



# The high-sweet-fat food craving among women with premenstrual dysphoric disorder: Emotional response, implicit attitude and rewards sensitivity

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**Summary** This study aimed to: (1) evaluate food craving and high-sweet-fat food craving across the menstrual cycle; (2) compare the craving and explicit/implicit emotional response to different food; and (3) investigate the reward sensitivity among PMDD and control groups. The PMDD group without treatment history and control group were evaluated for food craving, emotional response to food, implicit attitude task to food, and responsiveness to reward both in luteal and follicular phases. A total of 59 women with PMDD and 60 controls had completed the study. The results revealed that both PMDD diagnosis and luteal phase were associated with higher body mass index. The high-sweet-fat food provoked higher craving, positive emotional, and positive implicit response more than other foods. The luteal phase contributed to higher food and high-sweet-fat food cravings. Besides, the PMDD women had higher reward sensitivity, emotional response, positive implicit attitude, and craving response to high-sweet-fat foods. Further, the rewarding sensitivity was associated with emotional response to high-sweet-fat food which was associated with high-sweet-fat food craving. These results would suggest emotional response and implicit attitude might play a role for high-sweet-fat food craving of PMDD. Further, PMDD women with higher reward sensitivity should be a target group of intervention for high-sweet-fat food craving.

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## 1. Introduction

Premenstrual dysphoric disorder (PMDD) has been reported to cause a variety of psychiatric and somatic symptoms and results in functional impairment in 3–8% of women at childbearing age (Mishell, 2005). It leads to a heavy life burden and foundational impairment among PMDD women during reproductive age (Rapkin and Winer, 2009). Obesity has been reported to be associated with premenstrual syndromes (Masho et al., 2005) and a variety of physical burdens (Ginsberg and MacCallum, 2009). Marked change in appetite, overeating, or specific food cravings were included in PMDD diagnostic criteria (American Psychiatric Assn, 2000) and might be associated with weight gain and obesity (Wurtman and Wurtman, 1995; Pelchat, 2009). However, the phenomenon of PMDD has not been well understood.

Several studies have suggested that menstrual cycle, but not PMDD, is associated with food craving (Bancroft et al., 1988; Hill and Heaton-Brown, 1994; Dye et al., 1995; Dye and Blundell, 1997). However, intake of carbohydrate has been noted to increase in the luteal phase among women with premenstrual syndrome (Wurtman et al., 1989; Brzezinski et al., 1990). Desire for foods containing fat increased premenstrually among women with PMDD (Evans et al., 1999; Reed et al., 2008). Furthermore, women with premenstrual syndrome had menstrual cyclic chocolate or high-sweet-fat cravings (Michener et al., 1999) which amounted to 49% of all the food cravings (Hill and Heaton-Brown, 1994). These previous studies might suggest that all of carbohydrate, high-salted-fat dietary items, or high-sweet-fat foods were the target of craving among PMDD women. However, whether the food craving resulted from the menstrual cycle or PMDD has not been well clarified in previous reports. Furthermore, which type of food was the major target of craving among PMDD has not been confirmed.

Pleasure experience and mood status along with eating behavior are associated with food craving (Hill et al., 1991; Hill and Heaton-Brown, 1994). Since immediate pleasure response could be conditioned to develop craving response, anticipatory pleasure response was suggested to explain the chocolate craving (Parker et al., 2006). Thus, the emotional response for craved food might play an important role in developing food craving and should be well investigated among PMDD women. Furthermore, implicit association task (IAT) has been used to assess automatic implicit affective responses to smoking and found to be associated with the craving response (Waters et al., 2007). It is also necessary to evaluate the implicit affective response to high-sweet-fat food among PMDD women to understand the mechanism of craving.

According to reinforcement sensitivity theory (Bijttebier et al., 2009), responsiveness to reward contributes to addictive behavior. Furthermore, reward sensitivity has been reported to contribute not only to substance addiction, but also to overeating behaviors (Loxton and Dawe, 2006). Thus, the responsiveness to reward should be investigated along with food craving in order to explore its role on food craving of PMDD.

Accordingly, the study aimed to evaluate and compare: (1) food craving and high-sweet-fat food craving; (2) the craving

and explicit/implicit emotional response among different foods; and (3) the reward sensitivity among and between PMDD and control groups, respectively.

## 2. Method

### 2.1. Demographic data

A total of 119 participants (60 PMDD and 59 controls) recruited from campus entered the study and completed all assessments. There was no significant difference on age ( $t_{117} = 0.79$ ,  $p = 0.43$ ) between the PMDD group ( $23.03 \pm 2.45$ ; range 20–31) and the control group ( $22.70 \pm 2.37$ ; range 20–32). Furthermore, there was no significant difference on educational level ( $t_{117} = -1.21$ ,  $p = 0.23$ ) for PMDD ( $15.53 \pm 1.06$ ; range 14–19) and control groups ( $15.77 \pm 1.13$ ; range 13–18).

### 2.2. The protocol

The advertisement posted recruited a PMDD group without treatment history of PMDD and a control group on campus. A total of 105 subjects who had positive response to more than 5/11 symptoms of DSM-IV criteria of PMDD, and who had most symptoms relieved after menstruation were enrolled as the PMDD group. The other 66 subjects responding to less than 3/11 symptoms of DSM-IV criteria of PMDD were recruited as the control group. Participants with current psychotropic medication treatment were screened and excluded. All participants had at least college education level. They were then arranged to be screened by The Premenstrual Symptoms Screening Tool (PSST) for existence of moderate or severe premenstrual symptoms. Sixty-six participants in the PMDD group and 65 females in the control group were screened to have and have not moderate or severe premenstrual symptoms respectively. After excluding psychotic disorder, bipolar I disorder, and eating disorder according to Mini-International Neuropsychiatric Interview (MINI), they were given a diagnostic interview conducted by one of two psychiatrists according to the DSM-IV-TR criteria of PMDD (American Psychiatric Assn, 2000).

Sixty-four females in the case group and 62 females in the control group were diagnosed to have PMDD and have no PMDD, respectively. However, one PMDD female fulfilling the diagnostic criteria of Bulimia nervosa was excluded. The 63 females in the PMDD group and 62 females in the control group were arranged to participate in the investigation both in luteal (1 week before menstruation predicted by the last menstruation cycle) and follicular phases (end of menstruation). Half of them were assessed firstly in the luteal phase and the other half firstly in the follicular phase. Then, they completed the questionnaire assessments and the implicit association task (IAT) for high-sweet-fat foods. Besides, the body mass index (BMI) was recorded and calculated both in luteal and follicular phases. A total of 59 subjects in the PMDD and 60 in the control group completed the two-phase evaluation and entered the analysis. All participants accepted the assessments after informed consent was obtained. The study was approved by the Institutional Review Board (IRB) of Kaohsiung Medical University Hospital.

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