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ORIGINAL ARTICLE

Cancer-coping profile predicts long-term psychological functions and quality of life in cancer survivors

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Abstract

Purpose Cancer survivors experience significant psychosocial distress even after completion of cancer treatment. The association between cancer coping and cancer recovery is not well established. The present study investigated the cancer-coping profile and cancer outcomes in breast cancer survivors.

Methods A three-wave longitudinal study was conducted. In 2009 (wave 1), 248 breast cancer survivors completed a package of psychological inventories to evaluate cancer copying style, psychological distress, anxiety and depression, and quality of life. They received follow-up survey in 2012 (wave 2) and 2016 (wave 3). A latent profile analysis (LPA) was conducted among participants in wave 1 to identify cancer-coping class. Identified cancer-coping class was used to predict psychological and survival outcomes in waves 2 and 3.

Results Two cancer-coping classes were identified through LPA, namely adaptive cancer coping (class I; 52%) and maladaptive cancer coping (class II; 47.8%). Demographic and clinical factors did not differ significantly between the two classes. Subsequent analyses demonstrated that the cancer-coping style in wave 1 predicted the psychological symptoms and quality of life outcomes at the two follow-ups (waves 2 and 3). Survivors in the adaptive group (class I) exhibited lower cancer distress, anxiety and depression scores, and higher quality of life scores than those in the maladaptive group did. Cancer coping were not found to be significantly associated with cancer survival or recurrence.

Conclusions The identified cancer-coping styles were predictive of the survivors' psychological symptoms, psychological well-being, and health-related quality of life but not cancer survival or recurrence.

Keywords Cancer · Survivor · Coping · Trajectory · Psychosocial

Introduction

A systemic review on psychological distress of cancer survivors reported that the prevalence of anxiety was 6–23% and that of depression was 0–58%; thus, anxiety and depression are approximately twice as prevalent in cancer survivors as in the general population [1]. Psychological stressors after the completion of cancer treatments are fear of recurrence, the future, and death [2]. A significant proportion of survivors have been reported to display anxiety and depression as well as experience restriction and impairment in daily functioning after the completion of treatment [3–5] for up to 10 years [6]. Other studies, however, have revealed that the prevalence of depression decreased approximately to 25% in the third year and to 15% in the fifth year after diagnosis in disease-free survivors [7, 8]. Alternatively, psychological distress in cancer survivors may increase, decrease, or remain stable. A constant

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objective in oncology is to find methods for identifying subgroups of patients and survivors that are more likely than other groups to experience psychological symptoms and underlying conditions that contribute to the risk of psychological morbidity. Previous studies have identified a few socio-demographic characteristics, including young age, being unmarried, low education level, and low socio-economic status [9, 10], as risk factors. Psychosocial factors such as perceived stress, knowledge and utilization of support, and attachment styles have also been identified [11–13]. Among the predictors, coping has received increasing attention that affects psychological well-being among cancer survivors [14].

The term "coping" is widely used in psycho-oncology literature. According to the transactional model of stress [15], coping refers to "ongoing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 237). In clinical oncology, Greer and Watson [16] proposed the following five cancer-coping styles: helplessness/hopelessness, anxious preoccupation, fighting spirit, denial/avoidance, and fatalism. It has generally been established that fighting spirit (a positive attitude according to which cancer diagnosis is considered a challenge) is associated with low levels of anxiety and depression. By contrast, helplessness/hopelessness (an attitude in which the focus is on final loss of life, and cancer is regarded as defeat) and anxious preoccupation (an attitude in which patients spend most of their time worrying about the recurrence of cancer and are hypersensitive toward any signs or symptoms) are positively associated with depression and anxiety [17].

On the other hand, both denial/avoidance (an attitude in which the threat and consequences of cancer are believed to be minimal) and fatalism (a passive acceptance attitude toward the diagnosis) tended to be either uncorrelated or exhibited low positive correlation with anxiety and depression symptoms [18, 19]. In summary, evidence shows that fighting spirit is an adaptive coping style whereas both anxious preoccupation and helplessness/hopelessness are maladaptive coping styles. Expecting that survivors with a coping profile characterized by high fighting spirit, low anxious preoccupation, and low helplessness/hopelessness should experience the least anxiety and depression is logical. Whether denial/avoidance and fatalism among cancer survivors should be categorized as adaptive or maladaptive remains unclear.

