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Menopausal symptoms and physical activity in multiethnic groups of midlife women: A secondary analysis

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Abstract

Aims—To explore the effect of diverse types of women’s physical activity on menopausal symptoms among multiethnic groups of midlife women in the USA.

Background—Although physical activity is one of the most widely used non-pharmacological methods for managing menopausal symptoms, there is a paucity of clinical guidelines for women and healthcare providers because the relationship between physical activity and menopausal symptoms has been found inconsistent in previous studies.

Design—A secondary analysis of the data from a larger Internet survey study conducted in 2008 – 2010.

Methods—A total of 481 midlife women among four ethnic groups were selected from the original study. The data were collected using the Kaiser Physical Activity Survey and the Midlife Women’s Symptom Index. Bivariate correlation analyses and hierarchical multiple regression analyses were used to analyze the data.

Results/Findings—The household/caregiving activity index was positively associated with the prevalence scores of the psychological symptoms in both Non-Hispanic Asians and Non-Hispanic African Americans. The increased sports/exercise activity index was negatively associated with the severity scores of the physical symptoms in both Hispanics and Non-Hispanic Whites. The occupational activity index and the active living activity index significantly predicted the severity scores of the psychosomatic symptoms in Hispanics and Non-Hispanic African Americans, respectively.

Conclusion—Nurses who take care of multiethnic groups of midlife women who experience menopausal symptoms should be aware of diverse types of women’s physical activities within the cultural context.

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1. substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

* http://www.icmje.org/ethical_1author.html

Keywords

Menopause; Symptom; Physical activity; Midlife; Women; Nursing

INTRODUCTION

Although menopause is a natural process through normal aging, it is one of the most challenging issues in a woman's life because many women who experience menopause throughout the world exhibit various symptoms including hot flashes, vaginal dryness, sleep problems, mood problems and psychosomatic symptoms (International Menopause Society 2011, National Institute of Health 2005). These menopausal symptoms may negatively impact their quality of life and psychological well-being, which in turn may affect their health in later life (Elavsky 2009, Hess *et al.* 2011). Hence, women and health care professionals have recently given their close attention to managing menopausal symptoms in many countries (International Menopause Society 2011, National Institute of Health 2005).

Background

According to the International Menopause Society, many therapeutic strategies have been suggested to relief and manage menopausal symptoms for midlife women (Sturdee & Pines 2011). Among these strategies, hormonal therapy is well-known as an effective treatment in relieving some physical symptoms (MacLennan *et al.* 2004), but it has potentially serious risks, such as myocardial infarction and breast cancer (Stefanick *et al.* 2006, North American Menopause Society 2010). For this reason, women have looked for or used alternative strategies for their menopausal symptoms (Morelli & Naquin 2002, Newton *et al.* 2002, Borrelli & Ernst 2010).

Among alternative strategies to alleviate menopausal symptoms, physical activity is one of the most frequently recommended and used non-pharmacological strategies (Borrelli & Ernst 2010). It is also a recommendation for postmenopausal women in maintaining their health as well (Rao *et al.* 2008). Physical activity has been reported to be effective in reducing psychological, psychosomatic and vasomotor symptoms (Elavsky & McAuley 2005, Mirzaiinj Mabadi *et al.* 2006, Nelson *et al.* 2008, McAndrew *et al.* 2009). Potential risk of osteoporotic fractures in postmenopausal women can also be reduced by physical activity (Martyn-St James & Carroll 2009). However, some studies showed that physical activity had no effect on sexual and vasomotor menopausal symptom such as hot flashes (Mirzaiinj Mabadi *et al.* 2006, Nelson *et al.* 2008, McAndrew *et al.* 2009); additionally, physically active women were more likely to experience vasomotor menopausal symptoms than minimally active women (Whitcomb *et al.* 2007). One plausible reason for the inconsistent results of previous studies might be inappropriate and/or inadequate definitions and measurements of women's physical activity. Women have been more likely to engage in household and caregiving tasks than regular leisure-time physical activity such as exercise and recreation (Shaw 1991), which may not be adequately measured with existing instruments. Interestingly, some of the household and caregiving activities have moderate intensity that is equivalent to 3–6 metabolic equivalents [METs] – the equivalent of brisk walking (Ainsworth *et al.* 2000, Marquez & McAuley 2006). Hence, diverse types of physical activity in women including sports/exercise, household, occupational and caregiving activities should be considered when estimating women's physical activity. However, few studies have been internationally conducted to explore the associations between physical activity and menopausal symptoms while considering diverse types of women's physical activity among multiethnic groups of midlife women.

The purpose of this secondary analysis was to determine the influences of diverse types of physical activity on menopausal symptoms of multiethnic groups of midlife women. For the secondary analysis, the data from a national Internet survey by Authors (2012) were used. A national Internet survey was conducted to explore ethnic differences in midlife women's attitudes toward physical activity among four ethnic groups (Hispanic, Non-Hispanic [N-H] Asian, N-H African American and N-H White) and to identify the relationships between the attitudes and the women's participation in diverse types of physical activities while considering multiple factors such as demographic, cultural and health/menopausal characteristic. A total of 542 midlife women from four ethnic groups participated in the original Internet survey which included questionnaires such as demographic and health/menopausal characteristics, menopausal symptoms, barriers to physical activity, attitudes toward physical activity, self-efficacy and diverse types of physical activity. For this secondary analysis, only data of demographic and health/menopausal characteristics, menopausal symptoms and diverse types of physical activity were retrieved from the original study.

