



Relationships among personality, coping, and concurrent health-related quality of life in women with breast cancer

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Abstract

Background Theory has suggested that personality plays an important role related to health behavior and results in health outcomes, but inconsistent with the findings exist. Moreover, limited research has focused on style of coping with personality traits and health-related quality of life (HRQOL) for patients with breast cancer. We tested how ways of coping and personality traits are associated with HRQOL in patients with breast cancer, after controlling for age, education, disease severity, and sleep disorders.

Methods In a cross-sectional study of 207 patients with breast cancer, they completed a set of questionnaires at two general hospitals. The measures used were demographic and individual characteristics, personality traits, ways of coping, and health surveys. We used correlations and hierarchical regressions to determine all relationships among factors, sleep disorders, personality, coping, and HRQOL.

Results Most participants were reported as having stage II (77, 37.2%) breast cancer. About 60% patients with breast cancer have poor sleep and sleep disorders having a negative association with HRQOL. Participants using more active coping, with lower neuroticism, and higher agreeableness traits are more likely to have a better physical quality of life (PQOL). In the PQOL regression model, clinical conditions (duration since cancer diagnosis; sleep disorders) and two personality traits (neuroticism and agreeableness) significantly explained 23% of variance. Moreover, fewer sleep disorders and two personality traits (neuroticism and conscientiousness) significantly explained 31% of variance in the mental quality-of-life (MQOL) regression model.

Conclusions A high prevalence of sleep disorders for patients with breast cancer has occurred and sleep disorders were negatively associated with PQOL and MQOL. In addition, neuroticism was positively related to sleep disorders and could be relevant to psycho-educational interventions.

Keywords Personality · Coping · Sleep disorders · Health-related quality of life

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Introduction

Breast cancer was a common cancer from 2008 to 2012 [1], and it was also reported as the highest incidence rate in 2017 globally and in Taiwan [2]. The relevant survival rate was high compared to other cancers; for instance, the 5-year survival rate for breast cancer was 93% for stage II and 72% for stage III from 2007 to 2013. Patients with cancer must struggle with physical changes and psychological distress during and after treatment. The coping behaviors of patients with breast cancer play an essential role and are associated with negative health outcomes that are characterized by poor sleep quality, nausea, fatigue, or a lack of confidence, etc., and impacts health-related quality of life (HRQOL) [3].

Personality may relate to the incidence of cancers; however, studies of the associations between personality and health outcomes have yielded inconsistent results [4, 5]. Jokela et al. [6] examined personality traits with the Five Factor Model, and the incidences of cancers including lung, colon, breast, prostate, skin, and leukemia/lymphoma among 42,843 cancer survivors in a random effect meta-analysis. They concluded that personality was not associated with an increased risk of cancer or cancer-related mortality.

Several researchers have explored the relationships among personality, health seeking behaviors, and quality of life in women with breast cancer [4, 5]. They highlighted personality as possibly playing a key role in influencing one's view of disease and health-seeking behaviors. Costa and McCrae [7] indicated that personality could be broken down into the following five factors: neuroticism, extroversion, openness to experiences, agreeableness, and conscientiousness.

Neuroticism is associated with irrational or negative thoughts; thus, high degrees of neuroticism for individuals are associated with a poor ability to adjust to their stressors [8]. Huang et al. [9] mentioned that personality traits, especially neuroticism, were more likely to be associated with psychosocial HRQOL. People who exhibit extraversion personalities are inclined towards positive views about the future and usually energetic in the face of challenges. The openness personality trait influences individual intellectual and imaginative abilities and people who exhibit the high levels of extraversion and openness are capable of acquiring new knowledge or make changes to deal with variation and adversity better [10]. The agreeableness personality trait indicates being cooperative or friendly. People with high levels of agreeableness are supportive and have cooperative relationships with others as well as having fewer conflicts [7]. On the contrary, people with low levels of agreeableness may be distant or uncooperative. The last one, conscientiousness is associated with reliability, ability for self-discipline, and organization [11].

