

# The Effects of Morning Preconditioning Protocols on Testosterone, Cortisol and Afternoon Sprint Cycling Performance



## Introduction

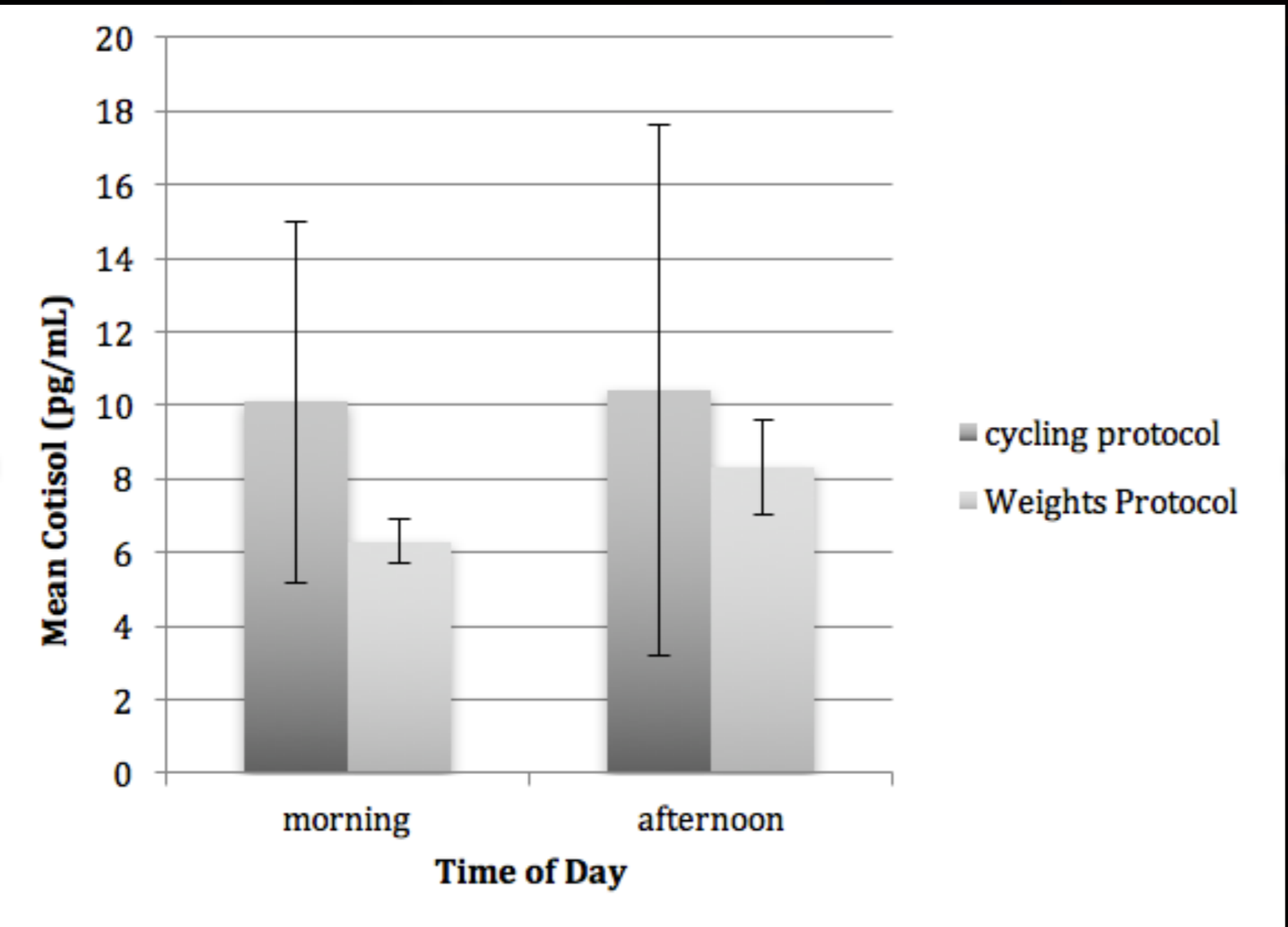
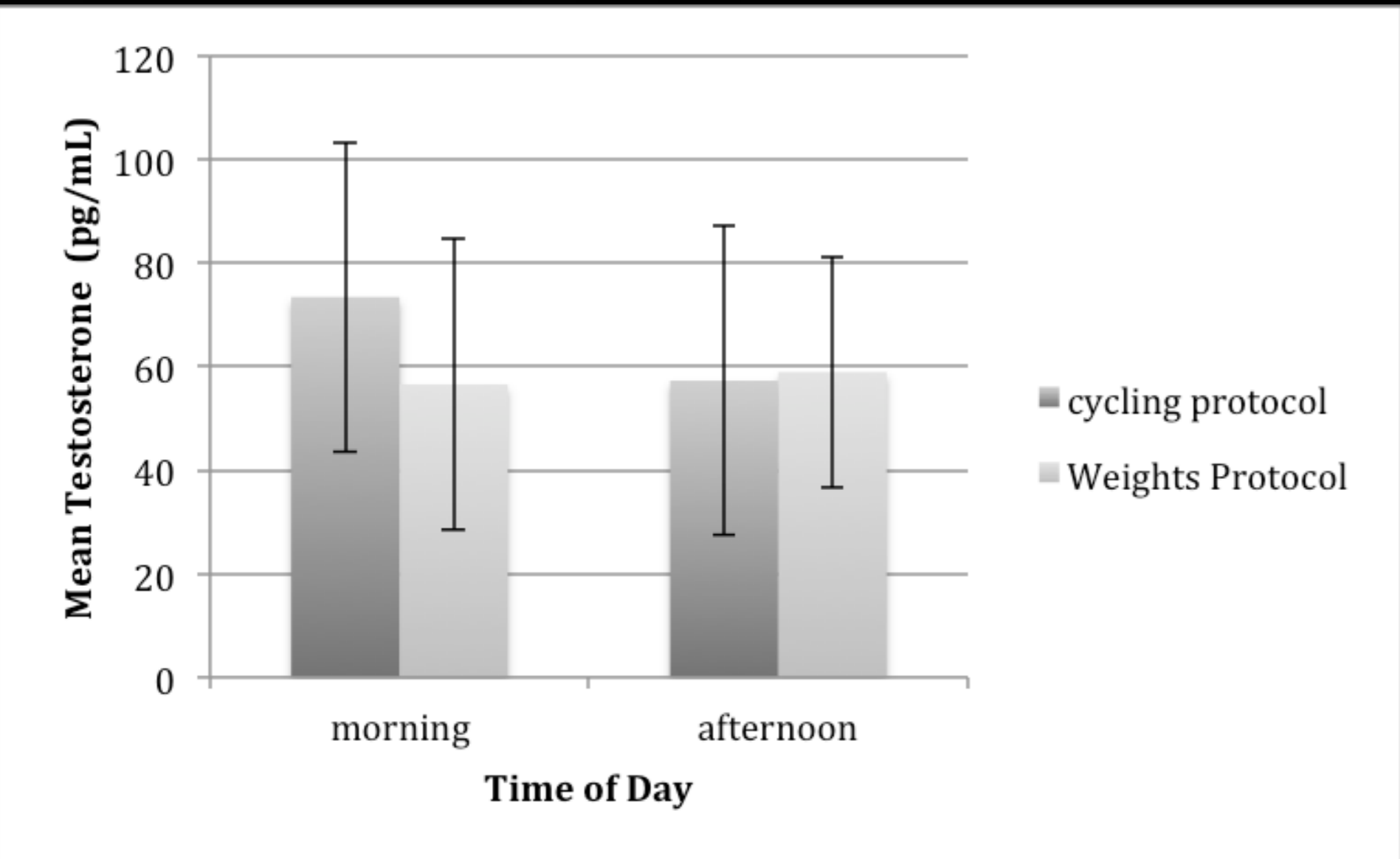
Kerin McDonald & Dr. Peter Maulder



