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Research report

Labeling exercise fat-burning increases post-exercise food consumption in self-imposed exercisers

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ABSTRACT

The goal of the study was to determine whether the label given to an exercise bout affects immediate post-exercise food intake. The authors hypothesized that explicitly labeling an exercise bout 'fat-burning' (vs. labeling an exercise bout 'endurance' exercise) would increase post-exercise food intake in individuals who self-impose physical activity, because they are more likely to see the label as signal of activated fat metabolism and license to reward oneself. No such effect was expected for individuals who do not self-impose physical activity but consider exercise enjoyable. Ninety-six participants took part in an experiment manipulating the label given to an exercise bout (fat-burning exercise or endurance exercise) between participants. They cycled on an ergometer for 20 minutes at a consistent work rate (55–65% of predicted VO_2 max) and were offered *ad libitum* food (i.e., pretzel pieces) after the exercise bout. The results showed that self-imposed exercisers, that is, individuals with low behavioral regulation and individuals with high psychological distress, high fatigue levels, and low positive well-being when exercising, ate more food after exercise when the bout was labeled fat-burning exercise rather than endurance exercise. The results help develop health interventions, indicating that the tendency to compensate for energy expended following physical activity depends on both the label given to the exercise bout and the degree to which individuals self-impose physical activity.

Introduction

Exercise, in addition to a hypocaloric diet, is the key to weight loss and long-term weight maintenance in humans (Serdula et al., 1999). Individuals who exercise expend energy and thus can reach a negative energy balance more easily than individuals who do not exercise. Individuals may compensate, or even overcompensate, for the energy spent during physical activity via post-exercise energy intake, but the mechanisms for this remain largely unknown (Schubert, Desbrow, Sabapathy, & Leveritt, 2013). King, Tremblay, and Blundell (1997) demonstrated that physical activity generates a drive to eat. In contrast Ueda et al. (2009) found an exercise-induced suppression of energy intake. Whilst physiological factors and the type and mode of exercise influence post-exercise energy intake (Blundell & King, 1999), there is recent evidence that contextual and psychological factors are relevant too (Hall et al., 2012). This study therefore used a behavioral regulation approach to study contextual effects on post-exercise food intake.

The study considers the label given to the exercise bout as one contextual factor that potentially influences post-exercise energy compensation. In particular, we consider the influence of labeling an exercise bout 'fat-burning' (compared with the label 'endurance' exercise) on immediate post-exercise food intake. The label fat-burning may act as signal that fat metabolism has been activated, thus liberating individuals to consume more food after they have finished exercising. This effect is likely to be present in individuals who struggle to regulate their physical activity, because they tend to rely on such signals.

Fat-burning exercise

The names of products and services (including brand names) trigger automatic associations in consumers and influence goal-directed behavior (Fitzsimons, Chartrand, & Fitzsimons, 2008). This also applies to food; the names of foods have been shown to influence food intake (Koenigstorfer, Groeppel-Klein, Kettenbaum, & Klicker, 2013; Wansink & Chandon, 2006). For example, labeling trail mix 'fitness food' can increase consumption (Koenigstorfer et al., 2013). More pertinent to this study, adding the nutrient claim 'low-fat' to foods can cause overconsumption by leading consumers to make erroneous inferences about serving size and reducing consumption guilt (Wansink & Chandon, 2006). The nutrient claim provides a cue to consumers that the food is a low-calorie choice and thus safe to eat. The cue therefore liberates consumers' attempts to

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control their food consumption (Fishbach, Dhar, & Zhang, 2006; Geyskens, Pandelaere, Dewitte, & Warlop, 2007).

References to fat cannot only be found on food packages, but also on products and services in the exercise domain. For example, treadmills and bicycle ergometers offer 'fat-burning programs' which individuals can select when they start exercising. Health and fitness clubs offer 'fat-burning classes' to their customers. These programs and classes are typically used to describe low-to-moderate intensity exercise bouts. There are reasons to believe that individuals perceive fat-burning exercise to be conducive to positive health and body appearance, including weight loss (Warburton, Nicol, & Bredin, 2006). First, individuals may believe that fat metabolism is stimulated, because the percentage of energy derived from burning fat (rather than carbohydrates or protein) is higher for less intense physical activity. An increase in fat metabolism is associated with several health benefits (Eriksson, Taimela, & Koivisto, 1997). Second, the concept of fat is closely linked to changes in energy balance (Wansink & Chandon, 2006). The fact that individuals burn off fat (and hence calories) may thus be more salient when they exercise using a fat-burning program. These processes likely influence food consumption, given that fat is also often used as an indicator of the calorie content of foods (Wansink & Chandon, 2006). Next, we will explain when we expect fat-burning labeling of exercise bouts to influence post-exercise food consumption.

