# A dynamometric central for 3d forces and moments assessment in swimming starts

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## INTRODUCTION

Over the years, swimming start technique has evolved in close relationship with the modifications in the swimming rules and technologies developed to assist the swimmers action and to evaluate its proficiency, inspiring new research directions (Vantorre et al., 2010). As sprint swimming events classifications can be decided by very small margins (e.g. 0.01 s), sport engineers and biomechanists aimed optimizing instrumented starting blocks for more/multi-conditions analysis purposes (de Jesus et al., 2014). The noticeable technological advances provided by these devices supply swimmers and coaches with new opportunities for assessment and training of technical elements of swimming race as starts and turns. The purpose of this study was to reveal the value of using an instrumented starting block (3D dynamometric central), developed at the University of Porto, as a tool to diverse analysis purpose. Moreover, this review aims describing running research trends in assessment and training in swimming starts and turns optimisation.

## METHODS

To upgrade knowledge in swimming starts and turns researches, this study reviews literature from swimming specific publication, proceedings of scientific conferences and academic thesis (PhD).

## RESULTS

The design and construction of a 3D force plate prototype, which might be use as a modular sensor of an instrumented starting block, was described by Mourao et al. (2016). The linear static and model simulations shown that the dynamometric central might be used as a tool for starts and turns detailed analysis (Vilas-Boas et al. 2014). Evaluation of value in use was performed during a large number of data acquisitions taking place in Porto University under the patronage of LABIOMEP, the University of Porto Biomechanics Laboratory. These experiments provided results proving that swimming start and turns performance evaluations are an invaluable tool for technical optimisation for all level swimmers. Different studies were conducted, including biomechanical analysis of starts and turns, considering different positioning of upper and lower limbs on starting block and its configuration on changes in performance, comparison to results from land tests, as well as analysis of dynamical asymmetry. Moreover, the high sensitivity of the device allows specific physical analysis of swimmers actions.

## CONCLUSIONS

The Portuguese 3D dynamometric central could be considered as the most modern and versatile instrumented starting block complying with the FINA facilities and starting rules, allowing independent measurement of external forces and moments performed by each limb, independently, at ventral and dorsal starting and turning techniques.

## REFERENCES

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