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Psychometric Evaluation of the Midlife Women's Symptom Index (MSI) in Multiethnic Groups

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Abstract

The Midlife Women's Symptom Index (MSI) was designed to measure menopausal symptoms specifically in a multiethnic sample of midlife women. This study is a psychometric property test to evaluate MSI among 512 multiethnic groups of midlife women (White, Hispanic, African American, and Asian American). Across the ethnic groups, MSI had an adequate internal consistency in all subdomains except psychosomatic symptoms. The item-to-total correlation coefficients of "lost weight" and "nosebleeds" were less than 0.20 among all ethnic groups. The discriminant validity was confirmed among all ethnic groups except Asian Americans. Overall, MSI may work better for Whites and not as well for Asian Americans, compared with other ethnic groups. Additional studies with diverse groups of multiethnic midlife women are needed, however, to confirm MSI psychometric properties.

Keywords

psychometric property; reliability; validity; menopausal symptom; ethnicity

Menopause, the phase of a woman's life when she no longer experiences menstruation, affects all females across ethnic groups (North American Menopause Society, 2009). Although not every woman experiences symptoms other than cessation of menstruation (Umland, 2008), menopausal symptoms have been an important issue because they have been associated in midlife women with impaired quality of life (Kumari, Stafford, & Marmot, 2005; Nappi & Lachowsky, 2009; Utian, 2005), as well as poor physical and mental health (Matthews & Bromberger, 2005; Nappi & Lachowsky, 2009; Svartberg et al., 2009). Also, women have generated significantly more health care costs during their years of menopause than have men during those same years (Owens, 2008). These facts illustrate the need to assess the menopausal symptoms of midlife women accurately, both to find preventive solutions for those symptoms and to provide adequate management systems (Schneider, MacLennan, & Feeny, 2008; Yarbrow, Grogge, & Goodman, 2004).

Measurement of menopausal symptoms

In recent decades, a number of instruments have been developed to measure menopausal symptoms, such as the Blatt Menopausal Index (BMI), Menopausal Symptom Checklist (MSC), Kupperman Index, Greene Climacteric Scale (GCS), and Menopause Rating Scale (MRS). These tools are similar in the following ways: (a) assessing the severity of menopausal symptoms, (b) having less than 30 items, and (c) using a Likert scale (Blatt, Wiesbader, & Kupperman, 1953; Greene, 1991; Hauser et al., 1994; Kupperman, Wetchler, & Blatt, 1959; Neugarten & Kraines, 1965). The Kupperman Index highly values symptomatic relief, which is based not on a woman's self-reported perceived symptoms but rather on a physician's summary of the severity of her climacteric complaints (Heinemann, Potthoff, & Schneider, 2003). MSC and CGS use divided subscales, such as sexual dysfunction and psychological, somatic, and vasomotor symptoms. BMI is distinguished by measurement of the frequency, duration, and severity of menopausal symptoms. Among these instruments, only MRS has been used worldwide (Heinemann et al., 2003). This scale was developed in the early 1990s using the German population for measuring the severity of aging symptoms and their impact on health-related quality of life in menopausal women (Heinemann et al., 2004; Heinemann et al., 2003). The MRS scale is currently available in nine languages (Portuguese, English, French, German, Indonesian, Italian, Spanish, Swedish, and Turkish). More studies are needed, however, on the reliability and validity of versions used in Latin America and Indonesia (Heinemann et al., 2004).

