TRAJECTORY OF RESILIENCE AND ITS PREDICTORS AMONG SPOUSAL CAREGIVERS OF PATIENTS WITH ADVANCED CANCER IN CHINA

SUN HAI YAN

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR DOCTOR DEGREE OF PHILOSOPHY
(INTERNATIONAL PROGRAM)
IN NURSING SCIENCE
FACULTY OF NURSING
BURAPHA UNIVERSITY
2023

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The Dissertation of Sun Hai Yan has been approved by the examining committee to be partial fulfillment of the requirements for the Doctor Degree of Philosophy (International Program) in Nursing Science of Burapha University

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Resilience plays a significant role in spousal caregivers’ mental health after caring for patients with advanced cancer. The purposes of this study were to investigate the trajectory of change in resilience over six months after advanced cancer patients' initial treatment and to examine the effect of the selected predictors including social support, spirituality, coping self-efficacy, mutuality, caregiver burden, patients' functional status, Chinese familism on resilience change over six months post-treatment period. A longitudinal study with three data collection waves was carried out. A multistage random sampling technique was used to recruit a sample of 312 spouses of patients with newly diagnosed advanced cancer from five Chinese regional hospitals. Research instruments included the Conner-Davidson Resilience Scale, Social Support Rating Scale, Coping Self-efficacy Scale, Spiritual Well-being Scale, Mutuality Scale, Zarit Burden Interview, Briefs in Chinese Familism Scale, and Activities of Daily Living Scale. Data were analyzed by using descriptive statistics and Latent Growth Modeling.

The average level of caregivers' resilience increased significantly across the first six months after patients’ post-initial treatment (slope mean = 1.982, $p < .001$) in the unconditional Latent Growth Curve Modeling (LGCM). In the conditional LGCM with time-invariant and time-variant covariates, the selected seven predictors were partially significantly related to in resilience scores change across times, especially in the third month post-treatment. The findings provide evidence that timing is an important consideration when evaluating the effects of psychosocial factors on resilience. Future research should continue to incorporate multiple assessments of factors at the time of early posttreatment to provide insight on carrying

out targeted interventions of promoting resilience among spousal caregivers involved in caring for their loved ones.

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CHAPTER 1

INTRODUCTION

Statements and significance of the problems

Cancer has been a leading and increasing cause of death for many years (Wei et al., 2020). The International Agency for Research on Cancer reported that cancer burden is rapidly increasing and becoming a major public health problem worldwide based on the Global Cancer Observatory. In China, about 4.1 million new cases of cancer and 2.4 million new deaths from cancer occurred in terms of the latest cancer statistics (Zheng et al., 2022). China had higher cancer mortality, which might be due to the lower early cancer detection rate and substandard treatment methods provided by different regions in China. Furthermore, urban China reported a higher cancer incidence and lower mortality than rural China owing to the imbalance of social and economic development (Cao et al., 2020).

Many newly diagnosed cancer patients could be locally advanced stage (stage III) or metastatic cancer (stage IV) which both refer to advanced cancer (American Cancer Society, 2020; National Cancer Institute, 2022). In China, a population-based cohort study found more than 63.5% of non-small cell lung cancer patients are diagnosed at Stage IIIb and IV (Fan et al., 2015). Furthermore, advanced colorectal cancer was identified in around 5.6% of all asymptomatic patients (Li & Ma, 2014), whereas the prevalence of newly diagnosed stage IV colorectal cancer was 14.4% in China (Shi et al., 2021), as well, the breast patients were diagnosed at an advanced stage (stage III or stage IV) totally accounting for 25.6% from 1993 to 2013 (Si et al., 2015). Because liver cancer often has no obvious clinical symptoms and signs at its early stages, nearly 80% of patients have progressed to the advanced stage when the diagnosis of hepatocellular carcinoma was made (Wu & Qin, 2013). Similarly, there were only 20% of gastric cancer diagnosed in its early stages, most of which were in advanced stage (National Health Commission of the People's Republic of China, 2019). Advanced cancer means unlikely to be cured or controlled with treatment which affects not only the patients but also their families (National Cancer Institute, 2019). As the patient transitions along the trajectory of cancer disease, each stage brings new challenges and stressors to family caregivers. These caregivers run at risk for developing mental disorders such as anxiety, depression, and distress (Li et al., 2016; Meyers et al., 2020).

To overcome these mental disorders and ensure the quality of care, caregivers should maintain their mental and physical stability, and this process is described as resilience (Hwang et al., 2018; Peng et al., 2023). According to the American Psychiatric Association (2020), resilience refers to both the process and the outcome of successfully adjusting effectively to difficult or challenging life experiences. Although resilience was considered a specific trait, or an individual ability (Davydov et al., 2010; Poe et al., 2023; Southwick et al., 2014), the consensus core components include the presence of adversity, the influence of protective factors, and a subsequently more positive outcome. Therefore, resilience in this study is a positive adaptation ability that caregivers had to endure and persist through cancer health events in this study. That is, resilience plays a crucial role in alleviating physical and psychological burdens in caregivers.

For cancer patients, their primary caregivers are their spouses (García-Torres, et al., 2020; Stenberg et al., 2010). Compared with other caregivers, spouses of cancer patients are more deeply involved in patient care, providing routine and cancer-related care as well as emotional, spiritual, and financial support (Huang et al., 2019), and they tended to show significantly more symptoms of psychiatric disorders than caregivers with a different relationship to the patient (Rumpold et al., 2016). Because smaller families are caused by low birth rates and high migration rates, spouses are now caring for more elderly people or patients. In China, about 60% of family caregivers of cancer patients are spouses (Li et al., 2016; Li et al., 2013).

Although wives typically take on the caregiver role, there has been a growing proportion of husband caregivers in recent years owing to the aging population, increased female employment rate, and transformation of family structures (Wang, 2018; Zhao et al., 2023). When cancer patients are faced with the fear of death, or feelings of uncertainty and hopelessness, their spouses also experience potential changes in their own emotional state such as experiencing caregiving strain and bereavement. Indeed, the trauma experienced by spouses of newly diagnosed patients with advanced cancer is particularly severe given to the life-threatening nature and high mortality rate of advanced cancer. Despite these risks, however, most spouses of advanced cancer patients seem to adapt well throughout the caregiving period. Thus, this study paid close attention to the resilience of spousal caregivers of patients with advanced cancer.

Being diagnosed with advanced cancer can be also regarded as a potentially traumatic event for both the patients and their families, because advanced cancer is unlikely to be cured or controlled with treatment (Opsomer et al., 2020). Interestingly, caregivers have been shown to have higher prevalence rates in psychiatric disorders than advanced cancer patients, such as panic disorder (8.0% and 4.2%, respectively) or post-traumatic stress disorder (PTSD) (4.0% and 2.4%, respectively) (Miovic & Block, 2007). Particularly during the first six months of patients undergoing anti-cancer therapies, the nature of caregivers' psychological adjustment has been shown to change substantially as the patients' condition evolves (García-Torres, et al., 2020; Lee et al., 2018; Northouse et al., 2012). For example, caregivers' distress was highest when providing care for newly-diagnosed advanced lung cancer patients and declined over time within 6 months (Lee et al., 2018). A longitudinal study assessing caregivers of patients with head and neck cancer over a six-month period discovered that both depression and anxiety rates in caregivers decreased from 14.7% at the time of diagnosis to 14.6% in the first three months after the initial treatment, and to even lower at 12.9% at the sixth post-treatment month (Lee et al., 2017). Moreover, longitudinal trajectories of caregiver distress showed the levels of distress began stable after 6 months until 12 months of follow-up (Murphy et al., 2020). For instance, care partners' mental health declined at the lowest point at 6 months in a 12-month follow-up study (Lyons & Lee, 2020). Therefore, the time frame to capture trajectory of spousal caregivers' resilience in this study was the first six months post-initial treatment.

Previous studies have shown that caregivers who had a resilient trajectory display more positive emotions and report a greater quality of life (QoL). So, resilience is an important indicator of mental health in cancer caregiving and a predictor of mental health after bereavement (Opsomer et al., 2020; Opsomer et al., 2022). The prevalence of caregivers' resilience varied between 18.0% and 94.0% (Bonanno et al., 2002; Fisher, 2020; Gaugler et al., 2007; Joling et al., 2016). Not surprisingly, the prevalence rate for resilience in caregivers varied considerably, because it is difficult to estimate the rates of resilience given widespread differences across studies. As a positive psychological resource, resilience has a positive effect on adaptation and reduces risk factors for caregivers related to emotional distress, burden, fatigue and stress, and benefits patient care (Palacio et al., 2018). With the development of medical treatments, the progression-free survival of patients with advanced cancer has improved, but the life-threatening nature of cancer and its complex symptoms and prolonged treatments have adverse effects on the emotional wellbeing of patients and their spousal caregivers (Huang et al., 2019). Resilient caregivers of advanced cancer utilize various resources to guarantee the quality of caregiving, being able to ask for and accept support and advice. Moreover, most intimate spouses seem to resist the psychological strain and cope adaptively, protected against mental distress by resilience (Opsomer et al., 2023; Sun et al., 2021).

Resilience has also been identified as a personal protective factor for caregivers, enhancing their psychosocial well-being during or after responding to an illness, such as shouldering the burden of caring (Li et al., 2019), emotional distress

(Dias et al., 2016), self-efficacy (Ye et al., 2015), coping strategies (Ye et al., 2015), bereavement (Bonanno et al., 2002), and other psychosocial functions (Palacio et al., 2020; Sun et al., 2021). Numerous instances of prospective and longitudinal research had frequently demonstrated clear trajectories of individual differences in resilient outcomes over time following care for serious illness (Bonanno et al., 2002; Elliott et al., 2014; O'Rourke et al., 2010). These resilient caregivers often managed to continue functioning normally even soon after the traumatic events. Further, some resilience training programs and interventions were implemented at the early stage of caring, for instance, cognitive behavioral therapy and mindfulness techniques (Joyce et al., 2018; Macedo et al., 2014). Another positive impact of a resilient caregiver is beneficial for the patients and the family (Chen et al., 2020). Caregivers owning resilience can provide high-quality care for patients and improve patients' resilience (Li et al., 2018). In addition, family harmony and solidarity existed in families of resilient caregivers after bereavement, especially in aging caring (Chen et al., 2020). Therefore, understanding trajectory of resilience specific to spousal caregivers can help earlier detection of persons who are at risk for mental illnesses, and ensure that intervention is better targeted.

When describing the trajectories of resilience in caregivers, much of our current understanding relies on research about resilience in other groups, and researchers can only assume that spousal caregivers of patients with advanced cancer follow the same trajectories as described after other types of trauma (Bonanno et al., 2001; Kumpfer, 1999; Masten, 2001; Richardson, 2002; Rosenberg et al., 2013). Nevertheless, due to a number of different factors across studies such as instruments used to evaluate resilience, time of assessment, population characteristics, and cut-off point scores, caregivers experienced different levels of burden, distress, and needs (Given et al., 2012; Given et al., 2004; Rumpold et al., 2016). Regarding the instruments used to measure resilience, most studies have reported that post-adversity resilience outcomes are more than merely the absence of posttraumatic stress disorder, depressive symptoms, or caregiver burden (Elliott et al., 2014; Lee et al., 2018; Opsomer et al., 2020). Existing studies have analyzed the changes in caregiver burden, depressive symptoms, and posttraumatic disorder as outcome variables, but these have often not considered resilience as a dependent variable and, as such, there are no reports on the trajectory of resilience in spouses of advanced cancer patients.

Due to inconsistency in the operational definitions of adversity, adaptation and resilience, the prevalence of resilience is difficult to estimate, however, some studies have attempted to do so by looking at no or low depression, low anxiety, or minimal post-traumatic stress disorder symptoms (Cosco et al., 2017). For instance, Tang et al. (2013) identified the prevalence of caregivers' resilience was 11.4% using low depression during caring for terminal patients. In addition, the level of resilience in caregivers of cancer patients was lower than general adult population (Chen et al., 2020; Üzar-Özçetin & Dursun, 2020; Ye et al., 2015). For instance, a survey of caregivers of patients with advanced cancer in Taiwan, looking at the first six months post-initial treatment, reported that 33.8% of caregivers showed moderate resilience, and 61.5% showed low resilience (Chen et al., 2020). In mainland China, several kinds of literature described caregivers' resilience and its influencing factors in cross-sectional studies at a certain time. The resilience of caregivers of cancer patients was at a moderate to low level (Luo et al., 2020). Using multiple regression or qualitative interviews, many researchers found different manifestations of resilience in caregivers of cancer patients (Wang, 2018; Wang et al., 2020). However, over the first six months after diagnosis or treatment, few studies have reported the change in resilience and its predictors of spousal caregivers from a longitudinal perspective.

From literature reviews, longitudinal studies about the resilience of spousal caregivers to advanced cancer patients are scarce. Most research focused on patients rather than their partners while suffering from cancer events. Furthermore, spouses of advanced cancer caregivers often failed to seek medical and psychological assistance for themselves (Li et al., 2013). In China, the trajectory of resilience was investigated in cancer patients but ignored their husbands and wives (Zhang et al., 2019). As a result, difficulties arise for healthcare professionals in being able to perform timely assessments to determine whether caregivers may be at risk for mental dysfunction based on their individual trajectory of resilience. Due to the unobservable nature of the construct, resilience cannot be directly tested but must instead be inferred from measurements of successful adaptation to adversity. Accordingly, many qualitative inquiries were used to explore resilience (Donnellan et al., 2018; Gibbons et al., 2019). Hence, it is time to use the resilience concept to uncover caregivers' adaptation process which is better to understand the nature of resilience.

In addition, to date, the majority of research on resilience in caregivers of cancer patients has been cross-sectional designs at one single time point (Cosco et al., 2017; Davydov et al., 2010; Palacio et al., 2020). It is not possible to investigate resilience as a dynamic multidimensional concept with this type of design, which limits the generalization of the obtained results, particularly when not specifically focusing on the first few months after a newly diagnosed advanced cancer treatment. Definitely, longitudinal approaches have been utilized to explore trajectories of resilience. Data-driven modeling approaches have been utilized to capture different trajectories, such as latent growth mixture modeling, latent class growth analysis, actor-partner interdependence modeling, and relevant methods attempt to identify unobservable mixture distributions underlying an observed non-normal distribution (Galatzer-Levy et al., 2018). These approaches have been successfully applied to examine different change trajectories of resilience and capture information about interindividual differences over time. Some longitudinal studies, using other concepts, have found that those who adapt most effectively to the cancer diagnosis do so after the first six months (Meyers et al., 2020). Meanwhile, about 27% to 35% of advanced cancer caregivers report clinically significant symptoms of anxiety and depression during a patient's course of treatment (Oechsle et al., 2020). Other studies on the resilience of spousal caregivers have focused on the period after the patient's death

(Bennett et al., 2020; Bonanno, 2004). These existing findings on resilience are useful, but also point to the need to identify the actual trajectory of resilience among spousal caregivers of patients with advanced cancer during the initial treatment period.

Research has revealed that while some patients and spouses appear to psychologically adapt to cancer rather well, the majority may remain distressed across the illness trajectory (Choi et al., 2018; Milbury et al., 2013). There are several sources of emotional distress and they can vary according to the phase of the illness trajectory. Once a patient has received a diagnosis, treatment will normally begin right away. Resilience can help both patients and their spouses cope with the cancer tumor and diagnosis after having started treatment. Just after diagnosis, patients and spousal caregivers are immediately confronted with new and unfamiliar therapies for cancer. They experienced more emotional distress than in their normal life before (Northouse et al., 2012). Particularly the first month after a cancer diagnosis, sources of emotional distress during this period are related to their worry and concern over the patient's tolerance for the treatment (DuBenske et al., 2008). Caregiver involvement in physical care and symptom management starts to increase during this time. It is not surprising that spousal caregivers report more caregiver burden and strain than before cancer events.

As cancer treatment such as targeted drug therapy and immunotherapy has improved, cancer patients are enduring the disease for longer, and the trajectory of cancer illness is increasingly patterned that of a chronic rather than an acute disease. A treatment cycle is between a 3-week and 4-week period, and a course of chemotherapy usually takes between 3 to 6 months (American Cancer Society, 2020). Within the first month of posttreatment initiation, caregiving reactions to caring for the patient are most obvious especially in schedule disruption (Lee et al., 2018; Milbury et al., 2013). Increased involvement in household duties and time spent on hospital-related activities cause caregiver strain to significantly rise. Involvement disease management offered evidence that physical and psychological burdens significantly depend on coping self-efficacy (Lee et al., 2018). During the first month of cancer care, critical changes occur in patients' and caregivers' lives that have an impact on a wide range of life situations (Hyde et al., 2018). Caregivers would seek various resources to cope with adversity, probably due to the substantial number of new tasks to face without previous training and an uncertain future. Therefore, selecting the first month after initial treatment as the time point is very crucial to capture the information of social support, coping ability, resilience, and caregiver burden, and identify mental health problems in caregivers earlier.

Three to four months after cancer treatment is another important time point for the levels of caregivers' emotional distress, and the best predictors of distress at a follow-up assessment (Given et al., 2012; Kim & Given, 2008). During this time, caregivers are more actively involved in providing daily care and managing treatment-related symptoms. When compared to the 1-month baseline, spouses of lung cancer reported a significantly greater lack of family support and more health issues but less financial stress at 3-month follow-up (Milbury et al., 2013); they showed the highest severity of post-traumatic stress symptoms or remained highly distressed at 3-month after treatment (Meyers et al., 2020). In addition, a regression analysis disclosed that emotional burden at three months after diagnosis was related to and predicted anxiety of caregivers in the first six months after cancer diagnosis (Saria et al., 2017). Hence, these data provide emerging evidence that the 3-month interval following treatment is also an important time of distress for caregivers.

Furthermore, several longitudinal studies have confirmed that the first six-month interval following the diagnosis or start of treatment is a time of significant stress for caregivers (Lee et al., 2017; Lee et al., 2022). Social support has a key role in developing anxiety and depression in cancer caregivers in the first six months after cancer diagnosis (García-Torres et al., 2020). All burden dimensions were significantly associated with anxiety and depression at 180-200 days after diagnosis

(Saria et al., 2017). Depression and anxiety scores were the lowest in a 6-month follow-up, whereas mental health increased in the same period of follow-up (Lee et al., 2017). Many studies also showed that changes in the mental health of caregivers remained relatively stable or were not significant after 6 months in a longer follow-up time (Chen et al., 2020; Lee et al., 2022; Lyons & Lee, 2020). For example, Lee et al. (2022) found primary caregivers in advanced head and neck cancer showed significant growth in resilience over six months after initial completion of treatment but there was no difference between six months and one year. After the six-month point, caregivers tend to be more familiar with the process and possible complications of the related treatment. Therefore, the first six months interval following diagnosis is a particularly significant time of stress for caregivers, and an important period to investigate changes in resilience.

Taken together, the first 6 months after newly diagnosed cancer, especially initial anti-cancer therapies are a critical period for adaptation in the first six months. This study followed the participants up to three time points based on three aspects of evidence. The distress initially occurred beyond one month when people were confronted with an acute traumatic event or adversity. Second, prolonged distress among caregivers can persist for at least three months after adversity or trauma (American Psychiatric Association, 2013). In addition, longitudinal studies showed the levels of distress of caregivers began to stabilize at 6 months across 12 months (Murphy et al., 2020), and the physical condition of family caregivers of cancer patients significantly changed at 6 months within the following-up 12 months (Lee et al., 2022; Lyons & Lee, 2020). Many longitudinal studies on resilience or posttraumatic stressor of caregivers selected a six-month follow-up time at three time points: 1-, 3-, and 6-months posttreatment or postdischarge (Choi et al., 2018; Galatzer-Levy et al., 2018; Meyers et al., 2020; Sun et al., 2023). Thus, this study investigated variables at three time points within the first six months of initial treatment including the first month posttreatment (T1), third month posttreatment (T2) and sixth month posttreatment (T3).

Resilience can change within one individual across time and circumstance. There is a wide range of factors contributing to caregivers' resilience throughout the course of the patient's disease from diagnosis to death. Numerous explanatory factors contributed both to positive and negative adaptation, being important aspects of resilience. Previous studies had revealed the factors influencing resilience including internal and external factors to the individual, such as socio-demographic characteristics (e.g., family income, education), coping ability, spirituality, self-efficacy, hope, dyadic relationship, social support, caregiver burden, severity of depression and patients' health status (Dreer et al., 2019; Engeli et al., 2016; Gibbons et al., 2019; Hwang et al., 2018; Sun et al., 2021). By the way, caregivers' problems may be predominantly psychological in the patient's early stage of treatment, but more psychosocial or physical in later stages (Stenberg et al., 2010). Patients and caregivers were able to recognize some beneficial changes from their cancer experience (e.g., learning how valuable life is, appreciating relationships) (Northouse et al., 2012). However, although many factors have been verified, very few studies evaluated how these factors affected caregivers' resilience process during different stages in the illness trajectory of advanced cancer patients.

Factors associated with resilience are heterogeneous because of many situational and contextual factors (Bonanno et al., 2015; Kumpfer, 1999; Mancini & Bonanno, 2009; Richardson, 2002). Indeed, it is increasingly evident that resilience can be achieved through a variety of means. According to previous studies, there are multiple risks and protective factors across individuals. The variables chosen for this study were based on empirical evidence. First, this study tried to examine the protective factors in individual, family and societal terms, including coping self-efficacy, social support, mutuality between couples, spiritual well-being and beliefs of familism in the Chinese context, because the influence of psychosocial factors on resilience can be improved by personal empowerment or environmental modification.

Moreover, the role of contextual risk factors provides the nature of advanced cancer as a potential trauma stressor like caregiving strain or caregiver burden, the patient's health status and their potential interaction with individual differences.

Poor health status is a very important prediction of resilience change among caregivers of cancer patients. Lee et al. (2022) found that higher performance status not only influenced caregivers' overall resilience (β= .24, 95%CI= .08 - .40, *p* = .004) but also affected different two dimensions including equanimity (β= .06, 95%CI= .02 - .10, *p*= .003), perseverance (β= .09, 95%CI= .02 - .16, *p*= .010). Patients' performance of activities of daily living also impacted caregiver burden which is a hope for continued treatment (Guerra-Martín et al., 2023). Therefore, focusing on cancer patients' functional status is an essential alternative to assessing resilience of spousal caregivers across the illness trajectories.

Caregiver burden is the most important context stressor. For example, caregiving strain did not appear to be related to resilience, but it does predict an unusual trajectory of improved functioning following adversity (Bonanno et al., 2002). In one prospective longitudinal study, family members of patients with advanced cancer who reported a significant caregiver burden engaged less in self-care (OR = .87, *p*<0.001) and were less resilient (OR = .76, *p*=0.001) compared to ones with low caregiver burden (van Roij et al., 2021).

Social support was a resource of adaptation and could contribute to enhancing resilience to stress, protecting against developing trauma-related psychopathology. An insufficient amount of resources to handle the demands involved in providing care to cancer patients would increase the risk of psychological distress and caregiving burden (Given et al., 2012). Social support as external resources could play a protective role in caregivers' mental adjustment. Previous studies confirmed that social support enhances psychological resilience according to the match of caregivers' needs (Donnellan et al., 2017; Peng et al., 2023).

Mutuality is another evidence for resilience in the role of dyadic factors was found in a recent study using a large panel data set (Gibbons et al., 2019). Using a latent class framework, Bonanno and his colleagues (2015) not only validated the resilient trajectory empirically but also found that dyadic relationships were associated with resilience like parent-child, husband-wife, and patient-physician. Crothers et al. (2021) confirmed that the absence of relationship difficulties between parents and children was predictive of parents' well-being in the resilient group compared to the chronic group (OR=8.95, 95%CI=2.42 - 33.08, $p< .01$). Hence, mutuality was possibly believed to vary across different couples which could influence resilience.

In stressful conditions, caregivers tended to give meaning to their stressful experiences based on their worldview, to lessen their distress and give themselves peace (Adams et al., 2014). Caregivers' spiritual well-being can buffer the adverse effect of caregiving stress on mental functioning (Kim & Schulz, 2008). Furthermore, because of the dyadic nature of mental health, studies had shown that high levels of spirituality are linked to high levels of mental health in both cancer patients and their caregivers (Nemati et al., 2017). Thus, spiritual health would play a major role in improving resilient recovery.

Successful coping in the face of the stress brought on by adversity is an important mechanism for strengthening resilience (Wu et al., 2020). Previous studies verified that training programs for children that focus on emphasizing coping self-efficacy can all contribute to resilience building from an early age in adolescents (Ronen, 2021). Coping self-efficacy as one's perceived confidence mostly is problem-based strategies or skills such as active coping, coping readiness and positive acceptance (Wu et al., 2021). Understanding the coping self-efficacy that contributes to resilience is an important step in designing resilience interventions (Bonanno et al., 2015). The development of coping strategies is acknowledged as being paramount in the growth of high levels of resilience.

Given the tremendous disparities in socioeconomic and cultural contexts, the predictive factors were selected by placing an emphasis on selected psychosocial variables in the Chinese context. Contrary to a more Westernized individualistic value, China now has a relational and collectivist culture based on values informed by Confucianism in the concept of family (Qiu et al., 2018). This cultural value is called collective familism or familismo. Chinese conceptions of familism are comparable to conceptions of familismo in the Latinx culture where family integration, family solidarity, intergenerational support, and submission of one's desire for the family are emphasized (Cardoso & Thompson, 2010). Chinese people transfer or generalize their familism cognitions, affects, and intentions (and corresponding behaviors as well) to their social life (Yang, 2006). In China, cultural expectations (e.g., family members have to take care of cancer survivors otherwise the family members are not accepted by society) make families consider it their primary responsibility to care for cancer survivors. Therefore, spouses tend to take up the responsibility of caring for a loved one with cancer to meet cultural expectations (Li et al., 2013). To date, few studies have been published that provide further information about resilience trajectories and how they evolve over the caregiving period from diagnosis to treatment of cancer patients in the Chinese cultural context.

Taken together, most studies on resilience were conducted among family caregivers and employed a qualitative or cross-sectional design exploring the characteristics and factors of resilience in caregivers. Although these studies found the importance of resilience for caregivers, very few studies had investigated resilience among caregivers over time from a dynamic perspective. Second, most studies used other concepts to describe resilience such as the absence of depression, posttraumatic growth, or less psychological burden, few studies focused on caregivers' resilience itself at the early time of traumatic events from diagnosis to treatment of cancer patients. Third, although multimodal risk and protective factors are involved in resilience process, there are no comparisons of the effects of one factor at different time points. Meanwhile, Chinese culture, such as filial piety or loyalty, may have a significant impact on the caregiving experience, but little knowledge has discussed how Chinese collective familism affects spousal caregivers' resilience. Therefore, a longitudinal study using latent growth modeling can capture information on change in resilience among Chinese spousal caregivers of patients with advanced cancer.

In summary, longitudinal studies on resilience mostly used psychological resilience as a baseline predictor and seldom explored the protective effects of positive psychosocial variables. Current literature has identified caregivers' resilience levels at the cross-section, whereas it could not provide resilience dynamic traits. Due to the knowledge gaps mentioned above, the purpose of the current study was to investigate changes in resilience of spousal caregivers among advanced cancer patients over the first six months of initial posttreatment periods in the Chinese context. Furthermore, this study explored the selected predictors including social support, coping self-efficacy, spirituality, mutuality, caregiver burden, patients' functional status, beliefs of Chinese familism on resilience at one month, three months and six months posttreatment respectively, and examined the selected predictors above on trajectory of resilience over the first six months posttreatment period. The advantage of this longitudinal study was that it could offer a better method of understanding the trajectory changes in resilience and predictive factors that influence resilience at different time points. Therefore, the findings could contribute to identifying spousal caregivers who are at risk for mental disorders earlier and help nurses to conduct effective interventions to promote spouses' mental health.

