

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

Mechanical power output at 4 mmol/L blood lactate of elite junior rowers is associated with long-term career attainment

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## INTRODUCTION:

It is well established that successful rowers exhibit larger anthropometrical characteristics and higher laboratory-based performance than their less successful peers. While talent identification programs in juniors typically include performance and anthropometric variables, their effect on long-term career attainment has not been sufficiently examined. Similar to a previous study focusing on anthropometrics [1], we aimed to assess the effect of laboratory-based performance outcomes on long-term career attainment in elite junior rowers.

## METHODS:

Retrospectively, 976 junior German national team rowers (female n=427) from 1992-2018 were grouped according to their highest progressive career level, being U19-, U23-, Senior World Championships (WCh), or Olympic Games (OG). We analyzed differences in absolute (P4) and allometrically scaled (P4-index= $P4/(\text{body mass} + 15)^{2/3}$ ) power output at 4 mmol/L blood lactate (5-6x4min step test) and tested their effect on long-term career attainment. Therefore, a one-way ANOVA with post-hoc test (Bonferroni correction) and proportional odds model (POD) with odds ratio (OR) analysis was applied.

## RESULTS:

Distribution for those female and male rowers reaching the U19-level as highest progressive career level was 53.4% (P4  $231 \pm 18$  W, P4-index  $11.8 \pm 0.8$  W/(kg+15)<sup>2/3</sup>) and 52.8% (322  $\pm 24$  W,  $14.9 \pm 1.0$  W/(kg+15)<sup>2/3</sup>), reaching U23-level: 26.9% (235  $\pm 18$  W,  $12.1 \pm 0.9$  W/(kg+15)<sup>2/3</sup>) and 29.9% (337  $\pm 27$  W,  $15.4 \pm 1.2$  W/(kg+15)<sup>2/3</sup>), reaching WCh-level 10.1% (239  $\pm 18$ ,  $12.3 \pm 0.9$  W/(kg+15)<sup>2/3</sup>) and 7.1% (344  $\pm 26$  W,  $15.6 \pm 1.0$  W/(kg+15)<sup>2/3</sup>), reaching OG-level 9.6% (247  $\pm 18$  W,  $12.7 \pm 0.9$  W/(kg+15)<sup>2/3</sup>) and 10.2% (353  $\pm 30$  W,  $16.0 \pm 1.2$  W/(kg+15)<sup>2/3</sup>), respectively. We calculated significant medium to large effects for P4 (F(3,426) = 9.504, p<.001,  $\eta^2 = 0.063$  and F(3,548) = 31.937, p<.001,  $\eta^2 = 0.150$ ) and P4-index (F(3,426) = 16.320, p<.001,  $\eta^2 = 0.104$  and F(3,548) = 24.201, p<.001,  $\eta^2 = 0.118$ ) among female and male progression levels. Further, both P4 (OR=1.024, p<0.001 and 1.029, p<0.001) and P4-index (OR=1.983, p<0.001 and 1.872, p<0.001) had significant effects on career attainment in females and males.

## CONCLUSION:

Our findings suggest that higher P4 and P4-index within a group of adolescent elite junior rowers are associated with long-term career progression in international elite rowing. Importantly, in females the allometrically scaled P4-index had larger effects compared to unscaled P4. Our data set may be used as thresholds associated with career success. However, as maturation to the elite senior level is inherently multi-dimensional, laboratory-based performance outcomes like P4 must not be exclusively used for talent identification. Rather, a holistic approach including at least anthropometric, physical, skill, and mental variables should be applied.

1.Winkert et al. (2018)

Topic: Training and Testing

Presentation: Poster

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