Many researches have demonstrated the influence of personality traits on coping behaviors [8]. Based on Lazarus and Folkman's Stress and Coping model [12], psychological distress occurs when the event exceeds available coping resources and these stressors may affect individual well-being and quality of life. Regarding patients with breast cancer have demonstrated high levels of anxiety and depression since their confirmed diagnoses. Thus, they may, consequently, experience negative impacts on physical conditions due to applying ineffective coping styles [13, 14]. In addition, patients with breast cancer may experience physical and mental symptoms because of the disease or treatment process, such as fatigue, pain, sleep disorders, anxiety, and depression [15].

Regarding sleep disorders, patients in cancer have complained with sleep disorders varied [16]. Sleep disorders

usually present a temporary or lasting for more than 2 weeks and have been defined as occurring more than three nights per week and having difficulty to fall asleep or awakenings greater than 30 min during the night and poor daytime functioning [17, 18]. Compared to insomnia in general population, the factors of sleep disorders may not comprise factors such as worrying recurrence, hormone inhibitors, and side effects of chemotherapy et al., and the causes of insomnia may occurred in individuals itself.

In summary, patients with breast cancer experience physical and psychological symptoms and coping style might be essential in managing and adapting their HRQOL which was measured in both physical quality of life (PQOL) and mental quality of life (MQOL). More importantly, individual personality traits could influence their coping style. In this research, we aimed how ways of coping and personality traits are associated with HRQOL in patients with breast cancer, after controlling for age, education, disease severity, and sleep disorders in the correlational study design. Those results can apply to the following psycho-education intervention study, which was included in the cognitive behavioral therapy protocol.

Method

Design and participants

A cross-sectional, correlational design was adopted to examine the relationships among disease characteristics, personality, coping, and health. A convenience sampling of 207 women with breast cancer was conducted at two general hospitals from February 2016 to March 2017 in Taiwan. To yield significant results with 80% power, a medium-effect size with f^2 is equal to 0.15 and α was 0.05 [19]. An adequate sample was recruited for this study. After received approval from Institute Review Board at the two hospitals, participants who coincided with the inclusion criteria and were willing to participate in the study were told their rights in this research and were able to join or leave the study at any time. The inclusion criteria include 20 years old or above with the diagnosis of breast cancer and capable of communicating in Taiwanese or Chinese. After collecting signed consents from all subjects, a trained interviewer conducted face-to-face, structured interviews to gather information.

Data collection

Data were collected by a set of structural questionnaires including a demographic information sheet, the modified NEO Personality Inventory (NEO-PI-R) [20], the modified Ways of Coping Checklist (M-WOC) [21, 22], and the SF-36 health survey [23].

Measures

The modified NEO Personality Inventory (NEO-PI-R)

Participant personality traits were assessed using Costa and McCare's [20] revised NEO Personality Inventory (NEO-PI-R). The revised NEO-PI-R consists of 30 items for the following five personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Each trait contains six items and items are measured using a 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). Scores for the nine items need to be reversed before being summed up for each personality trait. The Cronbach's α for the Chinese version in this present study was 0.76–0.81.

Coping

The modified Ways of Coping [21, 22] was used to measure the methods for how respondents dealt with various stressful situations from 1 week before. The M-WOC is derived for Lazarus and Folkman [12], and indicates three types of coping: avoidance coping, active coping, and minimizing the situation. This measure contains 36 items and we used a 4-point Likert scale (0 = not apply, to 3 = used a great deal). Higher scores mean better adaptations for a specific coping skill. Cronbach's α coefficients from Huang et al. [24] were 0.85, 0.75, and 0.73 for each of the three coping styles, respectively; and was 0.76–0.83 in this study.