Objectives

1. To describe the trajectory of resilience among spousal caregivers of patients with newly diagnosed advanced cancer over the first six months after initial treatment.

2. To examine the effects of predictors [social support, spirituality, mutuality, coping self-efficacy, caregiver burden, patients' functional status, Chinese familism]

on resilience process over the first six months posttreatment among spousal caregivers of patients with newly diagnosis advanced cancer.

Hypotheses

1. The level of resilience among spousal caregivers of patients with advanced cancer would be changed across times over the first six months after initial treatment.

2. The effects of selected predictors [social support, spirituality, mutuality, coping self-efficacy, caregiver burden, patients' functional status and Chinese familism] on resilience among spousal caregivers of patients with advanced cancer would be different across time at 1, 3, and 6 months post-treatment.

Conceptual framework

The conceptual model of this study was grounded on "the temporal framework" proposed by Bonanno et al. (2015) and the empirical findings (Galatzer-Levy et al., 2018; Van Breda, 2018). Notably, resilience is a dynamic process and varies in different contextual and situational factors. Bonanno's framework and previous empirical research highlighted the resilience process and the resilient outcome, specifically, that these can be acquired through exposure to stressors or adversity and may alter over time. Moreover, three connected components of resilience are included: adversity, outcomes and moderating factors. Conceptually, then, resilience is a process that leads to an outcome, and the central focus of resilience research is on moderating processes. To help distinguish between process and outcome, Ungar (2018) suggested that "resilience" was best used as a process definition, and that "resilient" was to be reserved for an outcome definition.

Bonanno's theory framework had been developed since 2001 from works (Bonanno, 2004, 2005; Bonanno et al., 2010; Bonanno & Diminich, 2013; Bonanno et al., 2012; Bonanno et al., 2001; Bonanno et al., 2015; Bonanno et al., 2011; Bonanno et al., 2002). Four temporal components made up this framework: (a) baseline or pre-adversity functioning, (b) the actual aversive circumstances, (c) post-adversity resilient outcomes, and (d) predictors of resilient outcomes. Measuring baseline levels of psychological adjustment is difficult, particularly in situations where pre-event assessments are typically unavailable. Thus, this theory was an appropriate framework for post-event resilient outcomes.

Firstly, the adversity of newly diagnosed advanced cancer events was ongoing and resilience processes were changing while individuals were still facing adversity. According to Bonanno and Diminich (2013), types of adversity could be roughly classified into two categories: chronic and acute. Newly-diagnosed advanced cancer can be regarded as an acute traumatic event, and trajectory of incurable cancer in treatment and caring as a potentially traumatic event is a chronic stressor. In this study, we used patients' functional status and caregiver burden as chronic stressor factors that could influence the change of resilience in caregivers.

Secondly, according to Bonanno et al. (2015), resilient outcomes were predicted by multiple independent variables, each of which explained a relatively small portion of the variance. Meanwhile, the predictors of a resilient outcome resulted from the magnified interactions and reciprocal processes within a variety of individual and social variables, because resilience processes occurred across multiple levels of the social ecology or person-in-environment, rather than merely in the individual (Bonanno et al., 2011). Bonanno identified three levels of significant predictors in resilience, including individual-level factors (e.g. demographic factors, personalities, dyadic relationships, problem-solving abilities, optimism about the future, perceived self-efficacy, flexibility in coping and emotion regulation, support from others, self-enhancement trait), family-level factors (e.g. positive outlook, spirituality, good communication, financial management, shared recreation, and mutual support), and community-level factors (e.g. social capital, social security, social network). In addition, Bonanno's framework did strengthen the correlation between resilient outcomes and a strong cultural belief in familism during bereavement, and some previous studies showed that beliefs or values in familism had a correlation with resilience (Leung, 2017; Taylor & Jones, 2020; Yang, 2006). Based on Bonanno's theory and the literature review, the study supposed that coping self-efficacy (in the individual-level factor), mutuality and spirituality (in the family-level factors), social support (in the community-level factor) and Chinese familism (in the country-level factor) would be relevant to the resilience of spousal caregivers.

The situational and personal resources were not static but rather fluid and likely to change over time (Bonanno et al., 2010). Therefore, social support, spiritual well-being, mutuality between couples, self-efficacy in coping and beliefs of familism value were believed possible to change over time and varied across different socioeconomic and cultural contexts. The changing of some predictor factors could affect the levels of resilience and vice versa. Clearly, this study only investigated patients' functional status, caregiver burden, social support, spirituality, coping self-efficacy, mutuality and Chinese familism. Because some intrinsic characteristics such as age, gender and education were hard to change, this study included them as control variables to make the model fit the empirical data. Moreover, the selected predictive factors were useful for a nurse to reduce risk or enhance protective factors in nursing practice. Thus, intrinsic characteristics such as humor, temperament and self-enhancement traits and some social-level factors were not included in this study.

Finally, post-adversity resilient outcomes are unknown such as increase, decrease or stable at different time points which could map the trajectory of resilience. For example, Galatzer-Levy et al. (2018) synthesized the trajectories of responses to potentially traumatic events considering resilience, recovery, chronic stress, and delayed onset, using latent growth modeling in accordance with Bonanno's theory (Bonanno et al., 2011). Therefore, this study captured the trajectory of resilience applying latent growth modeling at 1, 3, and 6 months post-initial treatment (T1, T2 and T3, respectively), and partial individual and social factors were hypothesized which had a powerful impact on resilience process. The hypothesized model is displayed in Figure 1.

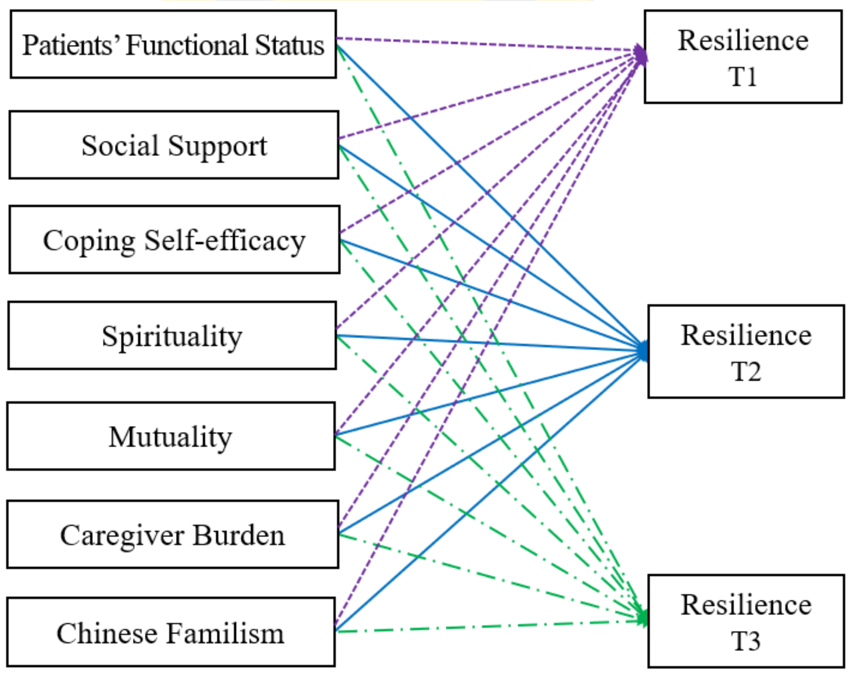


Figure 1 Predictors of resilience among spousal caregivers of patients with advanced cancer at three-time points after treatment model

Scope of the study

This study employed a longitudinal design and focused on the change of resilience over the first six months post-initial treatment (at 1 month, 3 months, and 6 months post-treatment). All included participants were the spousal caregivers of newly diagnosed advanced cancer patients, and were recruited from outpatient and inpatient departments of tertiary hospitals in Yancheng City of China, as the representative eastern part of China. Data collection was performed from January 2022 until December 2022. The selected predictors for resilience were social support, coping self-efficacy, spirituality, mutuality, caregiver burden, patients' functional status and Chinese familism.

Definition of terms

Resilience refers to the spousal caregivers' capacity in the face of cancer events and caring stress and shows a successful adaptation process across time following cancer care. Resilience was assessed by using the Conner Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003).

Patients' functional status refers to the patient's ability to carry on activities of daily living when living with cancer. The Chinese version of Activities of Daily Living scale (ADL-C) was used to measure the functional status of cancer patients by caregivers (He, 1990).

Social support refers to the perception of objective and subjective support to cope with stresses and strains of life situations as the spousal caregivers received from their social networks such as other family members, friends, and healthcare professionals during the treatment period. It was tested using the Chinese Social Support Rating Scale (SSRS) (Xiao,1994).

Coping self-efficacy is a specific form of self-efficacy and can be defined as spousal caregivers' perceived competence to cope and to cope effectively with challenging demands of the advanced cancer event. It was measured by using a 7-item Coping Self-Efficacy Scale (Bosmans, 2015).

Spirituality is derived from religion and linked to mental health. Spirituality refers to a state of being in the lives of spousal caregivers reflecting having hope and a sense of connectedness, understanding self and the nature of life, and resulting in a sense of inner peace and well-being. Spirituality was measured by a modified scale from the Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being (FACIT-Sp-12) (Peterman et al., 2002).

Mutuality refers to a double-sided expression of emotions, ideas, and activities between husbands and wives as the quality of interaction or reciprocity of sentiment in a couple's relationship. It was assessed by the Mutuality Scale (Archbold et al., 1990).

Caregiver burden refers to the subjective burden that spousal caregivers perceived in response to the caregiving experience. Caregiver burden includes two aspects: personal strain and role strain. The Zarit Caregiver Burden Interview is feasible for measuring feelings of burden of caregivers (Bédard et al., 2001).

Chinese familism refers to spousal caregivers owning Chinese cultural beliefs of familism to maintain family harmony and integrity based on attitudes and performance of Confucian values. It was measured by Belief in Chinese Familism scale (BCF) developed by Yeh and Yang (1997).

CHAPTER 2

LITERATURE REVIEWS

This chapter provides a literature review describing the concepts of resilience, the impact of resilience, factors associated with caregivers' resilience, and selected predicting factors of caregivers' resilience. The scope of this review includes an overview of advanced cancer, concepts of spousal caregivers, concepts of resilience, instruments for identifying resilience, positive impact of caregivers' resilience, factors related to resilience of spousal caregivers, and selected predictors influencing resilience of spousal caregivers among patients with advanced cancer.

Overview of advanced cancer

Cancer is a disease characterized by abnormal cells growing uncontrollably with the potential to eventually invade other parts of the body. It continues to be a serious public health issue all over the world. In China, the rate of new cancer cases tended to remain stable in men but increased by about 2.3% in women annually from 2000 to 2016 (Zheng et al., 2022). Recently, the National Cancer Center reported the most commonly diagnosed cancers in the Chinese population were dominated by lung (20.4% of all new cases), colorectum (10.0%), stomach (9.8%), liver (9.6%) and female breast (7.5%) cancer (Zheng et al., 2022). Given a change in disease profile linked to the transition to the burden of cancer in the country, especially for the five major cancers, researchers are more interested in studying the health issues caused by cancer.

Advanced cancer is described as cancer that is unlikely to be cured or controlled with treatment, that is, cancers do not totally go away and stay away completely with therapy (American Cancer Society, 2020). A few approaches are used to stage cancer, named for when in the diagnosis/treatment continuum the staging is carried out. Advanced cancer may have spread from where it first started to neighboring tissue, lymph nodes, or distant regions of the body. Therefore, there are different sorts of systems employed to stage cancer, but the Classification of Malignant Tumors (TNM) system is the most widely used and effective staging method for the majority of cancer types. The TNM is a widely recognized standard for classifying the extent of spread of cancer. The TNM system is mainly based on three aspects of cancer: **T**umor size, Lymph **N**odes affected, **M**etastases (National Cancer Institute, 2022). Most types of cancer have four stages, numbered from one to four (American Cancer Society, 2020). Stage I (also namely early-stage or localized cancer): The cancer has not infiltrated deeply into neighboring tissue, nor has it migrated to lymph nodes or locations away from the primary tumor. Stage II (also namely early locally advanced cancer): Cancer cells have spread deeper into nearby tissue, but not distant sites in the body. Stage III (also namely advanced-stage or locally advanced cancer): The cancer has spread to lymph nodes and deeper surrounding tissue, but not distant other parts of the body. Stage IV (also namely metastatic or advanced cancer): Tumor cells have moved beyond nearby tissue and into lymph nodes and other parts of the body, potentially far from the original site. According to TNM stage, stage III cancers are locally advanced, and stage III is called secondary or metastatic cancer (Cancer Research UK, 2014). Referring to TNM, advanced cancers include locally advanced or metastatic. Therefore, the health event context was patients with newly diagnosed advanced cancer at stage III and IV in this study.

Due to different socioeconomic status, variations in each stage of new cancer cases at diagnosis across the world and over time in some countries (World Health Organization, 2020). For example, a Cancer Registry Report in developed countries showed that more than half of patients had early stage 0, I, or II cancers (56%), whereas patients with stage III disease represented 12% of analytic cases and 19% had stage IV cancers in 2018 (Kraemer Cancer Center, 2019). In most low- and middle-income countries including China mainland, most cancers are diagnosed at a late stage. There are only 20% of gastric cancer diagnosed in its early stages, 80% of which are still diagnosed at an advanced stage (National Cancer Institute, 2019). A colorectal cancer report presented that Chinese cancer patients were at stages I (7.2%), II (19%), III (30%) and IV (44%), respectively at primary diagnosis (Xu et al., 2020). Nearly 70% of lung tumor patients presented with advanced stage III (20.5%) and IV (53.3%) at diagnosis, compared with stage I (10.5%), stage II (7.5%) and unknown (8.3%), as evidenced by the retrospective data from West China Hospital (Cheng et al., 2019). The coronavirus disease 2019 (COVID-19) outbreak delayed the diagnosis and treatment of cancer, which was followed by an increase in advanced-stage disease (Rebecca, 2021). Clearly, the high rate of late-stage cancers at diagnosis in China is common.

Although advanced cancer cannot be cured, treatment sometimes can slow its growth, help relieve symptoms, or help patients live longer. In general, options for cancer treatment include surgery, chemotherapy, radiation, immunotherapy or hormone therapy, and even targeted therapy to prevent or relieve certain symptoms (American Cancer Society, 2020). However, mortality of cancer is strongly correlated to the stage of cancer at diagnosis. Some cancers are not curable, often due to late stage. Cancer diagnosis and treatment may be a long journey in that patients and family caregivers are most likely to experience the risk of physical, psychological, and social dysfunction (e.g., fatigue, anxiety, depression, distress, uncertainty, financial difficulties, and social isolation) (van Roij et al., 2021). Moreover, cancer patients and their family caregivers may face a variety of challenges at every phase of their illness as well as during treatment. Caregiver stress and burden may increase due to cancer deterioration and treatment. In turn, caregivers’ problems are strongly related to their own QoL and patients’ well-being.

Impacts of cancer on caregivers

The complexity and uniqueness of caregiving for cancer patients vary depending on many factors such as the type of cancer, stage of disease, and type of cancer treatment. A sudden diagnosis of advanced cancer and the adverse effects of treatment did affect the patients but also their caregivers as co-sufferers of the disease. Caregivers could be very distressed by the life changes and multidimensional experiences, mainly in the social, psychological, and spiritual domains (Murray et al., 2010), which could impact their well-being and QoL. Particularly in China, according to Confucian philosophy and the traditional culture, family caregiving is an important and indispensable element of Chinese culture (Adams et al., 2014). In China, patients with advanced cancer rely more on informal care from family members, especially spouses (Cai et al., 2021). Meanwhile, due to the aging population, increasing employment rate of women, implementation of the One Child Family Policy, and transformation of nuclear family structures, husbands increasingly play a key role in family caregiving (Zhao et al., 2023). Unlike a typically patriarchal society, spousal caregivers gradually become a common social phenomenon in China.

More than 200 different types of cancer exist, and each is diagnosed and treated differently. Some studies have reported cancer type and therapy were factors that had an impact on anxiety and depression in cancer patients and their family caregivers (Gibbons et al., 2019; Li et al., 2018). Patients with different types of cancer experience different symptoms and treatments. Consequently, caregivers experience different care burdens that may affect them differently. More severe “financial,” “personal control,” “social support,” and “employment” problems may arise from a longer disease duration, which is typically connected to type of cancer.

In addition, stress and burden of caregivers may be influenced by the types of cancer treatment. In general, types of cancer treatments include surgery, radiation therapy, and drug treatments such as chemotherapy, immunotherapy, or targeted therapy. For example, compared to radiation therapy or chemotherapy, surgical treatment for the head and neck area leads to more disruption to daily functioning and an individual's self-image (Katz et al., 2003). As a result, caregivers are anticipated to assume more tasks to fulfill social demands after the surgery for head and neck cancer.

Many studies focused on the physical and psychological distress of cancer patients and their family caregivers following the diagnosis of cancer. At the beginning of cancer diagnosis, family caregivers usually feel unprepared to accept bad news, and have inadequate knowledge to provide proper care. Kim et al. (2010) assessed the needs of three cohorts of cancer caregivers at two months, two years, and five years after diagnosis. Compared to the last two cohorts, caregivers of newly diagnosed cancer patients at two months had more unmet psychosocial, medical, financial, and informational needs. During the treatment phase, when cancer patients are admitted to the hospital, family caregivers play a big part in the support of their patients. They often put aside their own needs and began to provide care. A meta-analysis discovered a tendency for caregivers to report increased distress during the treatment phase when physical and emotional caring responsibilities were high (Hodges et al., 2005). Of course, more guidance and assistance from health professionals would certainly be helpful to these caregivers. Also, caregiving does not cease at home. At the survivorship phase, a universal concern is the fear of the cancer recurring. Family caregivers express more anxiety about recurrence than survivors, possibly because they have fewer opportunities to get information that could alleviate their fears (Northouse et al., 2012). At advanced and end-of-life phases, high symptom distress and poor self-care of patients cause more and more caregiving burden and hopeless of the future. Caregivers who experienced increased caregiving demands and greater psychological distress had more unfavorable changes in their health behaviors. For example, family caregivers of breast cancer displayed elevated levels of anxiety and depression from the beginning of the palliative phase until the start of the terminal phase (Grunfeld et al., 2004). This is why this study selected the spouses of patients with advanced cancer.

Concept of resilience

We invariably encounter some form of adversity or difficulty over the life course. Responses to adversity are diverse, ranging from extremely negative to very positive. Although the notion "resilience" has been used in many contexts for centuries, it was only in the past several decades that it became popular as a psychological concept. Particularly in the past ten years, there has been an increase in research and theory about psychologically resilient functioning (Bonanno, 2004; Bonanno et al., 2011; Kumpfer, 1999; Masten, 2001; Richardson, 2002). Resilience in the psychological setting has developed to diverse meanings in different contexts. Nonetheless, the growth of research on resilience is severely limited by some ambiguities. For instance, resilience has no unified definition now. Although heterogeneity may not always be a problem, it has been observed that conceptual discrepancies have led to a variety of study designs and resilience measures, which significantly hamper the interpretation and comparability of study findings (Davydov et al., 2010; Fletcher & Sarkar, 2013). Therefore, further research in this field is important to explore the resilience concept.

Definition

There is no or little consensus to define resilience unequivocally. The Latin word *resilire*, which means "to spring back" or "to bounce back", is the root of the English word *resilience* (Hosseini et al., 2016). Over the years, numerous academic fields and disciplines have investigated the concept of "resilience" over time. As a result, the concept has been formulated in a variety of ways. In psychology, there are three classifications of the definition being regarded as a trait, a process, or an outcome (Southwick et al., 2014).

The first definitional differences focused on describing resilience as a personality trait, mostly referred to as resiliency or ego-resiliency (Richardson, 2002), compared with a dynamic process. In early research, resilient qualities such as optimism, faith, wisdom, creativity, forgiveness, gratitude or self-control have been described extensively (Richardson, 2002). It cannot be denied that the identification of resilient qualities has contributed significantly to the insights into how people adapt to new circumstances. Nevertheless, the term ‘a resilient person’ solely refers to a person’s individual resilience resource and does not imply a resilient process when confronted with adversity. The types of adversity have evolved over time to cover all unfavorable events across the whole lifespan that are statistically linked to adjustment difficulties or subsequent mental disorders. These incidents contained inadequate parenting, homelessness, poverty, traumatic experiences, natural catastrophes, crime, and illness (Hosseini et al., 2016).

Subsequent researchers concentrated on the contribution of systems (individuals, families, communities, and groups) to help people in dealing with adversity. As a result, resilience was given a broad definition. Despite the experiences with stressors showing a significant risk for developing psychopathology, the protective factors and mechanisms contribute to a beneficial outcome. Glantz and Johnson (1999), Masten and Tellegen (2012), Fergus and Zimmerman (2005), and Seery and Quinton (2016) unanimously considered resilience as an outcome. This definition emphasizes the “state of being resilient” in the face of adversity, highlighting resilience as an outcome.

In contrast, most researchers defined resilience as a process (Bonanno, 2004; Kumpfer, 1999; Luthar et al., 2000; Richardson, 2002; Rutter, 2012; Stainton et al., 2019). Resilience is defined as a multi-dimensional characteristic that changes with context, time, gender and culture, as well as within an individual exposure to various life events (Connor & Davidson, 2003). Process definitions include “The capacity to rebound from adversity strengthened and more resourceful” or “The process of adjusting well to significant adversity” (Southwick et al., 2014). Despite the lack of agreement on an unambiguous definition of resilience, there are two common components: the individual must be both 1) exposed to adverse conditions; and 2) able to adapt positively in the face of adversity (Opsomer et al., 2019).

Furthermore, the diversity of definitions highlights the concept's multidimensionality and complexity and reflects the variety of ways to view resilience across contexts and situations. For instance, an individual who handles stress successfully in a workplace or in an academic setting, may struggle to adjust in their personal life or in interactions with others. Lately, resilience is considered as a common phenomenon (Bonanno & Malgaroli, 2020). Rising above, adaptation and adjustment, dynamic process, and mental illness as a marker of resilience were some common themes identified (Aburn et al., 2016). Because the process definition correctly contains the elements of trait definition and outcome definition, that is, it highlights the adaptive result and the ability to adjust, and describes the specific process of resilience, which is currently a recognized definition in academia.

It is impossible to reach an agreement on a single definition of resilience; instead, various types of resilience depending on the situation should be properly defined. Compared with the definitions proposed in the three points of view, the definitions of resilience should reflect some shared elements. Resilience is a dynamic process that can be enhanced or learned, starting from exposure to adverse conditions and related to the experience. Cancer as a potentially traumatic event is the most common form of adversity identified (Cosco et al., 2017). When a cancer event occurs, it must be considered to be physically and/or psychologically traumatic for patients and spouses. Nevertheless, despite facing adversity and caregiving burden, most caregivers appear to have no trouble adapting to the new condition and even improve their ability to adjust (Applebaum, 2019; Rutter, 2012). Positive emotions and a satisfactory health-related QoL are shown by those who follow a resilient trajectory. For example, a study reported that more than half of caregivers reported positive outcomes of caregiving from diagnosis to treatment even bereavement (Palacio et al., 2018).

In conclusion, resilience is defined as a dynamic process of effectively adapting to adversity, trauma, or significant sources of stress (American Psychiatric Association, 2020). The validity, reliability, comparability, and transferability of study results would increase with uniformity in the conceptualization and definition of resilience. Therefore, for spousal caregivers of patients with advanced cancer, resilience can be defined as the process of spouses adjusting to advanced cancer caring (a sign of rebounding), capacity to provide informal care for the patients suffering from cancer (a sign of managing), and successfully coping with situations of caregiving stress and burden (a sign of adaptation). This definition highlights the interaction between the influence of the stressor, internal and external resources, and the coping processes that are effective and the successful outcome, indicating resilience. In this study, resilience is viewed as a dynamic process, otherwise, it would not make much sense to assess it with the purpose of enhancing it and assisting people afterward.

Criteria for an identity of resilience

Most often, resilience is understood to exist when no disorder is diagnosed (meaning that exposure has had a minimal effect), when the disorder was previously present and the individual is recovering, or when an individual exceeds expectations and performs better than they did before being exposed to a potentially traumatic event (Bonanno et al., 2011). Although the use of the diagnosis is certainly unconventional, its application aims to position the diagnosis of resilience as one part of an extensive mental health examination. For depression, anxiety, and PTSD, psychologists usually apply cut-off scores or standard deviations from established psychopathological testing tools to assess resilience. For instance, the absence of depression as a psychological component is the most common form of positive adaptation (Cosco et al., 2017). Therefore, the high variability in the prevalence of psychopathology across studies is most likely caused by diagnostic imprecision and selection or response biases.

Individuals' measures of mental health can also mention a broad sense of resilience. Over the past several years, there has been growing evidence that serious life events and life-threatening illnesses may result in both increasing psychological distress and benefiting positive life changes (Thornton & Perez, 2006; Weiss, 2004). In this context, benefit-finding or posttraumatic growth may be viewed as indirect pathways of resilience. On the other hand, researchers have developed specific tools to assess resilience, focusing on the particular resistance against psychological distress (e.g., the Connor-Davidson Resilience Scale, and the Resilience Scale). Because the methods of mental health measurement are complicated and the standards are inconsistent, so far there is no uniform standard in academia.

When investigating resilience, we focused on biopsychosocial resources and mental health. In this way, the process of assessing resilience informs more comprehensive treatment strategies, just as a childhood resilience diagnostic approach (Ungar, 2015). Not only is the goal to reduce the incidence of mental disorders, but also to improve the ability of individuals to deal with adversity. Some resilience measures can be employed to distinguish between persons who have less or more resilience depending on varying degrees of illness severity, and to assess the response of resilience to treatment in clinical settings.

The prevalence of resilience trajectory

The prevalence of resilience trajectory in caregivers has varied due to different criteria (e.g., different self-report questionnaires or clinical interviews), different research designs (cross-sectional, prospective or longitudinal), different event types (e.g., military, accidents, health events), different primary outcomes (e.g., PTSD, anxiety, depression, well-being or other psychological function) and different time intervals (from few days up to three-five years) used. These create difficulties in comparing prevalence across studies, even if study target populations encounter similar adversities. In view of time of assessment, mostly the level of mental health is based on a single measurement meaning at a one-time point, and is likely to underestimate the different patterns of resilience. The trajectory of resilience would be a more accurate measure if repeated or continuous assessment of the same individuals is possible in a population (Bonanno, 2004; Galatzer-Levy et al., 2018; Murphy et al., 2020). Numerous researches have been conducted providing evidence about the prevalence of resilience trajectories in many populations in the face of various adversities (Cosco et al., 2017).

