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Correlations between self-efficacy in resisting six temptations and dietary energy and macronutrient intake at each meal

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ABSTRACT

Self-efficacy in relation to eating behavior for weight control is commonly defined as having the confidence to control urges to overeat in high-risk situations. Prior researchers have suggested that self-efficacy plays a mediating role in eating behavior for weight loss and maintenance. The current study examined the relationship between self-efficacy in resisting certain temptations and daily dietary intake at each meal. Participants were 83 men and 122 women registered at the health management website "Asken". They administered questionnaires about self-efficacy and dietary records. As results of multiple regression analysis, self-efficacy in resisting negative emotions was negatively related to lunch energy intake in men ($\beta = -0.308$, $p = 0.023$) and total ($\beta = -0.302$, $p = 0.003$), breakfast ($\beta = -0.334$, $p = 0.004$), and snacking ($\beta = -0.232$, $p = 0.022$) energy intake in women. Also, self-efficacy in resisting rewards was negatively related to lunch energy intake in men ($\beta = -0.218$, $p = 0.040$). In men, self-efficacy in resisting hunger was positively related to protein intake ($\beta = 0.148$, $p = 0.021$) and relaxation was negatively related to lipid intake ($\beta = -0.211$, $p = 0.009$). Self-efficacy in resisting some temptations, especially negative emotions, and dietary intakes were negatively related. Future research is needed to confirm these results and assess the prospective effects of self-efficacy.

1. Introduction

In Japan, to improve and prevent non-communicable diseases (NCDs), the rates of people who tried to change their lifestyle were 50.4% in men and 57.6% in women, and the rates of people who said they try to not overeat were 47.2% in men and 51.4% in women (Ministry of Health, Labour & Welfare, the National Nutrition on survey in 2010). There is much to learn about the diet-related behavior change process.

Self-efficacy is an integrative cognitive–social learning framework that has proved useful in various treatment contexts for behavior change (Bandura, 1977). Self-efficacy is a person's belief in his or her ability to succeed in a particular situation. Researchers have suggested that self-efficacy plays a mediating role in eating behavior for weight loss and maintenance (Byrne, 2002; Clark, Abrams, Niaura, Eaton, & Rossi, 1991; Elfhag & Rossner, 2005; Stanton, Garcia, & Green, 1990; Teixeira, Going, Sardinha, & Lohman, 2005).

In previous studies, questionnaires were developed to assess self-efficacy in resisting temptations to overeat. Stanton et al. (1990) developed the Situational Appetite Measure (SAM) and evaluated its validity. SAM includes five high-risk situations as subscales: relaxation, food present, hunger, reward, and negative feelings. Clark et al. (1991) developed and validated the Weight Efficacy Life-Style Questionnaire (WEL). WEL consists of five situational factors; negative emotions, availability, social pressure, physical discomfort, and positive activities.

Associations between self-efficacy and weight loss were reported in many previous studies (Bas & Donmez, 2009; Carels, Cacciapaglia, Rydin, Douglass, & Harper, 2006; Roach et al., 2003). A previous intervention study found that as self-efficacy improved, eating habits improved and weight loss was greater (Roach et al., 2003).

The relationship between self-efficacy and eating behaviors when trying to lose weight has also been examined in some studies (Glasofer et al., 2013; Nothwehr, 2008; Riebe et al., 2005; Wingo et al., 2013). In a longitudinal study, self-efficacy was significantly related to total caloric intake at baseline, but changes in self-efficacy were not related to dietary intake at the 1-year follow-up point (Nothwehr, 2008). Associations between self-efficacy and dietary intake were mixed. Another previous study targeting adolescent girls at risk for excess weight gain and binge eating disorders suggested that only the WEL availability subscale score, but not the other WEL subscales, was inversely related to total energy, snack, and dessert intake in laboratory (Glasofer et al., 2013). The eating behavior may have been affected by the controlled environment of the meal.

Thus, there is a continuing need to investigate the associations between self-efficacy and eating behavior, such as daily energy and

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macronutrient intakes. Here, we examined the relationship between self-efficacy in resisting certain temptations and daily dietary intakes at each meal.

2. Method

2.1. Participants and procedures

The subjects were users of the health management website "Asken," operated by Green House Co., Ltd. At this site, users can record their diet and receive a report on their nutrition intake, providing advice automatically. In October 2012, an email containing an online link to a web page was sent to 61,559 users of the site. In the web page, we described the subjects aged 20–69 we wanted to recruit for this study. In total, 130 men and 388 women applied. Forty women were randomly selected from each age category (20–29, 30–39, 40–49, 50–59, 60–69). Thus, the total number of women was 200. Because the number of men was smaller, all 130 men were selected. Thus, 330 persons participated in this research.

The 330 participants recorded their diets for three days and received an email that contained questionnaires. The questionnaires informed participants that the survey was for research purposes and that they could refuse to participate further. We sent a report of the results and stationary that cost around 500 yen to each participant who completed the research. This study was approved by the Ethics Committee of Ochanomizu University.

