



# Overeating at dinner time among Japanese workers: Is overeating related to stress response and late dinner times?



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## ABSTRACT

There are several known risk factors for overeating, including negative feelings and hunger. It was hypothesized that overtime work is associated with stress responses and later dinner times, leading to longer periods of time without eating, and that this, in turn, leads to a strong experience of hunger and consequent overeating at dinner. The aim of this study was to examine relationships among overeating at dinner, stress responses (e.g., fatigue, anxiety, and depression), and dinner times in Japanese male workers. In December 2012, 255 Japanese male workers at a leasing company completed a self-report questionnaire about overeating at dinner, psychological stress responses, physical stress responses, and dinner times. Each worker was sent an email with a link to the questionnaire website, where his answers were collected. Relationships between overeating at dinner and lifestyle issues were investigated using multiple linear regression analysis treating overeating as a dependent variable. Factors related to overeating at dinner included psychological stress response ( $\beta = 0.251$   $p < 0.001$ ) and dinner time ( $\beta = 0.220$ ,  $p = 0.004$ ). These cross-sectional data suggest that overeating at dinner is related to dinner time in men and to stress responses.

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## 1. Introduction

Obesity, a major risk factor for coronary heart disease, diabetes, and cancer, has been increasing worldwide (World Health Organization: WHO, 2013). According to the WHO, nearly 35% of adult populations worldwide are overweight (body mass index (BMI)  $\geq 25$  kg/m<sup>2</sup>), and 11% of them are obese (BMI  $\geq 30$  kg/m<sup>2</sup>) (WHO, 2013). Japan is no exception according to a report released by the Ministry of Health, Labour, and Welfare (MHLW) in Japan; approximately 30% of men are obese by Japanese standards (BMI  $\geq 25$  kg/m<sup>2</sup>, Japanese obesity standard) (MHLW, 2011). Indeed, the rate of obesity increased sharply for persons in their 30s and remained constant until they reached their 60s (MHLW, 2011). A previous study among workers indicated that the mean BMI was on the rise and that the obesity rate had increased greatly from the mid-1980s to 2008 (Kitamura et al., 2010).

Weight management is clearly important for preventing and

decreasing the prevalence of obesity. However, it is known that efforts to manage weight present high-risk situations for overeating (Clark, Abrams, Niaura, Eaton, & Rossi, 1991; Stanton, Garcia, & Green, 1990). Stanton et al. (1990) identified five situations that induced high-risk behaviors: “rewards,” “negative feelings,” “hunger,” “the presence of food,” and “relaxation.” Clark et al. (1991) also identified five high-risk factors related to overeating: “negative emotions,” “availability,” “social pressure,” “physical discomfort,” and “positive activities.” Among these factors, negative feelings and physical complaints were identified by these studies. In particular, negative feelings, which were identified in both studies, are important contributors to overeating. Many studies have reported that tendencies toward overeating when experiencing negative feelings are related to obesity (Dallman, 2010; Laitinen, Ek, & Sovio, 2002; Nishitani, Sakakibara, & Akiyama, 2009; Sinha & Jastreboff, 2013; Takaki et al., 2010; Toyoshima et al., 2009). The Dutch Eating Behavior Questionnaire (DEBQ), developed by Van Strien, Frijters, Bergers, and Defares (1986), addresses negative emotional patterns and the “emotional eating” that occurs at such times. More chronic negative emotions also lead to increased eating (Dallman, 2010; Nishitani et al., 2009; Sinha & Jastreboff, 2013;

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Takaki et al., 2010; Toyoshima et al., 2009). Clark et al. (1991) also found that physical discomfort (e.g., fatigue or other physical complaints) also contributes to overeating.

In addition to negative feelings and physical complaints, hunger has been cited as another probable cause of overeating. For example, when participants in a weight maintenance program were asked whether they had experienced overeating in certain situations, approximately 90% answered that they had experienced overeating due to hunger (Tamaura, Akamatsu, & Nagata, 2009). Additionally, hunger has been identified as a high-risk situation with respect to one's ability to control overeating, because self-efficacy scores associated with hunger were lower than for other situations (Mizoshita, Akamatsu, Tamaura, & Takami, 2011). When people go for long periods of time without eating (e.g., the time between lunch and dinner), they may feel strong hunger. Approximately 75% of Japanese individuals eat lunch between 12:00 and 13:00, and approximately 63% eat dinner after 19:00 (NHK Broadcasting Culture Research Institute, 2005). The period between lunch and dinner can be as long as 6–7 h or more for many people. If people eat dinner at later times, they may feel hungrier when they do eat.

