

**Acute effects of exercise on self-regulation
of snacking-related variables
among habitual snackers**

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..... (Hwajung Oh)

ABSTRACT

Theories of health behaviour change largely focus on two processes, one involving cognitions and one involving more automated and responsive behaviour (Rothman, Sheeran, & Wood, 2009). The former theories focus on beliefs and attitudes, planning, intentions and goal focused actions. The latter focus on capacity to self-control actions in certain situations. Self-regulation theory considers the effort that people invest to control their own responses to achieve particular goals (Vohs & Baumeister, 2004). Within theories of addiction, self-control is fundamentally challenged. Incentive-Sensitization theory (Robinson & Berridge, 1993) suggests that cues become associated with incentive value and a sensitised motivational response. Despite the best of intentions to avoid a certain unhealthy behaviour, a learned automatic response becomes the norm. Only recently have aspects of eating become linked to addictive behaviour (Avena, Rada, & Hoebel, 2008; Benton, 2010) and the idea of building self-regulatory capacity is of increasing interest (Johnson, Pratt & Wardle, 2011).

Short single bouts of exercise appear to reduce self-reported cravings, engagement in addictive behaviours, and salience of cues associated with the behaviour for smokers (Taylor, Ussher, & Faulkner, 2007), and rehabilitating alcoholics (Ussher, Sampuran, Doshi, West, & Drummond, 2004). Regular exercise may also have benefits on self-regulation of other behaviour (Oaten & Cheng, 2006; Ussher, Taylor & Faulkner, 2008). Studies of animals addicted to various substances also support the idea that physical activity attenuates consumption (e.g., Smith, Schmidt, Iordanou, & Mustroph, 2008).

The aims of this thesis were to examine the effect of a short bout of exercise on self-regulatory processes associated with snacking involving behavioural observation, self-report measures, direct and indirect measures of attentional bias. Also the effects of different intensities of exercise, level of stress, participant weight, smoking status, and period of abstinence were explored.

In Study 1, *ad libitum* chocolate consumption was measured in a simulated workplace (low and high stress situation via Stroop task). The effect of prior moderate intensity exercise (a 15 min-brisk walk) was compared with a passive condition in a randomised 2 x 2 factorial design, involving 78 abstaining regular chocolate eaters. The main findings of Study 1 were that the two (low & high stress) exercise groups ate significantly less chocolate than the passive groups. The manipulation of different stress situations did not influence the effect of exercise on chocolate consumption.

Study 2 and Study 3 involved a randomised counterbalanced cross-over design in which the effects of exercise were compared with a passive condition. In Study 2, the effect of moderate intensity exercise (a 15 min brisk walk) on self-reported craving and attentional bias (using a visual dot probe task, with chocolate and neutral images presented in matched pairs) (both measured before and after each condition) were assessed among different groups (normal and overweight people, and 1 day and > 1 week (during Lent) chocolate abstainers) with a total of 58 participants. Exercise significantly reduced chocolate craving and attentional bias to chocolate images compared with a passive condition and the effects were similar irrespective of Body Mass Index and abstinence period.

In Study 3, given that abstinent smokers are at risk of emotional eating and weight gain, regular smokers and snackers were asked to abstain from smoking. Self-reported craving and attentional bias (using an eye tracking technology with short video clips) for both snack foods and cigarettes (presented alongside neutral images) were measured. The effects of two different intensities of exercise (i.e., 15 mins of moderate and vigorous intensity cycling) were examined among 23 temporarily abstinent smokers compared with a passive condition. The findings revealed that subjective snack cravings and strength of desire to smoke were reduced during and immediately after both moderate and vigorous exercise. In terms of attentional bias, initial attentional bias (% of first fixation) to snacking/smoking images were reduced after both intensities of exercise and maintained attentional biases (% of dwell time) to snacking/smoking images were reduced only after vigorous exercise.

Overall, the series of studies found that a short bout of moderate intensity exercise appears to reduce cravings and attentional bias to snack-related food cues, and the effects were similar among different groups, different type/intensity of exercise, and different measures of cravings. The findings of this thesis have therefore suggested that compared with being sedentary a short bout of physical activity may help to enhance self-regulation of snacking among people with a habit of snacking, particularly with chocolate.

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