There were different levels of resilience of caregivers across the phases of the disease caregiving trajectory. Despite facing similar adversities in the caregiving context, some caregivers were able to achieve a state of “normal” rather quickly, while for others, a steady state seemed elusive. A longitudinal prospective study (Chen, 2014) assessed resilience in family caregivers of patients with advanced oral cavity cancer at four-time waves: end of treatment, 1, 3, and 6 months after completing treatment (T0, T1, T2, T3, respectively). Resilience increased slightly from T0 to T2 and peaked at T2, but declined at T3. Another qualitative longitudinal study examined trajectories of resilience in dementia caregivers over time and found that five participants maintained resilient, three remained non-resilient and four participants became better resilient (Donnellan et al., 2018).

Longitudinal studies have identified four patterns of trajectories of response to adversities including resilience, recovery, delayed onset, and chronic stress (Bonanno, 2004). A meta-analysis study examined the prevalence of response trajectories following potentially traumatic events, showing resilience trajectories were average of 65.7% across populations compared with recovery (20.8%), chronicity (10.6%), delayed onset (8.9%), respectively (Galatzer-Levy et al., 2018). Furthermore, the prevalence of the resilience trajectories also depended on the type of events, but not the severity of the event remaining high even after multiple potentially traumatic events (Galatzer-Levy et al., 2018). For example, caregivers of terminal or advanced cancer patients were identified with four trajectories using clinical depression scores: endurance (32.0%), resilience (11.4%), moderately symptomatic

(36.9%), and chronically distressed (19.7%), respectively (Tang et al., 2013), whereas Dunn et al. (2013) modeled trajectories of resilience in family caregivers of cancer patients, including resilient (56.3%), subsyndromal (32.5%), delayed onset (5.2%), and peak (6.0%), during 25 weeks after patient radiotherapy.

In cancer care, the prevalence of resilience trajectories is important to know, especially in spouses of advanced cancer caregiving events who were the most important caregivers and family members, suggesting that even high rates of resilience could cause considerable population suffering distress.

Resilience in the context of cancer caregiving

According to resilience theory of Bonanno (2015), adult population research has more generally focused on acute types of aversive circumstances that are likely to effect adjustment in a transient and focal manner. Not surprisingly, a resilient outcome following acutely aversive conditions is evident considerably sooner through a positive adjustment (Bonanno, 2005; Bonanno et al., 2011). After life-threatening medical occurrences, such as receiving a cancer diagnosis, the most common outcomes trajectory seen so far is minimal-impact resilience (Elliott et al., 2014). Especially, the first several months following a cancer diagnosis are a critical period during which patients and their spouses are confronted with many physical, psychological, social, spiritual, and existential changes imposed by the disease (Seiler & Jenewein, 2019). Cancer patients and their caregivers could experience similar sufferings and emerge with minimal-impact resilient outcome (Dunn et al., 2013; Rumpold et al., 2016). As described above in the prevalence of resilience trajectory, it is worth noting that it is possible to allow the incorporation of developmental events assessments of minimal-impact resilience using latent growth modeling approaches (Feldman et al., 2009).

Although caregiving is not viewed as a stressful scenario in and of itself, the complex interaction of personal and environmental factors over time determines whether or not the caregiving procedure has to be adjusted (Elliott et al., 2014). The demands of cancer patients (e.g., assisting with activities of daily living, treatment decision-making) and context-related resources (e.g., social support, marital relationships) are dynamic, and changes in any one affect changes in another, and in turn, this influences the functional relationships that determine the experience and trajectory of the caring. These dynamic changes are obvious in the initial year of caregiving. Caregiving causes the stress, strain, and conflicts which could extend to other life domains, and this dynamic occurs over time. Thus, using longitudinal designs was more ideal and reasonable.

As Bonanno's framework reveals, the resilient processes were improved by interacting with intrinsic resources and context-related resources. However, it is unclear what the main predictors for a resilient trajectory are. Advanced cancer diagnosis, which can be viewed as a potentially traumatic event, is rarely followed by a period of stability. This period is mostly dominated by repetitive, stressful incidents (e.g., hospital admissions, financial issues, risk of bereavement or recurrent bad news). These stressors may interfere with a resilient trajectory (Opsomer et al., 2019; Seery & Quinton, 2016). When it comes to cancer care, highly resilient caregivers can protect themselves from stressors and traumatic events and experience lower levels of burden and helplessness across the whole of cancer caregiving (Li, Wang, et al., 2018).

Emotional distress and psychiatric disorders would happen at any time point during advanced cancer caregiving. Longitudinal trajectories of caregiver distress showed the levels of distress of all groups began to stabilize after 6 months until 12 months follow-up (Murphy et al., 2020). Caregivers showed the highest severity of post-traumatic stress symptoms at 3 months when patients were admitted to the treatment, and rates of posttraumatic stress longitudinally in dyads of patients and their primary caregivers were lowest at 6 months (Lyons & Lee, 2020; Meyers et al., 2020). For instance, Lee et al. (2017) investigated family caregivers of patients with head and neck cancer over six months using structured clinical interviews for DSM-

IV. According to their findings, rates of both depression and anxiety decreased throughout the first three months of follow-ups (from 14.7% to 14.6%) and continued to decrease further in the next 3 months (12.9%). In addition, Tang et al. (2013) concluded that depression increased from 45.8% to 54.9% among caregivers of cancer patients over time. These studies provided evidence of a resilience process or a positive outcome throughout cancer caregiving.

To our knowledge, few studies have been published that elucidated the trajectories of psychological resilience of spousal caregivers using positive evaluation and how to evolve across the caregiving period from diagnosis to treatment process. One individual was not expected to demonstrate resilient outcome in all arears and at all times of their life. Therefore, studying the trajectory of resilience over the first six months after the posttreatment period would be an important knowledge gap. It is useful to early monitor caregivers at risk for a major psychosocial dysfunction as early as possible.

Concept of spousal caregivers of advanced cancer

Caregivers provide direct care to those who are chronically ill and who are no longer able to care for themselves. They are often not trained for the caregiver job (American Cancer Society, 2016). Many definitions have been created in the same way to denote informal caregivers or family caregivers (Applebaum, 2019). A caregiver is anyone who provides help and protection to another person in need. A family caregiver refers to an unpaid family member, friend, or neighbor who looks after relatives and loved ones who have an acute or chronic condition and need assistance to manage a variety of tasks. They are also referred to as “informal caregivers” (Reinhard et al., 2008). Family caregivers of cancer patients offer care for their loved ones during cancer treatment in different roles, such as medical and financial decision-maker, patient advocate, and care provider. These roles shift as the patient’s needs change during and after cancer treatment (National Cancer Institute, 2022). In China, family caregivers are family members who has blood relations or a legal relationship with patients, and provides unpaid care for a patient, including the patient’s spouse, adult child, sibling, parent, and other relatives, typically unpaid. In this study, caregivers were defined as family members who provide daily care for their cancer patients.

In practice, most caregivers set their own demands and feelings aside to focus on the patients with cancer and the many tasks of caregiving (Reinhard et al., 2008). Moreover, the largest proportion of those caregivers was spouses in many countries (García-Torres et al., 2020; Stenberg et al., 2010). Previous research discovered that spousal caregivers tended to make greater sacrifice and be more affected by the disease during the caregiving period (Li et al., 2018). Spouses of advanced cancer patients are at great risk for adverse consequences, which is probably owing to increased demand for physical care of the patient and more emotional concerns like the fear of death (Ketcher et al., 2019; Rumpold et al., 2016). Additionally, witnessing the deterioration and dealing with impending loss may cause psychological distress or depression for spousal caregivers (Ketcher et al., 2019; Kim & Schulz, 2008; Stenberg et al., 2010). There is evidence that advanced cancer caregiving stress has a great impact on psychological and physiological health and even mortality in spouses (Ketcher et al., 2019). Hence, it is important for health professionals to pay attention to spousal caregivers in health care.

Caregivers’ roles are highly variable over time. In the Chinese family culture, the spouse has a traditional role of nurturing and attending to the needs and health of her ill partner. Once a patient was diagnosed with advanced cancer, the spouse has to take on the role rapidly as treatment decisions are made according to medical advice. Cancer therapy, whether it is curative or palliative, can be a demanding period for the patient and spouse both physically and emotionally. As the disease evolves, impairment and symptom progression are major sources of suffering. Lastly, when nearing death, grief that is anticipated can be quite difficult (Schulz et al., 2016). Spousal caregivers must deal with new challenges at each phase of the caregiving trajectory.

The stresses and changing roles along with the caregiving trajectory influence the social, emotional, and physical health of the spousal caregiver over time. The research had shown that the most obvious signs and symptoms of caregiving stress were often psychological issues (Li et al., 2013; Stenberg et al., 2010). The level of psychological distress reported by the caregiver of the cancer patient can be equal to or greater than that of the patient (Hodges et al., 2005; Li, Wang et al., 2018). In addition, those showing higher levels of emotional distress also demonstrated more problems with fatigue, sleep disorders and unhealthy behaviors (Fletcher & Sarkar, 2013). Despite the distress and burden, the large group of caregivers seems to adjust well to the new condition; this process is called resilience (Cosco et al., 2017; Opsomer et al., 2019). Family caregivers who followed a resilient trajectory reported having a status of healthy function or even found benefits in caregiving (Bonanno, 2004; Chen et al., 2020; Hwang et al., 2018). Hence, resilience seems to buffer against psychological problems.

Chinese families share some common values and morals that have been an important part of daily life for many centuries. A Chinese social expectation was that the family has to help and care for each other when a family member is faced with difficulties or illness. Research showed that spousal caregivers had a greater burden of caregiving than lineal blood relatives did (Wang et al., 2011). Spouses are often the first in line to assume caregiving responsibilities. The multiple needs of cancer patients put the spousal caregivers at risk of poor health. To sustain a positive health state for the patient and family, spousal caregivers use positive psychological resources to deal with stress and mood changes, and reduce anxiety. Therefore, the evaluation of spouses could help health professionals pay more attention to the capacity and willingness of the individuals to change in response to the situation.

Instruments for assessing resilience

There is no universal measurement of resilience level or resilient trajectories so far due to conceptual heterogeneity. Resilience cannot directly be tested due to the unobservable nature of the construct; instead, it can be inferred through measurements of its two basic constituent components (Luthar et al., 2000). As a result, there are several methods in which these components can be operationalized to identify resilient individuals. Two popular approaches to operationally defining resilience in longitudinal research are behavioral symptom methods and questionnaire measurement.

One important method is to assess individuals' behaviors and symptoms in a negative or positive state. The positive approach mainly focuses on the indicators of progress made in the process of individual development or growth. Resilience was defined as having more positive psychological outcomes like successful adaptation, well-being, positive coping. For example, Gibbons et al. (2019) used wellbeing scale like life satisfaction. Meanwhile, Bookwala (2014) used mastery and self-esteem to identify resilience. In addition, some studies appraised resilience by using the continued avoidance or absence of such as anxiety, depression, post-traumatic stress disorder or traumatic grief. For example, Elliott et al. (2014) followed up with 108 female caregivers of a traumatic spinal cord injury using a depression scale and found three groups of caregivers in the latent growth mixture modeling: chronic (24%), recovery (24%) and resilient (52%). These are the simplest and most easily practical methods for operationalizing resilience across time. Nevertheless, shortcomings of behavioral symptom methods are obvious in that individuals are unable to uphold optimal states of functioning using a binary threshold. Not employing a resilience tool may bring difficulties for longitudinal studies in cross-study comparisons.

Recently, resilience questionnaire measurements have been widely used such as the Connor-Davidson Resilience Scale (CD-RISC), the Brief Resilience Scale (RS), the Resilience Scale (RS). Windle et al. (2011) reviewed fifteen measures of resilience in different fields. Some scales measure resiliency as a stable trait, others the ability to cope and recover from stress, and others measure the protective factors available to the individual (Chmitorz et al., 2018). Furthermore, some research developed specialized tools to assess caregivers' resilience. For example, Maneewat et al. (2016) developed a 30-item Thailand caregivers resilience scale for caregivers of older dementia patients, but it was in the early stage of development and lack of relevant validation statistics in practice. These approaches were created on the assumption that resilience is a broad notion that can be operationalized universally across populations and different ages by using a single scale. Repeat observations of resilience captured by psychometric scales are employed to explore continuity or change in resilience over time (Cosco et al., 2017). Currently, validated resilience instruments measure specific populations and vary in length and format. While there are dozens of resilience measures, including child, adolescent, and adult, we narrowed them down to the three most popular and best empirically-based resilience scales for informal caregivers.

Connor-Davidson Resilience Scale (CD-RISC)

This scale was developed at Duke University to address resilience-related issues and to be used in clinical practice and research as a measure of ability to cope with stress (Connor & Davidson, 2003). It is one of the most often used tools for evaluating resilience among adults. The CD-RISC is a common measure that can be used in various research populations. Each item is rated on a five-point scale (from 0 = not at all true to 4 = true nearly all the time). There are three versions: 25 items, 10 items and 2 items (CD-RISC-25, CD-RISC-10, CD-RISC-2, respectively).

The original English CD-RISC is a 25-item scale that has been translated into over 50 languages (e.g., Chinese, Spanish, Indian, Thailand, Turkish, Korean, German, Japanese) and studied in a variety of populations such as members of different ethnic groups and cultural backgrounds, adolescents, seniors, family caregivers, patients with various diseases, military personnel, medical students, general students, social workers, and even some professional or athletic groups (Baek et al., 2010; Gras et al., 2019; Karaırmak, 2010; McGillivray & Ho, 2016; Yu & Zhang, 2007). The original CD-RISC includes five dimensions: personal competence, trust/ tolerance/ strengthening effects of stress, positive acceptance of change and secure relationships, control, and spiritual influences. The factor structure of the CD-RISC has been investigated in several research with varied populations and been reported inconsistent findings: five-factor different from the original study (Baek et al., 2010), four-factor (Kidd et al., 2019), three-factor (Yu & Zhang, 2007), two-factor (Green et al., 2014), and single-factor structures (Gucciardi et al., 2011). Owing to the factor model instability, the developers recommended not scoring the subscales separately and scoring the CD-RISC as unidimensional in this study (Connor & Davidson, 2003).

The original CD-RISC-25 has a good validity. The original scale demonstrated convergent validity with a hardiness scale ($r = .83$, $p < .001$) and a perceived stress scale ($r = .76$, $p < .001$). Moreover, the original scale had good reliability in psychometric properties (Cronbach's alpha = .89; test-retest reliability $r = .87$) (Connor & Davidson, 2003). The Chinese version of CD-RISC-25 was first translated by Yu and Zhang (2007). The authors reported the scale also showed high predictive validity and internal consistency in the Chinese population. The validity was verified that it was significantly correlated with self-esteem, life-satisfaction and personality. The reliability coefficient of the Chinese version of CD-RISC-25 was an alpha value of .91. Using confirmatory factor analysis (CFA), there was a three-factor model that emerged in a study of 560 Chinese residents of Guangdong and Beijing: 13 items tenacity (alpha = .88), 8 items strength (alpha = .80), and 4 items optimism (alpha = .60).

The overall scores range from 0 to 100 with higher scores indicating higher resilience. Meanwhile, there is no proposed cut-off value. In 115 Chinese patients, a cut-off value of 45.5 identified the participants with more than moderate PTSD symptoms (sensitivity= 57.8%, specificity= 91.4%), whereas a cut-off point of 57.5 identified the participants with psychological distress using the Symptom Checklist-90 (sensitivity= 73.0%, specificity= 62.8%) (Peng et al., 2014).

There are two brief versions of the 25-item CD-RISC. The first brief version is the 2-item (CD-RISC-2), which is based on items 1 and 8 from the original scale and can score from 0 to 8 (Vaishnavi et al., 2007). The CD-RISC-2 measures the characteristics of resilience, but does not evaluate the resiliency process or provide information about theories of resilience. The other one is the 10-item CD-RISC which is based on items 1, 4, 6, 7, 8, 11, 14, 16, 17, and 19. The CD-RISC-10 can range score from 0 to 40. The CD-RISC-10 was developed by Cambells-Sills and Murray Stein (2007). They found construct validity through a strong positive correlation between CD-RISC-10 total and subscale scores ($r = .93$, $p <.001$). Nonetheless, this study was to investigate the trajectory of resilience, and used the longer version which can provide more details on the components of resilience. Therefore, this study used the 25-item Chinese version to explore the trajectory of spousal caregivers to bounce back from cancer events and their caregiving.

Brief Resilience Scale (BRS)

The BRS was developed based on 195 American undergraduate students (Smith et al., 2008). The BRS operationalizes resilience as the self-perceived capacity to bounce back, and aims to assess resilience as an outcome and assesses the individual's ability to cope and recover from stress. The original BRS demonstrated convergent and discriminant validity, test-retest reliability, sufficient factorial, and good internal consistency. This tool is a 6-item self-report instrument via the positive psychology toolkit which measures the ability to bounce back from stress on a five-point Likert scale (from 1=strongly disagree to 5=strongly agree). Higher average scores indicate higher levels of perceived resilience. Three items are reverse-coded before scoring. Internal consistency was good, with Cronbach's alpha ranging from .80 to .91, and a test-retest reliability of .69. Smith and colleagues found an average score of 3.70 in 844 participants sample with a mix of healthy people and people suffering from diseases (Smith et al., 2013), suggesting that scores below 3.00 be considered low resilience and above 4.30 be considered high resilience.

It has been translated into many different languages and adopted by different research populations. In previous research, the BRS demonstrated good levels of reliability with estimates of Cronbach's α ranging from .71 to .91 reported in validation studies of workers, university students and patients with cancer or heart conditions in China, Germany, the Netherlands, France, Spain and the United States (Chmitorz et al., 2018; Fung, 2020; Jacobs & Horsch, 2019; Lai & Yue, 2014). The Chinese version of the BRS was first translated by Lai & Yue (2014). This scale showed acceptable internal consistency, with Cronbach's α values equal to .72 and .76 in mainland Chinese and the Hong Kong samples, respectively. The BRS was also used to measure resilience in family caregivers of cancer patients showing good reliability coefficients (Cassidy, 2013; Lim et al., 2014).

In contrast to the unifactorial model in the original scale (Smith et al., 2008), it has been widely supported and discussed in the literature that the BRS has a two-factor structure. Many studies have used confirmatory factor analysis to verify the underlying factor structure of the scale, indicating that it includes two latent factors, namely the positive items related to resilience (1, 3 and 5) and the negative valence items related to succumbing (2, 4 and 6) (Fung, 2020; Rodríguez-Rey et al., 2016). This finding may represent actual distinctions in the meaning of resilience between cultures or populations.

Criterion validity was established by negative relationships between the BRS score and depression, anxiety, PTSD symptoms and emotional exhaustion, and a positive correlation with well-being, optimism, self-esteem, self-efficacy and mental health in the resilience literature (Jacobs & Horsch, 2019; Rodríguez-Rey et al., 2016; Smith et al., 2010). They are in line with the more general notion that the ability to bounce back promotes individuals' physical and mental health. The BRS is viewed more closely related to the original concept of resilience and can be used to evaluate an individual's ability to bounce back or recover from challenges (Smith et al., 2008; Smith et al., 2010). However, the BRS was too short for assessing changes in spousal caregivers' resilience, and it also did not explain the resources and assets that could facilitate the outcome. Therefore, the BRS is useful either as a quick screen or as a brief measure of resilience.

The Resilience Scale (RS)

This scale is to evaluate the individual's ability to cope with and respond effectively to various life stressors (Wagnild & Young, 1993). According to Wagnild and Young (1993), the RS is the first instrument developed to assess resilience directly, and it is currently used around the world. This is a psychometrically sound measure with high scores indicating higher resilience. It is a 25-item scale (RS-25) rated on a 7-point Likert scale measuring two factors: 17-item personal competence, and 8-item acceptance of self and life. This scale was firstly developed on a sample of community-dwelling older adults. Cronbach's alpha coefficients ranged from .72 to .94 supporting the internal consistency reliability (Wagnild, 2009). Despite being widely used, the element structure of the RS-25 is still debatable, and some studies have shown that a single-factor structure is superior to the original two-factor version (Ruiz-Párraga et al., 2012). Following the validation of the RS-25, numerous studies have utilized this instrument for individuals of different ages and ethnic backgrounds, and a 14-item version (RS-14) was created and validated (Wagnild, 2009).

The RS-14 was used to evaluate the degree of resilience. The RS-14 was a single-factor structure instrument, including a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). It exhibited an excellent reliability ($\alpha = .96$) and the test-retest reliability was .736 (sensitivity=59.5%, specificity=83.7%). The RS-14 has been utilized with a range of people of various ages, socioeconomic backgrounds, and educational levels, and has shown to be an adequate and reliable measure to assess resilience (Wagnild, 2009). According to a methodological review, the RS is the most appropriate tool to assess resilience in the adolescent population due to the psychometric features of the instrument and its applications (Windle et al., 2011). In addition, the 7-point Likert options could cause participants to have difficulty choosing. Therefore, this study did not use this scale.

In summary, resilience can be best operationalized in a longitudinal context in which a person's psychological response to adversity is tracked over time in this study. Hence, the CD-RISC is considered to relate more closely to the original meaning of resilience. This is consistent with the concept of the Bonanno's frameworks. In relation to the definition in this study, and considering that CD-RISC is used by many organizations and shows high reliability, this instrument was chosen as the most appropriate tool for assessing resilience in this study. This scale is also available for free from the developer.

Factors associated with caregivers' resilience

Many researches using cross-sectional and prospective studies addressed protective or risk factors for resilience among caregivers of patients with various diseases like dementia, cancer. Many studies and frameworks of resilience have proposed that both risk and protective factors, internal and external to the individual act a role as a potential cause of resilience (Bonanno et al., 2015; Dias et al., 2015; Kumpfer, 1999; Manzini et al., 2016; Palacio et al., 2018; Rutter, 2012; Southwick et al., 2014; Sun et al., 2021; Sun et al., 2023). Some systematic reviews converged in the following ways. Risk factors of resilience that have relevant associations include the type of stressful events (e.g., types of cancer, cancer staging, severity and course of the disease), the variety of stressors (e.g., caregiving burden, financial strain, working pressure) or negative response (e.g., avoidance, isolation) (Palacio et al., 2020). Protective factors of resilience that mediate negative outcomes include social support, positive coping strategies, self-efficacy, high quality of the marital relationship, spirituality, self-esteem, pre-adversity, and hoping (Sun et al., 2021). In fact, factors related to resilience may be complex and changeable. According to the empirical study, resilience is associated with a wide range of biological, psychological, social and cultural elements that interact with one another to influence how one reacts to stressful situations.

Biological factors

Biological aspects associated with resilience include hormonal responses to stress and epigenetics. When exposed to potentially traumatic stress, the body’s autonomic nervous system could release the hormones epinephrine and norepinephrine; meanwhile, the hypothalamic pituitary axis may stimulate the release of cortisol, the “stress” hormone. These hormones have a wide impact on physiological functions and regulation of thoughts and emotions (Sherin & Nemeroff, 2011). For instance, resilience was significantly positively correlated with urinary cortisol in young adults (Simeon et al., 2007). On the other hand, genetic factors contribute significantly to resilient responses to trauma and stress, especially epigenetics also allows an individual a means of adaptation, resilience, and survival (Hornor, 2017). Early-life stressor exposure can induce epigenetic changes to match an organism’s adaptation to its surroundings and reduce the risk of illness. Studies have demonstrated that polymorphisms of the serotonin transporter gene may be related to resilience in individuals who were exposed to psychosocial traumas (Sapienza & Masten, 2011). Alternatively, sometimes these epigenetic changes can have slow but devastating consequences. It is thought that the risk of disease could increase when the ability to deal with the stresses in the current environment and the phenotypic consequence of the epigenetic modifications are incongruent (Hornor, 2017). Regrettably, there is little evidence of how hormones and epigenetics play a role in caregivers of cancer patients. Over the past decades, most work has concentrated on the biological distinctions between resilience and susceptibility in animal models, or in the development of children or adolescents.

Other biological factors related to higher levels of resilience were age, ethnicity/race, and gender. Firstly, there is a significant relationship between resilience and aging, which indicates that higher resilience was associated with increasing age (Opsomer et al., 2019; Simpson et al., 2015; Tang et al., 2013), whereas Jones et al. (2015) found the elderly spousal caregivers had lower levels of resilience than the adult general population. The relationship between gender and resilience in caregivers was a little complex; Street et al. (2010) hold that the high level of resilience displayed by the majority of wife caregivers, but Bookwala (2014) identified that women's resilience scored lower than men's. One study investigated that gender and resilience had no significant relationship (Simpson et al., 2015). Although there is evidence that the duties of caregiving do not vary by caregiver race or ethnicity, there are racial and ethnic differences in expressions of stress and degrees of resilience. (Joling et al., 2016; Rote et al., 2019; Toledano-Toledano et al., 2021). Toledano-Toledano et al. (2021) identified differences in the level of resilience between Christians and Catholics, and the Catholics with higher resilience ($p <.05$) while the level of resilience in gender was no difference ($p> .05$). These inconsistent results might be attributed to the use of different resilience instruments, different samples and sample sizes, and non-standardization of the test procedure.

Psychological factors

A range of psychological factors that contribute to resilience has been verified. The psychological aspects mainly include positive personality trait, cognitive flexibility, anxiety, depression, and coping styles (Harmell et al., 2011; Iacoviello & Charney, 2014; Palacio et al., 2020; Sun et al., 2021). As the above reviews, most research correlated the negative and positive psychological factors with resilience. In many studies, the role of resilience as a mediator between psychological factors and adaptation to the caregiving experience has frequently been studied.

Caregiver personality traits that were found to be associated with outcomes included self-control, self-efficacy, self-confidence, and self-esteem, optimism. These caregivers are capable of maintaining normal function, managing stress, staying positive, and having a sense of humor. A recent review found that the higher degrees of personal mastery and self-efficacy, and increased use of positive coping strategies appear to have a protective effect on a range of health outcomes in caregivers of dementia (Harmell et al., 2011). Moreover, mindfulness considered as positive thoughts and optimism may be critical for lower levels of anxiety and depression (r=-.26 to -.37, p< .05) (Jones et al., 2015). In addition, self-efficacy (r= .15, p< .01) (Cassidy, 2013), self-esteem (OR =1.82, 95%CI=1.12-2.94, p< .05) (Hwang et al., 2018), self-confidence (OR=.26, 95%CI=.10 -.65, p<.05) (Tang et al., 2013) were related to resilience. Therefore, people with optimism, high levels of self-efficacy, self-confidence, and self-esteem may be more resilient to stressful situations, which may reduce vulnerability to burden.

Cognitive flexibility refers to the ability to accept stress, trauma or failure as ingredients for growth, which allows an individual to maintain positive emotional perception, regardless of the caregiving difficulties (Iacoviello & Charney, 2014). Caregivers with positive cognitions and attitudes towards their caring had lower degrees of caregiver burden (β= -.28, p< .01) (Bekhet, 2013), higher levels of resourcefulness (β= .56, p< .001) (Bekhet, 2013), and better mental health (β=0.29, p< .001) (Cassidy, 2013). Most caregivers used perceived positive aspects of caring as coping strategies were the main predictors of the burden of caregivers of patients with advanced cancer (β= .48 p< .05) (Palacio et al., 2018). In contrast, family caregivers sometimes suffer negative cognitions, including feeling hopeless, catastrophizing, and blaming, as a result of demanding caregiving activities (Teahan et al., 2018). If maintained, these negative cognitions lead to caregiver burden increasing (Shim et al., 2012), poor physical health outcomes (López et al., 2015), or may prevent caregivers from finding meaning or benefit in their caregiving roles (Ali & Bokharey, 2015).