Of the initial 330 participants, 214 (86 men, 128 women) completed the questionnaires and dietary records (response rate: 65%). Nine respondents were excluded from the analysis because they consumed energy beyond two standard deviations above or below all other participants. Finally, data from 205 respondents (83 men and 122 women) were analyzed.

2.2. Measures

2.2.1. Eating self-efficacy

Six subscales were selected: availability, negative emotions, and social pressure from WEL (Clark et al., 1991) and relaxation, hunger, and reward from SAM (Stanton et al., 1990). We calculated factor loadings for the items using data from a previous study (Tamaura, Akamatsu, & Takemi, 2010) and selected three items that had higher factor loadings in each subscale. Finally, 18 items were selected for this study. Cronbach's alpha coefficient for the total was 0.926 in men and 0.917 in women, and those for each subscale ranged from 0.647 to 0.981. Respondents are asked to rate their confidence in resisting overeating in different situations, using a six-point scale, ranging from 1 (not confident) to 6 (very confident). Higher scores indicated more eating self-efficacy.

2.2.2. Dietary intake

Dietary intake was recorded by participants over 3 days using the "Asken" website (http://www.asken.jp/). At the website, respondents could select dishes, such as vegetable dishes, meat dishes, and bread. If their dish was not listed, respondents made their dish from food items and entered them. Then, they selected their portion sizes, from 1/4, 1/2, 1, 1.5, 2, and 3 portions. The dishes and portion sizes were derived primarily from several recipe books of Japanese dishes. Food energy and macronutrient (carbohydrate, protein, and lipid) contents were calculated using the Standard Tables of Food Composition 2010 for Japan (Ministry of Education, Culture, Sports, Science & Technology, 2010 for Japan). From 3-day dietary energy and macronutrient intakes, the average intakes per day were calculated. In the rest of this study, the average intakes per day were used.

2.2.3. Demographic characteristics and physical size

Respondents gave information on the following demographic characteristics: age, gender, marital status, and living situation (alone or with someone). Body mass index (BMI) was calculated using self-reported height and weight.

2.2.4. Physical activity

Physical activity level was assessed by asking respondents to choose among low (sedentary lifestyle), moderate, and high (Ministry of Health, Labour and Welfare, Japanese Dietary Reference Intakes, 2010).

2.3. Data analysis

All analyses were conducted using SPSS software (ver. 19 for Windows; IBM Institute). Because gender affects self-efficacy and diet intake, in this study, all analyses were conducted separately by gender. Pearson correlations identified relationships between self-efficacy and energy and macronutrient intakes. Then, multiple regression analyses were conducted for each dependent variable (total / per meal energy intake and macronutrient intakes) with each self-efficacy variable using stepwise methods. Age, physical activity, and BMI were entered as covariates into the model. In the analyses of macronutrient intake and self-efficacy, total energy intake was also entered as a covariate. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Participant characteristics

The mean age of the respondents was 44.4 (SD = 9.7) years. They consisted of 83 men (40%) and 122 women (60%). Their mean body mass index (BMI) was 23.5 (SD = 3.7) kg/m^2. The total scores for self-efficacy were 63.5 (SD = 17.3) in men and 54.2 (SD = 17.4) in women. Total energy intake was 2102 (SD = 424) kcal/day in men and 1676 (SD = 258) kcal/day in women.

3.2. Correlation between self-efficacy and energy intake

In men, self-efficacy subscale scores were not significantly related to total energy (Table 1). The reward subscale score was inversely related to dinner energy in men ($r = -0.269$, $p = 0.014$). That is, lower reward subscale scores were associated with more dinner energy intake. In women, negative emotions subscale scores were inversely related to total energy ($r = -0.267$, $p = 0.003$). Furthermore, the reward subscale score was inversely related to lunch energy ($r = -0.200$, $p = 0.028$).

When the results of multiple regression analyses included age, physical activity, and BMI as covariates, total energy intake was not significantly related to any subscale of self-efficacy in men. Lunch energy intake was negatively related to the negative emotions subscale score ($\beta = -0.308$, $p = 0.023$, adjusted $R^2 = 0.069$). In women, total energy intake was inversely related to the negative emotions subscale score ($\beta = -0.302$, $p = 0.003$, adjusted $R^2 = 0.116$). Lunch energy intake was negatively related to the reward subscale score ($\beta = -0.218$, $p = 0.040$, adjusted $R^2 = 0.033$). Snacking energy intake was negatively related to negative emotions ($\beta = -0.232$, $p = 0.022$, adjusted $R^2 = 0.081$).

3.3. Correlations between self-efficacy and macronutrients

Self-efficacy subscale scores were not significantly related to any macronutrient in men (Table 2). In women, the negative emotions subscale score was inversely related to carbohydrate ($r = -0.226$, $p = 0.012$) and lipid intake ($r = -0.270$, $p = 0.003$).

In multiple regression analyses, lipid intake was inversely related to the relaxation subscale score in men ($\beta = -0.211$, $p = 0.009$, adjusted $R^2 = 0.677$).