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Coping, anxiety and quality of life after coronary artery bypass graft surgery

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Abstract

Title. Coping, anxiety and quality of life after coronary artery bypass graft surgery

Aim. This paper is a report of a study to explore the relationship between ways of coping, anxiety level and quality of life for patients after coronary artery bypass grafting.

Background. Coronary artery bypass grafting requires appropriate coping strategies to achieve successful adaptation. In Taiwan, the incidence of this surgery is increasing, but research on adaptation following surgery is limited, with no research examining outcomes for women, who often have poorer adaptation outcomes than men.

Methods. An integrated research design, based on Lazarus and Folkman's transaction coping theory, was used. The research employed convenience sampling with four instruments: the Revised Ways of Coping Checklist, State-Trait Anxiety Inventory, Short Form 36-Health Survey, and a demographic questionnaire, sent to 50 men and 50 women who were recruited from a medical centre in Taiwan. Additionally, qualitative data from interviews with three men and three women, who had completed the instruments, were analysed.

Findings. Better quality of life was associated with lower anxiety level, greater use of problem-focused coping strategies and those who had more gender role responsibility. Women scored lower on the physical dimensions of quality of life, used more self-blaming coping strategies and experienced slightly higher levels of anxiety compared to men. The qualitative analysis supported the conclusions of the quantitative analysis.

Conclusion. The results will help nurses design specific interventions intended to lower anxiety levels, promote the use of problem-focused strategies and identify patients' values, necessary to achieve optimal quality of life.

Keywords: adaptation, anxiety, coping, nursing, Short Form 36-Health Survey, quality of life, Ways of Coping Checklist

Background

Heart disease is the leading cause of death worldwide, and coronary heart disease (CHD) accounts for the largest proportion of heart disease (Healthy People 2010, 2003). Coronary artery bypass graft (CABG) surgery is one of the major therapeutic approaches to the treatment of CHD. In the United States of America, the number of CABG procedures performed each year has increased 425%, from approximately 150,000 in 1979 to 598,000 in 1996 (Hunt 2000). In Taiwan,

over the past two decades, CHD has become the second leading cause of death. Similarly, the numbers of CABG procedures performed each year in Taiwan has increased threefold, from approximately 100 in 1988 to 356 in 1999 (Hunt 2000, Keresztes *et al.* 2003, Ku *et al.*; Wang 2000).

Historically, CHD has been a male disease; but there has been an increase in the number of women diagnosed with CHD, and the mortality rate for women is greater than that for men (Vaccarino *et al.* 2001). In Taiwan, 4323 women died from the disease in 2003, and the mortality rate is two to three times greater than for any kind of cancer (Department of Health of Taiwan, 2004). Further, slower physical recovery, poorer psychosocial outcome and lower quality of life in women who undergo CABG procedures have been reported (Artinian & Duggan 1995, Keresztes *et al.* 2003). Very few studies have explored CABG outcomes with women in international settings.

Recovery from CABG is a stressful experience and requires physical and psychosocial adaptation (Flanagan 1998, Redeker 1992), as well as appropriate coping strategies to manage the stressful condition and reduce the level of anxiety often associated with adaptation (Redeker 1992). According to Lazarus and Folkman's (1984) transaction coping theory, the theoretical framework for this study, an individual applies either problem-focused or emotion-focused coping strategies when encountering problems. Problem-focused coping attempts to alter and manage the stressor, whereas emotion-focused coping attempts to regulate the emotional response to the stressor. Adaptation outcome refers to physical and psychosocial health, both of which are affected by appraisal and coping (Lazarus & Folkman 1984).

The problem-focused process involves strategies that reduce stress by determining the best solution and means to achieve it. When the individual believes that nothing can be performed to deal with the problem, he or she uses emotion-focused strategies, such as avoidance or wishful thinking, to lessen the stress (Chan & Ward 1993). This dynamic interaction between person and environment is compatible with the Chinese Yin-Yang framework: a person is healthy when there is a balance in the body. When a Yin-Yang imbalance occurs, individuals utilize coping strategies and take action to protect the body from the outside and to restore energy within (Hwang S.L., unpublished data, Rush University, College of Nursing, Chicago).

Redeker (1992) conducted a repeated measures design to describe the nature and dynamics of coping in cardiac patients, utilizing Lazarus and Folkman's (1984) theory. The results showed that there is a need to promote coping in postcardiac surgery patients and that the gender differences in coping strategies warrant further investigation. Several Chinese researchers found that both problem-focused and emotion-focused coping were used by their cardiac participants. These studies revealed that men, as compared to women, used more problem-focused coping and less emotion-focused coping, to manage the stress of a cardiac event (Chen & Ku 1997, Hwang *et al.* 1997, Hwang S.L., unpublished data, Rush University, College of Nursing, Chicago; Lee W.L., unpublished data, University of Maryland, Baltimore).