Caregivers reported higher levels of resilience and exhibited fewer symptoms of anxiety and depression. Anxiety and depression were closely associated with lower resilience (OR=3.12, 95% CI=1.5- 6.13, p= .001,) (Hwang et al., 2018).

However, one study found that resilience had not a significant influence on emotional distress (r=-.08, p>.05) (Palacio et al., 2018). Furthermore, family caregivers of children with cancer reported high levels of resilience, which were negatively associated with anxiety and depression (β=-.189, t=-3.43, p< .05), and were associated positively with psychological well-being (β=.242, t=4.77, p< .01) (Toledano-Toledano et al., 2021). Hence, psychological distress like anxiety, depression, is a risk factor to decrease resilience but future researchers may need to think about confounding variables.

Coping style includes positive and negative coping strategies. Generally, high scores in resilience were associated with positive coping strategies according to cancer-specific situations (Palacio et al., 2020). Positive coping skills appeared to have a protective effect on resilience in spousal caregivers of cancer (r=.34; p<.05) (Luo et al., 2020). An active coping style correlated with high QoL, good mental health, and personal resources could improve the caregiving experience within the chronic illness context and reduce caregiver burden (Palacio et al., 2018). Negative coping strategies included defensive, avoidance, emotional coping. Less active coping strategies contributed to depressive symptoms and poorer perceptions of overall health among caregivers. For example, the avoidance coping techniques were found to mediate the relationship between stress and depressive symptoms (β= .37, t= 3.35, df = 124, p = .001) (Mausbach et al., 2012).

Social factors

Social factors involved illness-related factors of caring for patients, including relationship with patients, employment status, income, and education, among which illness-related factors include types of cancer, cancer staging, illness timeline, and treatments. First, the challenges posed by the process of cancer diagnosis and treatment, and the changes in the relational dynamics between cancer patients and their carers, can have an impact on the QoL of both patients and their spouses (Li et al., 2016). Although some literature found that the type of cancer treatment influenced caregivers’ health (LeSeure & Chongkham-Ang, 2015; Lin et al., 2020), many studies testified that the type of treatment was not correlated with caregivers’ mental health (García-Torres et al., 2020; Kitrungrote & Cohen, 2006). Caregivers’ resilience was not directly related to the severity of the cancer stage when the authors compared the different cancer stages of head and neck cancer (Simpson et al., 2015), while caregivers’ resilience had been influenced by the cancer stage and time since cancer diagnosis (Chen et al., 2020). Therefore, the illness-related risk is a factor influencing caregivers’ resilience, but whether to increase it or not still needs to be confirmed according to the disease context.

Secondly, prior studies reported that spousal caregivers showed higher levels of resilience than other family caregivers and high-quality relationships between spouse and patient may be protective for caregivers’ health (Li et al., 2016; Teahan et al., 2018), because caregivers with supportive spousal relationships had significantly greater caregiver self-esteem, lower levels of anxiety and depression. Li et al. (2016) showed that an improved dyadic relationship after the diagnosis of cancer was associated with lower role emotional burden and more vitality. Moreover, dyadic adjustment was related to spouses' mood disturbances (r= -.49, p = .001) and mental health functioning (r= .35, p = .02) (Sterba et al., 2011). These findings serve as a reminder that developing the relationship of couples may be a useful strategy for boosting the couples’ health in their journey of coping with cancer together. Again, the characteristics of spousal caregivers, such as education, employment status, and family income were identified as being related to caregivers’ health (Li et al., 2016; Teahan et al., 2018).

To our knowledge, social support and care burden were predictive factors of resilience in caregivers that have been verified in numerous studies (Joling et al., 2016; Manzini et al., 2016; Palacio et al., 2020; Sun et al., 2021; Teahan et al., 2018). Social support, emotional, instrumental and informational, was a major predictor of resilience in caregivers. When the family caregiver received support from outside the home, their protective factors increased. These factors included the number of friends and family members who helped the caregiver, assistance from professional health providers and social workers, and the positive attitude of the caregiver. An empirical link between perceived social support and the minimal-impact resilience trajectory has been found. in the framework of resilience of Bonanno (2015). Past studies found that social support can have a beneficial effect on the resilience of caregivers and can help alleviate caregiver burden (Costa et al., 2017; Del-Pino-Casado et al., 2018). Meanwhile, low caregiving burden were positively related to caregiver resilience. The Spanish research team found that higher levels of caregivers' resilience were related to lower caregiver burden and higher social support (Ruisoto et al., 2020).

Overall, there appears to be a connection between caregiver outcomes and social factors; however, it is still unclear whether this association is direct or indirect. Thus, to achieve a better understanding of the resilience of caregivers coping with cancer and the factors affecting it, some social factors such as social support, caregiving burden or other social factors need to be investigated and analyzed as potential influencing factors in the future study.

Cultural factors

Cultural factors of resilience consider how culture aids individuals and communities to overcome adversity. In other words, people can cope with and overcome adversity, not just based on individual characteristics alone, but also from the support and influence of larger sociocultural elements (Frison et al., 1997). For example, Frison et al. (1997) indicated that the presence of cultural factors was associated with better adjustment generally in relation to high-risk exposure to maladjustment. Clauss-Ehlers and Weist (2004) described "culturally-focused resilient adaptation" as how culture and the sociocultural context have an important effect on resilient outcomes. Raghavan and Sandanapitchai (2019) revealed that Asian participants scored significantly higher on resilience scores in a culturally diverse population.

Cultural values can reduce caregiver stress. Cultural values are influenced by caregivers' beliefs on the concept of family harmony as represented by filial piety, which is utilized to influence attitudes toward actions involving help-seeking (Taylor & Jones, 2020). There is evidence to suggest that these cultural beliefs may have an impact on key elements of the caregiving process, including caregivers’ appraisal of stress, informal and formal support, and coping strategies (Sun et al., 2012). The theoretical research on spirituality has also highlighted the close relationships between spirituality and resilience, with many multi-dimensional definitions of resilience incorporating spirituality (Kumpfer, 1999; Richardson, 2002). There is some evidence suggesting that spirituality and religion as cultural characteristics had a positive impact on caregiver outcomes (Gibbs et al., 2020; Simpson et al., 2020; Teahan et al., 2018). Furthermore, some studies demonstrated that spirituality had a protective relationship with negative affect, decreased anxiety and depression, and a positive association with positive affect (Gibbs et al., 2020; Simpson et al., 2020). Now there is a growing attention on the ways in which individuals draw on cultural practices, beliefs, and religion to endure and recover from a variety of challenges.

In sum, resilience is a dynamic process believed to arise from interactions among biological, psychological, social and cultural factors. Although resilience factors discussed above did not cover the whole scope of resilience factors found in the literature, they do act as a reference to potential future research fields.

Selected predictive factors of caregivers’ resilience

Caregiver burden

Caregiver burden refers to an individual’s subjective perception of tasks performed by him or her for the impaired person, or to personal and individualized reactions to caregiving behaviors (Liu et al., 2020). Caregiving burden affected resilience, which offered a negative effect on psychological distress. Reducing caregiving burden is believed to be a factor in enhancing the level of resilience.

Several studies found caregiver burden was negatively associated with resilience (Hwang et al., 2018; Li, Lin, et al., 2018; Li et al., 2019; Palacio et al., 2018; Saria et al., 2017; Tang et al., 2013; Üzar-Özçetin & Dursun, 2020), and was the best predictor of depression of family caregivers (García-Torres et al., 2020; Su et al., 2021; Tang et al., 2013). For example, Üzar-Özçetin and Dursun (2020) studied reported that resilience had a mediate effect on the caregiver burden (β= .203; 95% CI= -.374 – -.018) and positively predicted the QoL (β = .431; 95% CI= .683 – .207) among family caregivers of cancer survivors. Moreover, caregiver burden was related to and predicted anxiety of spousal caregivers in the first six months after patient cancer diagnosis. For example, Milbury et al. (2013) revealed that caregiver burden remained stable and even increased over time, and caregiving-related health problems of spouses at baseline were significantly associated with three-month ($p< .001$) and six-month ($p= .01$) follow-up psychological distress in both patients and their spouses. Furthermore, there was evidence that spouses' reports of financial strain (t=2.53, $p= .01$) and lack of support (t= 1.74, $p= .08$) at baseline predicted their own distress at the six-month.

Recently, a longitudinal study showed that higher caregiver burden was highly correlated with negative psychological state at all evaluation points among partners of men diagnosed with prostate cancer (Hyde et al., 2018). In addition, García-Torres et al. (2020) performed a longitudinal study at 45-60 days after diagnosis (T1) and 180-200 days after diagnosis (T2). There were no differences in caregiver burden comparing T1 with T2, but almost all burden domains were related to anxiety and depression at T2. According to multiple regression analysis, the emotional burden (T1) was associated with both anxiety and depression (T2) in caregivers after the partner cancer diagnosis. At the beginning of the terminal period compared to the beginning of the palliative period, more caregivers were depressed (30% v. 9%, $p = .02$) and they had a higher level of perceived burden (26.2% v. 19.4%, $P = .02$) (Grunfeld et al., 2004). Therefore, caregivers' burden is the most important predictor of mental health such as anxiety and depression.

Overall, a significant correlation between caregiver burden and mental health has existed in the literature. Resilience change is different from anxiety and depression. How caregiver burden influences caregivers' resilience should be investigated in the Chinese cancer caring context.

Spirituality

Spirituality is a complex multidimensional concept that includes religion, faith belief and opinion dimensions, and self-actualization (Yeh & Bull, 2009). Spirituality could also be defined as an individual's sense of harmony, purpose, connection to others, and beliefs about the meaning of life (National Cancer Institute, 2015). Besides, spirituality may be discovered and expressed through an organized religion or in other ways, and there is clearly overlap in both. Spiritual and religious faith played an important role in resilient caregivers. Caregivers who were able to find meaning and purpose within the caregiving experience could experience positive caregiving outcomes. The findings of family caregivers of the elderly and spousal caregivers of cancer survivors indicated that positive spiritual well-being was negatively related to mental health (Kim et al., 2011; Yeh & Bull, 2009). Furthermore, healthy spirituality may be associated with increases in both resilience and positive emotions, and resilience and positive emotions also may have a reciprocal influence on spirituality (Smith et al., 2008).

Many caregivers found that their faith, religion or sense of spirituality was a source of strength as they faced life during cancer treatment (National Cancer Institute, 2015). Several studies have addressed the connection between spirituality and resilience (Sun et al., 2021). For example, Kim et al. (2011) underlined that the ability to discover meaning and peace may be a crucial part of overall well-being during the cancer experience for both survivors and their caregivers. Moreover, the association between spirituality and resilience among caregivers was empirically supported by two recent observational studies of family caregivers of chronic diseases

(Jones et al., 2019; Simpson et al., 2020).

In addition, spirituality or religion was often discussed as a form of coping style. There was a significant association between religious coping and caregivers' resilience (Dreer et al., 2019). The authors highlighted that spiritual growth was one of the predictors of caregiver resilience ($R^2= .49$, $F(1, 85) =80.50$, $p< .001$). For example, Newberry et al. (2013) investigated the perceived spirituality in family caregivers of patients with primary malignant brain tumor changes in four- and eight-month following diagnosis. Spirituality scores reported at four and eight months showed no significant difference ($p= .8$), suggesting that spirituality may be a stable trait across the disease trajectory. Similarly, Teel et al. (2001) investigated 83 caregivers' experience of caring for stroke survivors over 1-, 3- and 6 months post-stroke and indicated that neither mental nor physical health was predicted by spirituality over time. Additionally, Frost et al. (2012) studied the spiritual well-being and quality of life of women with ovarian cancer and their spouses over a 3-year period. Over time, spouses had increased difficulty as indicated by the FACIT-Sp item corresponding to 'a sense of purpose' ($p= .03$). The spiritual well-being was strongly associated with physical, emotional, and social well-being.

In sum, based on previous foreign studies, spirituality is found as a positive factor that promotes caregivers' resilience, but further research focusing on causality and the relationship between spirituality and resilience change over time is needed.

Social support

Social support as a significant positive resource can be used to predict the mental health status. Social support refers to any assistance available from other people and social network provision of psychological and material resources aimed at enhancing an individual's capacity to handle stress (Cohen, 2004). The dimensions of social support comprised of emotional, tangible or instrumental, and informational (Cohen, 2004; Higginson et al., 2010). As Cohen (2004) explained, the benefit of social support eliminated or reduced the consequences of stressful situations by promoting fewer threatening interpretations of adverse events and effective coping strategies. In the cancer caregiving context, receiving social support through family and society during stressful times is believed to be a factor promoting the development of resilience and earlier studies have evaluated the roles of social support in enhancing resilience.

In China, the sources of informal social support from family members, close friends, relatives and neighbors, and formal social support from health care professionals, and public services, may positively affect caregivers' psychological well-being, regardless of whether they get formal social support, reducing less burden (Luo et al., 2020). Furthermore, support from family could be a positive resource for reducing depressive symptoms and caregiving burden, and resilience mediated the relationship between social support and depressive symptoms (Ong et al., 2018). Hence, social support could balance the psychosocial demands on caregivers and enhance their physical and emotional well-being so that they can better meet the physical and emotional requirements of patients with advanced cancer.

Prior studies showed that social support was associated with caregivers' resilience (García-Torres et al., 2020; Hwang et al., 2018; Luo et al., 2020; Ruisoto et al., 2020). Hwang et al. (2018) examined the factors associated with family caregivers' resilience in the terminal cancer care setting (OR = 3.70, 95% CI = 1.07-12.87). They identified positive social support remained significantly associated with high resilience in the multivariate regression model. The relationship between social support and resilience is consistent with previous studies. For example, García-Torres et al. (2020) observed that social support had significantly statistical differences between the two evaluation points in a longitudinal research. Moreover, logistic regression analysis showed that more support-seeking and less informational support received at 30-45 days after diagnosis predicted anxiety at 180-200 days after diagnosis (95%CI= .01−.84, *p*=.033), while less perceived available support predicted depression at 180-200 days after diagnosis (95%CI= .5−.97, *p*=.035). Furthermore, Milbury et al. (2013) completed a prospective dyadic study within 6-month follow-ups. The results presented that spouses of lung cancer patients reported significantly greater lack of family support and more health problems at 3-month follow-up than at baseline.

In sum, social support allowed spousal caregivers to reinforce and value extant social support connections, build new social networks and connections with others, and maintain resilience at post-cancer diagnosis. So, it is hypothesized that social support will positively influence resilience process.

Coping self-efficacy

Coping self-efficacy (CSE) in a potentially traumatic situation refers to the perceived capability to manage the internal and external post-traumatic recovery demands for reaching a goal (Benight & Bandura, 2004). They claimed that as it provides a sense of control and encourages adaptive coping, positive self-efficacy is crucial for effective adaptation. Several dimensions have been described as self-efficacy for caregivers' coping, including self-efficacy for self-care, self-efficacy for overmastering cognitions and upsetting thoughts, self-efficacy for managing care recipients' disruptive behaviors, and self-efficacy for handling care recipients' symptoms. In the face of adversity, people with high levels of self-efficacy, trust their own abilities, tend to conceptualize issues as challenges rather than as threats or uncontrollable situations. Compared with general self-efficacy more broadly, coping self-efficacy refers to an individual's judgment about their ability to cope effectively with challenges (Hua & Howell, 2022). Many previous reviews indicated the relationship between self-efficacy in the domain of coping and resilience in caregivers (Palacio et al., 2020; Sun et al., 2021; Teahan et al., 2018).

CSE predicted post-trauma recovery for survivors of different traumatic experiences (Cieslak et al., 2008); domestic violence (Benight et al., 2004); natural disasters (Benight & Harper, 2002); cancer events (Wu et al., 2021). Collectively, these studies support coping self-efficacy as a crucial factor in trauma recovery. In addition, CSE beliefs provide an important target for intervention. All the current evidence-based trauma treatments (e.g., Cognitive Processing Therapy, Cognitive Behavior Therapy) include a component focused on improving self-referent beliefs (Benight et al., 2015). In a meta-analysis, the evidence provided that general trauma-coping self-efficacy can longitudinally predict health-related outcomes (Luszczynska et al., 2009).

Coping self-efficacy has been reported to impact resilience in caregivers, and caregivers with strong coping self-efficacy may be more likely to experience a resilient trajectory (Barakat et al., 2021; Benight et al., 2008; Grano et al., 2017). Social cognitive theory can explain the various factors (e.g., strong coping self-efficacy, task-focused coping) shown in relation to resilience (Benight & Cieslak, 2011). For example, Grano et al. (2017) evaluated whether different self-efficacy dimensions served as a partial mediator between caregiving burden and depression in caregivers of Alzheimer patients. They found that the three self-efficacy domains at follow-ups three months later are significantly and negatively correlated with depression at initial assessment ($p< .05$). In the full causal model, the result indicated that the relationship between burden at initial assessment and depressive symptoms at one year later ($\beta= -.29 - -.30$, $p< .05$), is partially mediated by self-efficacy for controlling upsetting thoughts.

In conclusion, from the systematic review, resilience is related to effective coping, as it protects against negative consequences of burden and distress (McKenna et al., 2022). There is no doubt that high levels of self-efficacy appeared to have a protective effect on increasing resilient outcomes in family caregivers. However, Future research should use longitudinal designs to explore the impact of coping self-efficacy on resilience change in cancer caregivers more directly.

Mutuality

Mutuality is a form of dyadic interaction between two individuals. Mutuality is a process in which partners cooperate to develop a sense of empathy, intimate relationship, and empowerment (Genero et al., 1992). Mutuality was defined as sharing the same meanings, attitudes and orientation between the couple toward the diseases; and it shows interpersonal sensitivity to the degree that one partner is aware of the other partner’s feelings and thoughts in this study. Successful dyadic partnerships caused them to become closer to the adversity they faced through cancer. Caregivers and patients noted that intimacy in their relationships grew as the mutuality in their interactions increased during their illness journey. The co-experiences of suffering together, and communicating strengthen marital relationships (Gibbons et al., 2019). Evidence suggests that high mutuality has protective effects for one or both partners over time, often boosting dyadic confidence during periods marked by uncertainty and suffering, whereas low mutuality is a predictor of caregiver morbidity from role strain and burden (Park & Schumacher, 2014).

When it comes to understanding dyadic coping in the context of cancer, relational mutuality appears as a significant factor (Kayser & Acquati, 2019). The dyads reported high relational mutuality and were socially well-adjusted, despite the patient's health state and their partner’s roles changing over time. Mutuality may be an important factor of dyadic resilience in cancer patient/caregiver dyads. Other studies also suggested that dyadic partners reset their relationships even through the traumatic experience of cancer diagnosis and treatment (Gibbons et al., 2019).

Several studies reported mutuality is a significant predictor of resilience and trauma-related symptoms (Elliott et al., 2014; Gibbons et al., 2019; Lim et al., 2014; Tang et al., 2013). Interaction between couples during long-term caregiving revealed that intimate relationship was related to resilience. Once intimate partners take on new duties as caregivers, everyday couple interaction plays a new and important role in managing both the transition and the adaptation to the change in health status. Gibbons et al. (2019) discovered that spousal caregivers who expressed greater degrees of closeness within their relationship showed significantly higher resilience. Low resilience was linked to poor marital relationships, and resilience presented a dynamic trajectory across time during couple coping processes (Tang et al., 2013). Meanwhile, works of literature from other medical conditions also clearly demonstrated that both resilience and distress after illness are significantly interrelated within dyads (Pan et al., 2017). Conversely, Lyons and Lee (2020) conducted a longitudinal investigation over twelve months and found the relationship quality perceived by the care partner was stable over time and not predicted physical and mental health (B=1.40, SE= 1.69, $p > .05$), only patients reported significantly better mental health when they rated the relationship with their care partner more positively (B=6.31, SE= 2.16, $p < .01$).

Based on the above evidence, the present study examined whether mutuality in dyadic interaction plays a role in high resilience, which may be necessary to better understand the resilience process in the dyadic resilience framework.

Chinese familism

Familism is a central Chinese cultural value. Currently, familism has not been defined consistently in the literature. Familism is composed of common core values, for example, strong family identification, attachment, mutual support, family obligation, and familial interconnectedness (Sabogal et al., 1987; Steidel & Contreras, 2003). Chinese people have emphasized family as the center of life since ancient times, creating a strong sense of familism. Yeh and Yang (1997) defined Chinese familism as an attitudinal syndrome of cognitions, affects, and behavioral intentions towards or about their family, family members, and family-related affairs. Chinese familism included family solidarity and harmony, family prolongation, and family prosperity comprising a familistic attitude (Yeh & Yang, 1997). Yang (2006) hold the same views in attitudinal familism that family members hold towards their own family. This family cultural value may reinforce the use of family caregiving and add complexity to the caregiving experience. As Schwartz et al. (2010) suggesting, it was necessary to consider familism values or briefs when providing caregiver services was which could reduce the potential negative impact of caregiving.

Familism has been linked to psychological health, such as well-being, but also distress (Schwartz et al., 2010). For example, Latinx familism has been found to be more strongly associated with perceived support and closeness which have direct effects on better psychological health (Campos et al., 2014). Chinese cultural beliefs of familism influence the psychological competencies of teenagers raised in poor-single mother families through maternal sacrifice, and this familism belief contributed to the development of a family resilience model applicable to Chinese communities (Leung, 2017). Furthermore, due to the traditional Chinese culture of filial piety, stroke survivors preferred to receive care and support from their spouses and adult children (Mei et al., 2020). In a qualitative study, Chinese spousal caregivers of stroke survivors sacrificed themselves for the care recipients regardless of the hardships and the neglect of their own health, and experienced reciprocal love and increased inner strength (Qiu et al., 2018). In addition, the Chinese government encourages their citizens to take the initiative to care for their loved ones who require assistance. As a result, Chinese familism culture may have a significant influence on the caregiving experience, as caregivers view caring as natural.

On the other hand, familism as sociocultural beliefs of caregiving made caregivers more likely to experience depression and perceived stress. Within the Latinx community, familism has been proven to influence family caregivers' undertaking to meet their caregiving responsibilities which can affect their mental functioning, but also prevent Latinx caregivers from seeking professional services due to greater loyalty to their family, which can then lead to adverse emotional outcomes (Yáñez, 2021). Corona et al. (2017) examined the associations of familism with well-being/health in Latinos and non-Latinos including 171 Latinos, 225 Europeans, and 415 East Asian Americans. The results showed that familism was negatively associated with loneliness ($\beta = -.14$, SE=.02, $p < .01$), depression ($\beta = -.50$, SE= .22, $p < .05$), and physical symptoms ($\beta = -3.37$, SE= 1.18, $p < .05$), and the combination of high familism with high stress was associated with higher self-esteem ($t = -4.55$, p

< .001) and subjective health (t = −3.92, *p* < .001) than the combination of low familism with high stress.

In conclusion, familism occupies an important position in caregiving. However, the Chinese familism value beliefs for informal caregiving are still unknown in modern Chinese societies. Thus, Chinese familism as a kind of cultural factor would make research more novel.

Patients' functional status

Prognostication in advanced cancer is imperfect. As the disease progresses, the performance status of most advanced patients would get worse, because advanced cancer symptoms increase. Advanced cancer can lead to rapid deterioration in self-care ability brought on by progressive complications (e.g., fatigue, pain, sleep disturbance, and lack of appetite) or various treatments (e.g., disease-directed, palliative, or a combination of both) which can be a daunting challenge for family caregivers (National Academies of Sciences & Medicine, 2016). A succession of changes in functional status and self-care ability in cancer patients may influence caregivers' health. Deterioration of the patient's physical function may challenge caregivers' ability to provide care, because the caring ability during one phase of the caregiving trajectory may or may not be enough to meet the demands of the next phase (National Academies of Sciences & Medicine, 2016). Recent studies reported that patients' functional status was a significant predictor of spouse/caregiver health (Breitbart et al., 2002; Chen et al., 2020; Hwang et al., 2018; Li, Wang, et al., 2018; Opsomer et al., 2019). Just as poor performance status can affect cancer patients' resilience (Seiler & Jenewein, 2019), metastasis of brain cancer may increase caregiving coping difficulty that decreased caregiver resilience (Saria et al., 2017).

In a cross-sectional study. Chen et al. (2020) identified that patient performance status was the most robust factor associated with primary caregivers' overall resilience and each domain of resilience (β= .369, *p* < .001). In a longitudinal study, Chen et al. (2020) found that primary caregivers reported lower resilience during the early post-treatment period owing to a decrease in patient performance status within the first 6 months post-treatment. The results showed that worsening patient functional status was associated with poorer QoL of caregivers ($\beta = .21$, $p < .01$).

Goldzweig et al. (2019) surveyed 242 spousal caregivers of cancer patients more than 65 years old. They found that higher levels of functioning in patients were negatively associated with clinical levels of caregiver distress but were not associated with clinical levels of caregiver depression (95%= .21– .87, $p = .019$). Similarly, Breitbart et al. (2002) identified that the patients' performance status (OR = 9.1, $p < .001$) was the most significant predictor of spouse/caregiver distress in hospitalized patients with cancer. Son et al. (2012) investigated patients with cancer and their spouse-caregivers and found that the poor performance status of these patients with cancer was negatively associated with total QoL scores ($B = -4.491$, $p = .012$) and its disruptiveness domain of caregivers ($B = -1.648$, $p = .003$). Similar findings also appeared in other studies (Saria et al., 2017). It is not surprising that the poor functional status of cancer patients is associated with a heavy caregiver burden, and negatively affects caregivers' resilience.

In conclusion, based on the theory and previous studies, patients' health status is a crucial factor in the outcome of resilience. Thus, how patients' functional status affects caregivers' resilience cannot be ignored in cancer care.

Summary

This chapter has been reviewing the literature on resilience among caregivers of cancer patients and their care recipients. Previous studies established various attributes and examined factors of resilience in these groups. This indicates that an extensive literature review revealed the limitation in studies of resilience trajectories of spousal caregivers of advanced cancer patients. There are four major types of causes that explain resilience: biological, psychological, social and cultural. Bonanno's resilience framework provided the theoretical foundation for this research.

The empirical studies were used to develop the hypothetical psycho-social-cultural factors model for resilience. We selected associated factors that nurses can do prevention and intervention related to these factors, including social support, coping self-efficacy, spirituality, mutuality, caregiver burden, Chinese familism and patients' functional status. Further, the independent variables are described and defined with a clear indication of how to affect resilience. The dependent variable of resilience is the CD-RISC defined and discussed as the instrument used to assess resilience.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter presents the methods of the research design, population and sample, instrumentation, protection of human subjects, data collection procedures, and data analysis.

Research design

This was a prospective longitudinal, observational study on the trajectory of resilience in spousal caregivers of advanced cancer patients and its selected predicting factors. There were three assessment points: at 1, 3, and 6 months post-initial treatment after diagnosed advanced cancer (T1, T2, T3, respectively). The selected predictive factors were investigated including patients' functional status, social support, coping self-efficacy, spirituality, mutuality, caregiver burden and Chinese familism in Table 1. In this study, implementing a longitudinal design was suitable to capture the change in resilience over time.