Theoretical basis

The theoretical basis of the study is the symptom management model. The symptom management model is a middle-range theory that provides a framework for understanding symptoms and guiding symptom management strategies (Dodd *et al.* 2001). The symptom management model consists of three domains: symptoms experience (perception, evaluation and response), components of symptom management strategies (questions on intervention delivery) and outcome (symptom status, self-care and quality of life, etc.). These domains are interrelated and influenced by the personal, environmental and health/illness factors. The model has been widely used as a framework of disease-related symptom studies such as cancer (Linder 2010), HIV/AIDS (Nokes & Kendrew 2001, Voss *et al.* 2006) and diabetes (Skelly *et al.* 2008). Although menopause is not a disease, the impact on health and quality of life may be greater than or equal to other diseases; so the model would be suitable for explaining menopausal symptom management.

The theoretical framework that was modified for this study can be illustrated as in Figure 1. In this study, the prevalence and severity of menopausal symptoms were conceptualized as symptom experience of the symptom management model. Perception and evaluation of symptoms which are components of symptom experience may be closely linked with a sense of existence and severity of menopausal symptoms. Physical activity was conceptualized as components of symptom management strategies which are another domain of the symptom management model. However, we could not conceptualize outcome domain of the symptom management model because the original study did not collect information on outcome indicators. Personal, environmental and health/illness factors of the symptom management model conceptualized as demographic (age, education, marital status, family income, employment status, number of children), cultural (ethnicity/race) and health (body mass index, self-rated health)/menopausal (hormone therapy, menopausal status) characteristics, respectively. Based on this model, the study explored the relationship between physical activity and menopausal symptoms. Also, the effects of physical activity as a significant factor on menopausal symptoms explored, while controlling for personal, environmental and health/illness factors.

THE STUDY

Aims

The aim of this secondary analysis was to examine the effects of diverse types of physical activity on menopausal symptoms of multiethnic groups of community-dwelling midlife

women. In this study, the diverse types of physical activity were defined as household/caregiving, occupational, active living and sports/exercise activities (Ainsworth *et al.* 2000). Also, the menopausal symptoms were defined as physical, psychological and psychosomatic domain (Im 2006). The specific aims are as follows:

Aim 1. To explore the relationship between four types of women's physical activity and each of the three menopausal symptom domains among four ethnic groups.

Aim 2. To identify the effects of four types of women's physical activity on each of three menopausal symptom domains among four ethnic groups while controlling for personal, environmental and health/illness factors.

Design

This was a secondary analysis of the data from a national Internet survey on the attitude toward physical activity of multiethnic midlife women (Im *et al.* 2012).

Participants

For this secondary analysis, the data of 481 women (113 Hispanics, 114 N-H Asians, 113 N-H African Americans and 141 N-H Whites) who completed the questions on menopausal symptoms were used. The participants were midlife women who: (a) aged from 40 to 60 years, (b) could understand English and (c) completed the Midlife women's Symptom Index.

We calculated sample size with an alpha level of a 0.05 at a power of a 0.80 using the G*Power 3.1 program. With a medium effect size of 0.28, which is based on the Elavsky's study (2009), a total of 77 participants in the each menopausal symptom domain would be needed to detect statistically significant correlation between physical activity and menopausal symptoms (Aim 1). When we assumed an effect size 0.15 (Cohen's f^2) based on the previous study (Elavsky & McAuley 2009), a total of 86 participants in the each menopausal symptom domain would be needed (Aim 2). The number of participants in the physical and psychological menopausal symptom domain was sufficient to do analyses across four ethnic groups; however in the psychosomatic menopausal symptom domain, the number of participants was not enough except in N-H White women.

Data collection

In the original study, data were collected using self-administered questionnaires loaded on a project Website between January 1, 2008 and December 31, 2010. When potential participants wanted to participate in the study after reviewing the informed consent form available on the project website, they were asked to push the 'agree' button and then to answer several questions to verify the inclusion criteria. They were connected to the survey Webpage only if they met the inclusion criteria. More detailed information on the data collection can be found elsewhere (Im *et al.* 2012).

Ethical consideration

Approval from the Institutional Review Board of the organization where the researchers were affiliated was obtained. When an eligible participant visited a study website, the participant reviewed the informed consent information and clicked the agree button instead of signing an informed consent form. As mentioned above, all of the data collection procedure was conducted on the project website and the participants made a decision whether they participated in the study independently; when the participant wanted to withdraw, the data from the participant was destroyed immediately. During the survey, there were no ethical issues.

Data analysis

Descriptive statistics were used to analyze the all variables of the study. Correlations between each of the four physical activity indices- household/caregiving, occupational, active living and sports/exercise with the prevalence and severity scores of each of the three menopausal symptom domains included physical, psychological, psychosomatic symptoms were analyzed with Pearson's correlation analyses (Aim 1). After checking multicollinearity among all variables, hierarchical multiple regression analyses were used to identify the effects of the four physical activity indices on the prevalence and severity scores of each menopausal symptom domain while controlling for variables (Aim 2). In two regression models for the prevalence scores and the severity scores, background information variables (age, education, marital status, family income, employment and number of children), health-related variables (body mass index and self-rated health) and menopause-related variables (menopausal status and hormone therapy) were entered as controls into the first step. Then, four physical activity indices were entered into the second step. The number of participants who were included in each analysis varied because each participant had experienced different menopausal symptoms and this study focused on each menopausal symptom domain. All analyses were conducted in each ethnic group and statistical significance was set at $\alpha = 0.05$.