The choice of problem-focused or emotion-focused coping may depend on stress appraisal: primary appraisal, secondary appraisal and reappraisal (Lazarus & Folkman 1984). Anxiety is the end emotional response to one's appraisal of the stress. Primary appraisal involves the judgment that an encounter is irrelevant, positive, or stressful. Secondary appraisal is a judgment about what might be performed to manage an encounter, and involves the evaluation of available coping options. Reappraisal consists of changing an appraisal according to new information received about the stressor.

Anxiety has been identified as a common mood status in patients before and after cardiac surgery (Chan & Ward 1993). Tienari (1981, as cited in Lee W.L., unpublished data, University of Maryland, Baltimore) recorded an incidence of 53% of heightened anxiety and depression states in patients following cardiac surgery. Ben-Zur *et al.* (2000) investigated 171 patients, 2–20 months after CABG, and found that their anxiety level was higher than that measured in a community sample. In addition, post-CABG high anxiety levels were associated with greater use of emotion-focused coping strategies (Sheu 2000). Understanding this phenomenon in Taiwanese women who are cardiac patients is extremely important because anxiety is strongly associated with their adaptation outcome in terms of quality of life (Hwang *et al.* 1997, Jeng 1999).

Quality of life has been identified as a better indicator of success following heart surgery than objective measures, such as mortality and morbidity (Corcoran & Durham 2000, Healthy People 2010, 2003, Hunt 2000, Lei & Chiou 2000). Anxiety and coping have been identified as important factors associated with quality of life in post-CABG patients (Fok & Wong 2005, Hwang *et al.* 1997, Jeng 1999, Karlsson *et al.* 2000; Ku *et al.* 2002). High anxiety levels can result from ineffective coping, and coping can be affected by anxiety (Ben-Zur *et al.* 2000). However, research concerning the relationship between anxiety, coping and quality of life for Taiwanese post-CABG patients is lacking. To help close the gap, our study explored the relationship between ways of coping, anxiety and quality of life in male and female Taiwanese post-CABG patients, the effects of demographics on these variables and identified predictors of better quality of life using these variables.

The study

Aim

The aim of this study was to explore the relationship between ways of coping, anxiety level and quality of life for Taiwanese patients after CABG.

Design

Using Lazarus and Folkman's transactional coping theory, we conducted a descriptive, correlational, integrated research design.

For the purpose of this study, CABG surgery is identified as a stressor, which leads to primary appraisal, secondary appraisal and an adaptation outcome. We assessed anxiety as a means of indicating participants' primary appraisal of stress. Problem-focused or emotion-focused coping measures represented participants' secondary appraisal. We collected information about demographics, including sex, gender-role, age and education to assess the influence these variables may have on coping, primary appraisal and adaptation outcome. Quality of life has multiple dimensions, including factors related to physical, psychological, social and spiritual dimensions. Quality of life reflects the major characteristics of adaptation outcome (social functioning, morale and health), as defined by Lazarus and Folkman (1984). Therefore, we used the concept of quality of life to examine, conceptualize and measure adaptation outcome (Delunas & Potempa 1999, Lazarus & Folkman 1984). The model of the conceptual framework is presented in Figure 1.

Participants

Quantitative component

We recruited a convenience sample of patients returning for routine post-CABG check-up appointments at one medical centre in Taipei. Cohen (1988) recommended a power of 0·80 and moderate effect size (0·5) for the behavioural sciences; the level of statistical significance was set at 0·05 for this study. For the purpose of this study, which had three main variables and used Cohen's formula (Munro 2001), we needed a sample size of 77. The final sample size was 100 participants: 50 men and 50 women. The inclusion criteria were: (a) CABG surgery in the past 5 years; (b) being able to read Chinese and (c) a willingness to participate in the research. Patients who had a psychiatric diagnosis were excluded.