Table 1 Design of investigation

Variables	T1	T2	T3
Sociodemographic information	√		
Patients’ functional status	√	√	√
Resilience	√	√	√
Social support	√	√	√
Coping self-efficacy	√	√	√
Spirituality	√	√	√
Mutuality	√	√	√
Caregiver burden	√	√	√
Chinese familism	√	√	√

Population and sample

Settings of the study

The eligible sample of spousal caregivers of advanced cancer patients was recruited initially from the tertiary hospitals in Yancheng City, Jiangsu Province, representative eastern part of China. Then, they were followed up at three-time points: 1, 3, and 6 months post-initial treatment. There are ten regional tertiary hospitals in Yancheng City with the ability to provide and maintain the highest level of cancer treatment available, and they all also serve as teaching hospitals for the Jiangsu Vocational College of Medicine, allowing the researcher to access the sample when they visited the hospital for treatment sessions.

All ten tertiary hospitals are located in the 7 regions of Yancheng City and provide health services for about 6.7 million people: Yancheng urban district (3 hospitals), Dongtai urban district (1 hospital), Dafeng urban district (1 hospital), Binhai Country (1 hospital), Jianhu Country (1 hospital), Sheyang Country (1 hospital), Funing Country (1 hospital), and Xiangshui Country (1 hospital). There are both outpatient and inpatient oncological departments that provide care for patients with cancer who are receiving surgery, radiation, chemotherapy and/or palliative care. The crude incidence of cancer in Yancheng City was 281.75/100,000 during 2011-2014, and the incidence shows a significant upward trend (Liu Fudong et al., 2017), which means there is enough sample size provided.

Population

The target population was Chinese spousal caregivers who were taking care of their patients with newly-diagnosed advanced cancer mainly including the top five commonly diagnosed cancer types in China [lung cancer, gastric cancer, colorectal cancer, liver cancer, breast cancer] which were from ten regional tertiary hospitals: the First People's Hospital of Yancheng, the Second People's Hospital of Yancheng, the Third People's Hospital of Yancheng, Dongtai People's Hospital, Dafeng People's Hospital, Jianhu People's Hospital, Binhai People's Hospital, Sheyang People's Hospital, Funing People's Hospital, Xiangshui People's Hospital.

Sample

Participants were husbands or wives providing direct care to their spouses who were newly diagnosed advanced cancer patients (i.e., within the first month of initial treatment, and at Stage III or Stage IV using the TNM diagnosis system). Inclusion criteria: 1) were more than 18 years old, 2) provided care for a patient undergoing cancer treatment with the current cancer treatment having taken place for less than one month, 3) were able to communicate, read and write in Chinese, and 4) were willing to participate in a three-time point investigation throughout the study's full follow-up period. Exclusion criteria: those who took care of the patients died within six months period after beginning treatment.

Sample size

The sample size estimation for the latent growth model in this study used Preacher and Coffman (2006) online computer software, *Computing Power and RMSEA's Minimum Sample Size*. Based on $\alpha = .05$, H0: RMSEA = .20, H1: RMSEA = .05, and power = .80, $df = 1$, all calculations were performed. The univariate latent growth model estimated minimum sample size was 280. In view of a dropout of 20% for the attrition rate, a total of 360 participants were initially recruited from the five selected sites. Finally, 312 (86.67%) participants completed valid questionnaires for three times measurements while 48 (13.33%) were taken out of the study because they did not complete the questionnaires.

Sampling technique

Firstly, multistage sampling was used to select five hospitals from the ten regional tertiary hospitals in the administrative area of Yancheng City. Then, patients with newly diagnosed advanced cancer were identified in five selected sites. Next, spousal caregivers who fit the inclusion criteria were initially recruited until the required number of participants had been attained. Finally, 360 participants were enrolled from five hospitals by mathematically weighting for equal proportion: 120 participants from the First People's Hospital of Yancheng (The number of new cancer cases registered was about 190 per month in 2022), 90 from the Third People's Hospital of Yancheng (The number of new cancer cases registered was about 150 per month in 2022), 50 from Dongtai People's Hospital, Jianhu's People's Hospital and Dafeng's People's Hospital, respectively (The number of new cancer cases registered was about 80 per month in every hospital in 2022). The population at each site was to be sampled until the number of samples was completed. Finally, following up on eligible participants from the time point just beginning treatment less than one month. The researcher and five research assistants followed up three time points: 1, 3 and 6 months after post-initial treatment time points. The detailed sampling technique used in the study is presented in Figure 2.

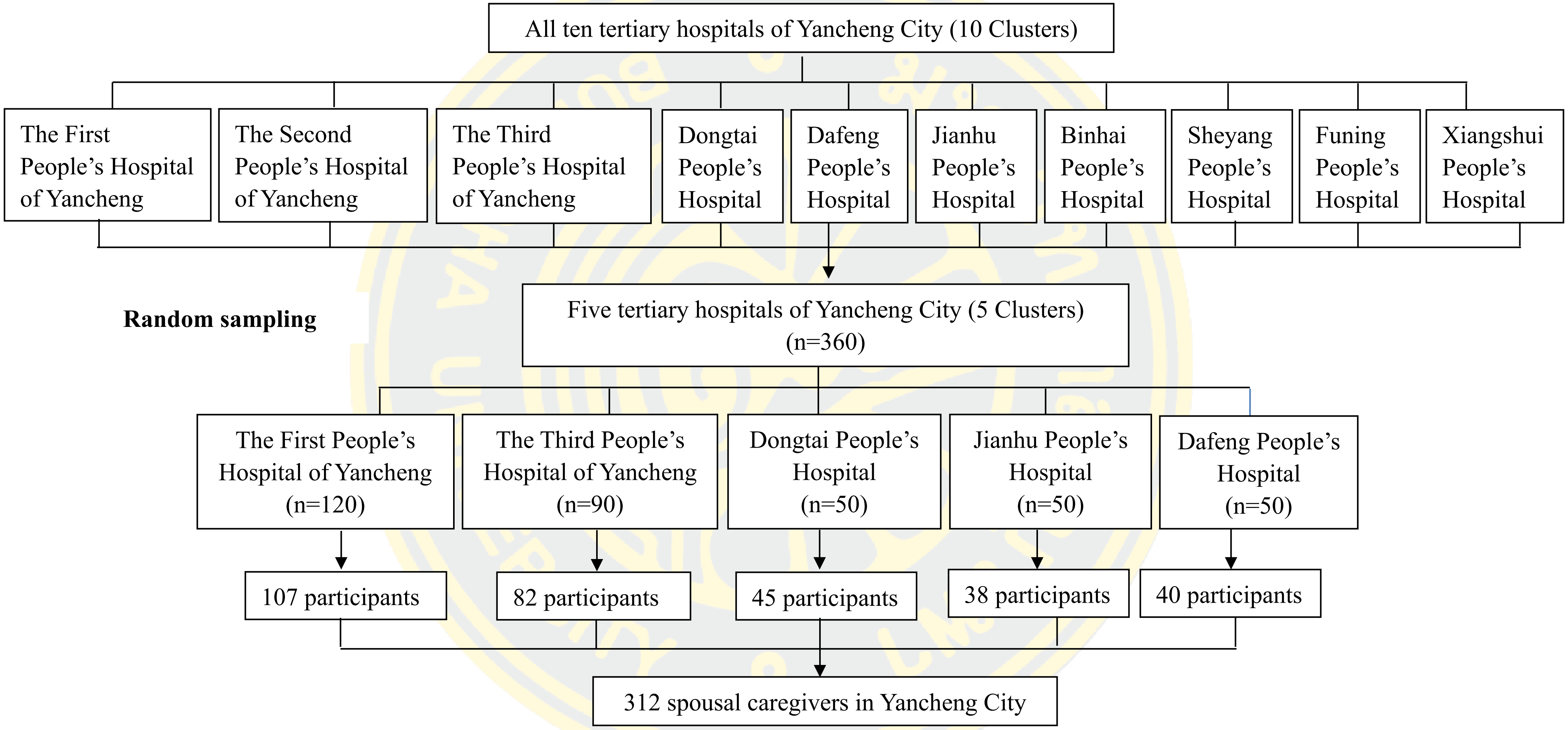


Figure 2 The multiatge sampling technique used in the study

Instrumentation

Data were collected using nine instruments as described below.

1. Personal sociodemographic information

A sociodemographic information sheet was used to collect information on socio-demographic characteristics from spousal caregivers at the baseline time point, including participants' gender, age, religion, ethnic group, education, job status, family income, health status, and duration of their marriage. In addition, demographic characteristics of the patients with advanced cancer patients were also collected, including their age, religion, type of cancer, stage of cancer, and types of treatment.

2. Conner Davidson Resilience Scale (CD-RISC)

The CD-RISC was used to measure resilience in this study. This scale was developed by Connor and Davidson (2003) which is a widely accepted measure of resilience. The original version has 25 self-rated items; Respondents rate their level of agreement with each scale item using a 5-point rating score: 0 = not true at all, 1 = rarely true, 2 = sometimes true, 3 = often true, 4 = true nearly all of the time. The total value is the sum of all responses ranging from 0 to 100. Higher scores indicate greater resilience. Test-retest reliability (r =.87) and internal consistency (=.89) of the initial 25-item CD-RISC were both high, and excellent structural validity according to goodness of fit tests. The factor construct of the original version is as follows: 8 items in the personal competency, high standards and tenacity, 7 items in the trust or tolerance of negative affect and stress, 5 items in the acceptance of change and secure relationships, 3 items in the control, and 2 items in the spirituality. The original English version was translated into the Chinese version by Yu and Zhang (2007). They retained all items and yielded a 3-factor structure of resilience, including 13 items in tenacity, 8 items in strength, and 4 items in optimism. The Cronbach's coefficient was .91 for the Chinese community sample (Yu & Zhang, 2007). The CD-RISC employed by family caregivers of senior citizens had a coefficient alpha reliability of .94 (Ong et al., 2018). In this study, the self-reported Chinese version

CD-RISC was used to assess the level of resilience (Yu & Zhang, 2007). Strong reliability was evidenced at each time point, with Cronbach’s alpha ranging from .851-.896.

3. Chinese Social Support Rating Scale (SSRS)

Social support was tested by the Chinese Social Support Rating Scale (SSRS) developed by Xiao (1994) which is one of the most widely used to assess the current social support status of caregivers in China (Luo et al., 2020). It consists of 10 measures that assess three dimensions: objective support (4 items), subjective support (3 items), and support utilization (3 items). Objective support reflects the level of actual support an individual received in the past. Subjective support represents an individual’s emotional experience about the available support. Support utilization refers to the pattern of behavior that an individual utilizes when seeking social assistance. Item scores of the SSRS are simply added up ranging from 12 to 66. Higher scores suggest more social support. The total support score is classified into three categories: low (≤22), moderate (23-44), and high (≥45) levels of support. Cronbach’s α ranged from .89 to .94, and the 2 months test-retest reliability was .92 (Xiao, 1994). Cultural adaptation of the SSRS has been undertaken in China because of its high reliability and validity. Hu et al. (2018) measured the reliability of SSRS among Chinese family caregivers of patients with lung cancer; the internal consistency of the SSRS scale in the study was adequate (α-coefficient = .87). This study Cronbach’s alpha across three-time points ranged from .810-.839.

4. Coping Self-Efficacy Scale (CSES)

The Coping Self-Efficacy Scale is a measure of a person’s perceived ability to cope effectively with life challenges, as well as a way to assess changes in self-efficacy over time in different types of coping (Bosmans, 2015; Bosmans et al., 2017). The 7-item CSES assessed the perceived ability to cope with trauma, which was developed based on a 20-item trauma-related CSES developed by Benight et al. (2008). Items 2, 3, 4, 11, 13, 17 and 19 from the original scale cover all aspects of trauma-related CSE: handling with reminders of the event (items 4 and 11), dealing with emotions related to the event (item 19), being able to employ active coping strategies (item 17) and being able to return to regular functioning (items 2, 3 and 13). Each item uses a 7-point rating score ranging from 1 (not at all capable) to 7 (totally capable). The CSES-7 has the benefit of maintaining a constant factor structure across a wide range of samples. Internal consistency for this 7-item scale was high. All factor loadings were above .59, and the internal consistency of reliability was between .90 and .93 (Bosmans, 2015). Higher scores reflect higher CSE levels. To our knowledge, there is no Chinese version to be used. Using the back-translation procedure, the items were translated into Chinese and confirmed by two translators with fluency in both Chinese and English. Available reliability using Cronbach's alpha across three-time points ranged from .825-.866.

5. Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being (FACIT-Sp)

The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being (FACIT-Sp) was used to assess aspects of caregivers' spiritual well-being related to the patient's cancer diagnosis. It is a 12-item questionnaire that evaluates the spiritual well-being of those with chronic illnesses developed by Peterman et al. (2002). The original factor analysis of the FACIT-Sp supported two components: meaning/peace and faith. In a subsequent study, the FACIT-Sp-12 contains three subcomponents of faith (4 items), meaning (4 items) and peace (4 items) (Canada et al., 2008). Psychometric analysis of the 3-factor scale revealed that the alpha coefficients were quite good (Cronbach's $\alpha = .84$-$.85$), and there was good convergent validity through examining the relationship between the FACIT-Sp and other measures of spirituality and religion (Canada et al, 2008). Responses are scored on a 5-point rating scale ranging from 0 (not at all) to 4 (very much). The higher scores demonstrate that caregivers had better spiritual well-being in the context of the patient's illness. The Chinese version of the scale had shown sound content reliability ($\alpha = .831$ for the total scale and .711-.920 for each dimension) and good test-retest reliability (*r*= .79 - .85) at four weeks intervals (Liu Xiangyu et al., 2016). The confirmatory factor analysis generally replicated the three FACIT-Sp12 subscales' original conceptualization. Previously used in caregivers (Adams et al., 2014; Koljack et al., 2022), the FACIT-Sp-12 showed good internal consistency reliability in family caregivers of cancer patients ($.80 < \alpha < .88$) and 4-month follow-up ($.83 < \alpha < .89$) (Adams et al., 2014). This scale was a self-filled questionnaire and was completed in approximately five minutes. Strong reliability using Cronbach's alpha across three time points ranged from .881-.895.

6. Mutuality Scale (MS)

The Mutuality Scale was used to evaluate the quality of the positive relationship between spousal caregivers and cancer patients developed by Archbold et al. (1990). Participants were asked to rate 15 items on a scale of 0 (not at all) to 4 (a great deal) scale. The measure considers global aspects of relationship quality relevant to spouses' care dyads, including the dimensions of love, reciprocity, shared pleasurable activities, and shared values. The total mutuality score is the mean of all items in the scale, with high scores indicating better quality of the spouse-patient relationship. A few examples are as follows: "How much emotional support does he or she give you?", "How close do you feel to him or her?", and "How much do you confide in him or her?" In samples of spouse and non-spouse dyads, the measure revealed good reliability and validity (Archbold et al., 1990; Ross et al., 2020). The scale demonstrated a Cronbach's alpha from .91 to .95; Construct validity has been shown in hypothesized relationships with other variables, including prediction of variance in role strain from providing care (Archbold et al. 1990). The traditional A sample of 176 Taiwanese caregivers of dementia patients validated the Chinese version of this scale with a Cronbach's alpha of.94 (Shyu et al., 2010). Strong reliability using Cronbach's alpha ranged from .898-.914 at each time point in this study.

7. Caregiver Burden Interview (ZBI)

The Zarit Burden Interview (ZBI) is a standardized and validated tool, which has been used widely for the assessment of caregiver burden (Bédard et al., 2001). This instrument evaluates the subjective burden, attitudes and emotional reactions of the caregiver when confronted with the duty of care and the perception of the situation. The 12 short-item version of ZBI (ZBI-12) is feasible for measuring feelings of burden of caregivers as the best short-form version (Bédard et al., 2001; Higginson et al., 2010). The ZBI-12 had been proven to have good validity and reliability in many clinical settings, countries and cultures, with Cronbach α ranging between .81 and .90 (García-Torres et al., 2020; Tang et al., 2016). Each question rates scale measurement on a 5-point Likert scale with 0 = never, 1 = rarely, 2 = sometimes, 3 = quite frequently, and 4 = nearly always. Total scores range from 0 (low burden) to 48 (high burden). The Chinese burden interview for caregivers of patients with chronic illness was developed using a blind back translation method developed by Lu et al. (2009) who tested construct validity of ZBI for 523 informal caregivers. Cronbach's alpha value was .875, indicating good internal consistency. Confirmatory factor analysis confirmed 2-factor model all fell within the acceptable range. This study used the ZBI-12 to measure caregiver burden of providing family care including personal strain (9 items) and role strain (3 items) (Bédard et al., 2001). In this study, the 12-item version was a more efficient measure of the overall caregiver burden, and showed acceptable internal consistency with Cronbach’s α coefficient among three-time waves ranging from .737- .781.

8. Briefs in Chinese Familism Scale (BCF)

Chinese familism was measured with two subscales of beliefs in Chinese familism scale (BCF) (Yeh & Yang, 1997). It is a 31-item questionnaire which involved both family solidarity and harmony (BCF-SH) and family prosperity (BCF-FP). BCF-SH evaluates Chinese beliefs on family compliance, forbearance, protection of family members, and family mutuality with 21 items, and BCF-FP assesses the

Chinese beliefs on family pride with 10 items. Each item is scored using a 6-point rating scale with “1= strongly disagree” and “6= strongly agree” as anchor points. The range of total possible scores is 30-186. An example of a BCF-SH item is “When facing difficulties, the most helpful persons are family members,” and that of BCF-FP is “Family members need to do more things that can gain pride to the family.” The BCF showed sound internal consistencies with Cronbach α from .80 to .95 in college students and adults in the Taiwan sample. In a Chinese poor single-mother sample, two subscales also showed acceptable internal consistencies with Cronbach α ranging from .50 to .85 (Leung, 2017). Strong reliability using Cronbach’s alpha ranged from .862-.867 at each time point.

9. Chinese version of Activities of Daily Living Scale (ADL-C)

Patients’ functional status was evaluated by the Chinese version of Activities of Daily Living Scale (ADL-C) (He, 1990). Spousal caregivers provided answers in the study. It was translated and revised based on the Katz Index of Independence in ADL and the Lawton IADL Scale, which was developed by Lawton and Brody (1969). It is the most common instrument for measuring ADL in cancer patients (Neo et al., 2017). In ADL-C, there are 6 items to determine how much help the patient needs with bathing, dressing, eating, toileting, grooming, and getting out of bed or a chair. There are an additional 8 items to determine how much help is needed for higher-level self-care skills, such as assistance with taking medications, shopping, managing finances, cleaning the house, and doing laundry. Each item on a Likert scale is independently coded from 1 to 4, where 1 indicates performance without difficulty or assistance, 2 indicates difficulty, 3 indicates assistance, and 4 indicates unable to perform. The range of possible scores for the full scale is between 14 and 56. Higher scores indicate lower functional status. The ADL-C was demonstrated to have good reliability and validity when it was used in a study with 5, 055 community-dwelling elders (He, 1990). The test-retest reliability of ADL-C was .602, and convergent validity was demonstrated by the correlation between the score of ADL-C and the

Mini-mental Status Examination ($r = .45$, $p < .01$). Strong reliability using Cronbach's alpha ranged from .922-.963 in this study.

Translation of instruments

In this study, CSES was translated from the original language (English) to the target language (Chinese). The researcher used a back-translation technique according to Brislin (1970). This translation technique is widely used for translating research instruments across cultures. Recommendations and guidelines for the translating process are available for use with other languages (Cha et al., 2007). The process of back translation includes three steps as described below:

1) The first step, forward translation was the beginning of the translation process by two bilingual translators who are Chinese native speakers (Translator 1 and 2) CSES was forward translated independently from the English language into the Chinese language by two bilingual health experts (C1 and C2). Comparison of two translated versions and the original instrument by two translators. After that, both translators came up with a final translation of Chinese version equivalent to English version. Thus, the initial Chinese version of CSES was generated (C3).

2) The second step, back translation from Chinese to English by two bilingual translators. The instrument of Chinese version (C3) was independently back translated from Chinese to English (E2 and E3) by two bilingual health professionals who were blinded to the original English version and were Chinese native speakers (Translator 3 and 4). Translators produced two back translated versions of CSES. The two English versions were discussed by the two bilingual health professionals. The discussion continued until the two translators agreed on the final English version (E4).

3) The third step, concept equivalence comparison between the original instrument and the back-translated version. The researcher and advisor compared the original English version with the back-translated version until they arrived in agreement that the meanings of the two versions of the instruments matched. Only a

few words were revised. The final Chinese version of the CSES is reviewed. The back-translation process is presented in Figure 3.

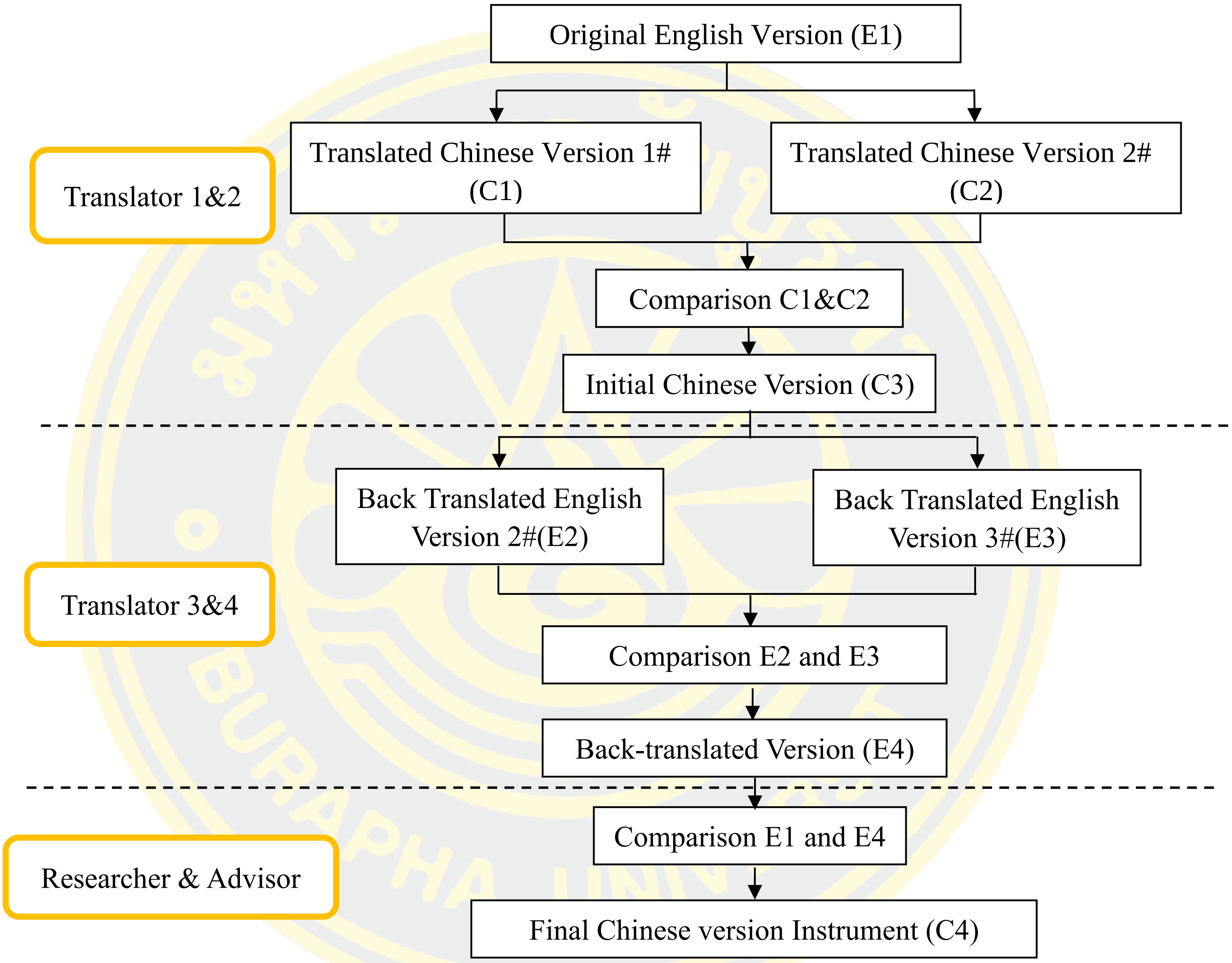


Figure 3 Back-translation process of the study

Quality of research instruments

The researcher performed test validity and reliability of the instruments before this study.

Validity

The content validity of the CD-RISC, ADL-C, SSRS, FACIT-Sp, MS, ZBI, and BCF was validated in previous studies. Validity of the CSES for equivalency was guaranteed by the process of back-translation approach in light of four bilingual experts. Therefore, the validity was not assessed in this study.

Reliability

In this study, the reliability of all research tools was examined for internal consistency using Cronbach's alpha in this study. The reliability coefficient from .70 to .95 is an acceptable value for a well-developed psychosocial measurement instrument (Tavakol & Dennick, 2011). A pilot study was done to test 30 spousal caregivers of advanced cancer patients who differed from this study's sample. Then, the internal consistency of the Chinese versions of the CD-RISC, ADL-C, SSRS, CSES, FACIT-Sp, MS, ZBI and BCF were calculated in Table 2. Details about selected variables and the specific measures used were as follows.

Table 2 Summary of variables and instruments

Variables	Instruments	Items	Range	Cronbach's alpha
Resilience	CD-RISC	25	0-100	.821
Patients' Functional Status	ADL-C	14	14-56	.964
Social Support	SSRS	10	12-66	.713
Coping Self-efficacy	CSES	7	7-49	.884
Spirituality	FACIT-Sp	12	0-48	.880
Mutuality	MS	15	0-60	.917
Caregiver Burden	ZBI	12	0-48	.770
Chinese Familism	BCF	31	30-186	.867

Protection of human rights

The Institutional Review Board (IRB) of Burapha University granted permission for this study (Number: G-HS081/2564), and the Clinical Research Ethics

Committee at Jiangsu Vocational College of Medicine (Number: 2021-0901) and was registered in the Chinese Clinical Trial Registry (Trial registration number: ChiCTR2100054048). After receiving the IRB approval, the researcher asked for permission to collect data in five settings which are the teaching hospitals of Jiangsu Vocational College of Medicine. After obtaining permission, the researcher informed the participants about the purpose of this study, risk of participants, duration of data collection and how they are involved in the whole process. When the participants had a clear understanding of this research, they freely signed the informed consent forms and got a code number to disguise their identities. The participants could refuse to participate in the study or discontinue the study at any time after informed consent had been obtained. Participants were assured their privacy, confidentiality, and anonymity to safeguard their information and their identities would not be revealed on research reports or publications. The researcher administered questionnaires. The participants were given enough time to finish the questionnaires. Data were stored in a locked file cabinet, only the researchers could access these data. Finally, all data would be destroyed over years after the study was completed. In addition, new knowledge gained from this study may have benefits to nurses such as serving as a guide for future research or clinical practice. Results may help researchers gain a better understanding of the course of resilience over time and these results may have implications for enhancing or fostering resilience in caregiver populations.

