



Premenstrual appetite and emotional responses to foods among women with premenstrual dysphoric disorder

Ju-Yu Yen ^{a, b, c}, Tai-Ling Liu ^c, I-Ju Chen ^d, Su-Yin Chen ^d, Chih-Hung Ko ^{b, c, e, *}

^a Department of Psychiatry, Kaohsiung Municipal Ta-Tung Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan, ROC

^b Department of Psychiatry, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung City, Taiwan, ROC

^c Department of Psychiatry, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan, ROC

^d Department of Nuclear Medicine, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan, ROC

^e Department of Psychiatry, Kaohsiung Municipal Hsiao-Kang Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan, ROC

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ABSTRACT

The aim of the study was to evaluate changes in late-luteal appetite for highly sweet (HS) and highly salty and fatty (HSF) foods in women with premenstrual dysphoric disorder (PMDD). After initial assessment in a psychiatric interview, the premenstrual symptoms screening tool (PSST) was used to identify women with moderate-to-severe premenstrual symptoms. Sixty-seven women with PMDD and 74 healthy controls were evaluated in the early-follicular and late-luteal (pre-menstrual) phases of the menstrual cycle. Because the PSST is designed to assess symptoms only in the late-luteal phase, an 11-point Likert scale was used to rate PMDD symptoms once a week in the evaluation mentioned previously and the following two menstrual cycles. Participants were shown pictures of 15 highly sweet (HS) and 15 highly salty and fatty (HSF) foods, desire to eat each food was rated on an eleven-point Likert scale (0, “none at all”; 10, “extreme desire”), and sweet-food craving was rated using the food craving-state questionnaire. Emotional responses to the foods were measured with a four-point Likert scale we previously validated. Depression, irritability, and impulsivity were measured with standard psychiatric instruments. Women with PMDD, but not control women, had late-luteal phase elevations in desire to eat HS food, sweet-food craving and emotional responses to HS foods. Desire to eat for HSF foods did not differ significantly across the menstrual cycle between groups. There were significant correlations between emotional responses to and desire to eat HS foods. Moreover, late-luteal phase irritability and impulsivity scores were associated with desire to eat HS foods. These data suggest that targeted assessment of increased late-luteal appetites for HS foods may facilitate clinical interventions in women with PMDD.

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1. Introduction

Women with premenstrual dysphoric disorder (PMDD) have predictable, cyclic psychological, behavioral and somatic symptoms that are aggravated in the late-luteal phase of the menstrual cycle and are improved after the onset of menses (American Psychiatric Association, 2013; Epperson et al., 2012; Rapkin & Winer, 2009). Typically, PMDD symptoms recur during about six days during the late-luteal phase throughout most of a woman's reproductive years (Yonkers & Simoni, 2018). The principal symptoms of PMDD include mood swings, depression, anxiety and irritability or anger.

* Corresponding author. Department of Psychiatry, Kaohsiung Medical University Hospital, 100, Tzyou 1st Road, Kaohsiung, 80708, Taiwan, ROC.

E-mail address: chihhungko@gmail.com (C.-H. Ko).

Markedly elevated late-luteal phase appetite, i.e., increased food intake or cravings for specific foods, is also among the diagnostic criteria for PMDD. For example, Yen et al. (2010) demonstrated that women with PMDD had a higher sweet food craving in the late-luteal phase than controls, and we (Ko et al., 2015) found that women with PMDD exhibited increases in the intake of sweet foods in the late luteal phase, but controls did not. The goal of this research was to further examine appetite changes in women with PMDD and their relation to other symptoms of this disorder.

The mechanisms underlying PMDD remain unclear. Changes in ovarian hormone levels during the menstrual cycle appear to contribute. Although hormone levels are normal in women with PMDD (Rubinow & Schmidt, 2006), recent evidence suggests that women with PMDD have altered sensitivity to ovarian-hormone dynamics, in particular to the increases in estrogen and

progesterone levels that occur early in the luteal phase, peak during the mid-luteal phase, decrease to basal levels during the late-luteal phase. When endogenous ovarian-hormone secretion was suppressed with GnRH-agonist treatment, symptoms remitted in many women with PMDD, and, in these women, but not in control women, either estradiol or progesterone administration elicited PMDD symptoms (Schmidt, Nieman, Danaceau, Adams, & Rubinow, 1998). Furthermore, again in women with PMDD whose endogenous cycles were suppressed, the first month of continuous treatment with estradiol plus progesterone elicited PMDD symptoms, but the second and third months did not, suggesting that hormone dynamics, but not steady-state hormone levels, provoke PMDD (Schmidt et al., 2017).

