UNIVERSITY OF TORONTO

Flipping the Self-Control Switch

A novel within-subject paradigm to test the effects of ego depletion

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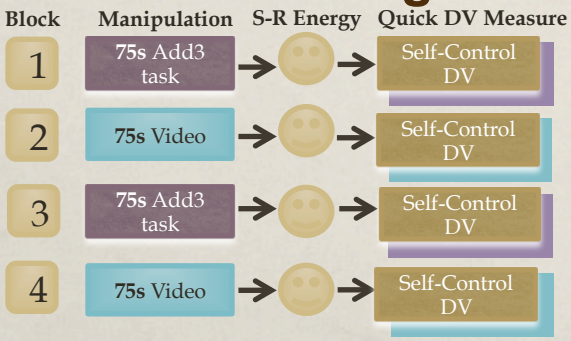
Introduction

- Ego depletion is a specific type of mental fatigue caused by 'using up' self control, characterized by difficulty performing subsequent (different) self-control tasks and subjective fatigue (Hagger et al., 2010)
- Ego depletion research has traditionally relied on a single between-subject design
- Ego depletion has recently come under criticism for frequently underpowered studies, an artificially inflated effect size due to publication bias, and failures to replicate (Carter & McCullough, 2013, 2014)
- In response, we have created a repeated-measures, statistically-powerful method for testing ego-depletion

The Paradigm



- Add3 task: Effortful task where participants must remember four numbers and add 3 to each. Numbers 'wrap around'. ex. 4591 becomes 7824 (Kahneman, 2011)
- Self-reported energy was measured on a sliding scale from 1 (fatigued) to 100 (energized)
- Analyzed in R with multi-level modeling

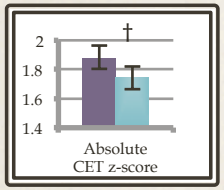
Methods & Results

- **Study 1a: Cognitive Estimation Task**
  - 44 in-lab undergrads; 22 blocks
  - DV: 3 CET; affected by depletion (Vohs, 2012)
  - Consistent difference in self-reported energy manipulation check (B=9.6, p<.0001) across all studies

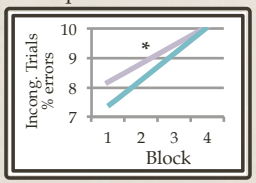
How old was the oldest figure skater to win an Olympic medal?

Depleted

Rejuvenated



- **Study 1b: CET Replication**
  - 68 online M-Turkers; 12 blocks
  - Replicated above results, p=.02
  - The effect diminished with time (see summary)
- **Study 2: Flanker Task**
  - 40 in-lab undergrads; 18 blocks
  - DV: 90 seconds of reaction time flanker task, number of incongruent errors (controlling for cong. errors)
  - Significantly more incong. errors during depletion blocks at the beginning of the experiment (interaction)
  - Depletion errors were not due to faster reaction times



Respond to center letter:
SSHSS

- **Study 3: Solving Anagrams**
  - 72 in-lab undergrads; 16 blocks
  - DV: 90 seconds to solve anagrams (one per screen)
  - Depleted participants spent more time before skipping unsolved anagrams, indirectly resulting in fewer correctly solved anagrams

ARINB

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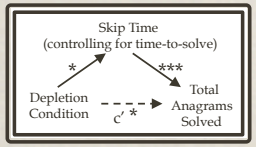
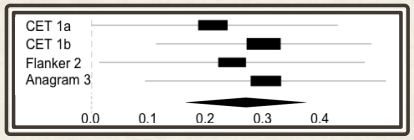
Skip



Summary

Dependent Variable (Study #)	Depletion Effect (B)	Block Effect (B)	Depletion x Block B)
CET (1a)	**.07, p=.06**	**.009, p=.01**	-.01, p=.25
CET (1b)	**.05, p=.03**	-.043, p=.17	**-.054, p=.02**
% Incong. Errors (2)	.25, p=.55	**.38, p<.001**	**-.13, p=.04**
Anagrams Skip Time (3)	**.42, p=.02**	**-.58, p<.001**	**-.08, p=.06**

Meta-analytic depletion effect on task performance
Cohen's d =.27
in first 6 blocks



Conclusions

- Ego depletion exists and can be studied using a within-subject, repeated measures design.
- This paradigm reliably affects self-reported fatigue (meta-analytic d = .51, 95% CI [.41,.61]).
- Depletion's effects on three tasks were successfully replicated using shortened, repeated versions.
- Reduced performance on anagram-solving tasks may be due to inefficient strategy or time-use.

References

Carter, E. C., & McCullough, M. E. (2013). Is ego depletion too incredible? Evidence for the overestimation of the depletion effect. *The Behavioral and Brain Sciences*, *36*(6), 683–4; discussion 707–26.
Carter, E., & McCullough, M. (2014). Publication bias and the limited strength model of self-control: has the evidence for ego depletion been overestimated? *Frontiers in Psychology*, *5*, 823.
Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: a meta-analysis. *Psychological Bulletin*, *136*(4), 495–525.
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