Postactivation potentiation in sprint swimming performance

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Introduction: In sprint swimming, every instant is critical. Nowadays, is common to see how sprint swimmers prepare for racing by activating themselves on many different ways such as doing ballistic stretching, by increasing their breathing and heart rate, or by strongly clapping their chest or limbs. Therefore, it cannot be rejected the fact that sprint swimmers need to create an extra activation on their neuromuscular system in order to race at the best of their capacities. Many of those methods have been based on post-activation potentiation (PAP). A procedure which improves muscle contractility both in strength and speed through previously applying maximal or submaximal conditioning exercises on the muscle system. The aim of this study was testing different PAP protocols on sprint swimming performance. ***Methods:*** This study received the approval of the ethics committee of the research board's university and all the protocols accomplished with the declaration of Helsinki regarding the use of human subjects. Thirty trained swimmers volunteered to participate on this study and signed informed consent. First of all, all the swimmers were obtained the maximal repetition lifting load (RM), through strength tests consisting on an incremental load repetition test both for lower and upper limbs. In order to obtain results related to specific swimming-movements, PAP methods were extrapolated from experimental conditions and tested on a swimming start performance. Free-weight load lifting and maximal eccentric flywheel contractions simulating the movement of a swimming start were tested. Kinetic and kinematic variables of performance were obtained through a dynamometer experimental block start station and by photogrammetry. Individual's strength index were also discussed and related to the results. Finally, conditioning exercises simulating arm strokes in swimming through free-weight and eccentric flywheel were tested on the variables of competition of a swimming race. ***Results:*** Swimming starts were able of being improved through PAP as velocity at take-off was higher, specially after eccentric warm-up protocols. These improvements would come from improvements on the vertical vectors of force/impulse developed by the lower limbs on the block. In fact, stronger athletes seemed to react better to PAP protocols, possibly because myosin phosphorylation (main PAP precursor) is more frequent on type II fibers. The first meters of a swimming race might be improved by using PAP. However, some swimming patterns as stroke length might be deteriorated along the race. ***Conclusion:*** Fatigue and potentiation co-exists as responses of PAP, therefore, it generates very individualized responses, specially in males. Positive results might be obtained from

applying PAP methods on the swimming start impulse although is still needed finding a suitable intensity for the conditioning exercises applied on upper limbs. ***Acknowledgements:*** DEP2014-59707-P: SWIM: Specific Water Innovative Measurements, applied to the development of International Swimmers in Short Swimming Events (50and100m).