Sleep quality

Sleep was measured with the 19-item Pittsburgh Sleep Quality Index, Chinese version (PSQI-C) [25]. The PSQI, a valid and reliable measurement, has been used in patients with cancer in Taiwan [26] to evaluate participant perspectives on sleep quality in seven dimensions. The PSQI consists of sleep latency, sleep duration, habitual sleep efficiency, sleep disorders, use of sleep medication, and daytime dysfunction, each dimension was rated 0–3, with the sum of scores from 0 to 21, with higher scores showing poor sleep quality. A PSQI score greater than 5 indicates participants with sleep disorders [25]. Cronbach's α for whole components was 0.82 in this study.

Health survey

The SF-36 questionnaire has been designed as a generic indicator of health [23]. The SF-36 health survey consists of eight subscales that are applicable to the general health for individuals, including physical function (PF), role physical

(RH), bodily pain (BP), general health (GH), vitality (VH), social functioning (SF), role emotional (RE), and mental health (MH). The weight score of each section ranges 0–100. HRQOL is usually divided into two components: PQOL and MQOL, which were applied in this study. Cronbach's α in our study ranged from 0.68 to 0.83 among these subscales.

Data analysis

Prior to analysis, we evaluated the data for meeting assumptions, normality, and multicollinearity. We used SPSS version 19.0 for data analysis. Data were described using mean and standard deviations (SD) for continuous variables or as percentages for categorical data. The correlations and hierarchical regressions were applied to determine all relationships among factors, sleep disorders, personality, coping, and PQOL/MQOL. The value of statistical significance was an α of 0.05.

Results

Participants' characteristics

Table 1 shows the demographics of the participants. There were a total of 207 women diagnosed with breast cancer participated in the current study. The mean age of the participants was 52.2 years (SD 9.2) and with a high school degree or higher degree ($n = 130$, 62.8%). The mean duration since the diagnosis of breast cancer was 20.4 months (SD 20.1). Of them, 68 (32.8%) were reported as stage I, 77 (37.2%) were stage II, 46 (22.3%) were stage III, and 16 (7.7%) were stage IV. The majority of participants have at least one adjuvant therapy (163, 78.7%) and 44 (21.3%) without. Most participants were married ($n = 147$, 71.0%); only a few were single ($n = 26$, 12.6%), widowed ($n = 19$, 9.2%), or divorced ($n = 15$, 7.2%). In responding on satisfaction with their marital relationship, 22 participants reported as single, a few reported as very unsatisfied ($n = 2$, 1%) or unsatisfied ($n = 19$, 9.2%), majority reported as fine ($n = 53$, 25.6%), satisfied ($n = 67$, 32.4%), or very satisfied ($n = 44$, 21.3%). More than half of them were satisfied with their marital relationship, spouses can be a good supporter for participants during disease progression and therapy trajectory. Understanding the satisfaction between spousal relationships may help patients to feel supportive and achieve positive health outcomes. Participant household monthly incomes were often between 20,001–40,000 NT dollars ($n = 70$, 33.8%).

The NEO-PI-R consists of five personality traits identified earlier in the paper. Average scores of the five personality traits were 15.14 (SD 3.19) for neuroticism, 18.92 (SD 3.04) for extraversion, 17.44 (SD 2.00) for openness to

Table 1 Demographic characteristics ($N=207$)

Variables	Mean (SD)	N (%)
Age (years)	52.2 (9.2)	
School years (education)		
Illiterate		9 (4.3)
Elementary		32 (15.5)
Junior high		36 (17.4)
High school		76 (36.7)
College(or above)		54 (26.1)
Duration (months)	20.4 (20.1)	
Stage of cancer		
Stage I		68 (32.8)
Stage II		77 (37.2)
Stage III		46 (22.3)
Stage IV		16 (7.7)
Adjuvant treatment		
Yes		163 (78.7)
No		44 (21.3)
Treatment type		
Hormone		78 (37.7)
Chemotherapy		164 (79.2)
Radiation therapy		81 (39.1)
Targeted therapy		40 (19.3)
Surgery		97 (46.9)
Marital status		
Single		26 (12.6)
Married/cohabitating		147 (71)
Widowed		19 (9.2)
Divorced (other)		15 (7.2)
Marital satisfaction		
Very satisfied		44 (21.3)
Satisfied		67 (32.4)
Fine		53 (25.6)
Not satisfied		19 (9.2)
Very unsatisfied		2 (1)
Single		22 (10.5)
Household income (monthly NT dollars)		
< 20,000		42 (20.3)
20,001–40,000		70 (33.8)
40,001–60,000		46 (22.2)
> 60,000		49 (23.7)