Although many instruments have been developed to assess menopausal symptoms, as a rule they were designed and used with mostly European Caucasian women and did not account for differences in ethnicity (Im, 2006). Few of the instruments demonstrated validity or reliability (Nelson et al., 2005). Ethnicity should be considered in measuring menopausal symptoms because prevalence and severity of the symptoms differ, both by ethnicity (Dillarway et al., 2008; Edwards et al., 2001) and by women's cultural beliefs and practices (Hall et al., 2007). Perceived symptoms were noticeably influenced not only by subjectivity of the symptom experience but also by cultural influences on symptom perception and expression (Cardoso & Faleiros Sousa, 2009). For example, Hispanic and African American women were reported to have positive attitudes toward menopause and to perceive menopause as part of the normal aging process (Dillarway et al., 2008; Longworth, 2003). Asian American women hesitated to discuss menopausal symptoms because of their cultural taboos related to women's sexual organs (Im & Meleis, 2000). Also, specific experiences of ethnic minority immigrant women—such as economic difficulties, unfavorable labor-market conditions, lack of information, and marginalization—influenced the women's menopausal symptoms (Im & Meleis, 2000). Therefore, questionnaires designed for European Caucasian women may not be specific enough to pick up subtle but important features in menopausal symptoms among midlife women of different ethnic groups (Hilditch et al., 2008). As the U.S. population continues to diversify, measures should have cultural competence, especially when a study includes multiethnic groups of people (Busch-Rossnagel, 2002). Measures need to have an awareness of, sensitivity to, and knowledge of the meaning of culture in order to understand and estimate effectively the experiences of people from different backgrounds.

Specificity of the Midlife Women's Symptom Index (MSI)

The Midlife Women's Symptom Index (MSI) was designed specifically for a multiethnic sample of midlife women. MSI was based on the Cornell Medical Index (CMI), but menopause-specific symptoms reported in previous studies on menopause in multiethnic populations were added (Im, Meleis, & Lee, 1999). In 2006, MSI was revised based on more recent literature, more recent menopause-specific instruments, and the reviews of experts

(Im, 2006). Unique features of the revised MSI included assessment of symptom severity and separation of menopausal symptoms from those of other conditions (Im). In the revised MSI, prevalence and severity of menopausal symptoms were assessed and then graded subjectively on a 5-point scale between 0 (not at all) and 4 (extremely). The current version of the MSI is composed of 73 menopausal symptoms divided into the subdomains of physical, psychological, and psychosomatic.

MSI is an instrument with the potential for cross-cultural research on midlife women. Several studies using MSI verified it as a reasonable measure for detecting ethnic differences in menopausal symptoms (Im, 2009;Im et al., 2005). According to these studies, African American women reported the highest prevalence and severity of menopausal symptoms of any ethnic group, while Asian American women reported the lowest. These findings agreed with the current literature. In addition, the studies using MSI showed new results that had not been reported by previous investigations. For example, African American women tended to have more difficulty sleeping and felt hot or cold more intensely than did White women, while Asian American women more frequently reported changes in vision than did women of other ethnic groups.

Previous psychometric property tests on MSI showed that the instrument was established as a tool with good internal consistency and was valid as a menopausal symptoms measure in multiethnic groups of midlife women (Im, 2006;Im et al., 2005). In Im's study, MSI internal consistency coefficients ranged from 0.78–0.97, suggesting that 15 items in Im's study be eliminated based on results of the item-analysis. When MSI validity was tested by comparison with MSC measures, correlation coefficients ranged from 0.61–0.94.

Despite the fact that the MSI was revised for greater reliability and validity, there have been no studies of the psychometric test using its current version among diverse ethnic groups of midlife women. Because specific concepts such as social norms, moral values, and beliefs can affect the reliability and validity of the measurement, researchers should pay special attention when using the tool among different ethnic groups (Waltz, Strickland, & Lenz, 2005). Also, it is important to conduct a psychometric property test of the instrument to establish validity and reliability before using the test in a cross-cultural setting (Oliver & Mahon, 2006). If the reliability and validity of existing measures were tested over time for cross-cultural research, then the development of a new measure would be much quicker and easier (Waltz et al.). The psychometric test is essential to create and evaluate instruments regarding psychological attributes or physiological parameters (O'Connor, 2004) and is undertaken to develop scientifically sound assessments and to evaluate measurement properties of these instruments (Hobart, Freeman, & Thompson, 2000). This study evaluated the psychometric properties of the most current MSI version in a multiethnic sample of midlife women.

Purpose

The purpose of this psychometric test study was to determine MSI reliability and validity in a multiethnic sample of midlife women. The two specific aims were (a) to evaluate MSI reliability (internal consistency, interitem correlation, and item-total correlations) and (b) to evaluate convergent and discriminant MSI validity.