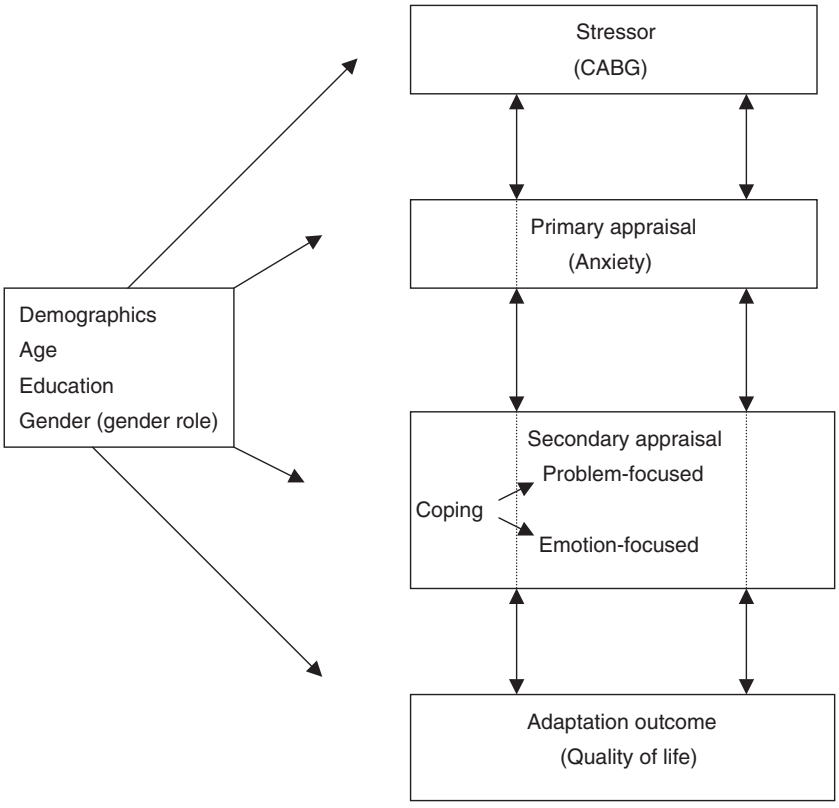

Figure 1 Model of the conceptual framework of the coronary artery bypass graft study.

Qualitative component

We selected six patients from the quantitative sample to participate in interviews: the first three male and female, Mandarin-speaking participants to return for a visit to the clinic after having returned their questionnaires.

Data collection

We collected quantitative data using valid and reliable research questionnaires which participants completed and returned by mail. The three main instruments were originally developed in English. Thus, despite the fact that the Chinese versions of the instruments had good psychometric properties, the interpretation of items was a concern. To ascertain whether the patients understood the words used in the instruments, and to provide more depth to the findings, we conducted semi-structured interviews, comprised of nine open-ended questions relevant to coping, anxiety, quality of life and adaptation processes with three male and three female participants. We recorded these data by hand.

Study instruments

We used four instruments in the study. These included the Revised Ways of Coping Checklist (RWCC), which was initially developed by Lazarus and Folkman (1984) and later revised by Vitaliano *et al.* (1985). This instrument is a 42-item measure, utilizing a 4-point Likert scale format with responses ranging from 0 (not appropriate) to 4 (regularly used). The scale contains five subscales, categorized as problem-focused and emotion-focused coping. Problem-focused coping is assessed by two subscales: problem-focused thinking (15 items) and seeking social support (six items); while emotion-focus coping is assessed by three subscales: wishful thinking (nine items), blaming self (three items) and avoidance (10 items).

The RWCC has been widely used to assess coping in patients with chronic illnesses (Redeker 1992, Lee, unpublished data). Cronbach's alphas ranged from 0·64 to 0·88 for the total score, with the reliability of subscales ranging from 0·69 to 0·91 (Redeker 1992, Lee, unpublished data). The Chinese version of the RWCC (C-RWCC), used in cardiac populations in Taiwan (Hu 1992, Sheu 2000), has demonstrated good psychometric properties, with content validity: $\alpha = 0{\cdot}90$ and internal reliability: $\alpha = 0{\cdot}80$ (problem-focused coping = 0·79, emotion-focused coping = 0·67).

We measured anxiety with the State-Trait Anxiety Inventory (STAI) (Spielberger *et al.* 1971), which uses a 4-point Likert format and contains 40 items, including 20 state anxiety items and 20 trait anxiety items (Frank-Stromborg & Olsen 2004). State anxiety measures temporal feelings of fear or worry, whereas trait anxiety measures the tendency of an individual to be anxious. The total score range is 20–80, with higher scores indicating greater anxiety. Alpha coefficient values for internal consistency ranged from 0·83 to 0·92 for state anxiety and 0·86 to 0·92 for trait anxiety. The STAI has been successfully used with the elderly and in medical/surgical populations (Frank-Stromborg & Olsen 2004, Sheu 2000). The Chinese version of the State-Trait Anxiety Inventory (C-STAI) has good reliability and validity (Sheu 2000: A-State and A-Trait, $\gamma = 0{\cdot}71$; Taylor-Piliae & Molassotis 2001: state anxiety $\alpha = 0{\cdot}93$; trait-anxiety $\alpha = 0{\cdot}88$). Sheu (2000) also found that A-Trait and A-State scores were differentially sensitive to chronic mental health attributes and acute symptoms. The study showed that both scales of the C-STAI correlated significantly with other measures of psychological well-being, including the Chinese Beck Depression Inventory and the Chinese Somatic Scale. These findings provided evidence of concurrent validity.

We chose the *Medical Outcomes Trust Short Form 36-Health Survey (SF-36)* to measure quality of life. The SF-36 (Ware & Sherbourne 1992) includes one transition question and 35 questions on quality of life. The transition question asks patients to rate the amount of general health change that they have experienced during the past year. The remaining 35 questions are organized into eight subscales: (a) physical function (10 items); (b) role limitation caused by physical problems (four items); (c) role limitation caused by emotion problems (three items); (d) social function (two items); (e) bodily pain (two items); (f) mental health (five items); (g) vitality, energy/fatigue (four items) and (h) general health (five items). The eight scales are divided into two categories: the physical component summary (PCS) and the mental component summary (MCS). Scores are transformed to a scale of 0–100, where higher scores represent higher functioning. Reliability coefficients for each of the eight scales are $\geq 0{\cdot}80$ and the scales are sufficiently sensitive to detect changes in health-related quality of life in patients with CHD after CABG surgery (Kiebzak 2003, Ware & Sherbourne 1992).