Validity and reliability

Background information—Three categories for background information were collected: (a) demographic questions on ethnicity/race, age, education, marital status, family income, employment status and number of children, (b) health-related questions on body mass index (kg/m^2) and self-rated health status and (c) menopause-related questions on hormone therapy and self-reported menopausal status. Menopausal status were categorized into premenopausal, early perimenopausal, late perimenopausal and postmenopausal; premenopausal meant that there was no change in regularity of menstrual periods and early perimenopausal meant irregular menstrual periods but no change in the past three months. Late perimenopausal and postmenopausal meant that menstrual periods had stopped for 3~11 months or for more than 12 months, respectively (Greendale *et al.* 2009). Premenopausal midlife women are in early menopausal transition; hence we assumed that premenopausal midlife women's symptoms would be menopause-related symptoms (American Society for Reproductive Medicine, 2012).

Physical activity—Physical activity was assessed by the Kaiser Physical Activity Survey (Ainsworth *et al.* 2000). The instrument was developed to measure diverse types of women's physical activity and consisted of four indices: (a) household/caregiving activity index (11 items) such as preparation of meals, cleaning, grocery shopping, gardening, heavy outdoor work and home repair, (b) occupational activity index (8 items) such as physical tiredness and lightness/heaviness at the workplace (c) active living activity index such as walking, biking to and from work, school or errands (4 items) and (d) sport/exercise activity index such as recreational physical activity, playing a sport or exercising, sweating during sports or exercise and intensity/proportion/time of sports or exercise during the past year (15 items). Each index was calculated as the average score, which ranged from 1–5. If the participants were unemployed, the occupation index was coded as 1 (Schmidt *et al.* 2006). In an evaluation study on women who aged from 20–60 years, one-month stability which measured intra-class correlation was above 0.79 (Ainsworth *et al.* 2000).

Menopausal symptoms—Menopausal symptoms were assessed by the Midlife women's Symptoms Index (Im 2006). The instrument consisted of 73 items which categorized into physical symptom domain (51 items), psychological symptom domain (18 items) and psychosomatic symptom domain (4 items). Each of the 73 items measured both prevalence

(1= *yes*; 0= *no*) and severity (1= *not at all*; 5= *extremely*). The prevalence scores of physical, psychosocial and psychosomatic symptom domain ranged from 1–51, 18 and 4, respectively because the participants who had never experienced menopausal symptoms were excluded. The severity scores of physical, psychosocial and psychosomatic symptom domain ranged from 1–255, 90 and 20, respectively. The instrument found significant ethnic difference in menopausal symptoms in a study on multiethnic midlife women (Im 2009) and the internal consistency and the validity were also confirmed among multiethnic midlife women (Lee *et al.* 2010). The internal consistency of the instrument was from 0.63 for psychosomatic symptom domain to 0.93 for psychological symptom domain in the study.

RESULTS

Participant's characteristics

Characteristics of a total of 481 midlife women are shown in Table 1. The mean age of the participants was 49.0 years and 66.5% of the participants had a college or higher degree. The mean body mass index of the participants was 28.5 kg/m² (ranged from 23.1 kg/m² for N-H Asian women to 31.1 kg/m² for Hispanic women) and most of the participants (76.3%) felt that they were healthy. Only 9.6% of the participants were currently taking hormones for relieving their menopausal symptoms and about 45% of the participants were postmenopausal status.

Table 2 summarizes the prevalence and severity scores of each menopausal symptom domain and four physical activity indices in each ethnic group. Across four ethnic groups, almost all women experienced physical menopausal symptoms (99.1% of Hispanic women; 98.2% of N-H Asian women; 100% of N-H African women; 99.3% of N-H White women), while 53.5% (N-H Asian) ~ 71.6% (N-H White) of women experienced psychosomatic menopausal symptoms. Among the four physical activities, the highest index was the sports/exercise while the occupation index was the lowest one across all four ethnic groups.

Correlation between menopausal symptoms and physical activity

There are ethnic differences in the correlation between the prevalence and severity scores of three menopausal symptom domains and four physical activity indices (Table 3). The physical symptom domain was negatively associated with the sports/exercise activity index in Hispanic women ($r=-0.28$, $p<0.01$ for the prevalence score; $r=-0.27$, $p<0.01$ for the severity score), while it was positively associated with the household/caregiving activity index in N-H African women ($r=0.20$, $p<0.05$ for the prevalence score; $r=0.23$, $p<0.05$ for the severity score). In N-H Asian women, the psychological symptom domain positively correlated with the household/caregiving activity index ($r=0.28$, $p<0.01$ for the prevalence score; $r=0.30$, $p<0.01$ for the severity score), whereas it negatively correlated with the active living activity index ($r=-0.22$, $p<0.05$ for the prevalence score; $r=-0.21$, $p<0.05$ for the severity score). In N-H White women, the sport/exercise activity index was negatively associated with all of three symptom domains (Table 3).

