## 28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Quantification of pulling force during a incremental rowing test in para-athletes: pilot study

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## INTRODUCTION:

The scientific literature identifying the physiological and biomechanical factors of performance in able-bodied rowers allows for the characterization of expectations in both novice and high-level rowers (Lawton 2012, Smith 2012). This work allows the identification of indicators associated with cardiorespiratory, muscular, and gestural capacities during muscle, boat, and rowing tests. Despite this work, few have focused on the development of pulling force during rowing tests. Indeed, only Curtler (2016) reports a decrease in strength when the athlete is found to be able to use only their arms, or only their arms and trunk compared to the arms, trunk, and legs condition. Although not focused on para-athletes, this study questions the impact of muscle deficit on athletic performance. The objective of this study is to characterize the pulling force developed by the national and elite para-athletes during incremental rowing VO2 max Test. **METHODS:** 

6 para-rowers of national and elite level perform a 3-minute incremental test with 30 seconds of recovery on a rowing machine (RowErg, Concept C2, USA). The pulling force is recorded during the test (K-Pull, Kinvent, France). The temporal parameters of the cycle as well as the maximum pulling force and its onset were calculated for each cycle at each level. The percentage difference between the penultimate and the last level was calculated for each biomechanical parameter [median Q1-Q3]. **RESULTS:** 

The 6 athletes achieved 4 or 5 validated landings. Concerning the biomechanical performance parameters, we observed a 13% [10-15] decrease in cycle time between the penultimate and the last stage, which was accompanied by a 13% [10-14] increase in cadence. Logically, the pull phase increases (5% [5-7]) less than the return phase decreases (17% [12-22]). While the pull force also increases (5% [4-8]), the analysis of the onset of peak force remains almost identical at all levels (14±1.3%). This last parameter underlines that despite the different motor deficits, the athletes have the capacity to develop a quasi reproducible force at each cycle of each level.

CONCLUSION:

This pilot study identifies that the adaptations of the performance parameters are in agreement with the literature. The analysis of the pulling force highlights a low variability of the appearance of the peak in the cycle. These results seem to indicate a technical reproducibility of the para-rammers independently of their level of motor deficit. This last point may allow the identification of the expected level of motor expertise. References

Lawton et al. Strength testing and training of rowers: a review. Sports Med. 2011

Smith et al. Measures of rowing performance. Sports Med. 2012

Cutler et al. Comparing para-rowing set-ups on an ergometer using kinematic movement patterns of able-bodied rowers. J Sports Sci. 2017

Topic: Sports Medicine and Orthopedics

Presentation

Poster

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