The present study was conducted to examine the aforementioned issues. It aimed to develop cancer-coping profiles of breast cancer survivors and to examine the predictive power of the profiles for psychological outcomes, health-related quality of life, and cancer survival during a 7-year follow-up period. Breast cancer survivors with adaptive coping styles were hypothesized to exhibit lower psychological distress, higher quality of life, and higher cancer survival rates than survivors with maladaptive coping styles.

Materials and methods

Sampling procedures

Consecutive patients who received diagnoses of stage 0 to II breast cancer between 2006 and 2009 in the Koo Foundation Sun Yat-Sen Cancer Center (KF-SYSCC) in Taiwan were recruited. Patients who had completed a post-diagnosis period of 3 months to 2 years and 3 months at the time of the survey in August 2009; were aged between 20 and 80 years; had received education for at least 6 years; and did not have any history of mental retardation, dementia, severe mental disorder, or organic brain disorder were included in the study.

In 2009 (wave 1, on average 1.5 years after cancer diagnosis), 470 eligible patients were identified and were sent questionnaires through mail; of these, 248 patients (52.8%) returned the questionnaires. In 2012 (on average 4.5 years after cancer diagnosis), the wave 2 questionnaires were sent to the 248 patients who had returned the questionnaires in 2009. Among them, 127 (51.2%) patients returned the questionnaires. In 2016 (on average 8.5 year after cancer diagnosis), the wave 3 questionnaires along with a USD 3 coupon were sent out to the same 248 patients as an incentive to increase their response rate. One hundred fifity-eight of 248 patients (63.7%) returned the questionnaire. In summary, among the 470 eligible patients identified in 2009, 96 patients (20.4%) completed all three waves of questionnaires (Fig. 1, CONSORT flowchart).

