Journal of Science and Cycling

Breakthroughs in Cycling and Triathlon Sciences

Special number: World Congress of Cycling Science 2015, 1/2 July 2015, Utrech

Editors: Mikel Zabala (PhD)
Greg Atkinson (PhD)

Science & Cycling
1 & 2 July 2015, Utrecht

CRC

OPEN ACCESS

www.jsc-journal.com

BOOK OF ABSTRACTS Open Access

Validity of the Wahoo KICKR Power Trainer and Reliability of a 4 km Cycle Time Trial

Emma K Zadow[1] ✉, James W Fell[1], Stuart T Smith[1], Cecilia M Shing[1]

Abstract

***Purpose*:** To assess the validity of power and the reliability of a 4 km cycle time trial (TT) using the Wahoo KICKR Power Trainer.

***Methods*:** The Wahoo KICKR power output was assessed using a dynamic calibration rig (DCR) over power outputs of 100-600 W at cadences of 80, 90 and 100 rpm. Twelve trained male cyclists (mean ± SD; age: 34.0 ± 6.5 years, height: 178.4 ± 6.2 cm, body mass: 76.8 ± 9.6 kg) completed three 4 km TTs on the Wahoo KICKR, each separated by a minimum of two and a maximum of three days. Mean power (W), cadence (rpm), speed (km.h-1), heart rate (bpm) and total time (s) were recorded for each TT while ratings of effort (0-10) and sessional ratings of perceived exertion (6-20) were collected immediately and 10 mins post each TT.

Results: Bias for differences in power (%) recorded by the Wahoo KICKR to the DCR was 0.8% (95%LOA -4.0-5.6%) (Figure 1). Average ICC between trials (2-1, 3-2, 3-1) for power was 0.95 (95%CI 0.89-0.98), cadence 0.80 (95 %CI 0.60- 0.92), speed 0.70 (95%CI 0.46- 0.88), heart rate 0.93 (95%CI 0.85- 0.98) and total time 0.75 (95%CI 0.53-0.90). Coefficient of variation was 2.9%, 4.5%, 3.7%, 1.5%, 3.6% for power, cadence, speed, heart rate and total time, respectively (Table 2).

Results: sIgA concentrations (μg.ml^{-}) before and after the treadmill were [mean 595, s = 64.6 and mean 841, s = 76.3] and before and after the bike were [mean 593.9, s = 51.1 and 778.8 s = 99.3]. sIgA secretion rates (μg.min^{-}) before and after the treadmill were [mean 396.2, s = 73.7 and 223 s = 99.6] and before and after the bike were [mean 284.1, s = 74.3 and 216.6, s = 29.5]. Saliva flow rates (μl.min^{-}) before and after the treadmill were [mean 657.8, s = 92.2 and 289.3, s = 56.6] and before and after the bike were [mean 487.2, s = 123.3 and 319.5, s = 66.5]. The results indicated that sIgA secretion rate ($P < 0.028$) and saliva flow rate ($P < 0.01$) were significantly decreased following the 2 hour treadmill protocol but not the 2 hour bike protocol. sIgA concentration was also significantly elevated following the treadmill ($P < 0.01$), with no significant increase following the bike protocol.

Conclusion: These results suggest that when compared to a DCR, the Wahoo KICKR Power Trainer displays a small mean bias across all measures of power, with caution to be applied at the lower ranges of power output (<200 W). When completed on the Wahoo KICKR Power Trainer, a 4 km TT in trained cyclists is highly reproducible.

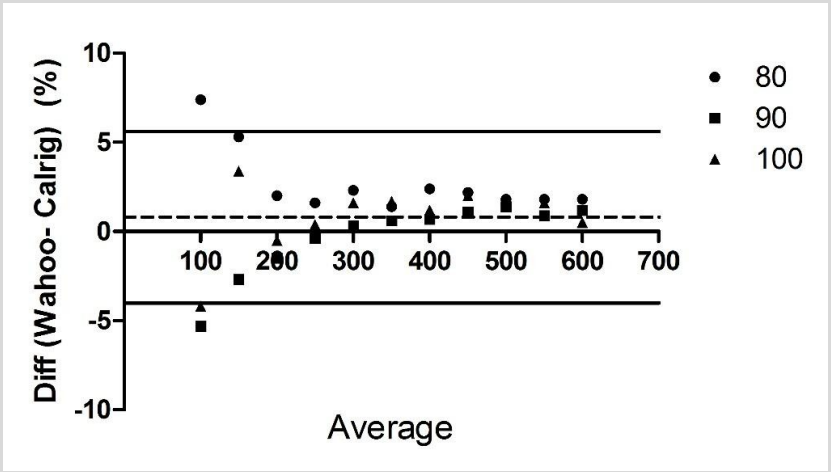

Figure 1. Bland-Altman plot of the differences in mean power output as a (%) between the dynamic calibration rig and the Wahoo KICKR Power Trainer at) 80 rpm,) 90 rpm,) 100 rpm. Solid line represents the bias. Dashed lines represents 95% limits of agreement.

Table 1. Mean within –participant intraclass correlation coefficients (ICC) and typical error as a coefficient of variation (%) between trials. Data are presented as mean (95% CI).

	Mean power (W)	**Mean cadence (rpm)**	**Mean speed (km/h)**	**Heart rate (bpm)**	**Total Time (s)**
$ICC^{(2\ to\ 1)}$	0.97 (0.91- 0.99)	0.78 (0.36- 0.93)	0.36 (-0.24- 0.76)	0.97 (0.89- 0.99)	0.51 (-0.05- 0.83)
$ICC^{(3\ to\ 2)}$	0.92 (0.75- 0.98)	0.87 (0.58- 0.96)	0.70 (0.23- 0.90)	0.90 (0.68- 0.97)	0.77 (0.38- 0.93)
$ICC^{(3\ to\ 1)}$	0.80 (0.45- 0.94)	0.34 (-0.29- 0.77)	0.49 (-0.08- 0.82)	0.75 (0.34- 0.29)	0.54 (-0.02- 0.84)
Mean	**0.95 (0.89- 0.98)**	**0.80 (0.60- 0.92)**	**0.70 (0.46- 0.88)**	**0.93 (0.85- 0.98)**	**0.75 (0.53- 0.90)**
$CV^{(2\ to\ 1)}$	2.4 (1.7- 4.0)	4.9 (3.4- 8.8)	4.5 (3.1- 7.7)	1.1 (0.8- 1.8)	4.7 (3.3- 8.2)
$CV^{(3\ to\ 2)}$	3.8 (2.7- 6.5)	3.5 (2.4- 6.2)	3.9 (2.7- 6.7)	1.9 (1.3- 3.2)	3.6 (2.6- 6.2)
$CV^{(3\ to\ 1)}$	3.8 (2.7- 6.5)	6.8 (4.7- 12.2)	4.4 (3.1- 7.5)	2.2 (1.6- 3.8)	4.0 (2.8- 6.9)
Mean	**2.9 (2.4- 3.8)**	**4.5 (3.6- 6.1)**	**3.7 (3.0- 4.8)**	**1.5 (1.2- 2.0)**	**3.6 (2.9- 4.7)**

✉ **Contact email** emma.zadow@utas.edu.au (E. Zadow)

[1] University of Tasmania, Department of Health Sciences