The involvement of both estrogens and progestogens in PMDD appears to dissociate PMDD from the contribution of ovarian hormones in normal eating. In healthy women, food intake decreases through the follicular phase to a minimum during the periovulatory phase and increases during the luteal phase, although whether food intake is uniformly high during the luteal phase remains undetermined (Asarian & Geary, 2013). The pre- and periovulatory decreases in eating appear to be due to increased estrogen levels, with no contribution of progestagens (Asarian & Geary, 2013). Estrogens and progestogens have, however, been linked to disordered eating during the luteal phase. Klump et al. (2013) discovered that in a community sample, there were day-to-day associations between ratings of emotional eating and estradiol and progesterone levels. Their further study demonstrated the associations were stronger in women who engaged in binge eating, but had not been diagnosed with bulimia nervosa, than in women who did not binge eat (Klump et al., 2014). As women with PMDD may have heightened sensitivity to the normal fluctuations of estrogens and progestogens across the menstrual cycle, healthy women and women with PMDD may display differences in the associations between estrogens and progestagens and eating behaviors, appetite for specific foods, and emotional eating during the cycle. Evaluating this may shed a light on the complex ways in which PMDD affects eating behavior and inform clinical intervention options.

Mood may partially mediate the association between fluctuating levels of ovarian hormones during the menstrual cycle and appetite in women with PMDD. For example, premenstrual increases in appetite were larger in women with premenstrual syndrome (PMS, a milder form of PMDD) and were correlated with ratings of mood, especially depression, only in women with PMS (Both-Orthman, Rubinow, Hoban, Malley, & Grover, 1988). Mood and emotion may influence eating through either physiological or by psychological effects (Gibson, 2006). For example, eating usually reduces irritability or promotes positive affect (Gibson, 2006). These effects, however, are short lived (Macht & Mueller, 2007). Because negative affect may motivate the consumption of energy-dense snack foods (Gibson, 2012), particularly in women with depression (Camilleri et al., 2014), we examined the correlations between mood and appetite in women with PMDD.

In addition to increasing mood symptoms, women with PMDD exhibited increased impulsivity (Yen et al., 2011). The increased impulsivity has been associated with uncontrolled eating (Karlsson, Persson, Sjostrom, & Sullivan, 2000) and negatively associated with self-regulation of food intake to control body weight (Leitch, Morgan, & Yeomans, 2013). Therefore we also examined the association of impulsivity with in appetite for HS and HSF foods in women with PMDD.

To this end, we measured reactions to pictures of familiar, energy-dense, palatable Taiwanese foods that were either highly sweet (HS) or highly salty and fatty (HSF). Previous studies have assessed appetite among women with PMDD by using

questionnaires to rate the desire to eat specific food items (Evans, Foltin, & Fischman, 1999; Reed, Levin, & Evans, 2008; Yen et al., 2010). Sorensen, Moller, Flint, Martens, and Raben (2003) suggested that the effect of sensory perception of the food on appetite. They suggested that sensory-specific satiety and variety of food might influence the amount of food eaten. Pictures of foods are more advantageous because they relay the appearance of the food more directly. They also could provide the varied sensation, such as appearance, color, or texture of a specific food that was defined as a word in questionnaire. For example, visual appraisal of a food evokes expectations about its satiating properties based on memory, which can guide decisions about selecting what to eat (McCrickerd & Forde, 2016). Pictures are also more easily standardized than verbal stimuli, which might evoke a range of imagined varieties of a food. Finally, pictures of foods are also use frequently in fMRI studies of appetite. For these reasons, in the present study, we standardized food stimuli by showing pictures of the foods on a computer screen.

2. Methods

2.1. Participants

Participants were recruited via advertisements for women with untreated PMDD and controls at university campuses. Volunteers for the PMDD group were required to endorse having at least five of the eleven DSM-IV-TR criteria of PMDD (American Psychiatric Association, 2000), which corresponds to Criterion A of DSM-V (American Psychiatric Association, 2013), with most symptoms being alleviated after the onset of menses. Control-group volunteers were required to have at most one criteria or to have mild symptoms with no functional impairment. Individuals currently taking psychotropic or gonadotropic medication were excluded.

After obtaining informed consent, 90 women with PMDD and 79 control women with at least college education completed the self-report Premenstrual Symptoms Screening Tool (PSST) for moderate or severe premenstrual symptoms (Steiner, Macdougall, & Brown, 2003) with the assistance of research assistants. Based on the cutoff point for PSST, 86 participants in the PMDD group and 75 in the control group screened positive and negative for moderate-to-severe premenstrual symptoms, respectively. They were then interviewed by a psychiatrist to exclude psychotic disorder and bipolar I disorder using the Mini-International Neuropsychiatric Interview (Sheehan et al., 1998) and to diagnose PMDD using the DSM-IV-TR criteria (American Psychiatric Association, 2000). This resulted in 83 participants in the PMDD group and 75 participants in the control group. Of these, 67 women with PMDD and 74 healthy participants were included in the final analysis after elimination of women with irregular menstrual cycles during testing, as described below. The study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital.

2.2. Measures

The PSST (Steiner et al., 2003), which contains fourteen 4-point items for assessing the severity of PMDD symptoms as well as five 4-point items for assessing impairments of function, was used to screen women with moderate to severe premenstrual symptoms. Women were required to satisfy 1) at least one of the first four items assessing the severity of symptoms, 2) four or more of the 14 items assessing the severity of PMDD symptoms, and 3) moderate or severe impairments in at least one of the five items assessing functional impairments.

PMDD severity questionnaire (PMDDSQ). Because the PSST is designed to assess symptoms only in the premenstrual phase, we

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