Method

Study design

This study is a psychometric property test to evaluate MSI in multiethnic groups of midlife women. The investigation is a secondary analysis of data collected from a larger Internet

survey study on menopausal symptoms of midlife women in the United States. Only partial data from the larger study were analyzed to evaluate MSI reliability and validity in a multiethnic sample of midlife women. The study was approved by the Institutional Review Board of the university where the authors are affiliated.

Sample and setting

Participants were recruited through the Internet communities of ethnic minorities (ICEMs) and of midlife women (ICMWs) in the United States. Participants eligible for study inclusion were (a) between the ages of 40 and 60 years old, (b) Hispanic, African American, Asian American, or White as self-reported ethnicity, (c) familiar with the Internet as a medium of communication, and (d) able to read English. The participants were required to provide informed consent before participation and to comply with study protocol. A total of 649 midlife women participated in the Internet survey. Of these, 512 (120 Hispanics, 121 African Americans, 111 Asian Americans, and 160 Whites) had less than 10% missing data and were included in the final analysis. Among the participants, 23% were Hispanic, 24% were African American, 22% were Asian American, and 31% were White. Participants reporting a low-income level represented 19% of all subjects. Although we planned for a balanced sample on ethnicity and income level, White women were overrepresented in the sample, and low-income women were underrepresented. One possible reason for this disparity is Internet accessibility: Internet users tend to be younger, more educated Whites with higher incomes (Im, Shin, & Chee, 2008).

The sample size of 512 participants is adequate for this analysis of psychometric properties. For evaluating discriminant validity, group comparisons using ANOVA tests were performed. To achieve a medium effect size ($d = .50$), a minimum of 51 participants per group will provide 80% power to detect such a difference at the 0.05-significance level (Cohen et al., 2003). In the Pearson correlation analysis used to test for convergent validity, a moderate correlation ($r = 0.30$) between variables is considered meaningful. Thus, a sample of 111 (total = 444) analyzable subjects provides 95% power to discover a correlation statistically different from zero at 0.05 significance (Cohen et al.). In addition, there is evidence to suggest that a useful reliability and validity estimate can be obtained from a sample as small as 20 (Hobart, Cano, & Thompson, 2002; Cano, Warner, & Hobart, 2003).

Measurements

The Midlife Women's Symptom Index (MSI)—MSI is a self-administered instrument designed to obtain information about symptom experience during the menopausal transition. Again, this instrument was adapted from the Cornell Medical Index (CMI) (Im, 1994) and revised using recent literature, three of the currently existing menopause-specific instruments (the SWAN study instrument, the Washington Women's Health Diary, and Chi's scale), and reviews from a panel of eight experts in women's health (Im, 2006). The revised MSI has many virtues: It reduces participant burden because it is shorter, and it assesses symptom severity and separates the menopausal symptoms from others (Im). In this study, the most current MSI version was used to evaluate measurement reliability and validity in estimating symptom experiences during the menopausal transition among a multiethnic group of midlife women. The most current MSI version is divided into two parts—prevalence and severity. Prevalence includes a dichotomous scale of 73 items, while severity consists of a 5-point Likert scale (0 = not at all, 1 = a little bit, 2 = moderately, 3 = quite a bit, 4 = extremely) for every symptom. Each part can be categorized into three domains: physical (51 items), psychosocial (18 items), and psychosomatic symptoms (4 items). The revised MSI also includes open-ended questions on the perceived causes,

meanings, and management strategies of menopausal symptoms, but these items are not considered in this study due to their open-ended nature.