Household income (monthly): new Taiwan (NT) currency

experience, 20.63 (SD 2.74) for agreeableness, and 21.03 (SD 3.08) for conscientiousness, respectively.

The average weighted scores for the eight sections were 75.24 (SD 20.16) for PF, 37.20 (SD 42.44) for RP, 78.10 (SD 21.14) for BP, 53.39 (SD 13.23) for GH, 59.59 (SD 11.16) for VT, 83.47 (SD 21.40) for SF, 59.25 (SD 46.22) for RE, and 62.26 (SD 12.04) for MH, respectively. Four sections: PF, RL, BP, and GH, were summed and weighted as

PQOL. While the other four sections: VT, SF, RE, and MH were summed and weighted as MQOL. The average score of PQOL and MQOL was 61.13 (SD 17.37) and 66.23 (SD 17.09), respectively.

The average score of the PSQI was 6.69 (SD 2.91). There were 123 participants (59.4%) reported PSQI scores greater than 5, which indicated sleep disorders.

Correlations among personality traits, health, and sleep disorders

Correlation analyses revealed that personality traits and sleep disorders were associated with PQOL and MQOL (Table 2). Neuroticism was negatively, significantly associated with both PQOL and MQOL. Extraversion was positively, significantly associated with PQOL and MQOL. Openness was insignificantly associated with PQOL and MQOL. Agreeable was positively, significantly associated with PQOL and MQOL. The association between conscientiousness and quality of life was controversial; it was positively significantly associated with PQOL. On the other hand, it was insignificantly associated with MQOL. Moreover, poor sleep quality measured by PSQI was negatively, significantly associated with PQOL and MQOL. In other words, sleep disorders was positively associated with poor quality of life.

Sleep disorders, coping, personality, PQOL, and MQOL

Bivariate analyses indicated that several variables were associated with PQOL and MQOL. Four aspects of variables were examined their association with PQOL and MQOL, respectively, using stepwise hierarchical linear regression (Tables 3, 4). The four aspects are demographics (i.e., age and education), clinical conditions (i.e., stage of cancer, duration since of diagnosis, and sleep disorders), ways of coping (i.e., active, avoid, and minimize way of coping), and components of personality (i.e., neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness).

In the PQOL model (Table 3), after controlling for demographic variables, clinical variables (i.e., stage of cancer, duration since cancer diagnosis, and sleep disorders) increased the variance 10% of PQOL (model 2). A high score for sleep quality indicated sleep disorders; and in model 2, sleep disorders ($\beta = -0.29$, $p < 0.001$) were negatively associated with PQOL. In model 3, three ways of coping did not significantly increase the variance of PQOL (R^2 change = 0.02, $p = 0.19$). In model 4, after adjustment for demographic variables, clinical variables, and ways of coping, five components of personality increased 14% variance of PQOL ($p < 0.01$). Of clinical

Table 2 Correlations among three coping ways, five personality traits, PQOL, MQOL, and sleep disorders