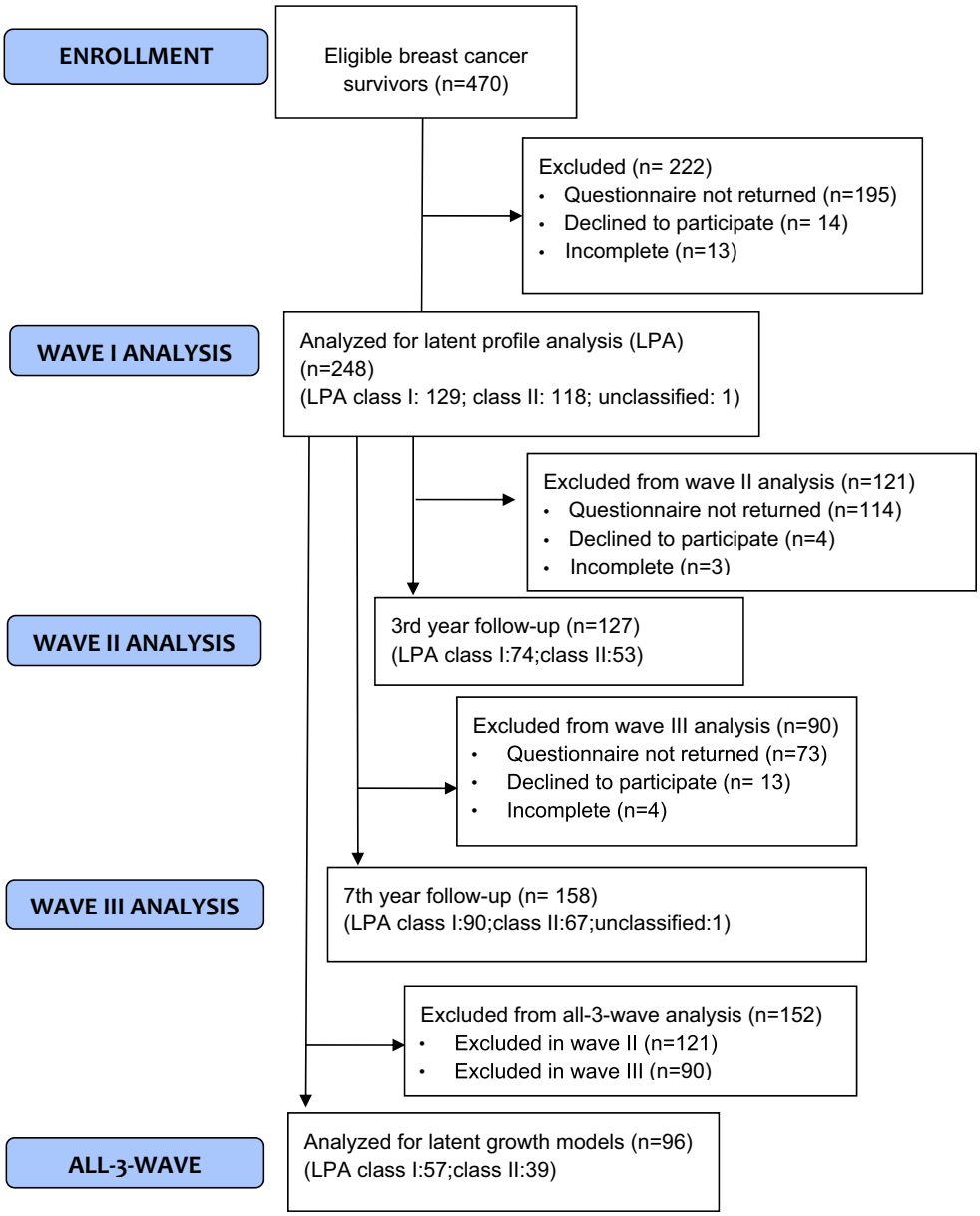
Measures

Demographic and clinical factors such as age, sex, marriage, educational level, and clinical stage were collected from the hospital registry database. Recurrence and survival data were retrieved from the national death registry for events between 2009 and 2013 and were supplemented by the hospital death registry for events from 2009 to 2017. The length of survival was calculated from the date of cancer diagnosis.

The *Mental Adjustment to Cancer* (*MAC*) Scale was developed as a 40-item self-rating scale to measure adjustment to cancer for various types and stages of cancer [20]. The scale was shortened to 29 items as the Mini-MAC, which was found to have a five-factor structure, including Helpless-Hopeless, Anxious Preoccupation, Fighting Spirit, Cognitive Avoidance, and Fatalism [19]. Ho [18] translated the questionnaire into Chinese and found a three-factor structure (Negative Emotion, Positive Attitude, and Cognitive Avoidance) using cancer survivors from Hong Kong. The original five-factor structure was found more applicable for cancer survivors in Taiwan [21]. We therefore used the score of the five factors for the latent profile analysis.

The *Distress Thermometer* (*DT*) is a single-item self-report measure presented as a 10-point scale in a thermometer format

Fig. 1 CONSORT flow diagram



Note: LPA Class I = 129; and Class II = 118

ranging from (0) "No Distress" to (10) "Extreme Distress" [22]. The patients were asked "How distressed were you during the past week?" In response, each patient identified one single score to express stress levels. DT is recommended by National Comprehensive Cancer Network as an efficient instrument for evaluating the psychological distress of patients with cancer. DT has been validated by Wang, et al. [23] for evaluating the psychological distress of patients with cancer in the Taiwanese population and is widely adopted for evaluating the stress levels of in- and out-patients at KF-SYSCC. The optimal cutoff point for referral is 3/4 in Taiwan population. Holland [24] suggested that DT can be modified and used with cancer survivors.

The *Hospital Anxiety and Depression Scale* (*HADS*) is a 14-item measure of anxiety and depression developed by Zigmond and Snaith [25]. The score for the entire scale ranges from 0 to 42, with maximum of 21 points for each subscale. HADS has been widely used for physically ill patients. Leung et al. translated HADS into Chinese and validated the Chinese version [26]. In Taiwan, the optimal cut off points for caseness in the screening of anxiety and depression are 8/9 and 7/8, respectively [23].

The *36-Item Short Form Survey* (*SF-36*) is a multipurpose health survey for the assessment of quality of life. It consists of eight scales that contribute to a physical and mental component summary [27]. The Taiwanese edition of SF-36 was

developed using the data of 18,142 patients through the 2001 Health Interview Survey [28]. The internal reliability was acceptable for all the scales ($\alpha > 0.7$), except for Social Functioning subscale. A comparison between results from the USA and Taiwan revealed that the age and sex distribution patterns were similar in both the populations [28].

Statistical methods

A latent profile analysis (LPA) was conducted using MPlus version 7.4 for identifying the mental adjustment styles of the 248 patients who had returned the questionnaires to us in 2009 (wave 1). LPA is an extension of latent class analysis [29], in which categorical latent classes were identified according to the patterns of responses on observed variables.