Sociodemographic characteristics—Age, education level, religion, employment status, family-income level, marital status, country of birth, length of stay in the United States, level of acculturation, self-reported ethnicity, general health status, body weight, height, menopause status, and diagnosed disease were measured to describe sociodemographic characteristics of the participants. Family-income level was defined as the difficulty of payment for basics such as food, housing, clothing, and health care, each of which was categorized into very hard, somewhat hard, and not hard. When the country of birth was not the United States, then degree of acculturation and length of stay in the United States were measured. Acculturation was determined using a sum of preferences for foods, music, customs, language, and close friends via a 5-point Likert scale. These questions were developed by modifying the Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA) (Suinn et al., 1987; 1992). The reliability and validity of the modified questions were well supported in previous studies (Im & Chee, 2005; Im et al., 2005). The reliability of acculturation (Cronbach's alpha) in this study was 0.98. Self-reported ethnicity was assessed using the ethnicity questions required by National Institute of Health (NIH) guidelines. Self-reported health status was measured using a Likert scale (1 = very unhealthy ~ 5 = very healthy). For data analysis, body mass index (BMI) was calculated in kg/m² from the self-reported height and weight at the time of the Internet survey, and added as a variable. BMI was categorized for the analysis as 24.9 or less (normal), 25.0–29.9 (overweight), or 30 or more (obese) kg/m², in accordance with World Health Organization (WHO) definitions. Menopause status was determined through questions about last menstrual cycle and menstrual regularity, and categorized into four levels: premenopause, early perimenopause, late perimenopause, and postmenopause.

Data collection procedures—The project website was opened according to the Health Insurance Portability and Accountability Act (HIPAA) and SysAdmin, Audit, Network, Security Institute (SANS)/FBI recommendations. Informed consent forms and Internet survey questions were displayed on the website. Research assistants who culturally matched this study's target ethnic groups contacted the ICMWs and ICEMs to request that they post an announcement of the study through their websites, web pages, and e-mail lists of ICMWs and ICEMs. Midlife women who saw the announcement and wanted to participate were asked to visit the project website, where they were required to give their informed consent and respond to the research questionnaire. Before participants started their participation in the online survey, their inclusion criteria (age, literacy, Internet access, and ethnicity) were verified. While participants were filling out the online survey, several random questions were repeated to check for consistency and verify identity.

Data management and analysis—A serial identification number assigned by the researchers was the only subject identifier used throughout the analysis. The Internet survey database was copied to CD-ROMs and stored in a locked file cabinet in a research office. The validity and missing answer fields were automatically checked by Java script codes. If there were missing fields or invalid data, participants were reminded to provide complete and accurate information. Participants with more than 10% data missing at the end were not included in the analysis.

The psychometric analysis of the MSI consisted of two types of reliability tests and two types of validity tests. To evaluate MSI reliability, internal consistency reliability testing and item analyses were performed. For the internal consistency reliability test (a measure of how well scale items measure a single cognitive factor), the Kuder-Richardson Formula 20 (KR20) for the MSI prevalence part (using dichotomous scales) and Cronbach's alpha

coefficients for the MSI severity part (using 5-point Likert scales) were calculated. A KR20, a special case of Cronbach's alpha specifically for ordinal dichotomies, and Cronbach alpha coefficients above 0.7 indicated acceptable internal consistency and reliability of group comparisons (Streiner & Norman, 2003). In addition, item analyses were employed to check interitem correlations and item-total correlations. To assess interitem correlations, standards developed by Robinson, Shaver, and Wrightsman (1991) were used. According to these standards, the mean interitem correlation coefficient above 0.30 provided exemplary evidence, and 0.20–0.29 and 0.10–0.19 provided extensive and moderate evidence, respectively. Also, item-to-total correlation coefficients greater than 0.20 and less than 0.80 were considered acceptable (Cox & Ferguson, 1994).

Intercorrelation coefficients of MSI subscales were calculated to compare with each other and with the total MSI score, which determined convergent validity. Discriminant validity—that is, the ability of the MSI to discriminate between subgroups of participants—was also investigated. Based on previous research, this study hypothesized that menopausal symptoms were associated with changes in menopausal status (Avis et al., 2003; Gold et al., 2006; Thurston et al., 2008a; Thurston et al., 2008b; Xu et al, 2005).