The effect of physical activity on menopausal symptoms

The results of multiple hierarchical regression analyses are summarized in Table 4 and 5. The household/caregiving activity index and the active living activity index were significant factors of the prevalence scores of the psychological symptom domain in N-H Asian women ($\beta=2.02$, $p=0.03$ for the household/caregiving activity index; $\beta=-1.90$, $p=0.04$ for the active living activity index) and N-H African women ($\beta=1.83$, $p=0.03$ for the household/caregiving activity index; $\beta=-1.83$, $p=0.02$ for the active living activity index). The occupational activity index was found to predict the prevalence scores of the physical symptom domain in N-H White women ($\beta=3.39$, $p<0.01$) and of the psychosomatic symptom domain in

Hispanic women ($\beta=0.62$, $p=0.03$). The sports/exercise activity index was found to predict the prevalence scores of the psychosomatic symptom domain in N-H White women ($\beta=-0.21$, $p=0.04$; Table 4).

The household/caregiving activity index was a significant factor of the severity scores of the psychological symptom domain in N-H Asian women ($\beta=7.30$, $p=0.03$) and N-H African women ($\beta=6.18$, $p=0.04$), while the occupational activity index was found to predict the severity scores of the psychosomatic symptom domain in Hispanic women ($\beta=3.16$, $p=0.01$) and N-H White women ($\beta=9.58$, $p=0.01$; Table 5). The active living activity index was found to predict the severity scores of the psychosomatic symptom domain in only N-H African women ($\beta=-1.53$, $p=0.04$). However, the sports/exercise activity index was not a significant factor of the severity scores of three symptom domains in all of four ethnic groups (Table 5).

DISCUSSION

This study found that the influences of specific types of midlife women's physical activity on the prevalence and the severity of specific menopausal symptom domains, while adjusting for demographic, menopausal and health-related characteristics exist among the four ethnic groups of midlife women. Overall, the findings of the study showed new relationships between physical activity and menopausal symptoms, compared with the previous literature.

The findings on the relationship between household/caregiving activities and menopausal symptoms suggest that N-H Asian and N-H African American women who are more likely to participate in household/caregiving activities experience more prevalent and severe psychological menopausal symptoms. These findings are not compatible with previous studies that reported that Polish women with high and moderate physical activity during household/gardening tasks and Brazilian women with increased physical activities including household chores expressed less frequent and less severe menopausal symptoms (Skrzypulec *et al.* 2010, de Azevedo Guimaraes & Baptista 2011). It is also not compatible with studies concluding household/child care activities were not associated with prevalence of psychological menopausal symptoms (Sternfeld *et al.* 1999). The findings of this study on the association between household/caregiving activities and psychological menopausal symptoms in N-H Asian and N-H African American women may be due to their own cultural norms and cultural beliefs regarding women's role. Family life amongst African Americans is considered as the core of their culture and psychological well-being (Water & Locks 2005) and women have to take charge of their households and care for their children (Hill 2003). Most Asian cultures such as Korean, Japanese and Chinese cultures also are family-oriented. Women are considered as subordinate to the men and in charge of most of the household tasks and caregiving activities regardless of whether they are sick or have a job (Im 2003, Chin 2005, Shiba *et al.* 2005). This cultural environment tends to cause women psychological burden and distress (Im 2005). That is, increasing household/caregiving activities may aggravate psychological menopausal symptoms in certain cultural environments.

The findings on the influences of occupational activity on prevalence and severity of psychosomatic menopausal symptoms in Hispanic women and of physical menopausal symptoms in N-H White women disagree with previous studies; Skrzypulec *et al.* (2010) represented that none of the Polish women who suffered severe menopausal symptoms were physically active at work and Sternfeld *et al.* (1999) showed no associations between occupational activity and prevalence of three menopausal symptom domains including psychological, somatic and vasomotor menopausal symptoms. The findings on occupational

activity may partially be due to the increase in women's roles by their increasing entry into the workplace. Women in the U.S. placed a high value on working to economically contribute to their family and many women are employed in the public and private sectors (Rivera *et al.* 1997, Lagana & Gonzalez-Ramirez 2003). Active participation in a professional occupation caused conflict and burdened women's traditional role (Rivera *et al.* 1997, Lagana & Gonzalez-Ramirez 2003), thus it might affect perceived health, stress and symptoms of women. Moreover, Hispanic and N-H White women reported more frequent and more severe psychosomatic and physical symptoms than N-H Asian women, respectively (Green & Santoro 2009, Im *et al.* 2010). This might also be the reason for this finding. However, these findings should be carefully interpreted due to lack of information on type and intensity of occupations in this study.