Class models (with one to five classes) were constructed, and the model fit was examined. We aimed to use a model with the lowest Akaike information criterion, lowest Bayesian information criterion, and highest entropy. If the models exhibited close values of these indices, we selected the model with relatively few classes according to the law of parsimony. The bootstrap likelihood ratio test and Vuong-Lo-Mendell-Rubin likelihood ratio tests were also used to compare between models with n and $n-1$ classes.

The association of latent profile class and demographic and clinical variables were examined using independent sample t tests for continuous variables and chi-squared tests for categorical variables. Psychological and functional outcomes measured at wave 2 and wave 3 follow-ups were compared between the two classes of patients derived from the LPA. Survival analysis was conducted through Kaplan–Meier survival analysis.

The research ethical committee in the Koo Foundation Sun Yat-Sen Cancer Center approved the study (KFSYSCC-IRB No: 20160805A). All participants had provided written informed consent.

Results

Demographic and clinical factors

The mean age of the recruited 248 patients (Table 1) in wave 1 was 49.2 years (min 27 years, max 72 years). Two hundred three (81.85% of the 248 patients) were married, and 134 (54.0%) of them had received education up to or above the college level. The distribution of patients according to breast cancer stage was stage 0 ($n = 6$, 2.42%), stage I ($n = 122$; 49.19%), and stage II ($n = 120$, 48.39%). The average time between the wave 1 survey and the completion of cancer treatment was 12.4 months (SD = 6.4 months) and between the wave 1 survey and the date of cancer diagnosis was 18.1 months (SD = 6.6 months). All patients received surgery.

Comparing the demographic data of the 248 patients who had returned the wave 1 survey with those who had not returned them, patients who had returned the questionnaires were significantly younger and had received higher levels of education than those who had not returned the questionnaires. Other variables did not differ significantly between the two groups.

Reliability of psychological measures

The values of Cronbach's alpha (for internal consistency) of the psychological scales used during the three waves are listed in the Table 2. Fighting spirit and fatalism have relatively low (between 0.5 and 0.7) internal reliability; however, other domains have Cronbach's alpha values near or higher than 0.7.

Latent profile analysis

LPA was conducted for models consisting of one to five classes. The summary of the model fit study is presented in Table 3. Information criterion values in the class models were close. Vuong-Lo-Mendell-Rubin likelihood ratio tests revealed a significant difference only between the two-class and one-class models. A two-class model was therefore chosen as the final model.

In our two-class model, 129 (52.2%) patients were classified in class I and 118 (47.8%) patients were classified in class II. Figure 2 depicts the mean Mini-Mental Adjustment to Cancer (Mini-MAC) subscale scores of the adaptive group (blue line) and the maladaptive group (red line). The former (class I) displayed low hopelessness/helplessness scores, low anxious avoidance scores, high fighting spirit scores, low cognitive avoidance scores, and high fatalism scores. This class was named the "adaptive mental adjustment to cancer" group in the present study (adaptive group). By contrast, the maladaptive group had high hopelessness/helplessness scores, high anxious avoidance scores, low fighting spirit scores, high cognitive avoidance scores, and low fatalism scores. This class was termed the "maladaptive mental adjustment to cancer" group (maladaptive group) in the current study.

Chi-squared analyses showed no significant difference in demographic factors (education level and marriage) and clinical factors (stage, percentage of patients with stage II breast cancer, receiving chemotherapy, and receiving radiotherapy) between the class I and class II patients identified through the LPA. Independent sample t tests showed no significant differences in terms of age (class I: mean age = 48.9 years, SD = 9.3 years; class II: mean age = 49.3 years, SD = 9.4 years; $t(1) = -0.386$, $p = 0.700$) and duration after completion of active treatment (class I: mean = 12.4 months, SD = 5.5 months; class II: mean = 11.3 months, SD = 4.8 months, $t(1) = 1.567$, $p = 0.118$).

