



# Exposure to diet priming images as cues to reduce the influence of unhealthy eating habits



Shoji Ohtomo

Department of Psychology, Faculty of Human Sciences, Konan Women's University, 6-2-23, Morikita-machi, Higashinada-ku, Kobe, Japan

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## ABSTRACT

A key barrier to changing unhealthy eating habits is the current food-rich environment. Today, there are many palatable food cues that trigger unhealthy eating habits, and once a habit is strongly engrained, it becomes very difficult to change. This research examined the effects of diet priming that is a type of cueing intervention that activates a dieting goal in a tempting situation and thus reduces unhealthy eating behavior in line with the dieting goal. This research was conducted both in a laboratory and in two field experiments. In the three experiments, participants were randomly assigned to conditions where they were either primed by an image of a slim model associated with dieting (priming condition) or were presented with an image of an animal unrelated to dieting (control condition). The dependent variable was the number of snacks that participants took in the laboratory in Study 1 and the number of snacks consumed within the next two weeks in a daily setting in Study 2 and 3. The three studies showed that unhealthy eating habits strongly affect general eating behavior. However, in this research, diet priming changed the influence of unhealthy eating habits and resulted in the decrease of unhealthy eating. Exposure to diet priming cues moderated the influence of unhealthy eating habits triggered by palatable food cues in today's food-rich environment. These findings suggest that diet priming can change habitual reactions to temptations associated with unhealthy eating. Implications for diet priming as an intervention for unhealthy eating habits are discussed herein.

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## 1. Introduction

Unhealthy eating habits are a major contributing factor for people to become overweight or obese. Changing unhealthy eating behaviors or lifestyle is quite a difficult endeavor for most people. It is estimated that 95% of people who start a diet give up in discouragement (Wansink, 2010). Previous studies have indicated that unhealthy eating habits are a key barrier to behavior change (De Vet, Stok, De Wit, & De Ridder, 2015; Verhoeven, Adriaanse, Evers, & De Ridder, 2012; Verplanken, 2006). Social and psychological factors play a significant role in unhealthy eating habits.

First, today's food rich-environment is a social and cultural factor of unhealthy eating (e.g., Wadden, Brownell, & Foster, 2002). Tasty and densely caloric foods are inexpensive and highly accessible due to the development of food supply systems and consumer marketing. In this environment, people are not only exposed to the temptation of such products but also the easy accessibility of these

foods. Further, this environment reduces obstacles to unhealthy eating and allows this behavior to occur frequently until it becomes a habit.

Second, automaticity of habitual behavior is a psychological factor of continuing unhealthy eating. Habituation of behavior induces action automatically (Gardner, 2013; Verplanken & Wood, 2006; Wood & Neal, 2009). This psychological quality is not only a mental short-cut to decision-making for eating, but also a delegation of conscious self-control over unhealthy eating. According to Orbell and Verplanken (2010), through the repetition of behavior in the same context, habitual behavior comes to be cued by context and can be triggered by contextual cues. Habituation delegates self-control over behavior according to the behavioral context, relieving the person of conscious control. Actually, habit formation involves a shift from self-control to an external control that is governed by triggers in a behavioral context (Ohtomo, 2013). Additionally, the more exposures to palatable food cues in the environment, the more self-regulated eating is undermined (Papies, Stroebe, & Aarts, 2008a). The loss of self-control to eating empowers the habitual cue-contingent response, whereby habitual behavior is triggered

E-mail address: [s.ohtomo@konan-wu.ac.jp](mailto:s.ohtomo@konan-wu.ac.jp).

by palatable food cues in the environment. Then, habitual cue-contingent response of unhealthy eating overrides counter-habitual intention because of the absence of self-control.

Goal priming is considered to be a cueing intervention to change automatic unhealthy eating behavior (Papies, 2016; Sheeran, Gollwitzer, & Bargh, 2013). It activates a mental representation of target behavior using an external or environmental cue and can induce the behavior without the person's awareness of the influence of the cue. One example is a study where people who engaged in word tasks related to elderly stereotypes were induced to walk slowly (Bargh, Chen, & Burrows, 1996). In another study, people spoke more quietly after being exposed to a picture of a library (Aarts & Dijksterhuis, 2003). In a previous field study that applied dieting goal priming to reduce snacking, Papies and Hamstra (2010) found that diet priming, by placing a poster in a butcher shop describing only healthy recipes, inhibited snack consumption, even when the smell of grilled chicken was wafting. A similar effect was found in an experiment that primed participants by presenting a body-weight scale (Brunner, 2010). In another experiment, the priming agent was exposure to a picture of human-like skinny sculptures, which also successfully reduced consumption of snacks (Brunner & Siegrist, 2012; Stämpfli & Brunner, 2016). Although previous studies have focused on the direct effect of goal priming on unhealthy eating, the effect on the influence of unhealthy habits has not been previously examined well. Thus, the present study not only examines the effect of dieting goal priming on unhealthy eating behaviors, but also examines how the influence of unhealthy eating habit can be mitigated.

