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## **Self-Control Spillover: Impulse Inhibition Facilitates Simultaneous Self-Control in Unrelated Domains**

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Recent neuropsychological work suggests that inhibiting impulses in one domain can facilitate the simultaneous inhibition of other impulses. In five experiments, using a variety of self-control tasks known to require inhibition (e.g., emotion regulation) we show their beneficial impact on simultaneous but unrelated self-control tasks (e.g., unhealthy food consumption).

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# Self-Control Spillover: Impulse Inhibition Facilitates Simultaneous Self-Control in Unrelated Domains

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## EXTENDED ABSTRACT

Imagine participating in an important meeting. Despite the fact that the meeting already took for hours, there is still a list of decisions to be made. Keeping your attention focused on the discussion requires a significant amount of self-control. Notably, there is a bowl filled with chocolates on the table. How likely would you be to overindulge on the chocolates during this meeting?

One of the most influential theories of self-control predicts overindulgence on the chocolates. According to the strength model (Baumeister 2002), human ability to exert self-control relies on a limited energy resource. Consequently, each act of self-control (e.g., controlling attention) temporarily depletes this resource, resulting in a deteriorated performance on subsequent self-control tasks (e.g., resisting chocolates), termed an ‘ego depletion effect’.

Recent findings in (neuro)psychology suggest an alternative outcome. This research suggests that various forms of response inhibition which seem very different on the surface, all originate from the same neurological areas, also referred to as a general inhibitory network (Cohen and Lieberman 2010). Importantly, Berkman, Burklund and Lieberman (2009) show that a consequence of such a general inhibitory network is that inhibitory signals are not completely task specific, but can spill over to unrelated domains and result in unintentional inhibition of unrelated responses, termed an ‘inhibitory spillover effect’. Tuk, Trampe and Warlop (2011) show that a physiological form of inhibition (bladder control), can result in more impulse control in the behavioural domain (intertemporal patience). These findings suggest that intentional acts of self-control (of which response inhibition is a crucial property) could actually *facilitate* self-control in unrelated domains.

In the current research, we argue that a crucial determinant for whether one act of self-control deteriorates (ego depletion) or facilitates (inhibitory spillover) self-control ability on unrelated tasks is the timing of the control tasks. Inhibitory signals required for one task are only present *during* execution of this task, and should only facilitate self-control performance on *simultaneously* executed tasks. Conversely, when the self-control tasks are sequential to each other, we expect the ego depletion effect to occur, consistent with a large body of research supporting the strength model (see Hagger et al. 2010, for a meta-analysis). In the first four studies, we test the inhibitory spillover effect in simultaneous self-control tasks, using tasks that are well-known to be susceptible to ego depletion effects when sequentially administered. In a fifth study, we directly manipulate the sequential versus simultaneous nature of the self-control tasks.

## STUDY 1

In study 1, participants engaged in a thought listing task. Only participants in the inhibition condition were instructed not to think of a white bear during this task (Vohs and Faber 2007). This was followed by an intertemporal choice task (Li 2008), in which respondents made eight choices between a smaller, but sooner (SS) and a larger but later (LL) reward. Crucially, respondents in the inhibition condition were instructed to *continue* not to think of a white bear during this task. In line with the inhibitory spillover hypothesis, respondents made less impulsive choices in the inhibition condition.

## STUDY 2

In study 2, participants engaged in an attention regulation task while watching a movie of an interview. On the bottom of the screen, a series of words appeared. Only participants in the inhibition condition were instructed to ignore these words and focus on the interviewee. Simultaneously, participants received a bowl of crisps to consume *during* the movie. In line with our hypothesis, participants in the inhibition condition consumed less of the crisps.

## STUDY 3

In study 3, food consumption formed our self-control manipulation. Respondents engaged in a taste test, and were instructed to consume one crisp from a bowl of crisps. This was followed by the Stroop task. Only participants in the inhibition condition were explicitly instructed to resist further crisp consumption during the Stroop task. Results showed that participants in the inhibition condition made fewer errors on the self-control requiring (incongruent) trials of the Stroop task.

## STUDY 4

In order to provide stronger evidence for the inhibitory spillover hypothesis, we examined whether the inhibitory spillover effect is moderated by an interpersonal difference in sensitivity of the Behavioral Inhibition System (BIS; Carver and White 1994; Tuk et al. 2011). In study 4, respondents engaged in the same thought suppression task as in study 1, and continued with this thought suppression during the next task. This was a short self-control scenario (Labroo and Patrick 2009), measuring whether respondents opt for an impulsive or self-controlled option. Results showed that participants in the inhibition condition had a greater preference for the self-controlled option, especially when they have a sensitive BIS.

## STUDY 5

In study 5, we manipulated the simultaneity of the self-control tasks. Participants in the inhibition condition were instructed not to feel/express emotions during an emotional movie clip, whereas participants in the control condition could watch this movie freely. In the simultaneous condition, respondents received a bowl of crisps together with this first clip. In the sequential condition, respondents continued with a second movie (where they could feel/express their emotions freely) and received the crisps during this second clip. In line with our predictions, inhibition of emotions resulted in decreased food consumption in the simultaneous condition (inhibitory spillover), but resulted in increased food consumption in the sequential condition (ego depletion), relative to the control conditions. Hence, study 5 provides strong evidence for the crucial role of timing of the control tasks for inhibitory spillover versus ego depletion to occur.

## CONCLUSIONS

In five studies, we used a variety of the most well-known paradigms from the ego-depletion literature, but changed the timing of the self-control tasks such that they occurred simultaneously. Consistent with the inhibitory spillover hypothesis we found a self-control boost for simultaneously occurring tasks. Our results suggest that deliberative acts of self-control can facilitate self-control ability on un-

related tasks, when both tasks occur together. These findings provide support for the existence of an inhibitory network, susceptible to inhibitory spillover, and suggest that the predictions of the strength model cannot easily be translated to simultaneous control tasks.

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