

Modelling of critical power from road data

B Karsten¹✉, S Jobson², J Hopker³, L Stevens¹ and C Beedie⁴

Abstract

Background: Performance tests are an integral part of evaluating competitive cyclists. Despite all technological and physiological advances, limited research has been performed addressing the translation of standardized, relevant laboratory tests into the field and consequently into “real world” cycling (i.e. González-Haro et al., 2007: British Journal of Sports Medicine, 41(3), 174–179; Quod et al., 2010: International Journal of Sports Medicine, 31(6), 397–401; Nimmerichter et al., 2010: International Journal of Sports Medicine, 31(3), 160–166). For continuous activities between approximately 2 and 30 minutes, the assessment of Critical Power (CP) is one such relevant test. Compromising ecological validity, to date CP testing is mostly constrained to the laboratory.

Purpose: To investigate a novel CP road testing protocol.

Methods: Laboratory determined CP values using a 30 min intra-trial recovery period (Bishop & Jenkins, 1995: European Journal of Applied Physiology and Occupational Physiology, 72 (1-2), 115-120) were compared with those determined in the field, i.e. on the road. The experiment comprised of planned maximal efforts of 12 min, 7 min and 3 min with a 30 min recovery period between efforts. Linear regression was used to determine CP using the work-time equation ($W = CPT + W_{\square}$).

Results: There was no significant difference between laboratory and road CP values. The mean difference between the two environments was 0 ± 5.5 W. The standard error of estimates was 1.7% and limits of agreement were $-10.8 - 10.8$ W (Fig. 1).

Discussion: Results suggests that CP can be tested on the road. Gonzales-Haro accepted their incremental velodrome field test as being valid with reported limits of agreement of 130 W to -24 W and a random error of 13.9%. Our limits of agreement values are considerably higher and standard error of estimate values are considerably lower than those reported by Gonzales-Haro. The experimental protocol provides a practical and easy to use alternative to the conventional testing protocol for coaches and athletes when determining CP in on the road.

Conclusion: The aforementioned research provides support for the acceptance of road CP performance testing using a 30 min inter-maximal effort recovery period.

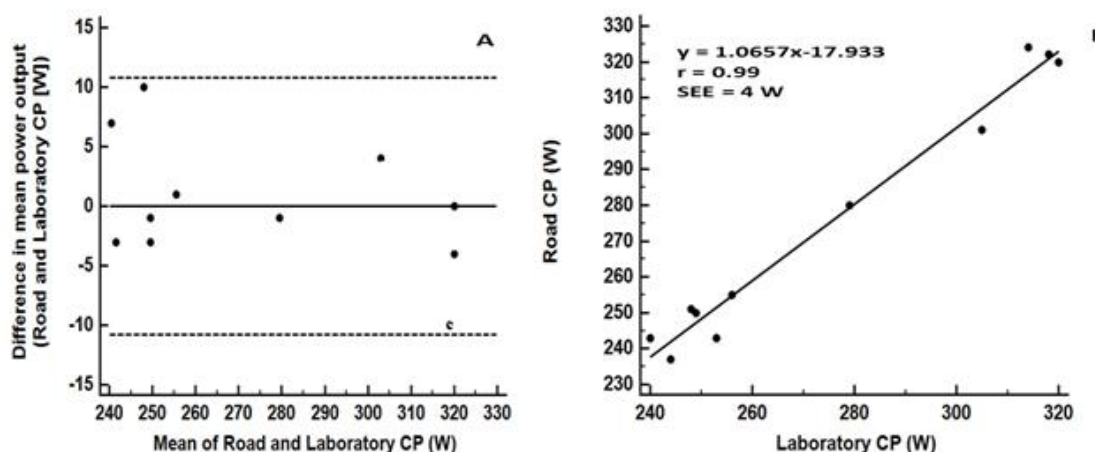


Fig. 1 Bland-Altman plots of the limits of agreement (panel A) and the relationship (panel B) between laboratory CP and road CP (W). In panel A the horizontal line represents the mean difference between laboratory CP and road CP, and the dashed line represents 95% LoA.

✉ **Contact email:** kb20@gre.ac.uk (B. Karsten)

¹ Centre for Sports Science and Human Performances, University of Greenwich, Chatham Maritime, United Kingdom

² Department of Sport Studies, University of Winchester, Winchester, United Kingdom

³ School for Sport and Exercise Sciences, University of Kent, Chatham Maritime, United Kingdom

⁴ Department of Sport and Exercise Science, ABER, Aberystwyth, United Kingdom

Received: 1 May 2014. Accepted: 1 June 2014.