Table 1 Demographic and clinical factors of the sampled population

Demographic and clinical factors	Recruited ($n = 248$) (mean ± SD)	Questionnaire not returned ($n = 222$) (mean ± SD)	t value
Age (year)	49.2 ± 9.4	51.8 ± 10.2	2.94*
Months after completion of treatment	12.4 ± 6.4	13.5 ± 6.24	1.89
Months after diagnosis	18.1 ± 6.6	19.1 ± 6.7	1.60
	n (%)	n (%)	χ^2 value
Marriage			
Married	203 (52.6%)	183 (47.4%)	0.03
Not married	45 (53.6%)	39 (46.4%)	
Education			
College education or more	134 (67.5%)	70 (34.3%)	24.14*
High school or less	114 (42.9%)	152 (57.1%)	
Stage of breast cancer			
0	6 (66.7%)	3 (33.3%)	1.11
I	122 (54.0%)	104 (46.0%)	
II	120 (51.1%)	115 (48.9%)	
Received chemotherapy			
Yes	179 (53.8%)	154 (46.2%)	0.45
No	69 (50.4%)	68 (49.6%)	
Received radiotherapy			
Yes	152 (54.9%)	125 (45.1%)	1.20
No	96 (49.7%)	97 (50.3%)	

*$p < 0.01$

Prediction of psychological, functional, and survival outcomes using the cancer-coping profile

The mental adjustment style in wave 1 predicted the psychological symptoms and quality of life outcomes at the follow-ups (Table 4). Class II patients (maladaptive group) developed higher level of cancer distress, anxiety, and depression than the class I patients (adaptive group) did. They also exhibited lower quality of life scores than the class I patients, both in the physical and mental domains. The predictive power was still significant during wave 3 of the survey for psychological symptoms and quality of life, which was 7 years after wave 1 of the survey.

Using the cutoff points of DT (3/4), HADS-anxiety (8/9), and HADS-depression (7/8) as criteria for referral to the psychological support team, both the adaptive group or the maladaptive group had average scores below the cutoff points. Nevertheless, a substantial proportion of patients scored higher than the cutoff points of clinical significance. For example, at wave 2, approximately one third of the patients in

Table 2 Reliability of the psychological inventories

Reliability (Cronbach's alpha)	Wave 1	Wave 2	Wave 3
Mini-Mental Adjustment to Cancer Scale			
• Helpless–hopelessness (8 items)	0.877	0.856	0.841
• Anxious Preoccupation (8 items)	0.877	0.841	0.862
• Fighting Spirit (4 items)	0.608	0.535	0.584
• Cognitive Avoidance (4 items)	0.685	0.687	0.733
• Fatalism (5 items)	0.572	0.569	0.527
36-Item Short Form Survey			
• Physical Component Scale (35 items)	N/A	0.885	0.901
• Mental Component Scale (35 items)	N/A	0.894	0.883
Hospital Anxiety and Depression Scale			
• Anxiety (7 items)	0.879	0.867	0.874
• Depression (7 items)	0.759	0.759	0.696

N/A 36-Item Short Form Survey was not administered at wave 1

Table 3 Summary of model fit for latent profile analysis on the domains of Mini-Mental Adjustment for Cancer Scale (Mini-MAC)

Measure	1-Class	2-Class	3-Class	4-Class	5-Class
Log-likelihood	− 2988.405	− 2906.446	− 2862.837	− 2831.091	− 2809.743
AIC	5996.81	5844.89	5769.67	5718.18	5687.49
BIC	6031.90	5901.04	5846.88	5816.44	5806.80
SSA-BIC	6000.20	5850.32	5777.14	5727.69	5699.03
Entropy	N/A	0.733	0.819	0.862	0.807
LMR test	N/A	− 2988.41	− 2906.45	− 2862.837	− 2831.091
LMR *p* value	N/A	0.0062	0.0941	0.1571	0.3337
BLRT test	N/A	− 2988.41	− 2906.45	− 2862.837	− 2831.091
BLRT *p* value	NA	0.0000	0.0000	0.0000	0.0000

AIC Akaike information criterion, *BIC* Bayesian information criterion, *SSA-BIC* sample-size adjusted BIC, *LMR* Vuong-Lo-Mendell-Rubin likelihood ratio test, *BLRT* bootstrap likelihood ratio test

the maladaptive group scored above the cutoff points in DT. Using the cutoff points of HADS-anxiety or HADS-depression yielded similar results.

In terms of survival outcomes, six and five registered all-cause deaths were recorded in the class I and class II patients, respectively. Kaplan–Meier survival analysis [30] did not reveal significant differences between the two groups of patients ($p = 0.893$). Five patients with cancer recurrence were reported in the adaptive group, whereas ten patients were reported in the maladaptive group. Recurrence-free survival also did not differ significantly ($p = 0.474$) between the two groups.