Results

Sociodemographic characteristics of participants

The mean age of participants was 48.90 years ($SD = 5.29$), and 68% were married. More than half (57%) reported their education level as high (college graduates or graduate degrees) and 41% were Protestants. Those employed constituted 73%, while 44% said it was not hard to pay for basics with their family incomes. The mean score of self-reported general health was 3.62 ($SD = 1.04$). A majority was born in the United States (78%) and had no diagnosed disease (58%). Among participants who were not born in the United States, the mean length of U.S. stay was 17.51 years ($SD = 13.79$): Hispanic 23.10 ($SD = 15.72$), African American 25.33 ($SD = 0.58$), Asian American 14.63 ($SD = 12.11$), and White 42.67 ($SD = 1.15$). The mean score of the level of acculturation was 13.86 ($SD = 2.78$): Hispanic 13.75 ($SD = 3.19$), African American 16.67 ($SD = 0.58$), Asian American 13.51 ($SD = 2.22$), and White 21.33 ($SD = 3.06$). About 41% had normal BMI. Menopausal stages of the women included 22% premenopausal, 33% postmenopausal, 31% early perimenopausal, and 14% late perimenopausal. Participant characteristics are summarized in Table 1.

Internal consistency

Table 2 summarizes KR20s and Cronbach's alpha coefficients on MSI according to ethnicity. Results indicated adequate internal consistency of the MSI prevalence part for all ethnic groups. The KR20 range was 0.90–0.92 for physical symptoms and 0.89–0.92 for psychosocial, although KR20s of psychosomatic symptoms were not acceptable for all ethnic groups. Cronbach's alpha coefficients on the severity of both physical and psychosocial symptoms were more than 0.90, but were not acceptable on the psychosomatic symptoms for any ethnic groups except Whites.

Item analyses

Table 3 shows the results of MSI item analysis. In the prevalence part, the item-to-total correlation coefficients of “lost weight” and “nosebleeds” were less than 0.20 among all ethnic groups. Item-to-total correlation coefficients of Hispanic participants ranged from 0.07–0.68, two items (“lost weight” and “nosebleeds”) had coefficients less than 0.20, and average interitem correlation coefficient for the total scale was an extensive 0.21. Among African American participants, item-to-total correlation coefficients ranged from 0.02–0.66, five items (“lost weight,” “nosebleeds,” “hearing loss,” “vaginal dryness,” and “urinary

pain”) had coefficients less than 0.20, and average interitem correlation coefficient for the total scale was 0.16—considered moderate by the standards of Robinson et al. (1991). Among Asian American participants, the range of item-to-total correlation coefficients was 0.06–0.61, coefficients of four items (“lost weight,” “nosebleeds,” “stomach pain,” and “loose bowel movements”) were less than 0.20, and average interitem correlation coefficient was an extensive 0.21. Item-to-total correlation coefficients of White participants ranged from 0.03–0.65, coefficients of four items (“lost weight,” “nosebleeds,” “gained weight,” and “heavier menstruation”) were less than 0.20, and average interitem correlation coefficient was a moderate 0.18.

Results of item analysis on the MSI severity part were similar to those on the prevalence part. Among Hispanic participants, item-to-total correlation coefficients ranged from 0.08–0.73, “lost weight” and “nosebleeds” had coefficients less than 0.20, and average interitem correlation coefficient was an extensive 0.26. Among African American participants, item-to-total correlation coefficients ranged from 0.03–0.70, the same five items on the prevalence part (lost weight,” “nosebleeds,” “hard of hearing,” “vaginal dryness,” and “urinary pain”) had coefficients less than 0.20, and average interitem correlation coefficient was 0.22. Item-to-total correlation coefficients of Asian American participants ranged from 0.01 to 0.75, three items (“lost weight,” “stomach pain,” and “loose bowel movements”) had coefficients less than 0.20, and average interitem correlation coefficient was 0.27 (extensive). Among White participants, item-to-total correlation coefficients ranged from 0.06–0.71, coefficients of two items (“lost weight” and “urinary pain”) were less than 0.20, and average interitem correlation coefficient was 0.23 (extensive).

Convergent validity

Intercorrelation of subscales, with each other and with the total score, determined convergent validity (Table 4). Across all ethnic groups, total prevalence and severity of menopausal symptoms were correlated with all subscales scores, as evidenced by *r* values ranging from 0.79–0.97. Subscales had strong positive correlations with each other among all ethnic groups.