This study found the influence of active living activity in women's daily routine and recreational sport/exercise activity in women's spare time on menopausal symptoms. As mentioned above, in this study, the active living activities included walking and biking for commute and watching television at home as a reverse item. Although virtually few studies showed an association between active living activities such as transportation and menopausal symptoms, our findings in N-H Asian and N-H African American women are consistent with the previous study which demonstrated that the majority of women with severe menopausal symptoms reported a low level of physical activity during transportation (Skrzypulec *et al.* 2010). This finding on recreational sport/exercise activities which referred to leisure-time physical activities such as exercise and recreation in one's spare or discretionary time (Kandula & Lauderdale 2005) was somewhat compatible with previous studies. In previous studies, physically active women experienced less severe psychological menopausal symptoms (Mirzaiinjmaadi *et al.* 2006, McAndrew *et al.* 2009), or less severe vasomotor and somatic menopausal symptoms (Elavsky & McAuley 2005), or less frequent and less severe psychosomatic and sexual menopause symptoms (Li *et al.* 1999). Some studies reported no association between leisure-time physical activity and menopausal symptoms (Sternfeld *et al.* 1999, Nelson *et al.* 2008, Elavsky & McAuley 2009). The study's finding in N-H White women agree with Li *et al.* (1999)'s study where White women were predominant participants, whereas the finding in N-H African American women is new knowledge in the current literature. These findings on active living and sport/exercise activity may be supported by the ethnic differences in attitudes toward physical activity in midlife women. N-H White women regarded leisure-time physical activity as an essential for health and had will to increase their physical activity (Im *et al.* 2011b); thus active participation in a leisure-time physical activity may positively impact psychosomatic menopausal symptoms. On the contrary, N-H Asian women placed less value on leisure-time physical activity, but actively participated in their daily routines (Im & Choe 2001). Also N-H African American women who spent time on leisure-time physical activity were considered selfish (Im *et al.* 2011a). That is, attitudes toward physical activity in their own cultures may affect attitudes toward perceived symptoms. However, the negative effect of leisure-time physical activity in N-H African American women on menopausal symptoms should be interpreted with caution since a lack of detailed information on sports/exercise activities in this study might possibly affect the finding.

From the overall findings from the study, some plausible reasons could be suggested. One plausible reason is the assessment method for women's physical activity. Most studies on the relationships between physical activity and menopausal symptoms have used the definition of leisure-time physical activity, while this study included virtually all of women's physical activities. Also, since the findings were analyzed by each physical activity index, the different relationships from previous studies may be able to be noted. Another plausible reason is that the analyses in this study were done for each ethnic group. As explained above, symptoms can be influenced by cultural environment such as beliefs,

values and practice. Cultural aspects are a critical factor for symptom management (Sternfeld *et al.* 1999, Dodd *et al.* 2001). To accurately understand the influence of physical activity on menopausal symptoms, this study was conducted in each ethnic group and showed some new findings, compared with previous studies.

Limitation of the study

Despite suggesting new findings on the relationship between specific types of midlife women's physical activity and specific menopausal symptom domains, this study has some limitations. Firstly, all instruments used in the study were self-reported questionnaires, particularly those for physical activity. Although the validity and the reliability of the instruments were evaluated from previous studies, self-reported questionnaires could be inherently biased by the writers' feeling and memory. A second limitation is the control for potential confounding variables which could affect menopausal symptoms. Despite adjusting for confounding variables, this study could not control other potential confounding variables such as current smoking, diet and duration of hormone therapy use because the original study did not collect such information.

CONCLUSION

Based on the findings, the study suggests implications for nurses and researchers who are interested in non-pharmacological therapies for menopausal symptoms. First of all, nurses and health care providers need to consider improving women's daily routine activities such as transportation rather than improving leisure-time activities as one strategy which can decrease menopausal symptoms. Secondly, in future studies, the effect of diverse types of women's physical activity on menopausal symptoms needs to be confirmed because this virtually is the first study to statistically explore the relationship between each of the four types of physical activity and each of the three menopausal symptom domains among multiethnic groups. Finally, in this sense, a longitudinal study needs to be conducted to examine the effects of physical activity on outcome of menopausal symptom managements such as symptoms status and quality of life.

The findings of the study showed that specific types of midlife women's physical activity influenced the prevalence and severity of specific domains of menopausal symptoms. Also, the findings also showed the effects of women's physical activity on menopausal symptoms differed by ethnicity/race. The knowledge on the relationships between physical activity and menopausal symptoms can help health care providers including nurses, who take care of multiethnic groups of midlife women, to provide appropriate physical activity interventions as alternatives for coping with the menopausal symptoms.

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Summary Statement

1. What is already known about this topic
 - Although menopause is a natural aging process, it is one of the most challenging issues in a woman's life.
 - Although hormonal therapy is effective for relieving menopausal symptoms, women have been interested in alternatives for coping with the menopausal symptoms such as physical activity because of the risks of hormonal therapies.
 - Inconsistent findings on the relationship between midlife women's physical activity and menopausal symptoms limit the development of guidelines for physical activity counseling for such women.
2. What this paper adds
 - Non-Hispanic Asian and Non-Hispanic African American women who are more likely to participate in household/caregiving activities experience more prevalent and severe psychological menopausal symptoms.
 - Non-Hispanic White and Hispanic women who are more likely to participate in occupation activities experience more severe physical and psychosomatic menopausal symptoms, respectively.
 - More sports/exercise activities were associated with less severity scores of the physical symptoms in both Hispanics and Non-Hispanic Whites.
3. Implication for practice and/or policy
 - Health care providers including nurses need to consider diverse types of physical activity to effectively manage midlife women's menopausal symptoms.
 - Ethnic-specific factors need to be considered in planning a physical activity promotion program for relieving midlife women's menopausal symptoms.
 - Further longitudinal studies need to be conducted to examine the effects of physical activity on outcome of menopausal symptom managements such as symptoms status and quality of life.