Lu *et al.* (2002) conducted psychometric testing of the Chinese (Taiwanese) SF-36 with a general Chinese population. Tai Chi was substituted for golf as a moderate activity because playing golf is not common among the general population in Taiwan. Lu utilized multi-trait scaling analysis to test the measure, and the results showed that the SF-36 Taiwanese version had good psychometric properties. Cronbach's alphas ranged from 0·65 to 0·92, indicating an overall acceptable reliability level ($\alpha > 0{\cdot}70$). The internal consistency of physical functioning and role limitation was 0·92 and social functioning was 0·65.

Using the *demographic questionnaire*, we obtained information about age, sex, educational status, postoperation time, income and other relevant data, including gender-role. In Chinese culture, as reflected in the literature, the major gender-role functions of men and women are comprised of childcare, elderly care, housework, money management and income earning (Chao & Roth 2000, You M.H., unpublished data, University of Utah, Salt Lake City).

Ethical considerations

We received approval from the institutional review boards at both the university and study hospital, and permission to use the instruments from the respective copyright holders. We also obtained support for the study from the primary cardiac surgeon at the hospital, who agreed to recruit participants to the study.

Eligible patients were invited to participate in the study while visiting their doctor for follow-up visits. They were informed of the risks and benefits of participating, and those who agreed to take part were given research packs, which included a consent form and the four questionnaires (coping, anxiety, quality of life and demographic). Confidentiality and the right of participants to withdraw from the study were ensured.

Data analysis

We analysed the quantitative data using SPSS for Windows Version 11 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used for the demographic data and two-tailed Pearson's coefficients were used to analyse the relationship between variables. Multiple regression analyses were used to identify predictor variables for quality of life. In addition, multivariate MANOVA was used to assess the effect of the demographic variables, as well as to compare the mean of quality of life, anxiety level and coping strategy across demographics (Munro 2001). The significance level was set at 0·05.

We used content analysis for the interview data to identify perceptual patterns expressed by interviewees. Word and phrase repetitions were used as a basis for determining whether the statistical results reflected valid perceptions of participants.

Results

Demographics

As seen in Table 1, the majority of participants were more than 60 years old. The mean post-CABG period was 27·1 months for males and 16·4 months for females. Educationally, 62% of the men had at least a high school education, while 58% of the women had only completed elementary school. Because of age, the majority of men and women were not in employment; as a consequence, they did not answer the income and salary questions.

The range of scores for role function was 0–20, with a mean of 11·0 for males and 15·4 for females. The majority of the female participants had little or no responsibility for taking care of children, taking care of elders, doing housework, managing money, or earning money. However, 50% of men were still actively involved with the financial aspects of the household.

Demographic differences in ways of coping, anxiety and quality of life

The Chinese authors (Chung S.K., 2007, personal communication, Hu H.L., 2007, personal communication, Lu J.R., 2007, personal communication) of the three instruments believe that, theoretically, combining the subscales into one index is feasible, and we therefore collapsed problem-focused and emotion-focused coping behaviours into a coping index (Cronbach's alpha = 0·84), state and trait anxiety into an anxiety index (Cronbach's alpha = 0·96), and physical and mental dimensions into a quality of life index (Cronbach's alpha = 0·83). Additionally, the subscales of each instrument were collapsed into one index to better detect the effects of demographic variables on these dependent variables.

Our results showed that men achieved a better quality of life (mean = 45·3) than did women (mean = 41·8) after CABG surgery (Table 2). There were no differences in coping, anxiety, or quality of life across different age groups, postoperation time, education levels, or marital status. Post-CABG patients who took more role responsibility obtained statistically and significantly higher scores on quality of life.

Although the author of the Chinese (Taiwanese) SF-36 believes that, theoretically, the PCS and MCS can be collapsed into one index, there is no literature supporting this (Lu 2007). The demographic differences in PCS and MCS are presented in Table 3. Participants exhibited differences on the PCS index across sex, employment status, marital status and role function; however, there were no differences in MCS across the demographic variables. Men achieved a better PCS of quality of life (mean = 45·5) than did women (mean = 40·1) after CABG surgery. Participants who were employed (mean = 49·2) had a higher PCS of quality of life, as compared to those who were not employed (mean = 41·3). With regard to marital status, participants who were widowed had a lower PCS quality of life. In addition, post-CABG patients who took more role responsibility had statistically and significantly higher quality of life scores.