Discriminant validity

MSI scores were compared according to menopausal status of participants to assess discriminant validity. Table 5 displays the results. The scale differentiated well among four groups differing in menopausal status among all ethnic groups. Participants who were of perimenopausal status had higher prevalence and severity scores than participants who were of premenopausal and postmenopausal status. This difference was statistically significant ($p < .05$), except for Asian Americans.

Discussion

The findings of this study add important information to the literature on the measurement of menopausal symptoms by evaluating MSI psychometric properties within multiethnic groups of midlife women. Several important findings emerged. First, adequate internal consistency reliabilities were obtained for all subdomains but psychosomatic symptoms, for which internal consistency coefficients were not acceptable except for Whites. The small number of items (four) used to measure psychosomatic symptoms could be one reason for the low values of internal consistency coefficients. Generally, more items decrease the error of measurement and increase the reliability (Hayes, 2008). Also, several words such as “frequent,” “severe,” and “complete” may be interpreted differently according to each participant’s subjective point of view, especially those whose first language is not English

(Hunt & Bhopal, 2003). Unclear instrument questions could induce measurement error and cause low reliability (Meshkani & Hossein, 2005).

Second, the “lost weight” and “nosebleeds” items had item-to-total correlation coefficients less than 0.20 among all ethnic groups, which meant these items made no contribution to the MSI measure. An item that measures different content areas than others may show a low correlation coefficient (Kline, 2005), meaning that most participants of this study did not regard “lost weight” and “nosebleeds” as menopausal symptoms. Generally, menopause is related to gaining weight. A number of studies have been performed to control the weight gain in menopausal women for management of their health problems (Church et al., 2009; Uusi-Rasi et al., 2009), and nose bleeding was rarely reported by them. Only one study on nose bleeding in women was found through PUBMED database searches, and it reported that 16.5% of mature French women experienced nasal bleeding (Lund et al., 2006).

Third, our findings supported MSI discriminant validity among all ethnic groups except Asian Americans. A possible reason for low validity among Asian Americans may be found in sociodemographic characteristics influencing the prevalence and severity of menopausal symptoms. Asian American participants in this study were more likely to have normal BMI and be without diagnosed disease. Also, Asian American participants were less likely to be born in the United States than other ethnic groups, and reported the lowest mean scores in length of stay in the United States and level of acculturation. Less-acculturated immigrants were reported to have good health outcomes (Frisbie, Cho, & Hummer, 2001; Goel et al., 2004; Read, Amick, & Donat, 2005). Women who were healthier tended to report fewer menopausal symptoms (Avis et al., 2003; Thurston et al., 2008a). In other words, the healthier Asian American participants, compared to those in the other ethnic groups, had barely discernible prevalence and severity scores according to menopausal status. Therefore, it may be difficult to detect a statistically significant difference. Also, perceptions of menopause in Asian culture could influence the instrument’s discriminant validity. Asian American women are inclined to ignore and neglect their menopausal transition because menopause, which means the end of fertility, has a negative connotation in the patriarchal system (Im & Meleis, 2000). This tendency among Asian Americans to minimize menopausal symptoms could be one reason why there were no significant differences in symptoms according to menopausal status.

Finally, in Hispanic and African American women, psychological and psychosomatic symptom scales showed unstable discriminant validity. These findings were possibly explained by the small number of women in these two groups who experienced psychological and psychosomatic symptoms. Hispanic and African American participants reported a statistically significant lower prevalence of psychological and psychosomatic symptoms than did White participants. In general, it is more difficult to detect statistically significant differences between small groups (Sexton et al., 2008). In previous studies, it was reported that Hispanic and African American women tended to have fewer psychosomatic menopausal symptoms (e.g., difficulty sleeping or headaches) than did White women (Avis et al., 2001; Gold et al., 2000). Psychological symptoms, including feeling irritable and depression, were also reported less by Hispanic and African American women (Avis et al.; Xu et al., 2005).