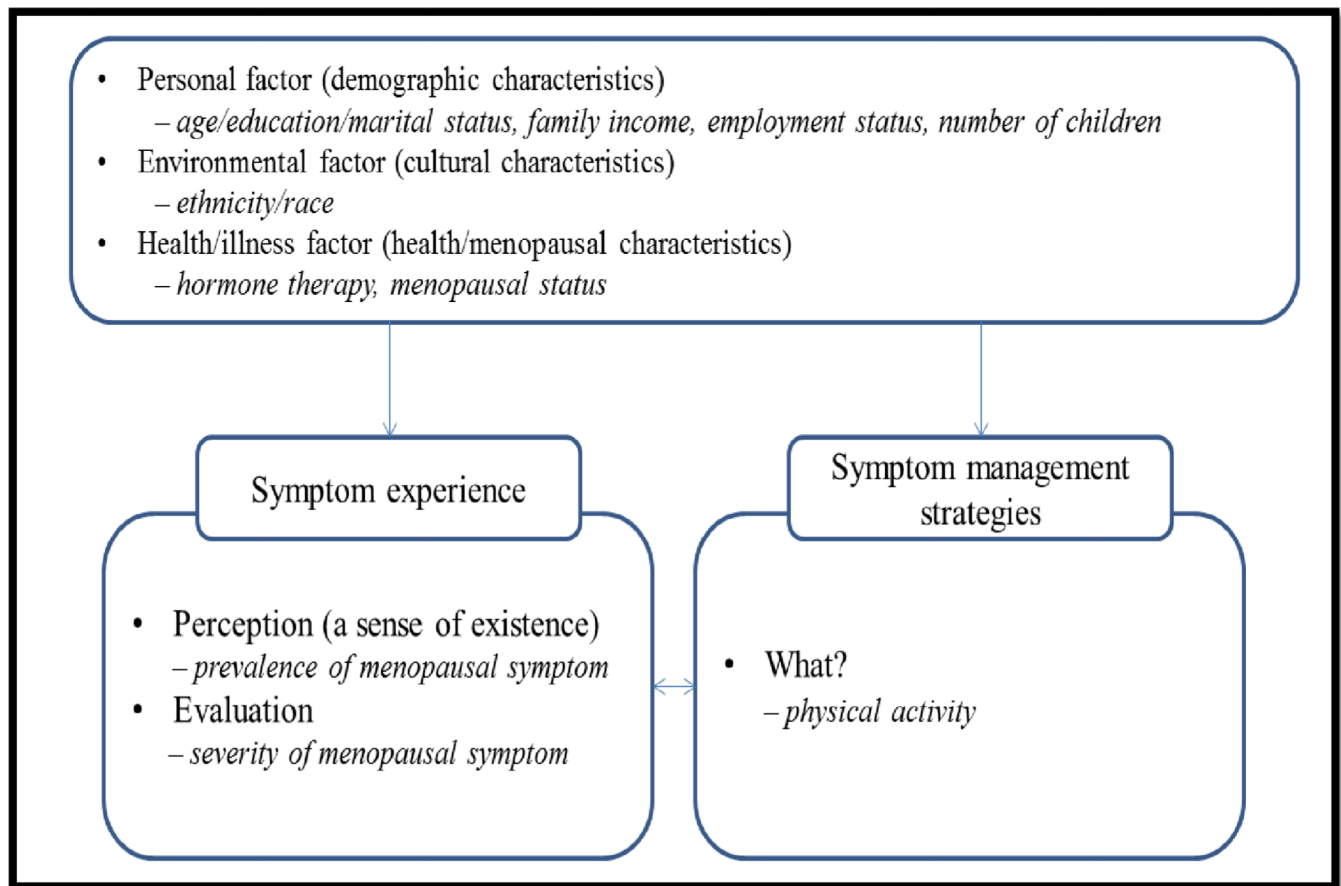


Figure 1.

The theoretical framework of this study

Note: Italicized words in the above figure mean conceptualized variables in this study

Table 1

Participants Characteristics

Characteristics	(N=481)				
	Hispanic (n=113)	N-H Asian (n=114)	N-H African American (n=113)	N-H White (n=141)	Total (n=481)
Age (years)	48.9 (5.6)	47.9 (6.2)	49.4 (6.4)	49.7 (6.0)	49.0 (6.1)
Education ^a					
High school graduated	12 (10.6)	13 (11.4)	7 (6.2)	15 (10.6)	47 (9.8)
Partial college	40 (35.4)	16 (14.0)	22 (19.5)	36 (25.5)	114 (23.7)
College	61 (54.0)	85 (74.6)	84 (74.3)	90 (63.8)	320 (66.5)
Current marital status					
Married/partnered	74 (65.5)	93 (81.6)	61 (54.0)	104 (73.8)	332 (69.0)
Single/separated	39 (34.5)	21 (18.4)	52 (46.0)	37 (26.2)	149 (31.0)
Family income ^b					
Very hard	14 (12.4)	10 (8.3)	14 (12.4)	37 (26.2)	75 (15.6)
Somewhat hard	51 (45.1)	42 (36.8)	47 (41.6)	52 (36.9)	192 (39.9)
Not hard	48 (42.5)	62 (54.4)	52 (46.0)	52 (36.9)	214 (44.5)
Employed					
Yes	96 (85.0)	74 (64.9)	95 (84.1)	105 (74.5)	370 (76.9)
No	17 (15.0)	40 (35.1)	18 (15.9)	36 (25.5)	112 (23.1)
Number of children					
None	25 (22.1)	20 (17.5)	23 (20.4)	27 (19.1)	95 (19.8)
1-2	45 (39.8)	72 (63.2)	50 (44.2)	78 (55.3)	245 (50.9)
3	43 (38.1)	22 (19.3)	40 (35.4)	36 (25.5)	141 (29.3)
Body Mass Index (kg/m ²)	31.1 (7.1)	23.1 (3.6)	30.9(6.6)	28.7 (7.2)	28.5 (7.1)
Self-rated health					
Healthy	83 (73.4)	89 (78.1)	92 (81.4)	103 (73.1)	367 (76.3)
Don't know	3 (2.7)	13 (11.4)	6 (5.3)	5 (2.8)	26 (5.4)
Unhealthy	27 (23.9)	12 (10.5)	15 (13.3)	34 (24.1)	88 (18.3)
Hormonal therapy					