Table 1 Participant demographics

Variable	Men		Women		Statistics	*P* value
	n	%	*n*	%		
Age (years)					4·41†	0·35†
30–40	1	2	0	0		
41–50	6	12	2	4		
51–60	11	22	10	20		
> 60	32	64	37	74		
Postoperation time (months)		27·1		16·4	2·90*‡	< 0·001*‡
Marital status					7·99†	0·09†
Single	2	4	2	4		
Married	45	90	38	76		
Divorced	1	2	0	0		
Widowed	1	2	9	18		
Separated	1	2	1	2		
Children					4·11†	0·39†
0	3	6	1	2		
1	2	4	3	6		
2–3	26	52	20	40		
4	18	36	25	50		
Educational level					17·37*†	< 0·001*†
Below elementary	1	2	10	20		
Elementary	12	24	19	38		
Junior high school	6	12	5	10		
Senior high school	10	20	10	20		
College/university	21	42	6	12		
Religion					4·73†	0·45†
None	10	20	5	10		
Buddhism	29	58	34	68		
Taoism	7	14	7	14		
Christianity	4	8	2	4		
Catholicism	0	0	1	2		
Employed					4·36†	0·11†
Yes	13	26	5	10		
No	26	72	44	88		

*$P < 0·05$.
†chi-squared test.
‡independent *t*-test.

Sex differences in subscales of coping, anxiety and quality of life

In Table 4, we present the effect of sex across the variables. Across both sexes, patients used more problem-focused coping behaviours (mean = 29·1) than emotion-focused coping behaviours (mean = 24·2). Moreover, women used statistically and significantly more self-blame coping strategies than did men. We determined this by putting into rank order the five subcategories in the coping checklist from most frequently to least frequently used: problem-focused thinking, wishful thinking, avoidance, seeking social support and blaming self. Women scored higher on anxiety level than did men; however, this was not statistically significant.

Males obtained higher scores on the PCS component of quality of life (mean = 45·5) than did females (mean = 40·1; $P < 0·05$). Within this component, we noted the greatest difference between the sexes in the sub-items related to physical functions: men scored a mean of 42·2 and women had a mean of 37·9 ($P < 0·001$). There was no significant difference in the MCS component between sexes; however, the sub-items related to the vitality of mental health did show that men achieved a significantly higher mean score (49·6) than did women (45·2; $P = 0·033$).

Correlations between variables

We used Pearson's product moment correlations to determine the relationship between the subscales of the three main variables: problem- vs. emotion-focused coping, anxiety and the physical (PCS) vs. MCS of quality of life. The

Table 2 Demographic differences in ways of coping, anxiety and quality of life

	Coping		Anxiety		Quality of life	
Variable	Mean	SD	Mean	SD	Mean	SD
Sex						
Male	53·4	12·4	42·7	10·3	45·3	8·1
Female	53·2	15·1	44·6	11·5	41·8	8·0
t	0·58		–0·85		2·17*	
P	0·95		0·40		0·03*	
Employed						
Yes	60·1	11·8	41·1	10·3	46·3	7·3
No	51·9	14·0	44·1	11·0	42·9	8·5
t	2·30		–1·05		1·65	
P	0·02		0·30		0·10	
Age (years)						
30–40	60·0	0·0	52·0	0·0	45·0	0·0
41–50	55·8	13·7	43·0	14·0	43·8	9·1
51–60	58·9	14·1	44·8	11·4	45·0	7·9
>60	51·3	13·5	39·5	10·6	43·0	8·4
F	1·42		0·26		0·30	
P	0·23		0·90		0·8	
Postoperation time (months)						
0–6	53·8	15·9	44·3	10·8	43·3	8·2
7–12	52·3	16·5	44·5	11·6	43·9	7·5
13–36	54·4	12·4	43·3	11·7	43·9	8·4
36–60	52·0	11·2	42·2	9·1	43·1	9·5
F	0·17		0·07		0·92	
P	0·92		0·92		0·98	
Education						
Below elementary	52·3	11·9	42·0	7·1	44·0	5·7
Elementary	53·9	13·0	43·8	10·6	43·4	8·1
Junior high	50·7	17·1	42·2	8·1	41·5	7·2
Senior high	52·4	17·1	46·9	15·9	42·0	9·6
College/university	54·8	11·8	43·5	9·2	45·6	8·5
F	0·22		0·60		0·79	
P	0·93		0·66		0·54	
Marital status						
Single	59·8	21·9	37·4	4·5	49·0	9·5
Married	53·4	12·9	44·1	11·5	43·5	8·3
Divorced	62·0	0·0	37·0	0·0	54·2	0·0
Widowed	50·1	18·8	43·1	8·0	40·9	8·5
Separated	49·0	5·6	43·5	2·1	43·5	6·5
F	0·50		0·46		1·10	
P	0·74		0·77		0·34	
Role responsibility						
Scores 5–10	51·6	13·9	44·0	10·5	42·3	8·0
Scores 11–15	59·4	12·6	43·0	12·5	47·0	7·4
Scores 16–20	58·0	13·7	40·3	4·6	51·8	6·3
F	2·70		0·22		4·52*	
P	0·07		0·80		0·01*	

*$P < 0{\cdot}05$. Multivariate analysis of variance.

results showed that problem-focused coping ($r = -0{\cdot}33$, $P < 0{\cdot}01$) was negatively related to anxiety level and positively related ($r = 0.20$, $P < 0{\cdot}01$) to the MCS of quality of life. Moreover, anxiety was negatively correlated ($r = -0{\cdot}29$, $P < 0{\cdot}01$; $r = -0{\cdot}70$, $P < 0{\cdot}01$) to both the physical and mental dimensions of quality of life, but a stronger association was seen with the mental dimension (Table 5).

