Personality and Individual Differences 46 (2009) 744–747

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Short Communication

Relationships between serum estradiol, follicle-stimulating hormone concentrations, and gender-related identity: A study of perimenopausal women

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ARTICLE INFO

Article history:
Received 5 November 2008
Received in revised form 9 January 2009
Accepted 16 January 2009
Available online 23 February 2009

Keywords:
Menopausal symptoms
Serum E2
Serum FSH
Gender-related identity
Perimenopausal women

ABSTRACT

The purpose of this study was to examine the relationships among menopausal symptoms, serum estradiol (E2) levels, follicle-stimulating hormone (FSH) concentrations and gender-related identity as measured by the Communion-Agency Scale in Japanese perimenopausal women. Forty-eight women (mean age ± SD: 55.2 ± 5.1 years) voluntarily participated in the study. The results revealed that unmitigated communion was positively associated with menopausal symptoms and FSH, and negatively associated with E2. Among the items of unmitigated communion, 'I automatically rely on others' showed strong associations with the E2 and FSH levels and menopausal symptoms. The hormone data did not show any significant associations with depressive symptoms. Hormonal changes during the menopausal transition may legitimize the traditional constructions of negative femininity.

1. Introduction

The transition into menopause is most commonly associated with fluctuating estrogen levels, and includes vasomotor symptoms such as hot flushes and sweats (Freedman, 2000). The relationships between menopause and mood disorders have not yet been clarified (Avis & McKinlay, 1991; Schmidt & Rubinow, 1991). Interestingly, menopausal complaints vary among cultures, and it has been proposed that not only cultural and demographic differences but also biological, genetic and nutritional/dietary factors may influence these complaints (Lock, 1994; Nagata, Takatsuka, Inaba, Kawakami, & Shimizu, 1998).

Changes in the behavior and self-conceptions of women, including masculinity and femininity, would be expected to occur during the menopausal transition. However, these changes may differ between cultural contexts. In a previous study, British women were more likely to perceive menopause as a loss of femaleness, whereas Portuguese women were more likely to perceive menopause as physical and other psychological changes (Figueiras & Marteau, 1995). Furthermore, although, Norwegian women showed no significant changes in gender-related personality during the menopausal transition, masculinity appeared to protect against vasomotor symptoms, such as hot flushes, late in the menopausal transition (Øverlie, Finset, & Holte, 2002). However, few studies have examined the associations between gender-related identity and sex hormones within the context of the menopause.

These preceding studies utilized questionnaires such as the Bem Sex Role Inventory (BSRI; Bem, 1974) to assess an individual's femininity and masculinity. However, the femininity assessment contained within the BSRI only includes desirable traits for women. Helgeson (1994) focused on the negative aspects of these traits as unmitigated traits that would represent the most predictive factors for psychological well-being and physical health. In a study by Hirokawa and Dohi (2007), a negative aspect of femininity (or unmitigated communion) was most strongly associated with dysphoria in Japanese young adults.

The purpose of this study was to examine the relationships among serum E2 levels, FSH concentrations and gendered psychological traits in Japanese perimenopausal women. We hypothesized that if a negative feminine aspect (i.e., unmitigated communion) is strongly associated with dysphoria, unmitigated communion may be positively associated with menopausal symptoms as well as hormonal changes, such as a lower level of E2 and higher level of FSH. Masculinity (i.e., agency) may be negatively associated with menopausal symptoms, especially hot flushes.

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doi:10.1016/j.paid.2009.01.026

2. Method

2.1. Participants

Participants for the study were sought as volunteers from women aged about 50 years who applied to a Japanese company to participate in an intervention study on soy intake and osteoporosis. A member of the company's study group recruited and enrolled the participants. This study analyzed the baseline survey results. A total of 48 women (mean age = 55.2 years, SD = 5.1) agreed to the purpose of the intervention study and participated in it. Participants who had menstruation were categorized as 1, those who had reached menopause within the previous 65 months were categorized as 2 and those who had reached menopause more than 66 months previously were categorized as 3. The subjects received a second explanation of the outline of this study from the authors and signed a letter of consent. The performance of this study was approved by the local ethical committee.

2.2. Procedures and measures

A self-administered questionnaire and blood samples were collected. The self-administered questionnaire contained questions regarding the menstrual cycle, in addition to those regarding menopausal symptoms, depression symptoms and gender-related identity. For the menstrual cycle, the participants were asked whether they had regular menstruation for the past 6 months, and responded with 'almost regular menses,' 'irregular menses' or 'no menses.' Participants who responded as having almost regular or irregular menses were asked the date when their last period began. Participants who responded as having no menses were asked the time when they reached menopause (months). The questionnaire was sent to the participants about one week before the day of blood sampling. The date and time of the blood sampling were arranged between 10 am and 5 pm over two days to comply with the schedules of the individual participants. The sampling time was controlled for associations with both E2 and FSH in this study. Hormone data, E2 and FSH were determined in the serum using an electrochemiluminescence immunoassay (ECLIA) technique. Logarithmic transformations were carried out for serum E2 and FSH.