(N=481)

Characteristics	Hispanic (n=113)	N-H Asian (n=114)	N-H African American (n=113)	N-H White (n=141)	Total (n=481)
Yes	13 (11.5)	6 (5.3)	10 (8.8)	17 (12.1)	46 (9.6)
No	100 (88.5)	108 (94.7)	103 (91.2)	124 (87.9)	435 (90.4)
Menopausal status					
Premenopausal	43 (38.1)	46 (40.4)	33 (29.2)	37 (26.2)	159 (33.0)
Early perimenopausal	20 (17.7)	22 (19.3)	18 (15.9)	23 (16.3)	83 (17.3)
Late perimenopausal	5 (4.4)	4 (3.5)	7 (6.2)	6 (4.3)	22 (4.6)
Postmenopausal	45 (39.8)	42 (36.8)	55 (48.7)	75 (53.2)	217 (45.1)

Note:

^a the highest grade or type of education;

^b Difficulty paying for basics such as food, housing, clothing and health care; All values were represented as 'N (%) or M (SD)';

Table 2

Characteristics of Menopausal Symptoms and Physical Activity

Characteristics (range)	Hispanic (N=113)	N-H Asian (N=114)	N-H African American (N=113)	N-H White (N=141)
	N (%) or M (SD)	N (%) or M (SD)	N (%) or M (SD)	N (%) or M (SD)
Physical Menopausal Symptoms				
Prevalence score (1~51)	112 (99.1)	112 (98.2)	113 (100.0)	140 (99.3)
Severity score (1~255)	11.2 (8.1)	8.8 (6.2)	9.7 (6.4)	10.7 (6.7)
Household activity (1~5)	33.0 (30.0)	23.7 (20.6)	27.1 (21.5)	30.9 (23.5)
Occupational activity (1~5)	2.7 (0.7)	2.7 (0.7)	2.5 (0.6)	2.7 (0.7)
Active living activity (1~5)	2.2 (0.8)	1.9 (0.8)	2.3 (0.8)	2.2 (0.9)
Sports/exercise activity (1~5)	2.8 (0.8)	2.6 (0.7)	2.5 (0.7)	2.6 (0.8)
Psychological Menopausal Symptoms				
Prevalence score (1~18)	2.8 (1.2)	2.7 (1.2)	2.8 (1.2)	2.8 (1.3)
Severity score (1~90)	103 (91.2)	97 (85.1)	94 (83.2)	123 (87.2)
Household activity (1~5)	6.7 (4.8)	5.8 (4.7)	5.4 (4.2)	6.4 (4.7)
Occupational activity (1~5)	21.4 (19.1)	17.4 (16.9)	15.6 (14.4)	19.2 (16.6)
Active living activity (1~5)	2.7 (0.7)	2.7 (0.7)	2.5 (0.6)	2.6 (0.7)
Sports/exercise activity (1~5)	2.1 (0.8)	1.9 (0.8)	2.3 (0.8)	2.2 (0.9)
Psychosomatic Menopausal Symptoms				
Prevalence score (1~4)	2.7 (0.8)	2.6 (0.7)	2.5 (0.8)	2.5 (0.8)
Severity score (1~20)	2.7 (1.2)	2.7 (1.2)	2.7 (1.2)	2.7 (1.3)
Household activity (1~5)	75 (66.4)	61 (53.5)	67 (59.3)	101 (71.6)
Occupational activity (1~5)	2.1 (1.0)	1.9 (0.9)	1.8 (0.9)	1.8 (0.9)
Active living activity (1~5)	7.4 (4.3)	6.1 (3.6)	6.0 (3.5)	6.0 (3.5)
Sports/exercise activity (1~5)	2.7 (0.7)	2.7 (0.7)	2.6 (0.6)	2.7 (0.7)
	2.1 (0.8)	1.9 (0.9)	2.4 (0.9)	2.1 (0.9)
	2.7 (0.8)	2.6 (1.2)	2.4 (0.8)	2.5 (0.8)
	2.7 (1.3)	1.9 (0.9)	2.6 (1.2)	2.7 (1.2)