Discussion

The present study is an attempt to relate different profiles of cancer-coping styles to mental health outcomes in longitudinal data. Each patient was assigned to one mutually exclusive class (or profile) based on the scores on the five coping styles measured using the Mini-MAC subscale. Using LPA, we were able to classify the cancer patients into either an "adaptive mental adjustment to cancer" group or a "maladaptive mental adjustment to cancer" group. The cancer-coping profile related low hopelessness/helplessness scores to low anxious avoidance scores, high fighting spirit scores, low cognitive avoidance scores, and high fatalism scores. Our result is consistent with previous findings in the factor analysis of mental adjustment scale for cancer [18, 19]. Almost half (47.8%) of the breast cancer survivors exhibited a maladaptive coping profile, suggesting that many survivors may need psychological support to develop healthy coping styles in the early stages of cancer diagnosis [1, 17].

Demographic and clinical variables in the LPA did not differ significantly between the class I and class II patients. Therefore, these factors are not potential confounders in the association between latent class and measures of psychological outcomes or quality of life. In other words, the cancer-coping profile independently predicted the long-term

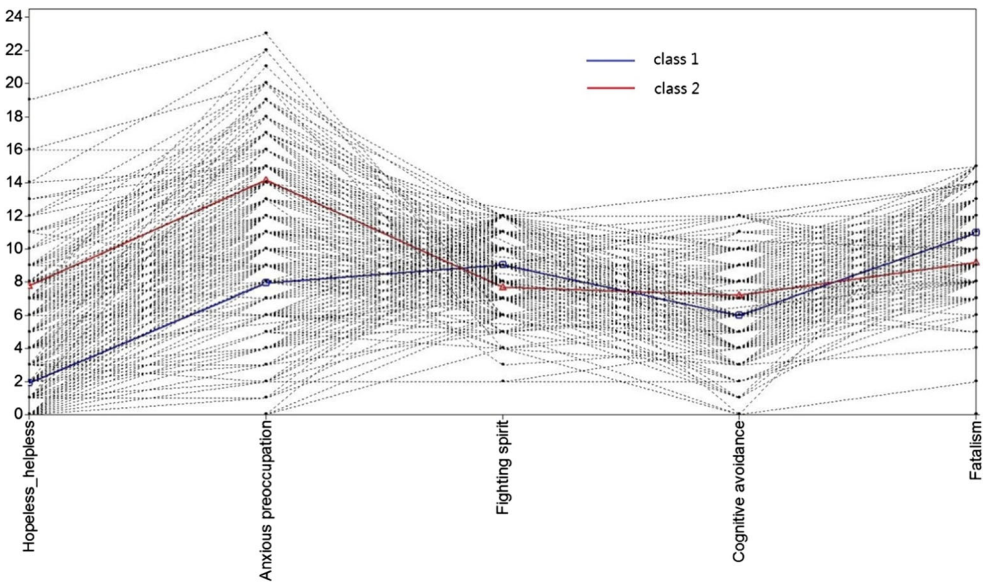


Fig. 2 A two-class latent profile analysis model using the five domains in the Mini-Mental Adjustment to Cancer Scale in wave 1, showing individual values and class means. One hundred twenty-nine (52.2%) patients were classified as class I, 118 (47.8%) patients were classified as class II

Table 4 Difference in psychological functioning and quality of life measures at years 3 and 7 between the two classes of patients regarding cancer coping

	Year 3			Year 7		
	Class I	Class II	*p* value	Class I	Class II	*p* value
DT	1.79 ± 1.88	3.33 ± 2.55	< 0.001	1.57 ± 2.28	2.50 ± 2.72	0.025
HADS						
Anxiety	3.88 ± 3.30	6.83 ± 4.04	< 0.001	4.10 ± 3.18	6.37 ± 4.28	< 0.001
Depression	2.82 ± 2.63	5.40 ± 3.83	< 0.001	3.25 ± 2.83	4.94 ± 3.44	0.001
SF-36						
PSC	55.23 ± 5.77	52.21 ± 8.35	0.022	55.40 ± 6.97	52.33 ± 6.91	0.011
MSC	50.47 ± 7.43	43.61 ± 10.51	< 0.001	50.57 ± 8.03	47.22 ± 9.24	0.024

DT distress thermometer, *HADS* Hospital Anxiety and Depression Scale, *SF-36* 36-Item Short Form Survey, *PSC*, physical component summary, *MSC* mental component summary

psychological outcomes and quality of life. The result suggests that individual differences are present among survivors and these differences may not be attributed to fixed factors such as sex and socio-economic status. Clearly, survivors who adopt positive coping styles and adjustment secondary to cancer treatment tend to exhibit a high level of psychological well-being.