Table 3 Demographic differences in quality of life

	Physical component summary				Mental component summary			
Variable	Mean	SD	Statistic	*P*	Mean	SD	Statistic	*P*
Sex			2·9*†	< 0·001*†			0·73†	0·47†
Male	45·5	9·1			45·1	11·5		
Female	40·1	9·7			43·6	10·0		
Employed			3·28*†	< 0·001*†			0·38†	0·71†
Yes	49·2	7·7			43·4	13·1		
No	41·3	9·6			44·5	10·1		
Age (years)			1·85‡	0·13‡			0·43‡	0·71‡
30–40	53·8	0			36·2	0		
41–50	47·2	10·0			40·6	16·4		
51–60	45·8	9·1			44·3	10·4		
> 60	41·2	9·7			45·0	10·3		
Postoperation time (months)			0·38‡	0·77‡			0·38‡	0·79‡
0–6	41·6	9·9			44·8	10·3		
7–12	41·7	8·1			46·4	12·1		
13–36	43·7	10·1			44·2	10·2		
36–60	44·0	11·3			42·2	12·0		
Education			0·97‡	0·43‡			0·90‡	0·45‡
Below elementary	39·5	8·7			48·5	6·7		
Elementary	42·9	9·7			44·0	11·1		
Junior high	41·1	10·9			42·0	10·7		
Senior high	42·0	10·4			42·0	12·2		
College/university	45·5	9·9			45·7	10·7		
Marital status			2·62*‡	0·04*‡			0·17‡	0·95‡
Single	51·1	6·5			47·0	6·0		
Married	43·0	9·2			44·0	11·4		
Divorced	58·2	0			50·2	0		
Widowed	36·4	12·2			45·4	8·3		
Separated	42·5	5·7			44·5	7·2		
Role responsibility			9·9*‡	< 0·001*‡			0·22‡	0·80‡
Scores 5–10	40·6	9·6			44·0	10·7		
Scores 11–15	48·7	6·4			45·3	11·5		
Scores 16–20	56·5	6·3			47·1	6·2		

*$P < 0{\cdot}05$.
†independent *t*-test.
‡One-way ANOVA.

Predictors of better quality of life

The results, as presented in Table 6, show that, in model 1, 37% of the variability of quality of life was accounted for by anxiety ($\beta = -0{\cdot}61$, $t = -7{\cdot}5$, $P < 0{\cdot}001$). In model 2, anxiety ($\beta = -0{\cdot}60$, $t = -7{\cdot}5$, $P < 0{\cdot}001$) and sex ($\beta = 0{\cdot}16$, $t = -2{\cdot}1$, $P = 0{\cdot}04$) accounted for 40% of better quality of life; however, the R^2 change is 0·03, indicating that sex explained only 3% of the variability.

Qualitative analysis

Qualitative analysis included a review of the oral and written comments of participants for recurring themes.

Both men and women identified physical and mental health, as well as being happy, as important components of quality of life. Men appeared more concerned about financial issues and having an enjoyable environment than did women, who paid more attention to their body and stated that experiencing no pain and having energy were very important to their recovery period.

Both men and women were concerned about physical recovery after surgery. Men were more likely to focus on the uncertainty following the procedure and wanting to be more in control, while women were more concerned about co-morbidities and the associated physical discomforts that contributed to their negative emotional responses. Role stress was discussed by female participants in the interviews,

Table 4 Gender differences in subscales of coping, anxiety and quality of life

	Men		Women			
Variable	Mean	SD	Mean	SD	*t*	*P* value
Coping						
Problem-focused	29·0	8·5	29·2	10·5	−0·07	0·94
Problem-focused	21·4	5·9	24·1	8·4	0·65	0·52
Seek help	7·7	3·4	8·7	4·4	−1·24	0·22
Emotion-focused	24·4	8·6	24·1	8·4	0·20	0·84
Wishful	11·6	3·8	10·5	3·9	1·38	0·17
Self-Blame	3·1	1·3	3·3	1·7	−2·10*	0·04*
Avoidance	9·7	3·8	10·3	4·7	−0·70	0·48
Anxiety						
State	44·3	8·8	45·6	8·4	−0·69	0·49
Trait	41·2	12·4	43·6	4·4	−0·88	0·38
Quality of life						
PCS	45·5	9·1	40·1	9·7	2·87*	0·005*
Physical function	42·2	10·1	37·9	11·6	3·36*	< 0·001*
Role limited by physical problems	40·5	13·5	37·0	13·1	1·33	0·19
Bodily pain	49·6	9·3	46·1	9·7	1·86	0·07
General health	43·6	10·8	40·4	11·9	1·40	0·16
MCS	45·1	11·5	43·6	10·0	0·73	0·47
Vitality	49·6	9·2	45·2	11·0	2·16*	0·03*
Social function	45·0	10·6	41·8	13·9	1·58	0·12
Role limited by emotional problems	42·6	13·1	41·4	13·9	0·45	0·65
Mental health	45·1	11·7	41·3	11·0	1·46	0·15

PCS, physical component summary of quality of life; MCS, mental component summary of quality of life.
*$P < 0·05$. Multivariate analysis of variance.