In summary, this study indicates that MSI may work better for Whites and not work well for Asian Americans compared with other ethnic groups. Yet that may be a hasty conclusion, due to the following limitations. First, the cause of low validity among the Asian American group might come not from ethnic differences, but rather from differences in sociodemographic characteristics. We could not ensure that there were no significant differences in sociodemographic characteristics by ethnicity. Asian American participants in

this study were more likely to be unemployed, married, and born outside the United States—as well as have high education levels—while they were less likely to stay in the United States and be acculturated. Factors such as language ability and levels of education and acculturation could influence reliability and validity of the scales (Kester & Pena, 2002; Montazeri et al., 2009). Although this study included only participants who could read and write English, we could not ensure that there were no significant differences in English capability by ethnicity. English-language ability has been associated with variations in reporting a physical disability (Dallo, Al Snih, & Ajrouch, 2009), and influenced the reliability and validity of the instrument used in such studies. Other limitations of the current study pertain to external validity of the results. This investigation was performed with the convenience sampling method, so participants should not be considered fully representative of each ethnic group of women. Furthermore, most participants in this Internet study were more educated women with high incomes who had easy Internet accessibility (Im et al., 2008; U.S. Government Working Group on Electronic Commerce, 2000). Therefore, any generalization of study findings needs to be done carefully.

Based on these results from the analysis, we propose the following directions for future exploration. First, additional studies with diverse groups of multiethnic midlife women and more rigorous sample requirements to control participants sociodemographic characteristics are needed to confirm MSI psychometric properties over time. Second, based on item-analysis results, we suggest that the items of “lost weight” and “nosebleeds” be excluded. That step should promote item homogeneity, making MSI shorter and more convenient for respondents. Finally, healthcare professionals who plan to utilize an instrument to measure menopausal symptoms need to pay close attention to cultural sensitivities, especially among participants of varying cultures and races. MSI will help healthcare professionals work more effectively with diverse ethnic groups of midlife women to manage their menopausal symptoms.

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Table 1

Sociodemographic characteristics of participants

Characteristics	Hispanic n (%)	African American n (%)	Asian American n (%)	White n (%)	Total n (%)
Education					
Low	5 (4.2)	0 (0.0)	5 (4.5)	3 (1.9)	12 (2.3)
Middle	54 (45.0)	47 (38.8)	20 (18.0)	85 (53.1)	206 (40.2)
High	61 (50.8)	74 (61.2)	86 (77.5)	72 (45.0)	293 (57.2)
Religion					
Protestant	23 (19.2)	70 (57.9)	43 (38.7)	72 (45.0)	208 (40.6)
Catholic	69 (57.5)	18 (14.9)	10 (9.0)	37 (23.1)	134 (26.2)
Others	28 (23.4)	33 (27.3)	58 (52.3)	51 (31.9)	170 (33.2)
Employment					
Yes	96 (80.0)	99 (81.8)	64 (57.7)	113 (70.6)	372 (72.7)
No	24 (20.0)	22 (18.2)	47 (42.3)	47 (29.4)	140 (27.3)
Income					
Very hard	25 (20.8)	16 (13.2)	10 (9.0)	45 (28.1)	96 (18.8)
Somewhat hard	42 (35.0)	48 (39.7)	42 (37.8)	57 (35.6)	189 (36.9)
Not hard	53 (44.2)	57 (47.1)	59 (53.2)	58 (36.3)	227 (44.3)
Marital status					
Married/partnered	83 (69.2)	70 (57.9)	95 (85.6)	98 (61.3)	346 (67.6)
Nonmarried/partnered	37 (30.8)	51 (42.1)	16 (14.4)	62 (38.7)	166 (32.4)
Country of birth					
US	96 (80.0)	118 (97.5)	30 (27.0)	157 (98.1)	401 (78.3)
Outside US	24 (20.0)	3 (2.5)	81 (73.0)	3 (1.9)	111 (21.7)
BMI (kg/m ²)					
Normal (18.5–24.9)	41 (34.2)	34 (28.1)	78 (70.3)	59 (36.9)	212 (41.4)
Overweight (25–29.9)	41 (34.2)	28 (23.1)	25 (22.5)	37 (23.1)	131 (25.6)
Obese (≥30)	38 (31.7)	59 (48.8)	8 (7.2)	64 (40.0)	169 (33.0)
Menopausal status					
Pre	24 (20.0)	25 (20.7)	27 (24.3)	35 (21.9)	111 (21.7)
Early peri	36 (30.0)	38 (31.4)	37 (33.3)	49 (30.6)	160 (31.3)