Clinical implications

An adaptive cancer-coping profile is predictive of lower cancer distress, anxiety, depression, and a higher quality of life even after 7 years of follow-up [31, 32]. The finding is consistent with a previous 12-month follow-up study, which showed that patients who had adaptive psychological responses to cancer has better psychological well-being and higher health-related quality of life [33]. These results contribute to the theoretical understanding of the complex relationship between distress and coping so that appropriate referrals for mental health evaluation and treatment can be prescribed (i.e., adaptive cognitive behavioral therapy coping strategies) [34]. Our results also revealed that clinicians should consider the entire coping profile instead of focusing on individual coping styles. Clinical intervention should also aim to change the coping profile of a survivor rather than increasing or decreasing individual coping styles. Several intervention programs were found to be effective at enhancing coping mechanisms in survivors [35, 36]. We also urge the inclusion of quality of life measures in the intervention programs as outcome measures.

Larger differences seem to exist in HADS-anxiety and HADS-depression than in DT score between the two groups with maladaptive and adaptive coping profiles. This is mainly because the HADS scale has a larger score range than does DT. The percentages of patients that require intervention based on the cutoff points suggested in relevant studies were similar using the HADS and DT scales. The size of the differences between the adaptive group and maladaptive group was approximately 1 to 1.5 points in DT, 2 to 3 points in HADS-anxiety, 1.5 to 2.5 points in HADS-depression, and 3 to 7 points in SF-36 quality of life measures. These were all clinically significant differences.

Survival did not differ significantly between the patients in class I and those in class II. This result is likely due to the small number of total deaths in the sampled population (i.e., 11 patients). This study lacks the power to examine the association between cancer-coping style and survival. Additional studies should be conducted for examining the relationship between cancer-coping style and survival.

Study limitations

This study has several limitations. The dropout rate of the sampled population during the wave 1 and 2 surveys was nearly 50%. Hence, a financial incentive was provided during the wave 3 survey, with an aim of increasing the response rate and was successful. Respondents who returned the questionnaires might not have been sufficiently representative of the general population. Table 1 shows that those who responded to the questionnaire were significantly younger and more educated than those who did not respond. The effect of this discrepancy on our study results is unknown. However, age and education were not associated with the coping profiles in our study (results shown), neither were they associated with outcome measures, including DT, HADS, and quality of life (results not shown). Therefore, they might not play a significant role in the association between coping profiles, psychological outcomes, and quality of life. The time points of the follow-up were originally supposed to be 3 years (wave 2) and 6 years (wave 3) after the wave 1 survey. However, for wave 3, the duration of 6 years was increased to 7 years because of a shortage of research manpower. The study results were also limited because the availability of only three surveys made observation of the time trend or trajectory of cancer recovery

over time difficult. In addition, patients were eligible for the study if they had completed their cancer treatment in the past 2 years before the study began. Thus, the time point of entry varied among the patients. The discrepancy of timing may be more significant during the wave 1 survey than in the wave 2 and 3 surveys. Only self-report questionnaires were administered in the present study. Although these instruments are well established and have been validated, the information collected is liable to exhibit potential report bias. We concluded that the coping profile at time 1 predicts anxiety and depression at times 2 and 3 based on the temporal sequence of association. However, we must be cautious about causal inferences in an observational study because more anxious or depressed people may adopt more passive, maladaptive coping strategies as well as hopeless or helpless attitudes. Additional studies should account for all of the aforementioned limitations to increase the reliability and validity of their results.

Conclusion

Developing an understanding of the psychological and social processes involved in long-term adjustment has many implications for cancer recovery [37] by which adaption can be enhanced and equilibrium can be restored in the lives of cancer survivors [38]. The pattern of mental adjustment to cancer can be used to predict psychological symptoms and the health-related quality of life among cancer survivors even over a long period. Hence, a potential effective guideline for identifying at-risk cancer survivors and deciding an appropriate course of psychological treatment can be created in the field of psycho-oncology.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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