Consequences for post-exercise food intake

Based on our arguments above, we predict that labeling an exercise bout fat-burning will increase immediate post-exercise food consumption, because it makes the concept of fat burning salient and individuals believe that activated fat metabolism produces health benefits. However, there are reasons to assume that this labeling effect is influenced by the degree to which individuals self-impose physical activity in order to reach health and body appearance goals. In particular, labeling exercise bouts fat-burning may increase food intake in individuals who exercise as a consequence of externally imposed self-regulation, because physical activity legitimizes rewarding activities from their perspective (Markland & Tobin, 2004). In the context of this study, these individuals may perceive exercise in the fat-burning zone as a license to consume and are thus more likely to compensate for the energy expended during exercise. We capture the degree to which individuals self-impose physical activity via two variables: behavioral regulation (i.e., motivational factors) and subjective exercise experience (i.e., emotional factors) (Markland & Tobin, 2004; McAuley & Courneya, 1994).

The concept of behavioral regulation implies that individuals pursue an activity as a result of various forms of motivation (Ryan & Deci, 2000). In the context of exercising, behavioral regulation consists of five dimensions: amotivation, external regulation, introjection, identification, and intrinsic regulation (Markland & Tobin, 2004). Amotivation and external regulation are factors that relate to the influence of other people and external rewards; high scores indicate poor behavioral regulation. Introjection, identification, and intrinsic regulation are factors that relate to the internalization of external controls, acceptance of activity as part of the value system, and perception of exercise as enjoyable, respectively; high scores indicate good behavioral regulation. In individuals with high behavioral regulation scores (exercise) behavior is self-determined rather than guided by externally imposed factors (Markland & Tobin, 2004). On the basis of this construct, we expect the effect of fat-burning exercise on immediate post-exercise food intake to be stronger in individuals who self-impose physical activity (reflected in lower behavioral regulation scores, i.e., higher amotivation and external regulation; lower introjection, identification, and intrinsic regulation).

The degree to which individuals self-impose physical activity should also be reflected in their subjective experience of exercising. Individuals who find physical activity stressful, tiring, and unenjoyable are predicted to be more likely to overconsume in the fat-burning label condition, because for these individuals exercising means exerting self-control and results in the perception that a goal has been achieved, which makes them more vulnerable to opposing goals, such as eating food after exercise (Fishbach & Dhar, 2005; Fishbach & Shah, 2006). If the exercise bout is labeled fat-burning, the label provides a signal that licenses higher post-exercise consumption. We therefore predict that the increase in food intake will be highest in individuals who find physical activity stressful and tiring rather than an enjoyable activity that increases well-being.

Methods

Design and participants

A laboratory experiment was conducted to test our hypotheses. The study employed a one-factorial design with the label given to an exercise bout (fat-burning exercise vs. endurance exercise) as a between-subjects factor. Participants were randomly assigned to either the fat-burning label condition (with reference to burning off fat) or the endurance label condition (with reference to endurance; the term endurance is central to the physical activity guidelines developed by the American College of Sports Medicine (Haskell et al., 2007) and was therefore chosen to be contrasted with fat-burning).

Ninety-six individuals (45 women; overall mean age 26.1 years, $SD = 9.4$) participated in the study. Participants were recruited on the campus of a large university and consisted of undergraduate and graduate students and university employees.

Procedure

The study was conducted in the laboratories of a university from Monday through Friday, between 2 pm and 6 pm. Individual appointments were made with the participants to ensure that food consumption was not influenced by the presence of other participants. Participants were not informed about the goal of the study when they were recruited; they were instead told that they would participate in a market research study to evaluate newly developed training software for bicycle ergometers. After the participants had given written informed consent for participation they were equipped with heart rate monitors and seated on the bicycle ergometer.

Participants then completed a twenty-minute low-to-moderate intensity bicycle ergometer ride. The heart rate monitor ensured that participants exercised at the same intensity in both experimental conditions. The intensity of the workout was equivalent to a workload of 55–65% of the estimated VO_2 max of the participant. During the exercise bout, the label given to the bout was made salient for participants via a poster displayed on the wall in front of participants and on the screen of the bicycle ergometers. In the fat-burning label condition, the poster showed the following sentence: 'fat-burning exercise – developing training software for exercise in the fat-burning zone.' In the endurance label condition, the control condition, the poster showed the following statement: 'endurance exercise – developing training software for exercise in the endurance zone.'

When the participants had finished the twenty-minute bicycle ergometer ride, they were told that they could help themselves to drinks and food whilst completing a survey. Behind a partition wall, water bottles and a two-liter bowl filled with *Snyder's of Hanover Pretzel Pieces* were arranged so that participants were out of sight

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