Characteristics	Hispanic		African American		Asian American		White		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Late peri	16	(13.3)	16	(13.2)	12	(10.8)	28	(17.5)	72	(14.1)
Post	44	(36.7)	42	(34.7)	35	(31.5)	48	(30.0)	169	(33.0)
Diagnosed disease										
Yes	50	(41.7)	52	(43.0)	29	(26.1)	82	(51.3)	213	(41.6)
No	70	(58.3)	69	(57.0)	82	(73.9)	78	(48.8)	299	(58.4)

*
1 = very unhealthy ~ 5 = very healthy

Table 2

Internal consistency reliability of MSI according to ethnicity

		Hispanic (KR20 or cronbach's α)	African American (KR20 or cronbach's α)	Asian American (KR20 or cronbach's α)	White (KR20 or cronbach's α)
Prevalence part	Total menopausal symptom (TMS)	.95	.94	.95	.94
	Physical menopausal symptom (PhyMS)	.92	.90	.91	.91
	Psychological menopausal symptom (PsyMS)	.89	.91	.92	.91
	Psychosomatic menopausal symptom (SomMS)	.61	.59	.59	.63
Severity part	Total menopausal symptom (TMS)	.96	.95	.96	.96
	Physical menopausal symptom (PhyMS)	.94	.92	.93	.93
	Psychological menopausal symptom (PsyMS)	.93	.93	.94	.94
	Psychosomatic menopausal symptom (SomMS)	.68	.60	.59	.72

Table 3

Results of item analysis

Characteristics		Hispanic	African American	Asian American	White
Prevalence part	Item-to-total correlation (Range)	.07 ~ .68	.02 ~ .66	.06 ~ .61	.03 ~ .65
	Interitem correlation (Average)	.21	.16	.21	.18
Severity part	Item-to-total correlation (Range)	.08 ~ .73	.03 ~ .70	.01 ~ .75	.06 ~ .71
	Interitem correlation (Average)	.26	.22	.27	.23

Table 4

Intercorrelations of MSI according to ethnicity

		<u>Hispanic</u>			<u>African American</u>		
		TMS	PhyMS	PsyMS	TMS	PhyMS	PsyMS
Prevalence part	PhyMS	.97 *			.95 *		
	PsyMS	.88 *	.74 *		.87 *	.68 *	
	SomMS	.75 *	.67 *	.64 *	.79 *	.72 *	.66 *
Severity part	PhyMS	.97 *			.95 *		
	PsyMS	.90 *	.77 *		.88 *	.70 *	
	SomMS	.82 *	.77 *	.69 *	.84 *	.79 *	.70 *
		<u>Asian American</u>			<u>White</u>		
Prevalence part	PhyMS	.96 *			.95 *		
	PsyMS	.91 *	.76 *		.87 *	.68 *	
	SomMS	.79 *	.72 *	.68 *	.79 *	.73 *	.63 *
Severity part	PhyMS	.96 *			.96 *		
	PsyMS	.91 *	.78 *		.88 *	.72 *	
	SomMS	.79 *	.73 *	.68 *	.84 *	.78 *	.70 *

* p < .01

Table 5

Differences of MSI score according to menopausal status of participants

		Hispanic (F-value)	African American (F-value)	Asian American (F-value)	White (F-value)
Prevalence part	TMS	4.20 **	3.72 *	2.09	4.58 **
	PhyMS	4.36 **	3.40 *	1.30	4.57 **
	PsyMS	2.83 *	2.82 *	3.80 *	2.75 *
	SomMS	1.50	2.41	1.95	4.28 **
Severity part	TMS	3.65 *	3.39 *	1.89	4.94 **
	PhyMS	3.77 *	3.67 *	1.33	5.12 **
	PsyMS	2.57	1.74	2.89 *	2.85 *
	SomMS	1.77	3.09 *	2.12	5.26 **

* p < .05
** p < .01