Data collection procedures

Before beginning data collection, this proposal and all research instruments were authorized by the IRB of Burapha University and the Ethics Committee of selected hospitals. The researcher and research assistants were responsible for data collection of spousal caregivers of patients from prior treatment after diagnosis, one month, three months, and six months after initial post-treatment at each selected study site. Data collection was performed in two phases as follows:

Phase One: Preparation stage

Selecting the settings of the study

The data collection was established in all ten tertiary hospitals concerned with the research sampling specified. Chinese tertiary hospitals have departments of oncology units for caring for cancer patients. Most patients came from the local Yancheng City. The tertiary hospitals can provide surgery, chemotherapy, and radiation treatments for patients with cancer. In 2018, the rate of new cases of cancer standardized incidence rate was 160.76 per 100000 in Yancheng City (Yancheng Bureau of Statistics, 2019). Selecting the settings was to choose for suitability and accessibility because there was a high number of new cancer cases at all the tertiary hospitals in Yancheng City. The researcher selected five sites randomly. The researcher coordinated with the nurse directors or heads of all selected hospitals to inform them about the objectives of this study and performed the identification of patients with newly diagnosed advanced cancer who were undergoing anti-cancer therapies within the first month.

Preparing research assistants' readiness

Before data collection, the researcher trained five research assistants, who are registered nurses and have at least 3 years of work experience in the oncology wards, about the area of research ethics, approaching the participants, consent procedures, research instruments, data collection procedures and the role of the research assistant. The package of questionnaires was printed into hard copies and put into the online survey tool Sojump at the same time which is a secure electronic data collection platform (http://www.sojump.com) by the researcher. Each package was given at each time point for collecting data. The researcher trained a research assistant at each site, a total of five. The researcher also observed them until the research assistants could collect the data independently.

The initial survey

The researcher contacted the head nurses of each selected hospital to tell them about the details of this study firstly. The head nurse informed the researcher when a patient and his/her spousal caregiver who met the inclusion criteria were followed up at the outpatient or inpatient departments. Then, the researcher contacted potential participants within one month of patient diagnosis or hospital admission after newly diagnosed patients and asked for their cooperation. The researcher or research assistants contacted the spouses of patients with newly diagnosed advanced cancer who agreed to participate, informed them of the aims, benefits, and risks of this study and their right to quit from the study at any time. Then, the participants were requested to sign consent forms. After consent was obtained from participants, they received an initial number to track. There were 366 participants who finished the initial registration including a unique code, contact details, follow-up requests and informed consent forms. Then, 6 participants refused the survey without any reason. Finally, 360 participants agreed to conduct data collecting.

Phase Two: Follow-up stage

The three times follow-up

Both the researcher and research assistants were responsible for collecting data from one month, three months, and six months after the patient's initial treatment or hospital admission at each selected study site. At baseline, the researcher and research assistants collected data through face-to-face interviews at the first-time survey. Participants can select paper questionnaires or electronic questionnaires. The researcher or research assistants explained the questionnaires one by one and recorded them immediately. The whole process of the survey took about 40-50 minutes. In the later follow-up survey, the researcher and research assistants contacted participants via phone or social media (WeChat App). To maximize the response rate, there was a reminder call or message at each time point according to the unique code. During the follow-up measurements, they were allowed to select either using paper questionnaires or electronic questionnaires. Prior to answering the questionnaires, the researcher and research assistants explained in details clearly. If participants were unclear or needed assistance, they could request help at any time. The whole questionnaire took about 30-40 minutes to be completed each time. The flowchart of the data collection process is shown in Figure 4.

Analysis of dropouts

The estimated number of participants in this study is as high as 86.7 % (312/360), partly due to regular accompanying patients to seek medical treatment. The researcher and research assistants checked data on the drop-out at each time point and analyzed the reasons for withdrawal. The researcher counted the number of participants who refused or missed during collecting data as follows. A total of 34 participants were able to quit the study at any point in time without giving any reason. Because cancer patients died, 2 participants did not meet the inclusion criteria. Due to patients moving away from the selected hospitals, 10 participants cannot be contacted by phone, social media (Wechat App) or email. In addition, 2 participants with invalid questionnaires filling in light of outliers on three-time measurement occasions were excluded from the analysis. Finally, 312 participants who completed all measurements three times were included in the statistical analysis.

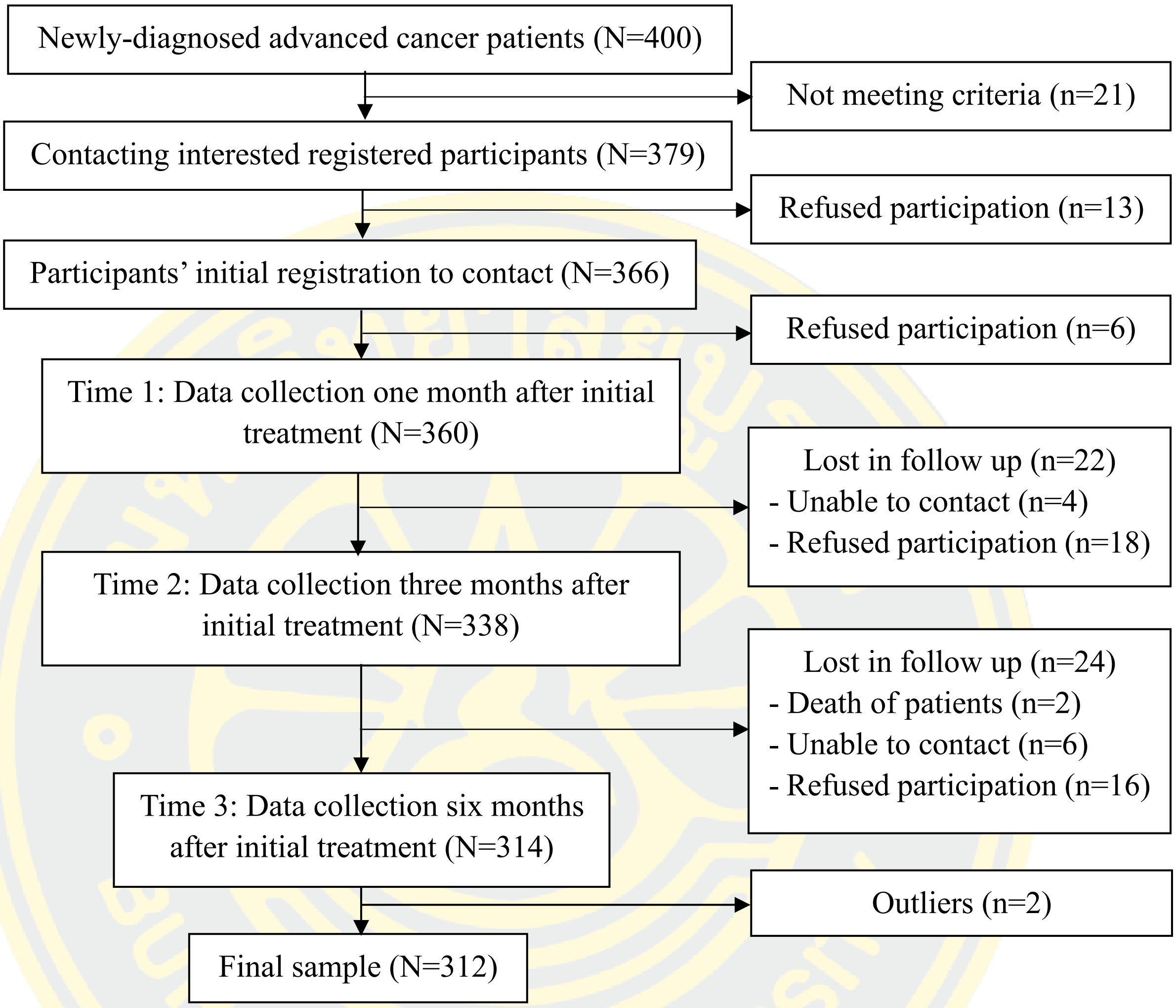


Figure 4 Participant data collection flow chart

Data analysis

Data were analyzed by using a statistical software program with the alpha level for significance set at less than .05. Data were explored visually and statistically. All variables were screened using IBM SPSS version 25 statistical software for accuracy of data entry. Data were analyzed using frequency and descriptive statistics (mean, standard deviation, range, skewness, kurtosis) to describe participants' characteristics and check statistical assumptions (missing data, outlier, normality, linearity, multicollinearity). To determine equality in baseline characteristics among the level of resilience, *t*-tests and $\chi 2$ tests were performed to compare continuous and categorical variables, respectively. A repeated measured ANOVA tested change variables scores over the first six months posttreatment periods. A Pearson correlation tested a correlation among resilience scores at three time points.

Latent Growth Modeling (LGM) with Mpuls 8.3 statistical programs was used to explore the trajectory of resilience over time and identify predictive factors associated with its change statistically. LGM is a statistical method for estimating growth trajectories in the structural equation modeling (SEM) framework. LGM was developed using SEM theories (Bollen & Curran, 2006; Heck & Thomas, 2020). It is a longitudinal analysis method to estimate growth over a period of time. It includes latent growth curve model (LGCM), latent class growth modeling (LCGM), and growth mixture model (GMM). It represents repeated measurements of dependent variables as a function of time and other measurements. These longitudinal data share the features that the same subjects are tracked repeatedly over time. Additionally, LGM is capable of modeling time points with varying spacings, either equal or unequal (i.e., each subject shares the same time points, but those time points need not be equally spaced) (Heck & Thomas, 2020). For instance, this study repeated three time points (i.e., three points create a line) and investigated the same participants' resilience at the same time points but in different phases (i.e., 1, 3 and 6 months posttreatment). We restricted the sample to those who have completed three data points to provide the best trajectory estimates. Therefore, LGM was used to analyze the individual growth trajectory of resilience.

The latent growth curve modeling (LGCM) is a class of LGM designed to capture change over time through the identification of latent (i.e., unseen or unobserved) growth factors. Latent growth factors, which can describe linear or nonlinear growth patterns, depict change by estimating a latent intercept (i.e., initial level) and latent slopes (i.e., rate of change). Therefore, the latent growth curve modeling provides information on the average change and individual variations affecting that change. Because they are not variables in the data set, the intercept and slope are latent. Instead, they are estimated based on the collection of trajectories obtained from each individual. The average growth trajectory and measures of variance around the average trajectory can then be used to summarize these trajectories. The measures of variance represent the individual slopes surrounding the average trajectory and shed light on inter-individual differences within the overall growth pattern(s) identified. Once the shape of growth is established, the parameters for an individual’s curve can be used to examine predictors of individual differences and answer questions about which variables influence the rate of development.

Firstly, following previous suggestions (Wickrama et al., 2021), the unconditional LGCM was applied to characterize the trajectory of resilience as reflected in the resilience total score over time with a random intercept and a random slope to examine variances for growth factors and model fit indices. LGCMs were analyzed for intercept-only, linear, and nonlinear models. For the latent intercept factor, the loadings are fixed to 1, which indicates the intercept affects all repeated measures across three waves of assessment equally. For the slope factor, various coding methods for time can be used. Linear growth model was assumed with the conventional codes for the slope loadings: 0, 1, 2 (Figure 5). Nonlinear growth model in latent basis model was freely estimated from the data for the slope loadings: 0, *, 1, where * is the freely estimated time score. The parameters of special interest in the unconditional LGCM are the means, variances and covariance of the intercept and slope random factors for the resilience trajectory. The model is defined as follows (Wickrama et al., 2021):

$y_{it}= \alpha_i+\lambda_t\beta_i+\varepsilon_{it}$

$\alpha_i=\mu_\alpha+\zeta_{\alpha i}$

$\beta_i=\mu_\beta+\zeta_{\beta i}$

Where:

i= 1, 2, …, N, where N represents the total number of cases.

t= 1, 2, …, T, where T equals the total number of time points.

y_{it} is the value of the outcome variable y for individual i at time t.

α_i and β_i are two growth factors that denote a random slope and a random intercept for case i, respectively.

μ_α is the mean intercept across all cases and $\zeta_{\alpha i}$ is the residual term.

$\mu\beta$ is the mean slope across all cases and $\zeta_{\beta i}$ is the residual term.

λ_t is the value of trend variable time t.

LGCM is a special type of GMM, whereby there is only one class identified with an equal intercept and slope across all cases. Moreover, LGCM might achieve a faster model convergence as the computational burden is less than that of GMM. Fitting an LGCM before doing GMM can not only serve as a starting point for conducting GMM but also provide insights into potential different classes.

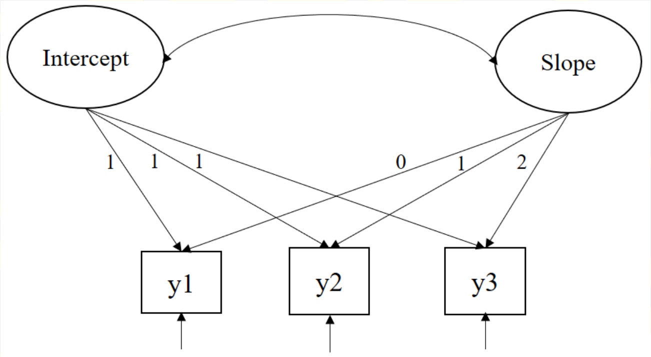


Figure 5 Unconditional LGCM for the trajectory of resilience

Secondly, the unconditional GMM was applied to analyze the longitudinal resilience data in the present study and explore the existence of multiple unobserved resilience subpopulations related to different resilience change trajectories. As shown in Figure 3-5, a latent categorical variable c denotes the unobserved subpopulation membership for each respondent in the present study (Wickrama et al., 2021). The categorized latent variable c with k classes represented individuals in different classes having distinct growth factors (intercept and slopes). The latent class extension model is defined as follows:

$$y_{tik} = \alpha_{ik} + \lambda_{\text{kt}}\beta_{ik} + \varepsilon_{tik}$$

$$\alpha_{ik} = \mu_{\alpha k} + \zeta_{\alpha ik}$$

$$\beta_{ik} = \mu_{\beta k} + \zeta_{\beta ik}$$

$$\text{In}\left[\frac{\mathrm{P}(C\text{ik}=1)}{\mathrm{P}(C\text{ik}=1)}\right] = \lambda ck$$

$$C\text{ik} = \begin{cases} 1, & \text{if subject i is a member of class k} \\ 0, & \text{otherwise} \end{cases}$$

Where:

k is the latent class indicator, k= 1…, k. Note that the subscript k now means that the parameters can vary across k classes. If k unobserved subpopulations exist in the longitudinal data of resilience, for a given respondent i, c_i represents the membership in the kth resilience subpopulation as c_i could be any number from 1 to k. When k is equal to 1, then the model reduces to an unconditional LGCM (Wickrama et al., 2021).

λkt is the factor loadings and ε_{kit} is measurement errors which may vary across different resilience subpopulations as indicated by the k subscript.

α_{ik} and β_{ik} represent the average intercept and slope for latent trajectory class k.

$\zeta_{\alpha ik}$ and $\zeta_{\beta ik}$ are the measurement errors displaying the variability of the estimated intercepts and slopes across respondents within the same latent class

λ_{ck} is the intercept of the multinomial logistic regression.

c_{ik} equals one if respondent i belongs to class k and zero otherwise.

In this study, unconditional linear GMM was tested and started with a one-class unconditional GMM and continued by fitting models with a larger number of classes until model fit indices did not indicate improvement (Figure 6). The Wald z-tests were used to test whether the differences in intercepts and slopes between classes were statistically significant after the most optimal GMM model was selected.

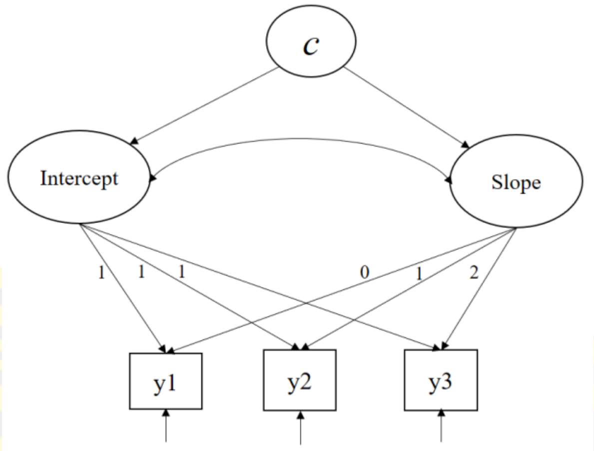


Figure 6 Unconditional linear GMM for the trajectories of resilience

Finally, the conditional LGCM was tested to estimate how variables such as time-invariant and time-variant covariates predicted growth factors (intercepts and slopes) of resilience. Conditional latent growth curve model allows us to examine the potential effects of the covariates on the trajectory parameters (Bollen & Curran 2006). In a nutshell, conditional models allow us to include variables that predict the latent intercept and latent slopes of the model. In this study, gender, age, religion, education, job status, family income, health status, cancer type, cancer stage, and treatment were included in the first conditional LGCM as time-invariant covariates (Figure 7). The seven selected predictors as time-variant covariates were included in the second LGCM (Figure 8). By adding time-variant covariates, the occasion-specific effects of time-variant covariates on resilience were examined over time. In this model, the outcome variables (resilience at T1–T3) were regressed on time-variant covariates by setting concurrent paths at each time point. Note that as time-variant covariates directly impact the outcome measure, the growth parameters (e.g., intercept and slope) should be interpreted as estimates after controlling for time-variant covariates on the outcome. The third LGCM included both time-invariant and time-variant covariates in the model at the same time (Figure 9). For the conditional LGCM adding time-variant and time-invariant covariates, we can examine the effect of changes in time-variant covariates on developmental trajectories of resilience after controlling multiple time-invariant covariates. By using a combination of time-invariant and time-variant covariates, we could identify a model that includes the combined effects of time-variant covariates after controlling one or more time-variant covariates. The effects of time-variant covariates related to the trajectory of resilience may be moderated by time-invariant covariates (Bollen & Curran, 2006).

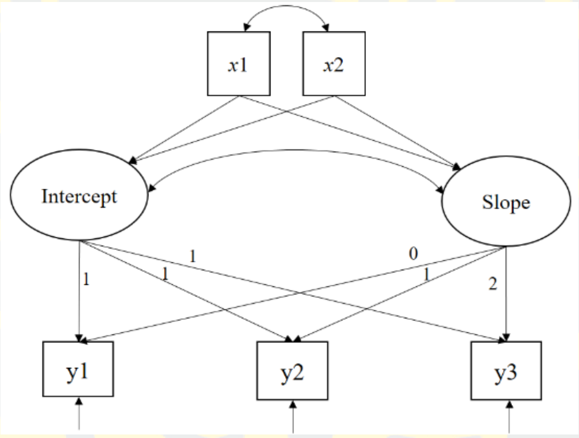


Figure 7 Conditional LGCM for the trajectory of resilience with time-invariant covariates

Note. x1, x2 are time-invariant covariates such as gender, eductional level.

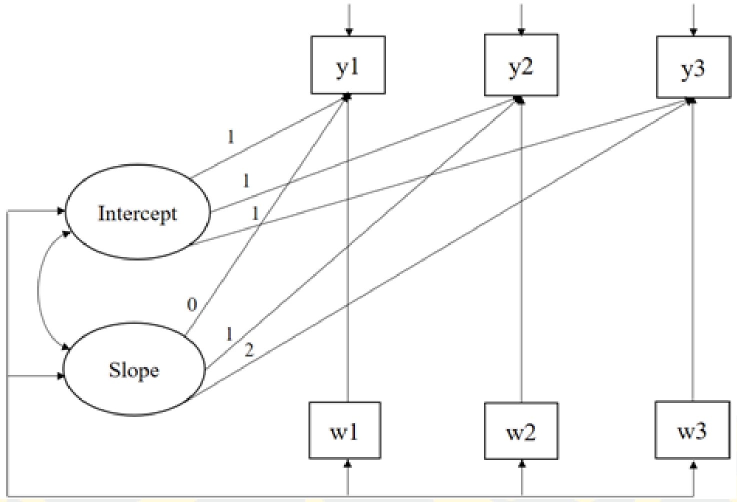


Figure 8 Conditional LGCM for the trajectory of resilience with time-variant covariates

Note. w = time-variant covariates. 1, 2, 3 represent *w* measured at T1, T2, and T3, respectively.

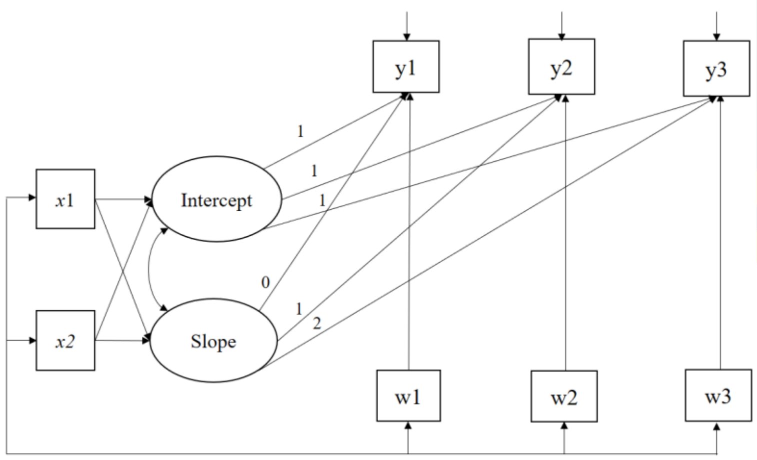


Figure 9 Conditional LGCM for the trajectory of resilience with both time-invariant and time-variant covariates

Note. x1, x2 are time-invariant covariates such as gender, eductional level. *w* = time-variant covariates. 1, 2, 3 represent *w* measured at T1, T2, and T3, respectively.

Model fit indices

In this study, the model fit was determined by a variety of fit indices instead of an absolute measure of fit. According to previous literature, multiple statistical indexes were used to select the best model (Kline, 2015). Indicators of goodness-of-fit were used to evaluate the appropriateness of models using standard global indices in LGCM: Chi-square test ($\chi2$), $\chi2$ /degrees of freedom (*df*), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Likewise, Akaike Information Criterion (AIC), Bayes Information Criterion (BIC) and Sample-size adjusted BIC (aBIC) are used to compare nested models, with the lower value indicating the better fitting model. As recommended by Hooper et al. (2008) and Marsh et al. (2004), the following fit values were used to determine a good fit in this study (Table 3). However, the Chi-square statistic was interpreted with caution as it tends to over-reject models that are a good fit based on other fit indices, especially in small sample sizes or in the face of non-normality. Thus, the *p*-value of $\chi2$ was not applied to assess the goodness of fit.

Table 3 Model-fit criteria and acceptable fit interpretation in the LGCM

Model-fit criterion	**Acceptable level**	**Interpretation**
$\chi 2/ df$	< 3.0	a lower value 3.0 means a good fit
p-value of $\chi 2$	$> .05$	a non-significant means a good model fit
CFI	$\geqslant .90$	greater than or equal to .90 indicates a good model fit
TLI	$\geqslant .90$	greater than or equal to .90 indicates a good model fit
RMSEA	$< .05–.08$	less than .05 means close to fit or .08 means fair fit
SRMR	$< .08$	Value less than .08 indicates a good model fit
AIC	0 to positive value	a lower value of AIC indicates a better fitting model
BIC	0 to positive value	a lower value of BIC indicates a better fitting model
aBIC	0 to positive value	a lower value of aBIC indicates a better fitting model

Note. $\chi 2$ = Chi-square Value, *df* = Degrees of Freedom, CFI= Comparative Fit Index, TLI= Tucker-Lewis Index, RMSEA= Root Mean Square Error Approximation, SRMR= Standardized Root Mean Residual, AIC = Akaike Information Criterion, BIC= Bayes Information Criterion, aBIC = Sample-size adjusted BIC.

The overall fit of the different class models of GMM can be evaluated using the following indicators: (1) -2Log likelihood, Akaike information criterion (AIC), Bayes information criterion (BIC), and sample-size adjusted BIC (aBIC) as the comparison of nested models, with the lower the values, the better the fit of the model to the data (Feldman et al., 2009); (2) Lo-Mendell-Rubins Adjusted Likelihood Ratio Test (LMR), and the parametric bootstrapped likelihood ratio test (BLRT) assess whether a given model with *k* classes offers significantly more information than the previous one with *k -1* classes, and a statistically significant p-value indicates that the current solution provides a significantly better fit (Wickrama et al., 2021); (3) Entropy indicates classification accuracy that assesses whether respondents have been classified into one and only one latent class. As a standard index, entropy ranges from

0 to 1.0, and a value closer to 1.0 denotes a better classification of individuals. Furthermore, the entropy value equals .80 indicating more than 90% accuracy of the classification. However, in fact, selecting optimal mixture models involves considering factors other than fit indices. If k and k-1 models have similar fit indices, the model with fewer classes is always favored. Moreover, interpretability is also an important factor to consider when selecting the optimal mixture models (Feldman et al., 2009). Therefore, each class was distinct and separated from the other classes and consistent with the theory of Bonanno et al.'s temporal framework.

CHAPTER 4

RESULTS

This chapter presents the results of the research including the characteristics of participants, descriptive statistics of study variables, testing of assumptions, and testing of research hypotheses.

Description of characteristics of the participants

At baseline, 360 participants were initially recruited in the first month posttreatment. The demographic characteristics are shown in Table 4. The age ranged from 32 to 76 years (*M*= 55.51, *SD* = 10.56). Husbands and wives accounted for 42.8% and 57.2%, respectively. Year of marriage ranged from 4 to 52 years (*M*= 29.26, *SD*= 11.36). The majority of participants had no religion (91.9%). As to their education, most participants (56.4%) completed high school or above. In terms of job status, 63.9% had part-time and full-time jobs. Nearly half (46.4%) had an average monthly family income ranging from 2,000 to 6,000 RMB, followed by 41.4% with more than 6,000 RMB monthly, and 12.2% with less than 2,000 RMB monthly. Most participants (64.4%) reported average health status.

Table 4 Demographic characteristics of participants at baseline (n=360)

Characteristics	***n***	**%**
Age (years) (*M* = 55.51, *SD* = 10.56, Range = 32-76)		
32-40	47	13.1
41-50	72	20.0
51-60	112	31.1
61-70	109	30.3
71-76	20	5.5

Table 4 (Continued)

Characteristics		***n***	**%**
Gender			
	Male	154	42.8
	Female	206	57.2
Years of marriage (years) (*M* = 29.26, *SD* = 11.36, Range = 4-52)			
	⩽10	25	6.9
	11-20	60	16.7
	21-30	109	30.3
	31-40	106	29.4
	⩾41	60	16.7
Religion			
	No	331	91.9
	Yes	29	8.1
Education			
	Elementary school	72	20.0
	Intermediate school	85	23.6
	High school	122	33.9
	College/ University	81	22.5
Job status			
	No job/Retired	130	36.1
	Part-time job	91	25.3
	Full-time job	139	38.6
Family income (RMB/monthly)			
	<2000	44	12.2
	2000-6000	167	46.4
	>6000	149	41.4
Health status			
	Poor	37	10.3
	Average	232	64.4
	Good	91	25.3

There were 312 participants who met the final inclusion criteria and were able to participate in the three follow-ups of this study. The response rate was 86.67% and the dropout rate was 13.33%. In terms of demographic characteristics, participants with missing data did not differ significantly from those with complete data, (all *p* > .05) in Table 5. This showed that the data met the condition of missing at random.