Psychological identities related to gender were measured applying a Communion-Agency Scale (CAS; Dohi & Hirokawa, 2004). The CAS consisted of 24 items, including agency (6 items, $\alpha = .75$), communion (6 items, $\alpha = .71$), unmitigated agency (6 items, $\alpha = .75$) and unmitigated communion (6 items, $\alpha = .74$). Agency refers to concerns about self-affirmation and individualization, and leads to a focus on self-protection and self-assertion by emphasizing separation. Communion refers to a focus on cooperation, nurturance, empathy and attachment by emphasizing the creation of unions. Agency and communion are considered to be nuclear factors for masculinity and femininity, respectively. Unmitigated agency is an extreme of agentic orientation with a lack of communal orientation, while unmitigated communion is an extreme of communal orientation with a lack of agentic orientation (Helgeson, 1994). The participants responded to each item in terms of how well it described their personal situation, choosing from 1 (not at all) to 4 (very true). A higher score indicated a higher tendency for these traits.

Depression symptoms were measured using the Japanese translation (Shima, Shikano, Kitamura, & Asai, 1985) of the Center for Epidemiologic Studies Depression Scale (CES-D scale; Radloff, 1977). The CES-D scale consisted of 20 items ($\alpha = .87$) that were asked to determine the frequencies of experiencing specific depressive symptoms in one week, choosing from 1 (not at all) to 4 (more than 5 days).

Menopausal symptoms were measured using a menopausal symptom screening test for Japanese women (Reproductive Endocrinology Committee, 2001). This test was designed to evaluate menopausal symptoms in Japanese women, and listed 21 items ($\alpha = .78$) including hot flushes (2 items), sleep disturbance (2 items), neurosis (4 items), fatigue (2 items), memory disturbance (1 item), dizziness (1 item), chest discomfort (2 items), pain (4 items) and paresthesia (3 items). These items were assessed for their level of severity and scored as 0 (null), 1 (light) or 2 (strong).

3. Results

This study included 12 premenopausal women and 36 menopausal women (17 women within 65 months of menopause, 17 women of 66 months or more after menopause and two women of unknown time of menopause). The characteristics of the participants according to their menopausal status are shown in Table 1. The group of women within 65 months after menopause showed higher levels of FSH and negative communion than the other two groups.

Table 2 shows the partial correlation coefficients between menopausal symptoms, E2, FSH, scores of the CAS subscales and the CES-D. Unmitigated communion showed a negative association with E2 and a positive association with FSH and menopausal symptoms. Depressive symptoms did not show any associations with E2 and FSH, but had significantly strong associations with hot flushes as well as menopausal symptoms. Among menopausal symptoms, hot flushes, neurosis and memory disturbance were positively

Table 1
Means (SDs) of variables by pre- and post-menopause groups.

	Mean (SD)	Pre-menopause	Post-menopause		*F*	Effect size
			⩽65 months	⩾66 months		
N	48[A]	12	17	17		
Age (years)	55.19 (5.07)	50.50[c] (1.57)	53.65[b] (3.48)	59.12[a] (3.95)	25.64***	0.54
E2 (pg/ml)	12.33 (2.99)	45.76[a] (4.20)	8.60[b] (1.66)	7.45[b] (1.41)	20.4***	0.49
FSH (mIU/ml)	56.08 (2.23)	22.57[b] (2.94)	81.41[a] (1.46)	69.16[a] (1.36)	16.85***	0.44
Menopausal symptoms	9.63 (5.57)	9.42 (5.45)	10.71 (6.05)	8.47 (5.22)	0.68	0.03
Agency	16.31 (2.87)	16.25 (2.67)	16.00 (2.57)	16.47 (3.43)	0.11	0.01
Communion	19.51 (2.59)	19.17 (2.62)	20.53 (2.18)	18.56 (2.68)	2.70	0.11
Unmitigated agency	10.53 (2.83)	10.33 (2.84)	10.18 (3.17)	10.94 (2.74)	0.30	0.01
Unmitigated communion	14.30 (3.35)	13.25[b] (4.27)	16.19[a] (2.32)	13.63[b] (2.90)	3.86*	0.16
Depressive symptom	9.00 (7.15)	9.50 (8.59)	10.71 (7.67)	6.88 (5.62)	1.23	0.05

a, b, and c indicate a significant difference between values (i.e., a > b > c, $p < 0.05$), according to the post-hoc test.
[A] Two participants whose menopausal status was unknown were included.
* $p < 0.05$.
*** $p < 0.001$.