It has been shown that the stress responses and dinner times of workers may depend on their work schedules. Stress responses increase with long periods of overtime work (Grosch, Caruso, Rosa, & Sauter, 2006), and longer work days are associated with a greater risk of depression (Yamasaki & Shimada, 2009) and an increasing number of workers with poor mental health (Artazcoz, Cortés, Borrell, Escribà-Agüir, & Cascant, 2007). Additionally, Lallukka et al. (2008) showed that stress and overtime work were associated, albeit weakly and inconsistently, with adverse health behaviors and obesity in middle-aged, white-collar employee cohorts in Britain, Finland, and Japan. Moreover, Van Der Hulst (2003) showed that long work hours were associated with adverse health effects and changes in health-related behaviors. Treating dinner time as a lifestyle issue, a previous study that examined the relationship between working time and eating behaviors, including dinner time, showed that workers who worked long and overtime hours ate dinner later (Nakamura et al., 1998; Yoshida et al., 2004). In fact, approximately 94% of male workers in their 20s ate dinner after 19:00, and approximately 34% ate after 21:00; that is, their dinner time was later than that of the general Japanese population, in which only about 17% ate dinner after 21:00 (NHK Broadcasting Culture Research Institute, 2005). In other words, the time from lunch to dinner was longer for workers than for non-workers, and the former may have been hungrier because of this long period without eating.

Thus, it was thought that workers who worked relatively long overtime hours came home later, ate dinner later, and overate at dinner because a longer time had elapsed between lunch and dinner, causing more hunger (Fig. 1). Although it has been shown

that long working hours and overtime work are related to weight gain (Solovieva, Lallukka, Virtanen, & Viikari-Juntura, 2013), high BMI (Escoto et al., 2010), and obesity (Jang, Kim, Lee, Myong, & Koo, 2013), few studies have examined the relationships of the risk of obesity with the stress and late dinner times that result from long overtime hours. Therefore, this study chose male workers for its target population because a previous study showed that the duration of overtime work was related to the lateness of dinner (Nakamura et al., 1998), and males reported working longer hours than did females (NHK Broadcasting Culture Research Institute, 2005; Yamasaki & Shimada, 2009). We hypothesized that male workers with high levels of stress responses and later dinner times would overeat at dinner. Thus, we examined the relationship between overeating and stress, including later dinner times.

## 2. Methods

### 2.1. Study participants and procedure

The study population included 523 workers at a leasing company in Japan. In December 2012, employees received an email from the company's human resources department instructing them to follow the attached link to a questionnaire website, where their answers were collected. The introduction to the questionnaire included an explanation of the present study and explained how personal information would be handled; informed consent for participation was collected at this time. Participants were then asked to complete the questionnaire within 2 weeks of having provided consent. This study was approved by the Ethics Review Committee of Ochanomizu University.

### 2.2. Content of the questionnaire

#### 2.2.1. Demographic characteristics

The questionnaire asked about age, sex, living status (“with family” or “alone”), marital status (“married” or “not married”), and whether they saw a doctor on a regular basis (“yes” or “no”). It also asked about height and weight, which were used to determine BMI. A study of the validity of self-reported height and weight in Japanese workers found that self-reported height and weight were strongly correlated with measured height and weight (Wada et al., 2005). Furthermore, a previous study showed that the test–retest reliability for height, weight, and BMI was substantial (Leatherdale & Laxer, 2013). Thus, self-reported weight and height have high validity and reliability. Participants were asked about their job characteristics: employment status, category of business, and overtime hours. Responses to employment status included “managerial post” or “regular employee,” and categories of business included “sales position” or “clerical position.” Responses to the number of overtime hours worked over the past month included “less than 45 h/month,” “46–60 h/month,” “61 h or more hours/month.” In Japan, the normal number of daytime work hours is set at 8 h. Time worked beyond 8 h is defined as overtime. Furthermore, from the viewpoint of disease prevention, it is recommended in Japan that workers perform no more than 45 h/month of overtime (MHLW, 2013). The regular working day of this workplace is 8:00 to 17:15 (including breaks).

#### 2.2.2. Overeating at dinner

In this study, we used one subscale, a “feeling of satiety,” of the Sakata Eating Behavior Questionnaire (SEBQ) (Sakata, 1996) to measure overeating. The SEBQ was developed to identify differences between obese and non-obese individuals with regard to bad habits and misconceptions (Sakata, 1996). The SEBQ, which is used widely in Japan at hospitals and other institutions involved in the

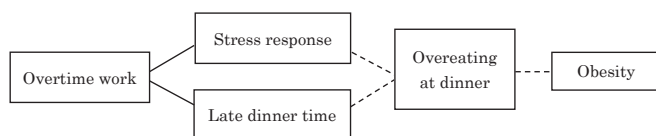


Fig. 1. The hypothesis of this study.

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