.03	0.38±0.08	0.34±0.05	0.31±0.03
	7x300	0.41±0.05	0.40±0.04	0.37±0.02	0.36±0.03	0.36±0.04	0.33±0.03	0.32±0.04
	7x400	0.43±0.02	0.38±0.07	0.39±0.07	0.36±0.03	0.33±0.05	0.33±0.04	0.30±0.04

a-significant different from 7x400
b-significant different from 7x200 and 7x300

CONCLUSIONS: The different step lengths of progressive swimming steps seem not to significantly affect the swimming technique, reinforcing the use of the 7x200m in training diagnostics due to pragmatic reasons.

Supported by PTDC/DES/101224/2008 (FCOMP-01-0124-FEDER-009577).

1909 *Board #317* **MAY 30 3:30 PM - 5:00 PM**

The Effect of a Dynamic and Static Start on Snatch Pull Technique and Performance

Erich J. Petushek[1], Karen Roemer[1], Brett Hamlin[1], William P. Ebben[2], Breanne R. Carlson[3], Casey Mallo[3], Andy Tysz[3], Randall L. Jensen, FACSM[3]. *[1]Michigan Technological University, Houghton, MI. [2]University of Wisconsin-Parkside, Kenosha, WI. [3]Northern Michigan University, Marquette, MI.*

(No relationships reported)

The start and "first pull" phase of the snatch lift is important for weightlifting success, however, two styles are often displayed. The variations are a "static" and "dynamic" movement of the hips just prior to barbell liftoff. The differences in these technique variations have yet to be assessed in elite weightlifting athletes**.**

PURPOSE: To assess the differences between a static and dynamic start on snatch pull technique and performance at various loads**.**