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Active coping	1										
2. Avoid coping	0.34***	1									
3. Minimize coping	0.48***	0.54***	1								
4. Neuroticism	-0.10	0.10	0.06	1							
5. Extraversion	0.48***	0.15*	0.24**	-0.29***	1						
6. Openness	0.23**	0.00	0.08	-0.15*	0.47***	1					
7. Agreeableness	0.43***	0.15*	0.24**	-0.33***	0.56***	0.20**	1				
8. Conscientiousness	0.45***	0.07	0.10	-0.17*	0.39***	0.15*	0.50***	1			
9. PQOL	0.20**	-0.02	0.09	-0.31***	0.31***	0.17	0.38***	0.16*	1		
10. MQOL	0.05	-0.01	-0.03	-0.48***	0.23**	0.11	0.22**	-0.09	0.56***	1	
11. Sleep disorders	-0.10	0.07	0.02	0.21**	-0.12	-0.13	-0.14	0.02	-0.29***	-0.31***	1

PQOL physical quality of life, MQOL mental quality of life

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Hierarchical models of the factors associated with PQOL (beta coefficients)

Variables	Model 1	Model 2	Model 3	Model 4
Demographics				
Age	0.01	-0.01	-0.01	-0.07
Education ^a	0.15*	0.17*	0.13	0.08
Clinical				
Stage of cancer		-0.06	-0.07	-0.11
Duration since diagnosis (month)		0.10	0.08	0.13*
Sleep disorders		-0.29***	-0.28***	-0.22**
Coping				
Active coping			0.13	-0.01
Avoid coping			-0.10	-0.09
Minimize coping			0.05	0.04
Personality				
Neuroticism				-0.16*
Extraversion				0.14
Openness				-0.03
Agreeableness				0.27**
Conscientiousness				-0.05
Adjusted R^2	0.01	0.10	0.11	0.23
R^2 change	0.02	0.10	0.02	0.14
Significant of F change	0.13	<0.001	0.19	<0.001

^a< high school = 1, ≥ high school = 2

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

variables, longer period since cancer diagnosis was positively, significantly associated with better PQOL ($\beta = 0.13$, $p < 0.05$); while sleep disorders were associated with poor PQOL ($\beta = -0.22$, $p = 0.001$). Neuroticism was negatively, significantly associated with PQOL ($\beta = -0.16$, $p = 0.03$). Agreeableness was positively, significantly associated with PQOL ($\beta = 0.27$, $p < 0.01$). Overall, these variables explained 23% variation on PQOL.

In the MQOL model (Table 4), after controlling demographic variables, clinical variables (i.e., stage of cancer, duration since cancer diagnosis, and sleep disorders) increased 11% variance of MQOL (model 2). In model 2, sleep disorders ($\beta = -0.32$, $p < 0.01$) were negatively, associated with a better MQOL. In model 3, three ways of coping did not significantly increase the variance of MQOL (R^2 change = 0.004, $p = 0.83$). In model 4, after adjustment for

Table 4 Hierarchical models of the factors associated with MQOL (beta coefficients)

Variables	Model 1	Model 2	Model 3	Model 4
Demographics				
Age	0.06	0.05	0.05	−0.02
Education ^a	0.03	0.04	0.04	0.04
Clinical				
Stage of cancer		0.06	0.05	−0.02
Duration since diagnosis (month)		−0.02	−0.03	0.03
Sleep disorders		−0.32***	−0.32***	−0.21**
Coping				
Active coping			0.05	0.02
Avoid coping			0.03	0.06
Minimize coping			−0.07	−0.09
Personality				
Neuroticism				−0.41***
Extraversion				0.15
Openness				−0.02
Agreeableness				0.13
Conscientiousness				−0.24**
Adjusted R^2	<0.01	0.09	0.08	0.31
R^2 change	0.004	0.11	0.004	0.23
Significant of F change	0.68	<0.001	0.83	<0.001

^a<high school = 1, ≥ high school = 2

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

demographic variables, clinical variables, and ways of coping, five components of personality increased 23% variance of MQOL ($p < 0.01$). Of clinical variables, sleep disorders were associated with poor MQOL ($\beta = -0.21$, $p < 0.01$). Neuroticism ($\beta = -0.41$, $p < 0.01$) and conscientiousness ($\beta = -0.24$, $p < 0.01$) were negatively, significantly associated with MQOL. Overall, these variables explained 31% of variation on MQOL.

