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(No relationships reported)

Swimming acceleration and velocity are the net balance between Drag Force and Thrust. It is a standard procedure to do the decomposition of the Thrust-Time curve, assessing the swimmer's thrust. However, there is not a convention or standard procedure on the variables to be selected. Researchers report on regular basis either the Peak Thrust, Mean Thrust or Thrust-Time Integral. It is yet unclear to which extend these variables can be used, reported and interpreted interchangeably.

PURPOSE: To analyze the association between different thrust variables performing arm-pulls in competitive swimming.

METHODS: 671 front-crawl arm-pull cycles of 14 competitive swimmers were analyzed. Thrust was collected by an in-house built system composed by differential pressure sensors and underwater camera (Aquanex, Swimming Technologies, USA). A customised software (LabVIEW®, v.2017) was used to acquire (f=50Hz) and streaming time-series and video signal. Data was transferred to interface by a 14-bit resolution acquisition card (NI-6001, National Instruments, Austin, USA). Then, it was imported into a signal processing software (AcqKnowledge v.3.9.1, Biopac Systems, USA). It was extracted the Peak Thrust, Mean Thrust and Thrust-Time Integral of each arm-pull. Coefficients of Determination were computed between the three thrust variables.

RESULTS: All Coefficients of Determination were significant (P<0.001). Peak Thrust vs. Mean Thrust was R^2=0.49, Peak Thrust vs. Force-time Integral R^2=0.51, and Force-time Integral vs. Peak Thrust R^2=0.61. Interception on Y-axis at the origin of the pairwise variables noted in the same SI unit (i.e. Newton) were very close to zero (-1.6948<c<4.5029) and standard error of estimate acceptable (6.54<S<12.14).

CONCLUSIONS: There is a strong association between different thrust variables, even though the proportion of the variance is about 50-60%.

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Power Parameters Appear Less Important To Water Polo Success Than Motor Control

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(No relationships reported)

Conditioning programs for water polo players typically focus on muscular power to enhance the wrestling and shooting components of play. While improvements in strength training are easily quantifiable, the relationship between upper limb power and in-game performance has yet to be established.

PURPOSE: To test the effect of upper limb force parameters on offensive performance in women's water polo players.

METHODS: We conducted biomechanical testing on 12 D1 women's water polo players using Proteus (Proteus Motion, USA). After completing a familiarization and warm-up protocol, subjects performed a single set of 10 repetitions at 3lb of magnetic resistance in 3 different exercises: shoulder adduction, internal rotation of the shoulder while in horizontal abduction, and a throw motion. Proteus calculated peak power (PP), peak force development rate (PFDR), and consistency (accuracy of movement replication in 3D space during successive repetitions). The corresponding season statistics (2018-2019) were tabulated for assists, goals scored, and shooting percentage. Descriptive statistics characterized the sample; linear regressions tested the effect of PP, PFDR, and consistency on in-game performance.

RESULTS: During the test season, players scored 23.1±19.9 goals, had a shooting percentage of 41.6±12.1%, and accomplished 10.5±10.9 assists. In the throw motion, Proteus calculated a PP of 59.2±15.5 watts, PFDR of 104.3±33.0 watts/sec, and consistency of 81.0±8.7%. PFDR exhibited negative relationships with goals scored (p=0.021) and shooting percentage (p=0.049), and a non-significant negative relationship with assists (p=0.111). Similar relationships were found with throw PP as well as PP and PFDR in shoulder adduction and internal rotation; all corresponded to worse performance in every performance metric. Consistency in all motions had a positive, non-significant relationship with all performance metrics; statistical trends were reached with horizontal shoulder adduction in which consistency predicted 7.1% more goals (p=0.062) and 8.8% more assists (p=0.050).

CONCLUSIONS: These data provide preliminary evidence that skill-based fine motor coordination may be more valuable than power development in offensive performance in women's water polo.

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Core Temperature While Swimming In A Wetsuit During 1000-m Race Pace Swim

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(No relationships reported)

Majority of fatalities that occur in the sport of triathlon happen during the swim portion of the race (Harris et al., 2010, JAMA). The potential risk of death while swimming has raised safety concerns. The governing body, USA Triathlon (USAT), has implemented guidelines related to water temperatures and the use of wetsuits. The varying water temperatures allow for a wide selection of wetsuits. Using a wetsuit while swimming in warm water may increase body heat storage which could increase core temperature. Currently, there are only limited data on the influence of triathlon wetsuits on core temperature when swimming in warm water while swimming a short distance at a somewhat hard swim pace (Aura et al., 2019, MSSE).

PURPOSE: The purpose of this study was to examine core temperature while swimming a long distance (1000 m) at a fast pace in warm water (25.5 ℃) while wearing a wetsuit.

METHODS: Two experienced triathletes (mean ± standard deviation (SD), age 38.5 ± 23.3 years, height 1.83 ± 0.03 m, weight 80.1 ± 1.1 kg) participated in the study. At least 8 hours prior to attending the test session, participants swallowed an ingestible core temperature pill (BodyCap). Before beginning data collection, core temperature (T_c) data were transferred to a computer and sample rate was set to 0.1 Hz (1 sample every 10 s). Testing consisted of a self-directed warm up of 250-m followed by a 1000-m swim in an indoor pool (set to 25-m length) for each condition: no wetsuit (NW) and full sleeve wetsuit (FS). Participants swam at a self-selected pace at a "race pace" intensity (Borg Rating of Perceived Exertion = 16). Participants were required to rest until core temperature was within 0.5 ℃ of baseline before starting the next condition. Core temperature data were transferred to a computer after each swim. Average T_c of each swim was computed for analysis.

RESULTS: The average core temperatures of NW and FS were 37.75 ± 0.11℃ and 37.74 ± 0.46℃, respectively. The total swim time for the NW and FS conditions were 14:04 ± 1:43 and 13:05 ± 1:06 minutes. Mean stroke rate calculated for NW and FS were 30.12 ± 0.17 and 30.68 ± 0.45 strokes per minutes. Average swim speeds for NW and FS were 1.19 ± 0.15 and 1.28 ± 0.11 meters per second.

CONCLUSIONS: Based upon the analysis of the results, the use of a wetsuit while swimming in warm water does not influence core temperature.

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Is There An Optimal Vertical Ground Reaction Force Profile For Maximizing Jump Height In A Countermovement Jump?

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PURPOSE: The vertical ground reaction force (VGRF) during a countermovement jump (CMJ) is classically described with a single peak force occurring at the low position of the