

Increased physical effort overrides the potentially deleterious effects of resource depletion following self-control

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Abstract

Background: Long duration cycling events require riders to maintain concentration and self-control over lengthy periods, for example, listening to race plans and/or eave-dropping on conversations of other riders whilst maintaining pace and bike control. Self-control is the deliberate effort to override a dominant response such as an emotion or thought with a response perceived to benefit goal attainment. Evidence suggests that self-control is an effortful process that draws upon both physiological and psychological resources (Gailliot et al., 2007: *Journal of Personality and Social Psychology*, 92 (2), 325–336). Thus, if effortful self-control draws upon physiological resources, then it could hamper endurance performance which utilises the same physiological substrates. However, recent research has questioned this explanation suggesting self-control might be more about resource allocation (Beedie & Lane, 2012: *Personality and Social Psychology Review*, 16(2):143-53).

Purpose: The purpose of the present study was to examine the effects of doing self-control tasks on cycle performance and emotion regulation. In a dual-task design, one task (bicycle ride) was personally meaningful and a second task (Stroop task) had unknown personal meaning. We hypothesised that by recruiting participants to a task that was personally meaningful, individuals' emotions would act as a signal to mobilise resources to overcome the potentially deleterious effects of resource-depletion deriving from the Stroop task. We predicted that performance on the Stroop task would deteriorate as participants re-allocated resources to the primary task.

Methods: 43 participants were randomly assigned to one of two conditions: an experimental condition comprising two self-control tasks performed consecutively and a control condition in which two tasks were performed consecutively but only one required self-control. The procedure was as follows: 1) Stroop task 2) Bicycle ride; 3) Stroop task; 4) Bicycle ride, 5) Stroop task. A modified version of the classic Stroop colour-word task was employed using shapes and colours. In the (non-depleting) control condition, shapes were presented in their respective shape and colour (e.g., the word "green" and shape "triangle" was presented in green ink and as a triangle). In the (depleting) experimental condition, the word and ink colour was incongruent with the shape (e.g., the words "green triangle" appeared below a red square in red font colour). Participants rated their emotions before and after both bicycle rides. They were all asked to rate how important it was to perform well.

Results: Cycle performance results indicated performance was fastest in the second trial (194 ± 48 s vs 212 ± 45 s) than the first trial (213 ± 39 s vs 230 ± 41 s) with no significant differences between the control and experimental group, hence suggesting the first self-control did not impair performance. Improved performance was matched with increased heart rate across trials for both the control (130 ± 19 bpm vs 136 ± 19 bpm) and experimental groups (125 ± 22 vs 133 ± 21 bpm). In contrast, the rate of improvement for the Stroop was significantly faster among the control group compared to the experimental group across all three tasks (18.38 ± 5.27 vs 24.17 ± 5.67 s; 17.54 ± 4.86 vs 23.12 ± 4.51 ; 16.39 ± 4.70 vs 22.08 ± 3.25).

Discussion: In support of our hypothesis, bicycle performance improved following completion of the Stroop task. In contrast to previous findings, final Stroop performance also improved suggesting that there could be a transfer effect. Our findings are consistent with recent research that has argued that cognitive and affective theory (Beedie & Lane, 2012) provides a better fit to deficits in self-control than the strength model (Gailliot et al., 2007).

Conclusion: These findings provide experimental evidence that self-control ability is temporarily impaired following a separate, unrelated self-control task. However, if participants are sufficiently motivated to perform well, then increased physical effort may improve self-control behaviour and this appears to transfer across tasks.

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