With a large number of sporting events being contested in the late afternoon and evening, a window of opportunity exists for athletes to undertake a morning exercise protocol in an attempt to potentiate performance. To date only a relatively small body of research pertaining to this topic has been conducted with performance measures mainly focusing on strength and power (1, 2, 3, 4). This study was therefore established to investigate the effects of two morning exercise protocols on 500m track cycling performance.

## Method

One female and three male elite track sprint cyclists (age  $24.5 \pm 5.5$  years; height  $182.3 \pm 6.7$  cm; body mass  $86.3 \pm 11.7$  Kg; training years (sprint cycling)  $4.5 \pm 3.1$  years; training years (strength)  $6 \pm 3.2$  years) were randomly assigned to either a morning cycling (Cyc) protocol (4 standing starts consisting of 6 maximal effort pedal strokes with gearing set at 10% above individual race gearing) or a comparable weights (W) based protocol (4 sets of 3 back squats at 50%, 80%, 90% and 100% of 3RM (1)). 5.5 hours after completing the allocated morning exercise protocol (P) a 500m cycling time trial was conducted. A repeated measures, counterbalance crossover design was implemented with testing days separated by 7 days to allow for a comparison of time trial performances. Heart rate, blood lactate, testosterone (T) and cortisol levels were measured in the morning and afternoon along with peak power (PP) from an inertial load cycle ergometer test.



500m Mean Split Times (seconds) Following a Morning Cycling and Weights Protocol							
	Cycling Mean	SD	Weights Mean	SD	P Value	Change in mean %	Change in mean as Cohen ES
0-125	11.98	±0.28	11.92	±0.24	0.439	-0.3	-0.09
125-250	7.31	±0.38	7.3	±0.33	0.596	-0.2	-0.03
250-375	7.02	±0.45	7	±0.43	0.149	-0.3	-0.03
375-500	7.19	±0.52	7.15	±0.54	0.085	-0.5	-0.06
250-500	14.21	±0.96	14.16	±0.97	0.018	-0.4	-0.04
500m TT	33.48	±1.6	33.37	±1.5	0.128	-0.3	-0.05

## Results

Inertial cycle ergometer peak power (PP) highly correlated with 500m performance times for both W and Cyc protocols ( $r = -0.903$ ,  $r = -0.909$  respectively). Am to pm change in PP following WP significantly ( $p = 0.027$ ) increased by 2.6%. 500m times were not significantly different between protocols (WP= $33.37 \pm 1.5$  sec, CycP= $33.48 \pm 1.6$  sec). WP produced significantly ( $P = 0.018$ ) faster times between 250-500m in comparison to CycP ( $14.16 \pm 0.97$  sec,  $14.21 \pm 0.96$  sec respectively) (Refer to table). The circadian decline of saliva T during the day was observed after the CycP (Delta -28.2%) but was however mitigated following the WP (Delta 15.5%). While the net difference in T change scores was 54.9%, afternoon T levels between protocols were comparable (CycP pm T  $57.31 \pm 29.79$ pg/mL; WP pm T  $58.96 \pm 22.28$  pg/mL). Cortisol levels increased from am to pm under both protocols (CycP am  $10.1 \pm 4.9$  pg/mL, pm  $10.4 \pm 7.2$  pg/mL; WP am  $6.3 \pm 0.6$  pg/mL,  $8.3 \pm 1.3$  pg/mL) with a significant ( $p = 0.004$ ) change recorded following the WP (Refer to figures).

## Discussion

While slight decreases in 500m times were experienced after the WP, they are considered within the normal variations experienced between performances by elite athletes (5). Differences in morning T levels between protocols may be due to athletes motivation to complete each protocol. The effect of the WP on the circadian rhythm of T could be linked to the greater number of muscle fibers innovated and increased duration of time muscular structures were loaded (6). Interestingly WP had the greatest positive effect on T and 500m TT performance for the female participant within the study.

## Conclusion

While findings from this study indicate that elite sprint cyclists who undertake a morning WP do not experience a worthwhile increase in 500m cycling performance compared to a CycP, they do improve performance over the final 250m. Furthermore a WP was seen to attenuate the circadian decline of both T and cortisol. Possible gender and individual responses from conducting a W over Cyc protocol may exist but requires further investigation.

## Recommendations

- Further research investigating the optimal time frame following morning precondition to potentiate evening performance is required.
- The use of a heavy resistance morning exercise protocol is recommended for positively effecting testosterone levels in the afternoon.
- To better understand the effect of each protocol it is recommended that future studies engage a larger number of participants and focus on a specific gender.

## References

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