Table 5 Demographic characteristics of participants (n=312) who finished three times follow up compared to participants (n=48) who dropped out

Characteristics	**Completed** (*n*= 312)	**Dropped out** (*n*= 48)	**χ^2/t-test**	***p*-value**
Age (*M/SD*)	56.38 ± 10.51	55.65 ± 10.33	.449	.654
Gender			.021	.884
Male	133 (42.6%)	21 (43.8%)		
Female	179 (57.4%)	27 (56.2%)		
Years of marriage (*M/SD*)	30.00 ± 11.32	28.50 ± 13.01	.837	.403
Religion			.233	.629
No	286 (91.7%)	45 (9.4%)		
Yes	26 (8.3%)	3 (6.2%)		
Education			4.637	.200
Elementary school	57 (18.3%)	15 (31.3%)		
Intermediate school	75 (24.0%)	10 (20.8%)		
High school	107 (34.3%)	15 (31.3%)		
College/ University	73 (23.4%)	8 (16.6%)		
Job status			3.207	.201
No/Retired	118 (37.8%)	12 (25.0%)		
Part-time job	78 (25.0%)	13 (27.1%)		
Full-time job	116 (37.2%)	23 (47.9%)		

Table 5 (Continued)

Characteristics	**Completed** (n= 312)	**Dropped out** (n= 48)	**χ^2/t-test**	***p*-value**
Family income (RMB/monthly)			.251	.882
<2000	36 (11.5%)	8 (16.7%)		
2000-6000	141 (45.2%)	26 (20.8%)		
>6000	135 (43.3%)	14 (29.2%)		
Health status			2.665	.264
Poor	29 (9.3%)	8 (16.7%)		
Average	202 (64.7%)	30 (62.5%)		
Good	81 (26.0%)	10 (20.8%)		

Note. M = mean, *SD* = standard deviation, χ^2= Chi square.

As presented in Table 6, 312 spousal caregivers ranged in age from 32 to 76 years with a mean of 56.38 (*SD* = 10.51). There were 133 husband caregivers and 179 wife caregivers. Years of marriage ranged from 4 to 52 years with a mean of 30.00 (*SD* =11.32). The majority of participants had no religion (91.7%). As to their education, 57.7% of participants finished high school or above. In terms of job status, 62.2 % of participants had part-time and full-time job. Nearly half (45.2%) had an average monthly family income ranging from 2,000 to 6,000 RMB, followed by 43.3% with more than 6,000 RMB monthly, 11.5% with less than 2,000 RMB monthly. Most participants (64.7%) reported average health status.

Table 6 Demographic characteristics of finally included spousal caregivers (*n* = 312)

Characteristics	***n***	**%**
Age (years) (*M* = 56.38, *SD* = 10.51, Range = 32-76)		
32-40	35	11.2
41-50	55	17.6
51-60	98	31.4
61-70	104	33.3
71-76	20	6.5
Gender		
Male	133	42.6
Female	179	57.4
Years of marriage (years) (*M* = 30.00, *SD* = 11.32, Range = 4-52)		
⩽10	23	7.4
11-20	41	13.1
21-30	94	30.1
31-40	95	30.5
⩾41	59	18.9
Religion		
No	286	91.7
Yes	26	8.3
Education		
Elementary school	57	18.3
Intermediate school	75	24.0
High school	107	34.3
College/ University	73	23.4
Job status		
No job/Retired	118	37.8
Part-time job	78	25.0
Full-time job	116	37.2

Table 6 (Continued)

Characteristics	***n***	**%**
Family income (RMB/monthly)		
<2000	36	11.5
2000-6000	141	45.2
>6000	135	43.3
Health status		
Poor	29	9.3
Average	202	64.7
Good	81	26.0

About the patients with advanced cancer in Table 7, they ranged in age from 30 to 80 years old (*M*= 56.43, *SD* = 11.02). Male and female patients accounted for 57.4% and 42.6%, respectively. Most cancer sites were the lung (27.6%), followed by stomach (18.9 %), colon (18.3%), breast (14.7%) and liver (12.8%). In terms of TNM diagnosed with cancer, 73.1% were at stage 3. In terms of treatment, the majority of patients received combined treatment including surgery and chemotherapy (56.1%), surgery, chemo- and radiotherapy (17.0%), chemotherapy and radiotherapy (12.5%), whereas only 14.4% received single chemotherapy.

Table 7 Demographic characteristics of advanced cancer patients (*n* = 312)

Characteristics	***n***	**%**
Age (years) (*M* = 56.43, *SD* = 11.02, Range = 30-80)		
30-40	35	11.2
41-50	60	19.2
51-60	96	30.8
61-70	92	29.5
71-80	29	9.3

Table 7 (Continued)

Characteristics	***n***	**%**
Gender		
Male	179	57.4
Female	133	42.6
Cancer type		
Lung cancer	86	27.6
Gastric cancer	59	18.9
Colorectal cancer	57	18.3
Breast cancer	46	14.7
Liver cancer	40	12.8
Other	24	7.7
Cancer stage		
III	228	73.1
IV	84	26.9
Medical treatment		
CT	45	14.4
Surgery+ CT	175	56.1
CT+ RT	39	12.5
Surgery+ CT+ RT	53	17.0

Abbreviation: CT, chemotherapy; RT, radiotherapy.

Descriptive statistics of study variables

There were eight major study variables for this study at three-time points including resilience, patients' functional status, social support, spirituality, mutuality, coping self-efficacy, caregiver burden and Chinese familism. Descriptive statistics for each variable are described by summing all the items at three time points in Table 8. The overall mean scores of resilience, patients' functional status, social support, coping self-efficacy, spirituality were increased over time, while mutuality, caregiver burden and Chinese familism remained stable.

Table 8 Descriptive statistics of the study variables (*n* = 312)

Variable	Possible range	Actual range	*M*	*SD*
Resilience	0-100			
T1		34-71	54.01	7.68
T2		37-70	56.20	6.37
T3		38-75	57.97	6.80
Patients' functional status	14-56			
T1		14-50	25.46	6.96
T2		14-51	26.88	6.63
T3		14-51	28.68	7.92
Social support	12-66			
T1		25-50	35.86	3.84
T2		29-50	38.03	3.59
T3		29-50	39.10	3.61
Coping self-efficacy	7-49			
T1		19-47	31.67	5.10
T2		23-48	34.48	3.76
T3		24-49	35.48	3.44
Spirituality	0-48			
T1		20-41	29.70	4.53
T2		20-44	29.79	3.86
T3		18-46	30.08	4.64
Mutuality	0-60			
T1		20-55	35.56	6.42
T2		20-56	35.52	6.06
T3		22-57	35.52	6.83
Caregiver burden	0-48			
T1		9-38	17.67	5.13
T2		6-35	17.18	4.09
T3		5-34	17.13	4.67

Table 8 (Continued)

Variable	**Possible range**	**Actual range**	***M***	***SD***
Chinese familism	31-186			
T1		120-162	140.71	9.45
T2		121-163	140.76	9.95
T3		120-162	140.91	9.12

A one way within-subjects (repeated measure) ANOVA was conducted to determine the change in resilience, patients' functional status, social support, coping self-efficacy, spirituality, mutuality, caregiver burden and Chinese familism across the first six months posttreatment. The sample was composed of 312 participants who completed the survey at all three assessment points, meeting one assumption to perform a repeated measures ANOVA. Another assumption that had to be examined was the test of sphericity. The test of sphericity tests the differences between pairs of scores in all combinations. Sphericity is met when these variances are roughly equal. Using Mauchly's test of sphericity revealed whether there were significant differences between the variance of differences. As shown in Table 9, the assumption of Sphericity was not met in resilience, patients' functional status, social support, coping self-efficacy, spirituality, mutuality and caregiver burden (all p <.001), but the assumption was met in Chinese familism (p = .064). Therefore, the Greenhouse-Geiser test was to determine the effect of time on resilience, patients' functional status, social support, coping self-efficacy, spirituality, mutuality and caregiver burden; and the Sphericity Assumed test was to determine the effect of time on Chinese familism.

Table 9 Mauchly’s Test of Sphericity in the study variables

Variable	Mauchly’s W	χ^2	*df*	*p*-value	Greenhouse-Geisser
Resilience	.472	232.658	2	<.001	.655
Patients’ functional status	.428	262.91	2	<.001	.636
Social support	.888	36.739	2	<.001	.899
Coping self-efficacy	.621	147.527	2	<.001	.725
Spirituality	.655	131.398	2	<.001	.743
Mutuality	.517	204.252	2	<.001	.675
Caregiver burden	.562	178.803	2	<.001	.695
Chinese familism	.982	5.512	2	.064	—

As presented in Table 10, there was a significant effect of time in resilience, patients’ functional status, social support, and coping self-efficacy (all $p < .001$), while there was not a significant effect of time in spirituality, mutuality, caregiver burden and Chinese familism (all $p > .05$). The post-hoc pairwise comparisons of resilience, patients’ functional status, social support, coping self-efficacy were performed using the Bonferroni post-hoc test. The results showed that statistically significant differences existed at three-time points, indicating changes in resilience, patients’ functional status, social support, and coping self-efficacy across time during the follow-up period (all adjusted $p < .016$), indicating the scores of these variables increased over time.

Table 10 Tests of within-subjects effects on study variables across the first six months after patients initial treatment

Variable	***F***	***p*-value**	**Mean difference**		
			T1-T2	**T2-T3**	**T1-T3**
Resilience	63.505	<.001	-1.413*	-1.807*	-3.221*
Patients' functional status	35.454	<.001	-2.192*	-1.772*	-3.964*
Social support	263.631	<.001	-2.169*	-1.070*	-3.240*
Coping self-efficacy	187.149	<.001	-2.814*	-1.003	-3.817*
Spirituality	1.293	.270	—	—	—
Mutuality	.010	961	—	—	—
Caregiver burden	2.461	.105	—	—	—
Chinese familism	.126	.882	—	—	—

Note. Bonferroni test *$p < .016$

Evaluation of assumptions

Testing for meeting statistical assumptions for the latent growth model, including problematic missing data, absence of outliers, normality distribution of residuals, linearity of residuals, and absence of multi-collinearity.

Missing data

Missing data was firstly checked. All participants who had completed data three times were included in the analysis. The results revealed that there were no missing data in the total 312 subjects. In addition, attrition analyses revealed that there existed no significant differences between those who completed the 6-month follow-up and those who did not on socio-demographic characteristics.

Outlier

Univariate outliers were the data with an extreme value or large standardized score on variables. If any case is more than 3.29 standard deviations or less than -3.29 standard deviations, it is an outlier (Tabachnick & Fidell, 2019). There were 2 outliers that were deleted. Thus, the final result of this study revealed that each variable had no univariate outlier (Appendix E: Table E-1). After deleting the univariate outliers, multivariate outliers were examined by using Mahalanobis distance. When the probability of Mahalanobis distances was less than .001, it is considered an outlier (Tabacknick & Fidell, 2019). No multivariate outlier was found among any of the tested variables. Therefore, 312 samples were tested for normality of distribution, linearity, and multicollinearity at three time points.

Normality

Normality is the most fundamental assumption in multivariate analysis. The critical values of skewness and kurtosis between -1.96 to 1.96 are univariate normal distribution at .05 probability level (Tabacknick & Fidell, 2019). Skewness and kurtosis are tested using their values divided by their standard error. Examination of skewness and kurtosis revealed that patients function status at T1 (skewness 0.534/ 0.138 = 3.869; kurtosis 0.598/ 0.275 = 2.174), caregiver burden at T2 (skewness -0.151/ 0.138 = -1.094; kurtosis 0.573/ 0.275 = 2.083) and coping self-efficacy at T3 (skewness 0.659/ 0.138 = 4.775; kurtosis 0.749/ 0.275 = 2.723) did not meet the criteria (Appendix E: Table E-2). The results indicated that the univariate normality assumption of this study was violated. Multivariate normality is examined by using the P-P plots. The standardized residuals’ observed cumulative probability of occurrence are plotted on the Y axis, while predicted normal probabilities are plotted on the X axis. If all the scatters of the residuals in the figure above basically fall straight on the normal distribution line, it represents the normal distribution. The dependent variable of multivariate normality at three time points is shown in the appendix (Appendix E: Figure E-1). The P-P plots demonstrated that the multivariate normality assumption was a little violated. The Maximum Likelihood Robust (MLR) estimator is one option of LGM with Mpuls programs for analyzing continuous variables with non-normal distribution. This method is a resampling technique that generates pseudo-multiple samples. Therefore, the MLR estimation method was applied for analysis the continuous variables which were non-normal distribution.

Linearity

Linearity assumption was assessed by using Pearson’s correlation coefficient (Tabacknick & Fidell, 2019). The bivariate relationships between the continuous variables did not show a non-zero correlation as shown at T1 in Table 11. In addition, linearity assumption for the selected variables demonstrated a nonzero correlation at T2 and T3 (Appendix E: Table E-3 and Table E-4). Therefore, assumptions of linearity were met within the analysis.

Table 11 Pearson’s correlation matrix for selected variables at T1 (*n*=312)

Variables	**Y**	**A**	**B**	**C**	**D**	**M**	**Z**	**F**
Y	1							
A	-.512**	1						
B	.333**	-.308**	1					
C	.612**	-.423**	.406**	1				
D	.609**	-.360**	.433**	.635**	1			
M	.557**	-.438**	.395**	.591**	.588**	1		
Z	-.496**	.439**	-.146**	-.585**	-.361**	-.414**	1	
F	.395**	-.231**	.120*	.399**	.248**	.396**	-.395**	1

Note. Y = Resilience, A = Patients function status; B = Social support, C = Coping self- efficacy, D = Sprituality, M = Mutuality, Z = Caregiver burden, F = Chinese familism.

$^{**}p < .01$, $^{*}p < .05$

Multicollinearity

Multicollinearity is a problem of correlation matrix that occurs when variables are too highly correlated among independent variables which can reduce independent variables’ predictive power. Correlation coefficients among the variables showed no more than .90. Additionally, multicollinearity was tested using a correlation matrix with tolerance value (< .20), and a Variance Inflation Factor (VIF> 4.0) (Tabacknick & Fidell, 2019). In terms of demographic characteristics of participants, the results were shown that age of spouse, age of patients and years of marriage had the problem of multicollinearity at three time points (tolerance value ranging from .023 to .058; VIF value ranging from 17.256 to 43.413) (Appendix D: Table D-5). Thus, only age of spousal caregivers was included in the model testing. In terms of selected variables, a tolerance value had a range from .357 to .861 indicating no tolerance value less than 0.20 and VIF values had a range from 1.161 to 2.805 indicating no VIF greater than 4. Therefore, evidence of multicollinearity among the selected variables was not found.

Hypotheses testing

Hypothesis 1: The level of resilience among spousal caregivers of patients with advanced cancer would be changed across times over the first six months after initial treatment.

To address Hypothesis 1, using the Pearson correlation coefficient to examine correlations in resilience over time was first conducted. Pearson correlation coefficients among resilience at different time points showed positively and significantly ($p < .01$), but the correlation tended to decrease over time (Table 12). Obviously, data closer together, tended to be more alike, which caused positively autocorrelated. Thus, a special statistical technique was required for valid analysis and inference. Next, LCGM was used to test the average change in resilience over time and individual difference change.

Table 12 Correlation matrix of resilience at three time points (*n* = 312)

Variable	**Resilience at T1**	**Resilience at T2**	**Resilience at T3**
Resilience at T1	1		
Resilience at T2	.799**	1	
Resilience at T3	.369**	.677**	1

Note. **p <0.01

Unconditional LGCM for resilience over time

There were three unconditional LGCMs estimated in the analysis. The non-growth model was first tested as a reference model. Then, a linear growth model and a latent basis growth model with a freely estimated time score were tested for estimating the intra-individual change in resilience across time. As shown in Table 13, the linear growth model showed the best fit to the data and adequately described the intra-individual change in resilience across time: $\chi2$ = 8.815, df =3, p =.031, $\chi2$/ df = 2.938; RMSEA= .079; CFI= .990; TLI= .990; SRMR= .060. This model also resulted in the lowest AIC and BIC values, also reflecting that it was the model with the best fit. Therefore, the linear growth model was selected as the best-fitting growth model (Figure 10).

Table 13 Statistics of model fit index among three models (*n* = 312)

Model fit criterion	**Non-growth model**	**Linear growth model**	**Latent basis growth model**
χ2	358.077	8.815	6.299
df	6	3	2
p-value	0.000	0.031	0.042
χ2/ *df*	59.679	2.938	3.150
AIC	6083.009	5739.147	5739.231
BIC	6094.238	5762.205	5765.432
aBIC	6084.723	5743.175	5743.231
RMSEA	0.438	0.079	0.083
CFI	0.366	0.990	0.992
TLI	0.683	0.990	0.988
SRMR	0.506	0.060	0.033

Note. χ2 = Chi-Square Value, *df* = Degrees of Freedom, AIC = Akaike information criterion, BIC= Bayes information criterion, aBIC= sample-size adjust BIC, RMSEA= root mean square error approximation, CFI= comparative fit index, TLI= Tucker-Lewis Index, SRMR= standardized root mean residual.

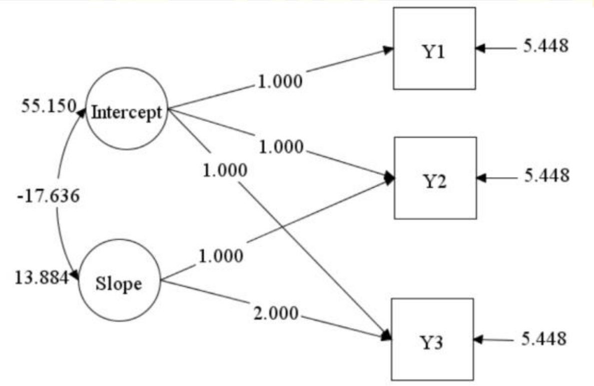


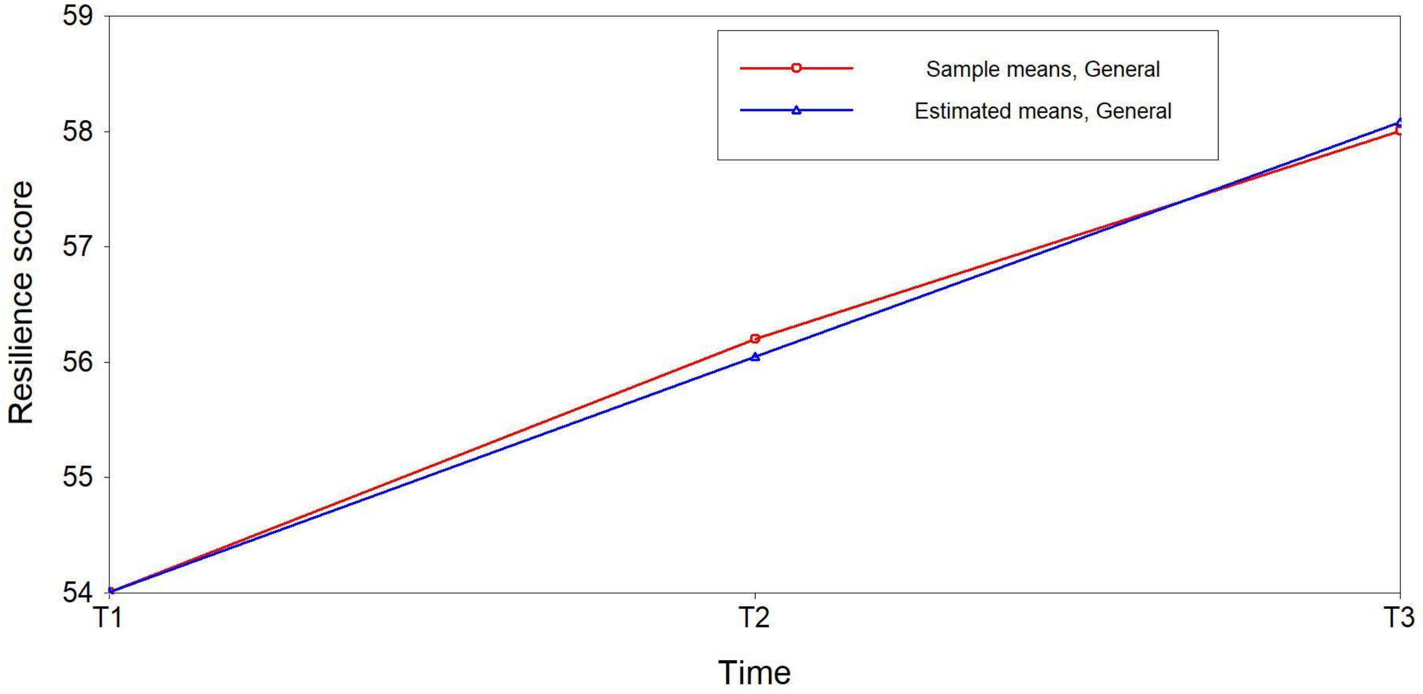
Figure 10 Unconditional LGCM with a linear growth for the trajectory of resilience

A linear growth model specified two latent factors: the intercept (baseline levels of resilience scores) and a single linear slope (change in resilience scores across time). Results indicated that a significant change in resilience scores increased in a linear fashion over the first six months posttreatment (Table 14). The unconditional linear growth model had a significant intercept mean (Mean intercept (Mi)= 54.08, SE =.437, $p < .001$) and a significant slope mean (Mean slope (Ms)= 1.982, SE = .231, $p < .001$). The mean intercept indicates that, on average, participants had resilience scores of around 54. The mean slope indicated that, on average, resilience scores increased by 1.982 units every measured time point during 6-month treatment periods. Mean resilience scores (observed and estimated) are presented in Figure 11.

The variance of the intercept (Variance intercept (Vi) = 55.150, SE = 4.793, $p < .001$) was statistically significant, indicating that there was a significant variation in the levels of resilience scores at baseline. And the variance of the slope (Variance slope (Vs) = 13.884, SE = 1.347, $p < .001$) was statistically significant, indicating that there was a significant variation in the rate of change in spouses' resilience scores over the course of patients' 6-month treatment. As shown in Figure 11, there was a significant increase in resilience from baseline ($M = 54.08$) to 6-month follow-up point ($M = 58.04$). Additionally, there was a negative and significant correlation between the intercept and slope factor ($r = -.637$, $p < .001$), indicating that participants with a higher level of resilience at baseline demonstrated less change in resilience during the follow-up period.

Table 14 Intercept and slope estimate of resilience in the Linear Growth Model

Parametres	**Unstandardized Estimate**	**S.E**	***t*** **-value**	***p*****-value**	**Standardized Estimate**
Means					
Intercept	54.080	0.437	123.640	0.000	7.282
Slope	1.982	0.231	8.592	0.000	0.532
Variances					
Intercept	55.150	4.793	11.507	0.000	1.000
Slope	13.884	1.347	10.304	0.000	1.000
Covariance					
	-17.636	2.134	-8.265	0.000	-.637



Parameters in the Figure 4-2	**T1**	**T2**	**T3**
Sample Means	54.01	56.20	57.97
Estimated Trajectory	54.08	56.06	58.04

Figure 11 Sample and estimated mean of the linear growth model in resilience

Model 2 — Unconditional GMM

As shown in the linear growth model of LGCM, there was a significant difference in the intercept and slope indicating there were individual differences in the initial level and the growth rate of resilience. Furthermore, a random sample of individual trajectories (n = 30) indicated that there was some variation around the mean trajectory, as was evident by a subset of individual trajectories shown in Figure 12. The next step was to determine how many latent growth trajectory classes of resilience existed in the study sample. Growth mixture modeling (GMM) enabled the identification of the following distinct trajectory classes of resilience. The model fit statistics for GMM with between one to five classes are shown in Table 15. Most model fit indices suggested the 2-class model was the optimal fit model (e.g., highest entropy values, significant BLRT and VLMR-LRT results). Although the decreased LL, AIC, BIC and aBIC indicated a better model fit for the 5-class model, the changes in them from one to two or from two to three classes were much more significant than from three to four or four to five classes. The 2-class solution was selected as the optimal unconditional model based on the small changes of BIC and aBIC values and the smaller entropy class in the 3-class solution, as well as fit with parsimony, theory, and interpretability.

In the 2-class solution model (Figure 13), two groups showed increasing developmental trends but differed in absolute values, namely fast-growth and slight-growth. The first class, containing 42.9% of the sample, exhibited a low level of resilience but showed a fast development across time. The second class contained 57.1 % of the sample and exhibited a high level but slow development of resilience across time.

Resilience scores differed significantly by trajectories of resilience scores over the course of 6-month treatment (Table 16). The average resilience score in the “low resilience with fast-growth group” trajectory (C1) was 47.27. This trajectory was followed by 131 participants. In contrast, the average resilience score in the “high resilience with slight-growth group” trajectory (C2) was 59.23. This trajectory was followed by 181 participants. The slopes of the two-class model were significantly different between the fast-growth group ($\beta = 3.31$, $p < .001$) and the slight-growth group ($\beta = 1.01$, $p = .005$) for Class 1 and Class 2, respectively.

Furthermore, Wald *z*-tests were performed to examine whether the differences in intercepts and slopes were statistically significant between the two classes (Table 17). Wald *z*-tests revealed that spousal caregivers in the low resilience with fast-growth group (C1) and the high resilience with slight-growth group (C2) showed significantly different levels of resilience at baseline (*Wald Z* = -158.981, $p < .001$), as well as different rates of change in resilience over time (*Wald Z* = 48.361, $p < .001$). Therefore, those spousal caregivers who had the lower level of resilience across the first six-month post-treatment time span displayed a significantly steeper increase in resilience slope, relative to the high resilience with slight-growth group.

As the above showed, the results supported the first hypothesis: the level of resilience among the spousal caregivers of advanced cancer patients significantly changed over the first six months of initial post-treatment.

