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Research report

The relationship between stress, dietary restraint, and food preferences in women

Summar Habhab, Jane P. Sheldon *, Roger C. Loeb

University of Michigan-Dearborn, United States

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ABSTRACT

The relationship between stress, restraint, and eating has been studied using various methods, including retrospective self-reports of stress and eating that are open to inaccuracies. Additionally, laboratory research has not systematically varied the fat content and sweetness of food items to assess how stress relates to specific food preferences. In this study of 40 women we examined the role of restraint and experimentally induced stress on the amount of sweet, salty, high-fat, and low-fat food consumed. High-restraint women ate more high-fat food than did low-restraint women, regardless of stress level. High-stressed women preferred sweet, high-fat food more than did low-stressed women, whereas low-stressed women ate more low-fat than high-fat food. There was no interaction between restraint and stress level. Social influence effects of small-group testing may have increased the ego-threat of the stressor or disinhibited high-restraint women in both stress groups. Future laboratory research is needed to assess the role of the presence of others in both stress induction and eating behaviors.

Stress plays a role in a multitude of negative human health behaviors. Researchers have investigated the relationships between stress and many different medical problems, such as cardiovascular diseases (Ohman, Nyberg, Bergdahl, & Nilsson, 2007), diabetes (Ohman et al., 2007), and cholesterol levels (Coleman, Friedman, & Burright, 1998; Van Doornen & Orlebeke, 1982). Because obesity is an underlying factor in these medical conditions, researchers (Gibson, 2006; Greeno & Wing, 1994; Macht, 2008; Torres & Nowson, 2007) have often studied the role of stress in individuals' eating behaviors, such as the amount eaten and the types of foods consumed. Such research has generally operated within the framework of individual-difference models, which look at the relation between stress and eating as being more complicated than a general physiological process. Instead, according to individual-difference models, physiological, environmental, and psychological factors interact to produce different stress reactions among individuals (Greeno & Wing, 1994).

One key psychological factor is emotion, which can be differentially induced by or related to stress and therefore may lead to a variety of eating outcomes. Macht's (2008) five-way model of how emotions relate to eating includes the ideas that eating (a) may be a way for individuals to regulate their negative emotions, and (b) may be caused by the stress-induced disruption of individuals' cognitive self-regulation. These two theoretical paths have been investigated extensively in studies involving emotional eaters (those who tend to eat in response to negative affect) and in restrained eaters (those who consciously try to restrict their food intake in order to lose or maintain weight). Both emotional and restrained eating have been tied to obesity, bulimia nervosa, and binge eating disorders (Delinsky & Wilson, 2008; Gluck, 2006); therefore, they play an important role in physical and psychological health.

Numerous researchers have been particularly interested in restraint theory (see Greeno & Wing, 1994). Competing ideas have evolved attempting to understand the mechanisms underlying the relation between restrained eating, stress, and food intake. One explanation in dietary restraint theory is that restrained eaters can become temporarily "disinhibited" by strong emotions or thoughts and then lose the energy needed to restrain their eating (Ruderman, 1986). An alternate idea (Ward & Mann, 2000) is that it is not the stress-induced emotional reactions of restrained eaters that cause disinhibition, but instead is a stressful task's "cognitive demand" (or "cognitive load") occupying so much of the restrained eaters' mental capacity that they no longer have the cognitive ability to restrict their eating.

Much research has been devoted to the relationships between restraint, stress, and food intake. Restraint has generally been measured through self-report, using one of several available measures. Because stressors often elicit negative affect, some researchers (Macht & Mueller, 2007a; Oliver, Wardle, & Gibson, 2000) have chosen to include measures of emotional eating in their studies of dietary restraint and eating, as well. In terms of stress, some previous research has examined chronic, naturalistic stress

* Corresponding author at: Department of Behavioral Sciences, University of Michigan-Dearborn, 4901 Evergreen Rd., Dearborn, MI 48128, United States.
E-mail address: jsheldon@umich.edu (J.P. Sheldon).

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via self-report (e.g., Liu et al., 2007; Macht et al., 2005; Sims et al., 2008). These assessments of stress are valuable in that they are naturalistic and they attempt to measure chronic stress—a form of stress that has been linked to many negative psychological and physical outcomes. However, these measures are problematic due to being retrospective self-reports of stress occurring during the last month or year, thus being open to inaccuracies and biases.

In response to the potential measurement problems of retrospective self-report measures, as well as to investigate the effects of acute stress on eating behaviors, other researchers (e.g., Haynes, Lee, & Yeomans, 2003; Schotte, Cools, & McNally, 1990; Wallis & Hetherington, 2004) have measured stress that has been induced in an experimental setting. These measures of acute stress, then, do not rely on retrospective accounts and can be systematically manipulated and controlled by the researchers. Such experimentally induced stressors may also involve high or low cognitive load (i.e., mental capacity), may include ego threats (e.g., failure, social comparison), and may elicit one of several different negative emotions (e.g., anxiety, fear, sadness). This variability in stressors increases the representativeness of results, yet also creates difficulty in making comparisons across studies. However, the experimental control gained by these measures of acute stress has afforded researchers many insights into the complex nature of stress-induced eating.