Table 5 Correlations between ways of coping, anxiety and quality of life

Variable	PCS	*P* value	MCS	*P* value	Problem	*P* value	Emotion	*P* value	Anxiety
PCS	1·00								
MCS	0·28**	< 0·006**	1·00						
Problem	0·07	0·48	0·20**	0·002**	1·00				
Emotion	0·01	0·95	−0·17	0·1	0·30**	0·003**	1·00		
Anxiety	−0·29**	0·004**	−0·70**	< 0·001**	−0·33**	0·001**	0·18	0·08	1·00

PCS, physical component summary of quality of life; MCS, mental component summary of quality of life.
*$P < 0·05$; **$P < 0·01$. Two-tailed Pearson's coefficients.

Table 6 Hierarchical regression for quality of life

Variable	Beta	*t*	R^2	R^2 change	*P* value
Model 1					
Anxiety	−0·61	−7·5**	0·37	0·37	< 0·001**
Model 2					
Anxiety	−0·60	−7·3**	0·40	0·03	< 0·001**
Sex	−0·16	−2·1*			0·04*

*$P < 0·05$; **$P < 0·01$. Multiple regression analyses.

although they denied such stressors on the role stress questionnaire. This appears to be accounted for by the fact that 'taking care of one's spouse' was not a question on this instrument and possibly should be included in future studies.

Both male and female participants coped with their stress by having a sense of trust (in their doctor and themselves), maintaining an optimistic attitude, or through such activities as making plans or obtaining information. Men tended to make schedules to feel more in control and decrease their uncertainty, or they coped by avoiding or ignoring the problem, while women ignored the stress or found distracters to cope.

Despite the small interview sample, our qualitative findings appeared to offer support for the quantitative findings that, despite their physical concerns, men still adapted better,

utilized more problem-focused coping and experienced less anxiety. Women were concerned about co-morbidities and physical discomforts that affected their outlook, recovery and quality of life.

Discussion

The majority of men and women in this study had little or no family care or work responsibilities as they were older and their children or other family members took care of them. Chinese culture is guided by the Confucian philosophy which embraces the concept of 'filial piety'. Filial piety is the children's obligation to care for their elderly family members. Family members have a strong cohesiveness and are bound to take care of each other, especially when a family member is ill (Lee, unpublished data).

The results show that male Taiwanese post-CABG patients had a better quality of life. Several other studies have also reported that male cardiac patients achieve a better quality of life than do female cardiac patients (Keresztes *et al.* 2003, Lukkarinen & Hentinen 1998, Lu L.Y., unpublished data, Chang-Gang University, Taiwan). This difference can be explained by the increased number of co-morbidities that women had before surgery and possibly by the fact that women were more likely to admit to their health problems, and thus ranked their health-related score lower when completing the questionnaire. These findings are in keeping with the literature (Artinian & Duggan 1995, American Heart Association. 1999) that female CABG patients are older, sicker and experience more physical symptoms than men. Lastly, because of their concurrent health problems, women were less physically active than men, which can lead to anxiety and lower quality of life.

We found that post-CABG patients who took more role responsibility had a better quality of life. Those who assumed more role responsibilities in their daily life may be viewed as more valuable to their family. Based on Bandura's (1997) self-efficacy theory, people make judgments about their capacity to engage in certain courses of action and behaviours or to produce desired effects or consequences. These judgments provide the bridge between knowledge and behaviour. If individuals believe that they have to overcome stress to perform their role function, this belief might help them engage in health-promoting behaviour and improve their quality of life after surgery. However, other research has not supported the finding that more role responsibility leads to better quality of life.

Interestingly, the women in this study who took statistically more gender-role responsibilities than the men had a lower quality of life than the men. Previous studies have also found that women who have more role functions or had more pressure to return to their social and household role functions had poorer physical outcomes post-CABG as compared to men (Artinian & Duggan 1995, Hawthorne 1994). This raises the question as to what role responsibilities women require in order to identify their self-value and feel needed. Further investigation concerning gender role-function effects on quality of life is needed.

Problem-focused, rather than emotion-focused coping, was used by both male and female patients. Similar results have been reported in previous research with Chinese chronic heart failure patients (Lee, unpublished data), Taiwanese heart surgery patients (Hwang *et al.* 1997) and Taiwanese cardiac transplant surgery patients (Chen & Ku 1997). Redeker (1992) showed that men tend to use more problem-focused coping than do women. In our study, however, we found that there is no difference in coping behaviour, except that women self-blame more than men. In Chinese culture, women are usually the ones who take care of the family and worry about other family members. Thus, women could tend to feel guilty and blame themselves when they are not able to fulfill their role or cause others to worry about them.