Table 3

Correlations between menopausal symptoms and physical activity

Prevalence of menopausal symptoms												
Hispanic			N-H Asian			N-H African			N-H White			
PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	
r (p)			r (p)			r (p)			r (p)			
Household	.02(.82)	-0.04(.69)	0.01(.97)	.16(.09)	.28(<0.001)**	.15(.25)	.20(.04)*	0.20(.06)	0.19(.13)	.11(.20)	.03(.73)	.03(.77)
Occupational	-0.08(.40)	-0.14(.17)	0.14(.23)	.13(.19)	.14(.17)	.01(.96)	0.13(.17)	0.04(.70)	0.23(.07)	.13(.14)	-0.10(.26)	-0.03(.80)
Active living	-0.04(.69)	-0.04(.72)	-0.07(.56)	.00(.99)	-0.22(.03)*	-0.14(.27)	-0.10(.31)	-0.11(.29)	-0.09(.46)	-0.18(.03)*	-0.24(.009)**	-0.11(.28)
Sports/exercise	-0.28(.003)**	-0.16(.12)	-0.09(.47)	-0.01(.93)	-0.15(.14)	-0.18(.17)	-0.15(.10)	0.08(.43)	-0.08(.54)	-0.27(.001)**	-0.30(.001)**	-0.30(.002)**
Severity of menopausal symptoms												
Hispanic			N-H Asian			N-H African			N-H White			
PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	PhyMS	PhyMS	SomMS	
r (p)			r (p)			r (p)			r (p)			
Household	.04(.69)	-0.06(.53)	-0.08(.52)	.21(.03)*	.30(<0.001)**	.21(.10)	.23(.02)*	0.22(.03)*	0.22(.08)	.09(.28)	.03(.73)	-0.01(.92)
Occupational	-0.09(.37)	-0.17(.09)	0.11(.34)	.16(.10)	.16(.12)	-0.01(.92)	0.13(.18)	0.01(.91)	0.15(.23)	.14(.11)	-0.08(.41)	-0.00(.98)
Active living	-0.05(.60)	-0.04(.72)	-0.05(.67)	.00(.99)	-0.21(.04)*	-0.13(.30)	-0.10(.28)	-0.09(.40)	-0.17(.17)	-0.16(.06)	-0.21(.02)*	-0.11(.27)
Sports/exercise	-0.27(.004)**	-0.19(.05)	-0.08(.48)	-0.04(.68)	-0.18(.08)	-0.18(.16)	-0.17(.07)	0.05(.66)	-0.11(.36)	-0.24(.004)**	-0.27(.002)**	-0.27(.006)**

Note¹: PhyMS = Physical menopausal symptoms; PsyMS = Psychological menopausal symptoms; SomMS = Psychosomatic Menopausal symptomsNote²:** $p < 0.01$;* $p < 0.05$

Table 4

Hierarchical multiple regression analyses: associations of physical activity with menopausal symptom prevalence in each ethnic group

	Physical		Psychological		Psychosomatic	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Hispanic						
Household	−0.40	.74	−0.97	.23	−0.04	.85
Occupational	2.53	.09	.79	.42	.62	.03 *
Active living	0.28	.81	.25	.75	−0.16	.42
Sports/exercise	−1.13	.17	−0.40	.48	−0.08	.54
N-H Asian						
Household	1.25	.65	2.02	.03 *	−0.02	.95
Occupational	1.16	.23	.18	.87	−0.18	.52
Active living	−1.01	.50	−1.90	.04 *	−0.51	.04 *
Sports/exercise	.65	.53	.36	.50	.10	.49
N-H African American						
Household	1.49	.20	1.83	.03 *	.42	.09
Occupational	2.20	.07	.12	.89	.24	.33
Active living	−0.81	.45	−1.83	.02 *	−0.31	.15
Sports/exercise	−0.08	.91	1.28	.02 *	.10	.50
N-H White						
Household	.66	.46	−1.02	.70	.17	.28
Occupational	3.39	<0.001 **	4.34	.15	.09	.61
Active living	−0.77	.31	−2.88	.17	.11	.40
Sports/exercise	−0.65	.24	−0.78	.62	−0.21	.04 *

Note¹: Adjusting for demographic variables (age, education, marital status, family income, employment and number of children), health-related variables (body mass index, self-rated health) and menopause-related variables (menopausal status, hormonal therapy)

Note²:

**
p<0.01;

*
p<0.05

Table 5

Hierarchical multiple regression analyses: associations of physical activity with menopausal symptom severity in each ethnic group

	Physical		Psychological		Psychosomatic	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Hispanic						
Household	−0.72	.87	−4.22	.19	−1.01	.22
Occupational	9.01	.09	2.63	.49	3.16	.01 *
Active living	−0.02	.99	1.31	.67	−0.44	.60
Sports/exercise	−3.24	.28	−2.19	.32	.04	.95
N-H Asian						
Household	4.97	.65	7.30	.03 *	.80	.39
Occupational	4.70	.23	1.47	.71	−0.84	.45
Active living	−3.18	.50	−5.90	.09	−1.72	.08
Sports/exercise	1.88	.53	.81	.67	.34	.55
N-H African American						
Household	6.43	.10	6.18	.04 *	1.80	.04 *
Occupational	5.92	.14	.14	.96	.25	.77
Active living	−3.10	.38	−4.38	.11	−1.53	.04 *
Sports/exercise	−0.60	.80	3.40	.07	.64	.22
N-H White						
Household	2.66	.41	−0.40	.57	.65	.28
Occupational	9.58	.01 *	1.35	.10	.27	.90
Active living	−2.05	.46	−0.85	.13	.30	.56
Sports/exercise	−2.21	.27	−0.31	.47	−0.65	.10

Note¹: Adjusting for demographic variables (age, education, marital status, family income, employment and number of children), health-related variables (body mass index, self-rated health) and menopause-related variables (menopausal status, hormonal therapy)

Note²:

**
 $p < 0.01$;

*
 $p < 0.05$