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Asymmetry of force fluctuation during low-intensity isometric knee extension

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OBJECTIVE Although there are few reports on the asymmetry of force fluctuation (FF) in the muscles of the upper limbs, the asymmetry of FF in the leg muscles during <30% MVC remains unclear. The purpose of this study was to investigate the asymmetry of FF in the leg muscles during isometric knee extension at 10% MVC.
METHODS 20 healthy males (21±2 years) performed unilateral isometric knee extension that was measured by a strain gauge force transducer. After obtaining the maximal voluntary contraction (MVC), the subjects performed force matching tasks; sustained isometric knee extension for 15s at levels corresponding to 10%, 20%, and 30% MVC with the visual feedback. During the force matching tasks, the mechanomyogram (MMG) signal was detected by an accelerometer arrangement placed on the vastus lateralis, midway between the greater trochanter and the lateral condyle of the femur.
RESULTS (1) a greater FF and MMG-amplitude were found in the 30% MVC task than in the 10% or 20% MVC tasks; (2) a lower mean power frequency (MPF) of MMG was found in the 10% MVC task than in the 20% or 30% MVC tasks; (3) a greater FF and MMG-amplitude were found in the stronger limb in MVC than in the weaker limb in MVC at 30% MVC task; (4) no differences were found in FF and MMG-amplitude between the stronger and weaker limbs at 10% and 20% MVC tasks; (5) no difference was found in MPF-MMG between the stronger and weaker limbs at all tasks; and (6) significant positive correlations were found between the target force values and the FF at each contraction intensity.
DISCUSSION & CONCLUSION These results suggest that (1) FF asymmetry at intensities of MVC below 20% is not due to differences between the contraction intensities and discharge rate properties; (2) FF asymmetry at intensities of 30% MVC is found by the difference of discharge rate properties; and (3) FF increases with absolute load (i.e. target force value) by increased discharge rate variability, in same relative loads (i.e. % MVC).
KEY WORDS Force fluctuation, mechanomyogram (MMG), asymmetry, isometric contraction

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Path-flow analysis model for anthropometric, hydrodynamic and biomechanical variables in age-group swimmers

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OBJECTIVE The aim of this research was to develop a path-flow analysis model for age-group swimmer's speed based on anthropometric, hydrodynamic and biomechanical determinants. The theoretical model was developed according to main review papers about these determinants (e.g. Lavoie and Montpetit, 1986).
METHODS Thirty eight male swimmers (12.97±1.05 years-old) with several competitive levels were evaluated. It was assessed: (i) anthropometrical variables such as body mass (SECA, 884, Hamburg, Germany), height (SECA, 242, Hamburg, Germany), fat mass (Tanita, BC-545, Middlesex, UK), body surface area (Haycock et al., 1978); (ii) hydrodynamic variables including vertical buoyancy (Costa et al., 2009), prone gliding after wall push-off (Costa et al., 2009) and; (iii) the biomechanical variables stroke length, stroke frequency and velocity after a maximal 25-m swim with an underwater start being data recorded in the middle 15-m (Craig and Pendergast, 1979). Path-flow analysis was performed with the estimation of linear regression standardized coefficients between the exogenous and endogenous variables. When appropriate, according to the theoretical model, simple or multiple linear regression models were computed. The standardized regression coefficients (â) were considered and significance of each â was assessed with the t-Student test ($p<0.05$). The effect size of the disturbance term for a given endogenous variable, which reflects unmeasured variables, was 1-R2. To verify the quality of the model, root mean square residuals (RMSR) was computed.
RESULTS Confirmatory path-flow model can be considered as being close to the RMSR milestone, but even so not suitable of the theory (RMSR = 0.11).
DISCUSSION & CONCLUSION The confirmatory model excluded the vertical buoyancy and the relationship between height and fat mass.
KEY WORDS Swimming, children, performance, relationships

References
1. Costa AM, Silva AJ, Louro H, Reis VM, Garrido ND, Marques MC, Marinho DA. (2009). Can the curriculum be used to estimate critical velocity