People obtain habitual behavior without forming a conscious decision to do so because daily context triggers the behavior (Danner, Aarts, & De Vries, 2008; Danner, Aarts, Papies, & De Vries, 2011; Sheeran et al., 2005). According to Verplanken (2006), habit can become a stronger trigger of behavior than conscious intention. Thus, habit enlarges the gap between conscious intention and actual behavior. Implementation intention is proposed as an approach to guide intended behavior (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). To counter existing unwanted habits, implementation intention encourages an individual to form an action plan that stipulates where, when, and how they will perform an intended behavior. However, previous studies of negating unhealthy habits using implementation intention have indicated an ironic rebound effect, which results in increasing rather than decreasing the consumption of snacks (Adriaanse, van Oosten, De Ridder, De Wit, & Evers, 2011). Moreover, Webb, Sheeran, and Luszczynska (2009) indicated that the effect of implementation intention was weaker among people who possess strong unhealthy habits. Because goal priming does not require the formation of a conscious counter habitual action plan, but changes the mental accessibility of goal pursuit, rebound effects are less likely to be induced as priming can make a dieting goal more accessible and override habitual cue responses.

## 2. Purpose of the study

This research examines how diet priming overrides the mental accessibility of unhealthy eating habits to reduce them. Previous goal priming studies have indicated that introducing health-related cues promotes the accessibility of related behaviors. For example, activation of negative stereotypes by presenting pictures of overweight people promoted stereotype-conducive behavior (e.g., eating more candies; Campbell & Mohr, 2011). And, perceptions of palatable food cues have an effect on accessibility to food and encouraged overeating (Kemps, Tiggemann, & Hollitt, 2014; Papies, Stroebe, & Aarts, 2008b). This research manipulated dieting goal priming with pictures of slim female models, similar to the way

Brunner and Siegrist (2012) used pictures of skinny sculptures as weight-related cues. Moreover, body types (McFerran, Dahl, Fitzsimons, & Morales, 2010) and slim models in television commercials (Anschutz, Van Strien, & Engels, 2008) can be priming cues for eating behavior. This research used pictures of commercially available models captured in real-life settings as supraliminal priming cues, which is similar to previous studies of dieting priming (Brunner & Siegrist, 2012; Brunner, 2010; Papies & Hamstra, 2010). This research implemented laboratory and field experimentations to assess the effects of diet priming to influence unhealthy eating habits regardless of conscious intention and tests the ecological validity of such diet priming as an intervention in real-life settings.

This research tests the following hypotheses. First, unhealthy eating habits are accessible predominantly as a daily default setting because they are cued by the food-rich environment. Second, diet priming can activate healthy goals over unhealthy goals (Papies & Hamstra, 2010; Stöckli, Stämpfli, Messner, & Brunner, 2016). According to Papies (2016), health goal priming can trigger motivational processes that reduce the attractiveness of unhealthy temptations in an environment and decrease the chances of unhealthy eating. Diet priming may detach people from the attractiveness of unhealthy food in daily situations and reduce the possibility of induction of unhealthy eating habits.

Third, this study hypothesized the motivational process that mediates the influence of habit. A previous study has indicated that the effect of habit on unhealthy eating was mediated by dual motivational processes (Ohtomo, 2013). The dual motivation model applied the prototype model (Gibbons, Gerrard, Blanton, & Russell, 1998; Gibbons, Houlihan, & Gerrard, 2009) to predict habitual unhealthy eating behaviors. The prototype model assumes that two types of motivations are involved in unhealthy eating behavior. The one motivation is behavioral intention (i.e., diet intention), which is a conscious deliberation leading to healthy behavior. The other motivation is behavioral willingness (i.e., unhealthy willingness). This is an unintentional or impulsive motivation that is a reaction to attractive situations. And, the dual process model assumed that habit affects unhealthy eating behavior by way of the two motivations (Ohtomo, 2013). Previous studies of the prototype model indicated that unhealthy eating behavior was influenced more by behavioral willingness than by behavioral intention (Dohnke, Steinhilber, & Fuchs, 2015; Fuchs, Steinhilber, & Dohnke, 2015). Traditionally, behavioral intention has been considered an important antecedent to health-related behavior (e.g. Ajzen, 1991; Armitage & Conner, 2000). However, according to recent studies (Churchill & Jessop, 2011; Churchill, Jessop, & Sparks, 2008), unhealthy eating behaviors are induced by an impulsive or automatic process, rather than by behavioral intention. To reduce unhealthy eating in today's food rich environment, diet priming induces changes in the intentional or unintentional motivational process of habit. In this research, study 1 and 2 examined whether diet priming could moderate the effect of habit regardless of diet intention. A previous study had indicated that unhealthy habits are mediated by unhealthy willingness, rather than diet intention (Ohtomo, 2013). To mitigate unhealthy willingness triggered by attractive situations, Study 3 examined whether diet priming can moderate the unintentional process that mediates the effect of habit by unhealthy willingness.

## 3. Study 1

The laboratory study was implemented to examine whether diet goal priming can attenuate the influence of unhealthy snack eating habits. To reduce unhealthy choices for snacks, the experiment manipulated diet goal priming with images of slim female idol

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