Commentary on Kurzban, Duckworth, Kable, & Myers, *Behavioral and Brain Sciences*

The Opportunity-Cost Model: Automaticity, Individual Differences, and Self-Control Resources

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Abstract

I contend that Kurzban et al.'s model is silent on three issues. First, the extent to which opportunity-cost computations are automatic or deliberative is unclear. Second, the role of individual differences in biasing opportunity-cost computations needs elucidating. Third, in the absence of 'next-best' tasks, task persistence will be indefinite, which seems unfeasible, so perhaps integration with a limited-resource account is necessary.

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The scope and ambition of Kurzban et al.'s model is commendable. I believe it advances understanding of mental fatigue and task performance and integrates hitherto disparate literatures on mental fatigue, self-control, and vigilance. My comments focus on areas that remain to be elucidated the model that I hope will further the debate on the link between mental fatigue and task performance. I will confine my comments to three main areas: automaticity and conscious awareness, the role of individual differences, and resource depletion models of self-control.

I felt it was unclear as to the extent to which the processes outlined in the model were automatic and outside the subjective experience of the individual, or whether the processes were, at least in part, driven by deliberative decision-making. This opens the question as to which kind of cognitive system(s) control(s) the opportunity-cost computations. The implication is that the computations occur outside conscious awareness and the phenomenology of subjective fatigue is a by-product signalling the effort involved and regulating task performance accordingly. However, the worked example involving 'next-best' alternatives to the task at hand (e.g., daydreaming, using smartphone) implies some conscious awareness of these as viable alternatives. The problem here is the extent to which individuals will have a clear representation of these alternatives if we were, for example, to apply the model to understand persistence and fatigue on tasks presented in laboratory environments where other alternatives are relatively limited (other than the "background" alternative of daydreaming). I found Kurzban et al.'s account relatively silent on this matter

and there were occasions where the authors' narrative implied deliberative decision-making processes (e.g., "We can think of this participant as having a *choice* [emphasis added] between performing those calculations or, alternately, daydreaming)".

Another illustration lies in the use of the Stroop task as an analogy for the proposed opportunity-cost computations. The performance decrements experienced on incongruent Stroop tasks is due to competition between the visual and word-naming systems leading to a response-inhibiting processing 'bottleneck'. This is an automatic process; individuals have no subjective awareness of the interference or control over whether or not their visual system reads the presented words. So, while this competition in processing systems may be the cause of subjective fatigue, it is independent of, and different to, the opportunity cost decision-making process involved in whether to persist with the task or select an alternative. So I think this analogy is problematic in that it does not elucidate the extent to which the individual consciously deliberates over decisions to persist with the 'best' task or allocate resources elsewhere (or not at all) or whether decisions on the devotion of processing capacity is automatic and outside the individual's awareness. Perhaps Kurzban et al.'s account needs to identify the extent to which the computational processes are accessible to the individual. Dual-systems models of social cognition describing the relative contribution of deliberative (reflective) and automatic (impulsive) processing may provide a possible framework (Strack & Deutsch, 2004).

Kurzban et al.'s account also does not incorporate individual differences. A hallmark of social-cognitive models is the assumption that individuals process information in identical ways. This is not the case if one takes into account individual differences that affect cognitive processing. For example, there is research demonstrating that individual differences in trait

self-control moderates effects of mental effort on computationally-demanding tasks (Hagger, Wood, Stiff, & Chatzisarantis, 2010). How could the opportunity-cost model explain individuals differences in processing bias brought about by such traits? Could it be that traits bias individuals' tendency to interpret the opportunity-costs of their response relative to next most desirable action similar to the way experimenter presence is outlined in the model (c.f. Figure 3)? It would be interesting to incorporate this into the model.

Despite an array of examples in support of the model, including alternative explanations of limited-resource models of self-control, a question remains as to whether all experiences of mental fatigue can be attributed to changes in opportunity-cost over time. Kurzban et al. state that "mental 'resources' are finite, *dynamic*, and *divisible*… rather than finite and *depletable over time*". Does this mean that in the absence of 'next-best' alternate tasks for which perceived opportunity-costs do not exceed those of the 'best' task, such that the marginal utility of the current task consistently exceeds that of the marginal value of the 'next-best' task leading to a decision not to divide processing capacity across the tasks, that performance on tasks will be consistent and indefinite? This seems implausible given research on vigilance tasks that consistently demonstrates fatigue and performance decrements over time. Kurzban et al. concede that "to the extent that there are no offsetting benefits... the relationship between perceived costs and benefits can become less favorable over time" suggesting that, given sufficient time, processing resources will inevitably be allocated elsewhere. However, no alternative explanation is provided in the model to explain fatigue in the absence of a competing alternative task that 'wins out' in the decision-making process over the best task in opportunity-cost computations.

So is there still room for a 'resource' account that provides additional limits on the extent to which processing capacity can be allocated over time? Kurzban et al. point out recent research that has challenged the limited resource approach. These include studies demonstrating that beliefs (e.g., Job, Dweck, & Walton, 2010) and motivational incentives (e.g., Muraven & Slessareva, 2003) mitigate ego-depletion, and conceptual (Kurzban, 2010) and empirical (Hagger & Chatzisarantis, 2013) accounts that raise doubts over glucose as a physiological analog for the resource. These issues notwithstanding, recent evidence suggests that self-control performance is impaired in the presence of beliefs about resources and motivation provided the level of depletion is sufficiently extensive (Vohs, Baumeister, & Schmeichel, 2012). Further, Kurzban and co-workers acknowledge that further candidate physiological analogs may exist for the limited resource, but conceptual and empirical verification is needed. The ego-depletion literature is problematic, but it seems that in light of new evidence, and the possibility that the opportunity-costs model may not provide a comprehensive explanation for mental fatigue, future research should aim to reconcile these differences, perhaps through theoretical integration (Hagger, 2009).

References

Hagger, M. S. (2009). Theoretical integration in health psychology: Unifying ideas and complimentary explanations. *British Journal of Health Psychology, 14*, 189-194.

Hagger, M. S., & Chatzisarantis, N. L. D. (2013). The sweet taste of success: The presence of glucose in the oral cavity moderates the depletion of self-control resources. *Personality and Social Psychology Bulletin, 39*, 27-41.

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*, 495-525.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion - is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science, 21*, 1686-1693.

Kurzban, R. (2010). Does the brain consume additional glucose during self-control tasks? *Evolutionary Psychology, 8*, 244-259.

Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin, 29*, 894-906.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review, 8*, 220-247.

Vohs, K. D., Baumeister, R. F., & Schmeichel, B. J. (2012). Motivation, personal beliefs, and limited resources all contribute to self-control. *Journal of Experimental Social Psychology, 48,* 943-947.