For example, Wallis and Hetherington (2004) used a Stroop color-naming task in which some participants were exposed to several types of ego-threatening words (e.g., "inadequate," "ridiculed") and other participants (the control group) were exposed to neutral words not involving ego threat. The researchers found that female participants in the stressful ego-threatening condition ate more chocolate than those in the control condition. In addition, these researchers included an "incongruent" condition (i.e., cognitive-load condition) in which the names of colors were printed in colors that were not consistent with the color name. They discovered that participants in the stressful cognitive load condition ate more chocolate than did those in the control condition. Like Wallis and Hetherington (2004), Lattimore and Maxwell (2004) conducted a study using a Stroop task with ego-threatening words, but these researchers chose to increase cognitive load by requiring additional memorization of words for an upcoming test. They found increased eating of potato chips, dried fruit, and chocolate items by participants in the high cognitive load condition that involved ego threat, particularly by highly restrained eaters. The role of ego-threatening situations on eating behavior was also found by Tanofsky-Kraff, Wilfley, & Spurrell (2000). Using three different tasks to induce ego-threatening stress (i.e., failure at a spatial puzzle, an anticipatory speech, being shunned by confederates in an interpersonal task), the researchers discovered greater ice cream consumption by highly restrained participants in the stressful conditions than in the control condition, and that the greatest amount of ice cream was eaten by those experiencing interpersonal ego-threatening stress.

As is evident from previously cited research, the variable of food intake has also been measured various ways in previous studies. Some research has relied on self-report (e.g., Macht et al., 2005; Oliver & Wardle, 1999; Tuschl, Laessle, Platte, & Pirke, 1990); however, due to the potential inaccuracies and biases inherent to self-report data, other researchers (e.g., Haynes et al., 2003; Lattimore & Maxwell, 2004; Oliver et al., 2000; Wallis & Hetherington, 2004) have surreptitiously assessed the amount of food eaten in a laboratory setting. Importantly, as Greeno and Wing (1994) summarized, many past laboratory studies provided participants with only one food to eat, and often one high in fat such as chocolate, ice cream, cookies, or buttered popcorn. Therefore, such studies have not been able to investigate whether there are particular kinds of food that individuals are likely to eat during times of stress.

Fortunately, several researchers have realized the importance of not only food amount, but also food choice, when examining the relationship between stress and eating behavior. The importance of stress-induced food preferences surfaced in animal studies, which showed that rats under mild stress increase their intake of fat (Diane, Victoriano, Fromentin, Tome, & Larue-Achagiotis, 2008) and sweet items (Rowland & Antelman, 1976). Humans' preference for sweet, high-fat items appears related to the food's palatability (Drewnowski & Greenwood, 1983; Macht & Mueller, 2007b) and such "comfort foods" tend to reduce negative mood and stress (Dallman et al., 2005; Macht & Mueller, 2007b). Surprisingly, a few studies that offered participants a variety of foods did not measure the impact of stress on the intake of specific food categories, but instead focused on the overall weight of food each participant consumed (Rutledge & Linden, 1998; Tice, Bratslavsky, & Baumeister, 2001). Other researchers (Liu et al., 2007; Oliver & Wardle, 1999; Wardle, Steptoe, Oliver, & Lipsey, 2000) have used participants' self-reported consumption of different types of foods as the measure of food choice, despite the known problems associated with self-report measures. A small number of studies (Grunberg & Straub, 1992; Haynes et al., 2003; Levine & Marcus, 1997; Shapiro and Anderson, 2005; Zellner et al., 2006) investigating stress-induced food preferences, though, have presented participants with several foods of varied levels of sweetness, saltiness, and fat content to discover more specific relations between stress and eating.

Considering the variety of measures utilized in the multitude of studies investigating the relation between stress and food preferences, it is hardly surprising that results are varied. For example, a few large-scale studies have found that individuals' self-reported stress relates to a diet high in fat (Ng & Jeffery, 2003) and sugar (Kandiah, Yake, Jones, & Meyer, 2006; Wardle et al., 2000). However, other research investigations have found no relation between stress and food preferences (Macht et al., 2005; Oliver et al., 2000).

With respect to the role of restraint in stress-induced eating, research has produced more consistent results. Most findings indicate that restrained eaters are likely to eat more when stressed than when unstressed, and that stressful situations elicit increased eating in restrained eaters but not in unrestrained eaters (Cools, Schotte, & McNally, 1992; Lattimore & Caswell, 2004; Polivy, Herman, & McFarlane, 1994; Schotte et al., 1990; Tanofsky-Kraff et al., 2000; Wallis & Hetherington, 2004). Many of these studies, however, did not assess the types of food preferred, but instead presented participants with only one food to eat.

In the current study our aim is to build on previous laboratory research investigating the role of stress, dietary restraint, and food preferences. Grunberg and Straub's (1992) study of stress-induced eating demonstrated that women in the high stress condition consumed slightly more sweet food than women in the low stress condition, but their intake of salty food did not vary by stress level. Zellner et al. (2006) also found in their sample of female college students that laboratory-induced stress related to food choice. The researchers presented participants with four food options varying on two dimensions: sweet versus salty and healthy versus unhealthy. Under stress, participants ate more sweet, unhealthy food (chocolate M&Ms) than sweet, healthy food (grapes). In addition, stressed individuals ate more M&Ms and fewer grapes than unstressed participants. There were no significant findings concerning salty foods and the researchers suspected that this could have been due to both salty items (potato chips, salted peanuts) being high in fat. Taken together, these two studies suggest that stressed females will be more likely than nonstressed females to eat sweet, high-fat food. However, the role of restraint was not investigated in either experiment.