Discussion

This study examined hypotheses about the association between personality traits, coping, and HRQOL of patients with breast cancer. The findings of five personality traits related to the sleep quality or HRQOL were mostly consistent with the previous research [8, 9]. Neuroticism was negatively associated with PQOL and MQOL; the reasons may be due to individuals with neuroticism cannot appropriately use effective coping styles to adapt to threats and consequently perform poor HRQOL. On the contrary, people with extraversion and agreeableness had significantly positive correlation with the three coping styles and had strong positive relationships with PQOL and MQOL, which is consistent with the previous research [8, 10]. Extraversion was identified as sociability. Usually, individuals high in extraversion are more likely to have positive perspectives about

the future [27] and better HRQOL, and may result in better health outcomes [28]. Individuals with extraversion may use effective coping styles to disengage or re-engage objectives during their treatment and, consequently, result into a better adaptation for a better HRQOL, which is consistent with Huang et al. [9] and Wrosch and Scheier [29].

Regarding the other personality traits, conscientiousness had a positive relationship with active coping and PQOL. Individuals high in conscientiousness are usually responsible and reliable. In addition, this result may be caused as conscientiousness is made up of self-control, discipline, and risk avoidance [11]. Moreover, they had higher active coping to their diseases and presented more willingness to cooperate with treatment.

Regarding the relationship between personality and sleep disorders, only neuroticism had a positive relationship with sleep disorders. In addition, HRQOL had negative correlations with sleep disorders. It is no surprised that patients with high levels of neuroticism have poor sleep quality. When individuals with high levels of neuroticism usually tend to experience negative emotions and easily be anxious, which may progressively result in sleep disturbances and a worse HRQOL.

In addition, the results of this study have indicated that duration since the confirmed diagnosis of breast cancer; sleep disorders, neuroticism, and agreeableness personality traits significant predicted PQOL. Patients with longer

periods of breast cancer were positively associated with a better PQOL, which may be during the longer recovery from the disease and would be well adjusted to the therapeutic journey associated with breast cancer. This finding was inconsistent with the previous research [30], which revealed breast cancer survivors had poor PQOL, because the body damage from the cancer progressions and side effects of treatments. It is believed that those differences occurred due to the severity of the disease itself.

On the other hand, patients with breast cancer with higher level of agreeableness were optimistic and hopeful [8], which may increase patients with breast cancer survival desire. Thus, they would seek a variety of ways to improve their PQOL.

In closing, the present findings suggest that sleep disorders, neuroticism, and conscientiousness had a significant predictability for MQOL of patients with breast cancer. These findings were supported by the previous research [8], which revealed that people with neuroticism were prone to feel the pressure and present with anxiety, irritability, or depression. These negative emotions affect the MQOL of patients with breast cancer. However, people with higher levels of conscientiousness were more thoughtful, persevered better, and presented better self-regulation [8].

Study limitations

Several limitations require consideration. The cross-sectional sampling was applied for two general hospitals and limited to external generalizations. Regarding cancer-related sleep disorders was investigated in this study but not compared to general populations, which was also a limitation. The HRQOL was only analyzed one time for correlational design; we will follow this with further interventions using cognitive behavior therapy. Another limitation is that the regression model explained 23% and 31% of the variance for PQOL and MQOL, respectively. This result suggests that there could be some other factors related to the disease, treatment, or support systems that need further research.

Conclusion

We cannot conclude that personality is highly correlated with breast cancer, but personality traits are highly related to effective coping styles, sleep quality, and HRQOL for patients with breast cancer. Neuroticism and sleep disorders had a negative association with PQOL and MQOL. Therefore, nurses should pay more attention to notice that neuroticism for breast cancer survivors may have poor sleep quality. Health care professionals can apply cognitive behavioral therapy to encourage patients for using an active coping style

during their survivorship trajectories to improve their sleep quality or HRQOL.

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Compliance with ethical standards

Conflict of interest All authors declare there is no conflict of interest.

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