In this study, the rank order of the five coping subscales for both sexes was as follows: problem-focused thinking, wishful thinking, avoidance, seeking help and blaming self. However, previous research (Chen & Ku 1997, Hwang *et al.* 1997, Lee, unpublished data) has identified seeking help as the most frequently used strategy, while in this study this strategy was ranked fourth out of five. This may be partially explained by the fact that patients in our study, as reflected in the semi-structured interviews, had either family help or were satisfied with hospital services; therefore, they spent the time focusing on problem-solving instead of seeking help.

Our results indicated that problem-focused coping was negatively related to anxiety in Taiwanese post-CABG patients; patients who used more problem-focused strategies paid more attention to attending to their physical problems than to their emotional responses. This finding was different from that of Sheu (2000), who showed that anxiety level was not associated with problem-focused coping, but emotional-focused coping, in cardiac patients.

Our findings also suggest that problem-focused thinking behaviour is positively related to the mental health dimension of quality of life. When patients focused on dealing with the problem itself, this was considered a positive emotional reaction. This finding supports Karlsson *et al.* (2000) research which showed that a higher capacity for coping was positively associated with quality of life in post-CABG patients.

Our results indicated that anxiety level was negatively correlated with quality of life. This result was similar to the

What is already known about this topic

- Adaptation process theory has been used across several ethnic studies exploring patients' recovery from physical stressors and as a framework in other Chinese research studies.
- Coping and anxiety are important factors affecting quality of life.
- Men achieve better quality of life and physical outcomes following cardiac surgery than women.

What this paper adds

- Anxiety was a good predictor for assessing quality of life following coronary artery bypass.
- Problem-focused coping can promote better quality of life and therefore interventions to promote this coping are important.
- Role function expectations could serve as a motivator to promote better adaptation outcomes as patients who undergo coronary artery bypass grafting and have more role responsibility may be more likely to achieve better quality of life.

findings of Delunas and Potempa (1999), who showed that lower anxiety was related to better quality of life in cardiac patients. Anxiety is an emotional response that may contribute to poor physical and psychological health. Given the overall higher trait anxiety scores for this population, the lack of effect on their physical and mental health appears to be related to the way they cope.

Limitations

Only 100 participants were recruited from one medical centre in an urban area, using a convenience sampling technique. Although the findings are important and raise relevant questions, they thus cannot be generalized across Taiwan or beyond. Another limitation is that the Cronbach's alphas of the emotion-focused coping subscale of the C-RWCC = 0·67, is lower than an acceptable reliability value. Previous research has found that a greater incidence of co-morbidity was associated with poorer quality of life among cardiac patients (Friedman 2003). Patients with a history of more than one episode of cardiac surgery were not excluded and this might have affected the results. Therefore, co-morbidities and number and type of previous cardiac surgery should be included in the demographic data. Age was not associated with adaptation outcomes in this study; however, age should be one of the inclusion criteria to increase the homogeneity of the sample. In addition, we employed a cross-sectional research approach, which did not assess the adaptation process over time; nor was an intervention studied and, therefore, no casual inferences can be made.

Recommendations

Replication of this study using larger samples and involving a variety of rural and urban hospitals representing different areas of Taiwan should be used. Future research should consider the use of a longitudinal design to gather data at different points in time to achieve a better understanding of how patients adapt over time. We also recommend using integrated research methods for future study, to assess the validity of the Chinese version of the instruments and uncover the answers left unasked via quantitative instruments – those related to why and how. This is especially important when studying people in areas that are culturally different from the area in which the instrument(s) originated. Additionally, future research needs to examine the gender-specific effectiveness of nursing interventions aimed at enhancing quality of life, promoting greater use of problem-focused coping behaviour and reducing anxiety.

Conclusion

Our results contribute to an increase in awareness of coping and anxiety as important indicators of successful adaptation. Problem-focused coping decreased patients' sense of anxiety and was positively related to better quality of life. Problem-focused interventions vary with men and women. Men may benefit from interventions that teach them about their health problem(s), medical procedures, postoperative schedules or rehabilitation, so as to diminish feelings of uncertainty. Women could benefit from information that can help them articulate symptomatology and health status better, so physicians can recognize impending cardiac dysfunction earlier, as well as interventions that can help them function better in relation too any co-morbidities they may have. In addition, role functions and social valuing of role expectations has been identified as a motivator in the development of a good quality of life and can increase self-worth. However, social valuing of role functions is different for men and women. Nurses can address the importance of valuing the role functions of each patient in ways that help families and patients respect who they are and what they do.

The findings cut across ethnic cultures and have the potential to raise nurses' awareness of gender differences affecting physical outcomes and quality of life for patients

undergoing CABG surgery. Such information could be valuable for designing gender-appropriate nursing interventions.

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Author contributions

TH and AH were responsible for the study conception and design and the drafting of the manuscript. TH performed the data collection and data analysis. TH obtained funding and provided administrative support. TH and AH made critical revisions to the paper. TH and AH provided statistical expertise. AH supervised the study.

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