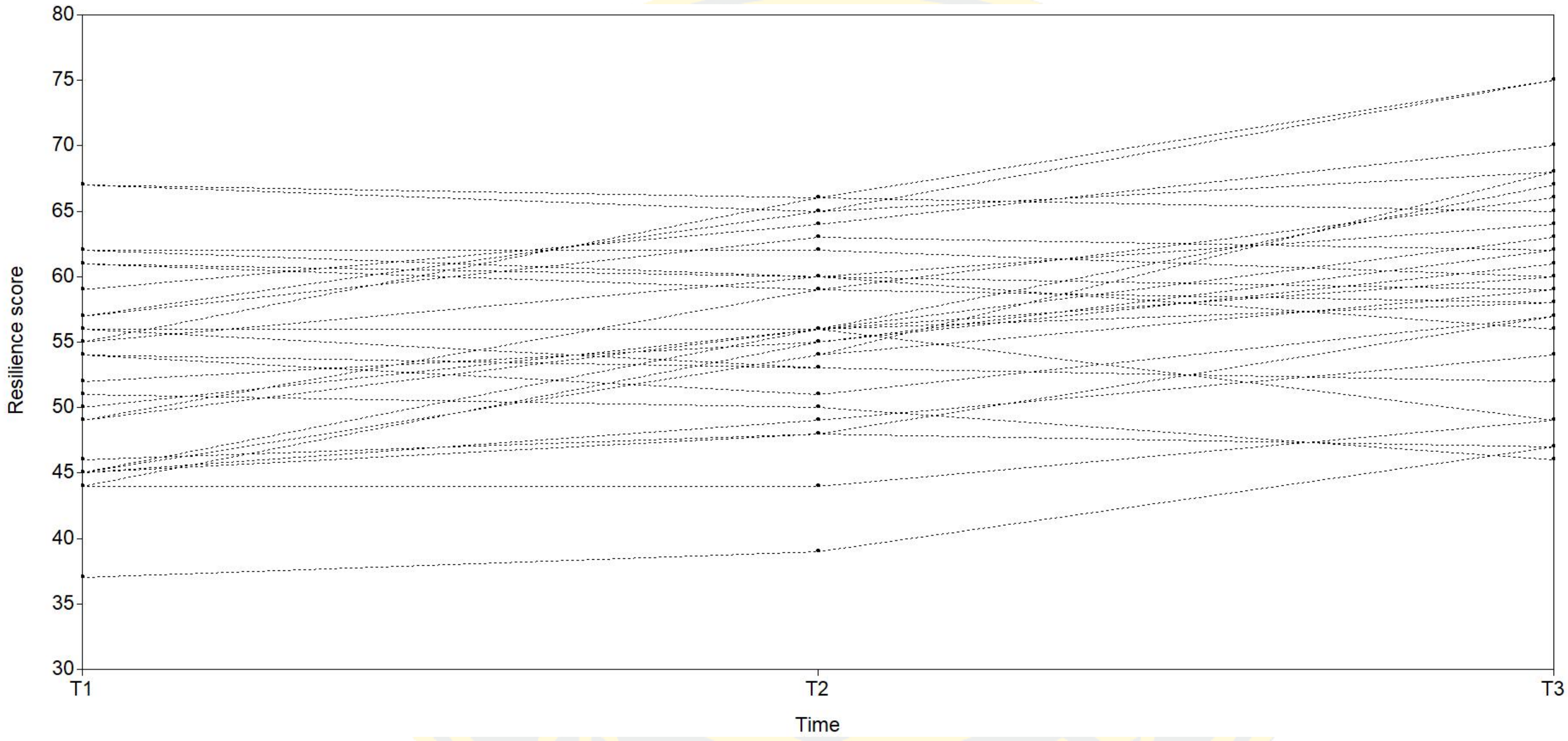


Figure 12 A sample of observed individual trajectories (random subset, *n* = 30)

Table 15 Fit indices for 1- to 5-class unconditional GMM for resilience in participants

Class	LL	AIC	BIC	aBIC	Entropy	LMR (*p*)	BLRT (*p*)	Class probability
1	-3138.724	6287.448	6306.163	6290.305	-	-	-	1
2	**-2988.380**	**5992.163**	**6022.107**	**5999.734**	**0.806**	**0.000**	**0.0000**	**0.429/ 0.571**
3	-2939.750	5901.500	5942.673	5907.785	0.780	0.145	0.0000	0.230/ 0.415/ 0.354
4	-2911.010	5850.020	5902.422	5858.019	0.793	0.111	0.0000	0.154/ 0.288/ 0.359/ 0.199
5	-2886.958	5807.916	5871.547	5817.629	0.787	0.352	0.0000	0.112/ 0.109/ 0.173/ 0.237/ 0.369

Note. LL = Log-likehood, AIC = Akaike Information Criteria, BIC = Bayesian Information Criteria; aBIC = Sample-size adjusted BIC, LMR = Lo-Mendell-Rubin Likelihood Ratio test, BLRT = Bootstrapped Log-likelihood Ratio tests.

Table 16 Growth parameters for the 2-class model in resilience

Group	n	Parametres	Estimate	S.E	*t*-value	*p*-value
C1	131	Intercept	47.27	0.66	71.802	0.000
		Slope	3.31	0.45	7.323	0.000
C2	181	Intercept	59.23	0.65	90.948	0.000
		Slope	1.01	0.36	2.812	0.005

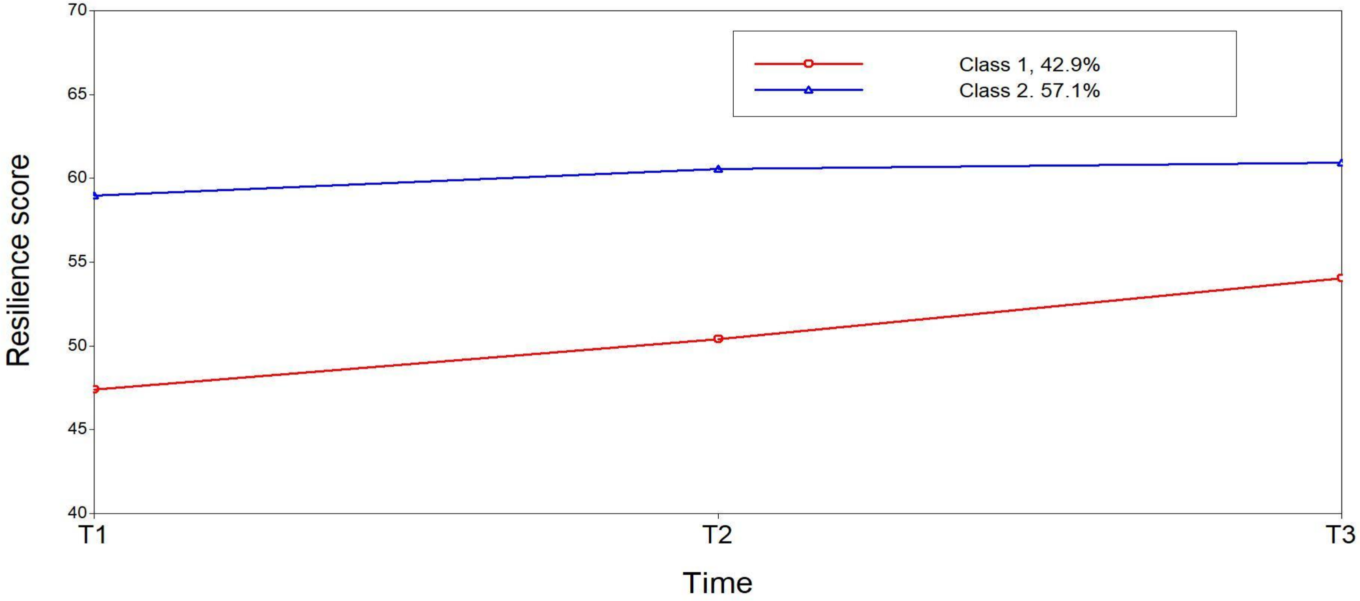


Figure 13 Two latent classes for trajectory plots of resilience in the study

Table 17 Comparison between two groups in change pattern of resilience

Group	**C1 (n=131)**		**C2 (n=181)**		***Wald-Z***	***p*-value**	**95%CI**
	Estimate	S.E	Estimate	S.E			
Intercept	47.27	0.66	59.23	0.65	-158.981	0.000	-12.107 ~ -11.813
Slope	3.31	0.45	1.01	0.36	48.361	0.000	2.207 ~ 2.393

CI = Confidence Interval.

Hypothesis 2: The effects of selected predictors [social support, spirituality, mutuality, coping self-efficacy, caregiver burden, patients' functional status and Chinese familism] on resilience among spousal caregivers of patients with advanced cancer would be different across time at the first, three, and six months posttreatment.

Model — Conditional LGCM of resilience with time-invariant and time-variant covariates.

The first step: Testing a conditional LGCM with time-invariant covariates

Time-invariant covariates included ten demographic characteristics of spousal caregivers and their patients at baseline. Age of spouses was coded as a continuous variable. Categorical variables contained gender [0 = male, 1 = female], religious [0 = no, 1 = yes], education [1 = elementary school, 2 = intermediate school, 3 = high school, 4 = college/ university], job status [1 = no job, 2 = part-time, 3 = full-time], family income [1= less than 2000, 2 = between 2000 and 6000, 3 = more than 6000], health status [1 = poor, 2 = average, 3 = good], cancer type [1 = lung, 2 = gastric, 3 = colorectal, 4 = breast, 5 = liver, 6 = others], cancer stage [1 = stage III, 2 = stage IV], and treatment [1 = chemotherapy, 2 = surgery + chemotherapy, 3 = chemotherapy + radiotherapy, 4 = surgery+ chemotherapy + radiotherapy].

According to model fit indices of LGCM, the first conditional LGCM with ten time-invariant covariates showed excellent fit, $\chi2 = 16.287$, $df = 13$, $\chi2 / df = 1.252$, RMSEA = 0.028, SRMR = 0.030, CFI = .995, TLI = .988, and AIC= 5629.343, BIC= 5726.661, aBIC = 5644.198. For ease of interpretation, some residual variances and non-significant paths were not reported in Figure 14. The results showed that significant time-invariant covariates included gender, family income, cancer type and cancer stage on the intercept, and family income and treatment on the slope. The standardized mean value of intercept and slope were 5.610 ($t = 6.996$, $p < .001$) and 2.467 ($t = 2.940$, $p = .003$), meaning the effect of the slope for time was significant after controlling for time-invariant covariates. That is, there are other covariates that influenced the development of resilience except for time-invariant covariates. The residual variances of the intercept ($\sigma^2 = .656$, $p < .001$) and the slope ($\sigma2 = .789$, $p < .001$) indicated significant individual differences at baseline level and development trajectory of resilience scores among participants. There was a significant negative relationship between intercept and slope ($r = -.575$, $p < .001$). Significant parameter estimates accounted for 34.5% ($R^2 = .345$, $p < .001$) of variance in intercept and 21.1% ($R^2 = .211$, $p < .001$) variance in slope.

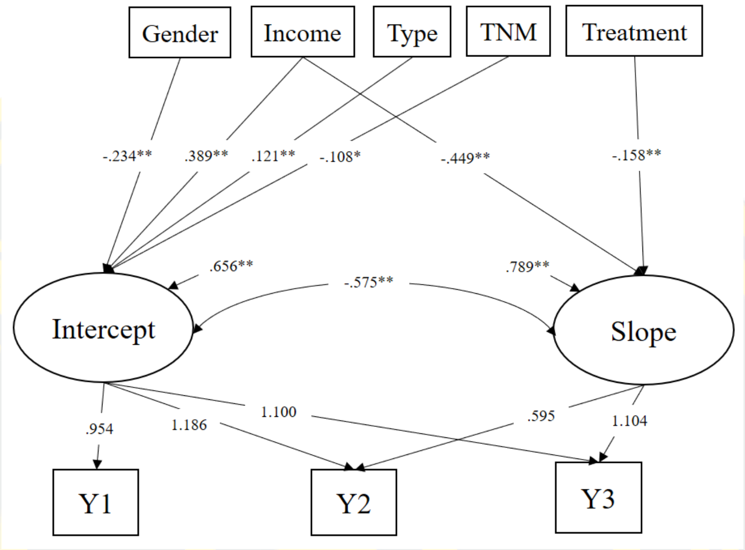


Figure 14 The LGCM for trajectories of resilience with time-invariant covariates.

Note. Y = Resilience, TNM = cancer stage. 1, 2, and 3 represented at T1, T2, T3, respectively.

$^{**}p < 0.01$, $^{*}p < 0.05$

The second step: Testing a conditional LGCM with time-variant covariates. There were seven time-variant covariates based on the conceptual framework in this study (Figure 15), including patients' functional status, social support, coping self-efficacy, spirituality, mutuality, caregiver burden and Chinese familism. The second conditional LGCM with seven time-variant covariates exhibited a little poor fit, $\chi2$ = 124.213, $df = 43$, $\chi2 / df = 2.888$, RMSEA = 0.078, SRMR = 0.116, CFI = 0.912, TLI = .865, and AIC=5390.795, BIC= 5499.342, aBIC = 5407.361. It indicated there were other covariates influencing resilience over time. Consequently, time-invariant covariates needed to be added to improve the fit to the empirical data as controlled variables. The mean value of intercept was significant (stand mean intercept = 5.535, $t = 5.734$, $p < .001$) but the mean value of slope was not significant (stand mean slope = 1.472, $t = .925$, $p = .355$). There was a significantly negative correlation between the intercept and slope ($r = -.432$, $p < .001$).

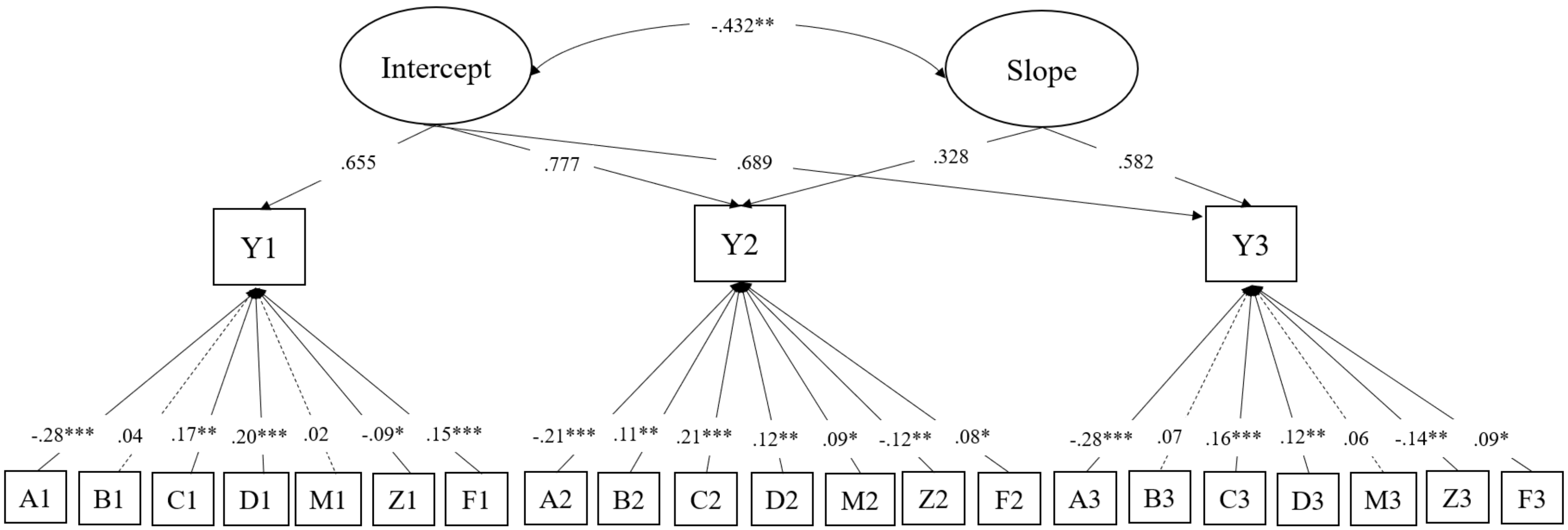


Figure 15 The LGCM for trajectories of resilience with time-variant covariates

Note. Y = Resilience, A = Patients' functional status, B = Social support, C = Coping self-efficacy, D = Spirituality, M = Mutuality, Z = Caregiver burden, F = Chinese familism. 1, 2, and 3 represented at T1, T2, T3, respectively.

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

The final step: Estimating a conditional LGCM with both time-variant and time-invariant covariates

Based on the LGCM with time-variant covariates, the third conditional LGCM added five significant time-invariant covariates (gender, family income, cancer type, cancer stage and treatment) into the second model. Time-invariant covariates as control variables are to control interference by external factors, and to make the model better fit the data, and to improve the accuracy of the model. The significant control variables not only made a better model fit but did not add complexity of the model. After controlling for potential time-invariant covariates (i.e., gender, family income, cancer type, cancer stage, and treatment), the third conditional LGCM showed a good fit, $\chi2 = 106.057$, $df = 48$, $\chi2 / df = 2.209$, RMSEA = .062, SRMR = .066, CFI = .939, TLI = .900, and AIC= 5352.758, BIC= 5498.736, aBIC = 5375.041. The final conditional LGCM accomplished significantly fit statistics and fitted the empirical data. In this model, the mean value of intercept was significant (standardized mean intercept = 4.410, $p < .001$) but the mean value of slope was not significant (standardized mean slope =2.538, $p = .180$) after adding time-invariant and time-variant covariates. There was a significantly negative correlation between the intercept and slope ($r = -.329$, $p < .001$), indicating that participants with a higher level of resilience at baseline demonstrated less development in resilience during the follow-up period. For ease of interpretation, some residual variances and non-significant paths were not reported in the final LGCM (Figure 16).

As shown in Table 18, at each time point, patients' function status, coping self-efficacy and Chinese familism were associated with resilience. Patients' function status at T1, T2 and T3 had negative effects on resilience at T1, T2 and T3, respectively (T1: $\beta = -.224$, $p < .001$; T2: $\beta = -.191$, $p < .001$; T3: $\beta = -.310$, $p < .000$); coping self-efficacy had positive effects on resilience at T1, T2, and T3, respectively (T1: $\beta = .119$, $p = .018$; T2: $\beta = .158$, $p < .001$; T3: $\beta = .154$, $p < .001$); and belief in Chinese familism had positive effects on resilience at T1, T2 and T3, respectively (T1: $\beta = .151$, $p < .001$; T2: $\beta = .090$, $p = .004$; T3: $\beta = .102$, $p = .005$). At T1 and T2, spirituality had positive effects on resilience (T1: $\beta = .199$, $p < .001$; T2: $\beta = .102$, $p = .004$), but there was no significant association between spirituality and resilience at T3 ($\beta = .077$, $p = .133$). At T2 and T3, caregiver burden had negative effects on resilience at T2 and T3, respectively (T2: β = -.106, *p* = .001; T3: β = -.136, *p* = .001), but there was no significant association between caregiver burden and resilience at T1 (β = -.068, *p* = .074). Social support only had a positive effect on resilience at T2 (β = .094, *p* = .012), but there was no significant association between social support and resilience at T1 and T3, respectively (T1: β = .039, *p* = .239; T3: β = .057, *p* = .236). Meanwhile, mutuality also only had a positive effect on resilience at T2, but there was no significant association between mutuality and resilience at T1 and T3, respectively (T1: β = .006, *p* = .890; T3: β = .065, *p* = .238).

As shown in Table 19, further simple effect analysis revealed that there was a significant difference in patients' function status on resilience between T1 and T2, and between T2 and T3, respectively. The negative coefficient indicated that the effect of patients' function status on the resilience change at T1 was smaller than that at T2 (B=-.076, *t*=-2.032, *p*=.042), and the positive coefficient indicated that patients' function status at T2 had a bigger effect on resilience change than that at T3 (B=.075, *t*=-2.085, *p*=.037). However, there was not a significant difference in patients' function status between T1 and T3 (B=-.001, *t*=-.023, *p*=.982). Moreover, further simple effect analysis demonstrated that spirituality, mutuality and Chinese familism had only significantly different effects on resilience between T1 and T2. Spirituality at T1 had a bigger effect on resilience change than that at T2 (B=.146, *t*=1.991, *p*=.046). Mutuality at T1 had a smaller effect on resilience change than that at T2 (B=-.103, *t*=-2.197, *p*=.028). Chinese familism at T1 had a bigger effect on resilience change than that at T2 (B=.066, *t*=2.837, *p*=.005). In addition to patients' function status, spirituality, mutuality and Chinese familism on resilience, no significantly different effects were observed in other time-variant covariates. Taken together, after controlling for time-invariant, the effects of time-variant predictors on resilience among spousal caregivers of advanced cancer patients were partially different across time at different time points.

A comparison among the unconditional and conditional models indicated that the conditional LGCM with time-invariant and time-variant covariates had a better fit to the empirical data than the unconditional LGCM in Table 20. After controlling the time-invariant covariates, the effect of the slope for the time was significant (standardized mean slope =2.467, *t* = 2.940, *p* =.003); but the effect of the slope for the time became non-significant. (standardized mean slope= 1.472, *t*= 0.925, *p*=.355) after controlling for time-variant covariates, indicating that the time-variant covariates had a significant effect on resilience change in the growth of resilience over time. Moreover, the effects of time-variant predictors on resilience process among spousal caregivers of advanced cancer patients were partially different across time.

Table 18 Standardized Estimates of the conditional LGCMs with time-variant covariates after controlling significant time-invariant covariates

Covariates	**Stand-Estimate**	**S.E**	***t*-value**	***p*-value**
Patients' function status T1	-.224	. 038	- 5.950	< .001
Patients' function status T2	-.191	. 038	- 5.068	< .001
Patients' function status T3	-.310	. 051	- 6.033	< .001
Social support T1	.039	.033	1.178	.239
Social support T2	.094	.037	2.520	.012
Social support T3	.057	.048	1.186	.236
Coping self-efficacy T1	.119	.050	2.364	.018
Coping self-efficacy T2	.158	.035	4.529	< .001
Coping self-efficacy T3	.154	.043	3.542	< .001
Spirituality T1	.199	.047	4.276	< .001
Spirituality T2	.102	.035	2.910	.004
Spirituality T3	.077	.051	1.180	.133
Mutuality T1	.006	.041	.138	.890
Mutuality T2	.094	.041	2.266	.023
Mutuality T3	.065	.055	1.180	.238
Caregiver burden T1	-.068	.038	-1.788	.074
Caregiver burden T2	-.106	.033	-3.228	.001
Caregiver burden T3	-.136	.040	-3.348	.001
Chinese familism T1	.151	.034	4.409	< .001
Chinese familism T2	.090	.032	2.843	.004
Chinese familism T3	.102	.036	2.809	.005

Table 19 Comparison of different effects of the selected variables on resilience change

Variables	**Unstand-Estimate**	**Unstand-Estimate**	**Unstand-Estimate**
	T1-T2	**T1-T3**	**T2-T3**
Patients' function status	**-.076***	-.001	**.075***
Social support	-.095	-.048	.047
Coping self-efficacy	-.084	-.128	.044
Spirituality	**.146***	.177	.031
Mutuality	**-.103***	-.072	.030
Caregiver burden	.069	.102	.033
Chinese familism	**.066****	.051	-.015

Note. $*p < 0.05$, $**p < 0.01$

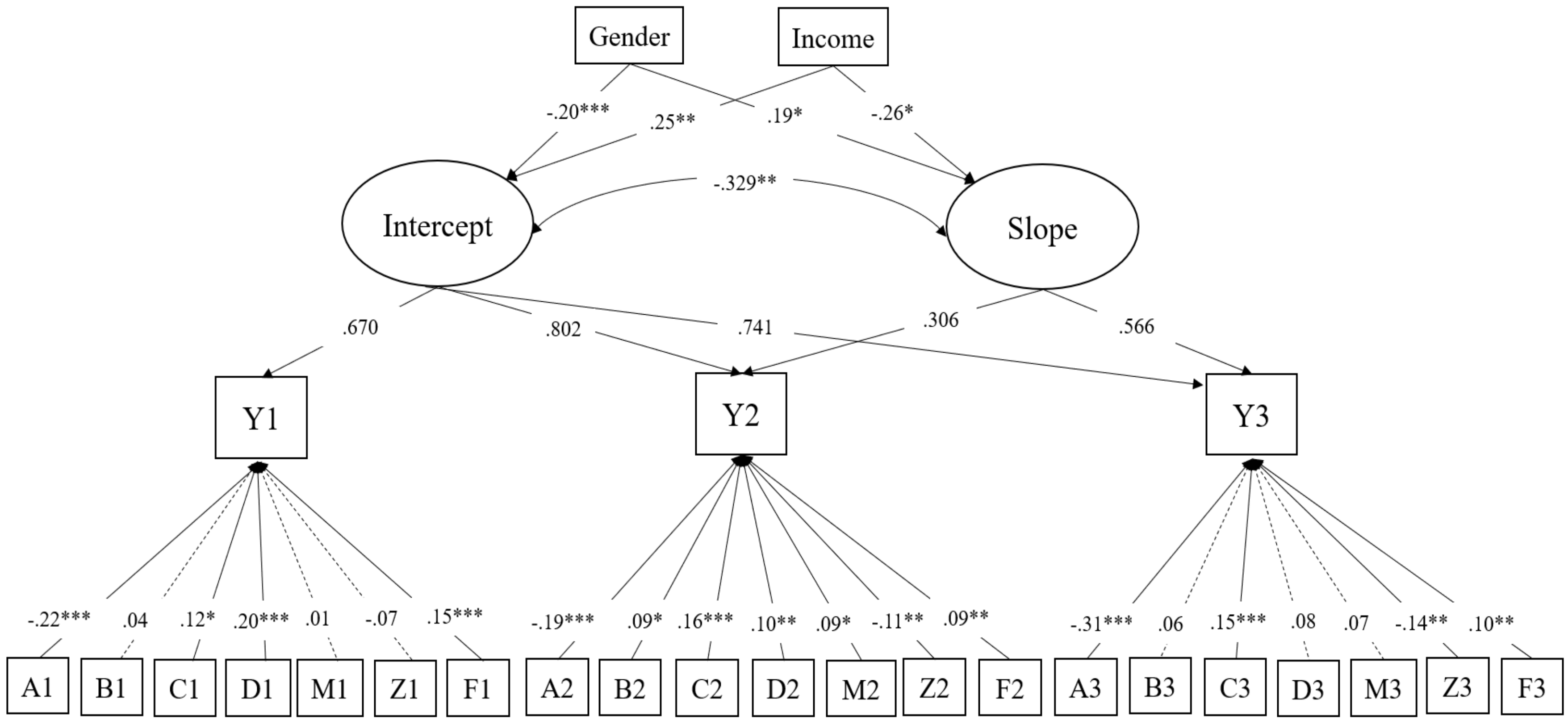


Figure 16 The LGCM for the trajectory of resilience with time-variant after controlling significant time-invariant covariates

Note. TNM = cancer stage, Y = Resilience, A = Patients’ function status, B = Social support, C = Coping self-efficacy, D = Spirituality, M = Mutuality, Z = Caregiver burden, F = Chinese familism. 1, 2, and 3 represented at T1, T2, T3, respectively.

$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table 20 Comparison of fitting indices and the developmental trajectory of resilience among the unconditional LGCM and the conditional LGCM

Model fit criterion	**Unconditional LGCM**	**LGCM with time-invariant covariates**	**LGCM with time-variant covariates**	**LGCM with time-variant and time-invariant covariates**
$\chi2(df)$	8.815 (3)	16.287 (13)	124.213 (43)	106.057 (48)
p-value	.031	.234	<.001	<.001
$\chi2/ df$	2.938	1.252	2.888	2.209
AIC	5739.147	5629.343	5390.795	5352.758
BIC	5762.205	5726.661	5499.342	5498.736
aBIC	5743.175	5644.198	5407.361	5375.041
RMSEA	.079	0.028	.078	.062
CFI	.990	.995	.912	.939
TLI	.990	.988	.865	.900
SRMR	.060	.030	.116	.066
Mean of intercept	7.282(.322)***	5.610(.802)***	5.535(.965)***	5.148(1.231)***
Mean of slope	0.532(.067)***	2.467(.839)**	1.472 (1.592)	2.103 (1.800)
Slope with intercept	-0.637(.038)***	-0.575(.058)**	-.432(.087)***	-.329 (.088)***

Note. **$p< .01$, *** $p< .001$

Summary

The testing of the LGCM of resilience in spousal caregivers of patients with newly diagnosed advanced cancer showed a good fit to the empirical data. The findings supported the hypothesis as described below.

Hypothesis 1: The level of resilience among spousal caregivers of advanced cancer patients is changed over the first six months of initial posttreatment.

The unconditional LGCM without covariates exhibited a significant change of resilience scores increased in a linear fashion over time. The results showed a significant positive slope mean (Ms= 1.982, SE = .231, p <.001) indicating that resilience scores increased by 1.982 units every time point during 6-month treatment periods on average. Additionally, the unconditional GMM showed increasing developmental trends in two groups: one was fast growth and the other was slight growth. Thus, hypothesis 1 was fully supported by unconditional LGCM.

Hypothesis 2: The selected predictors including patients' function status, social support, spirituality, mutuality, coping self-efficacy, caregiver burden, and Chinese familism on resilience process among spousal caregivers of advanced cancer patients were different at 1, 3, and 6 months posttreatment.

After controlling for five significant time-invariant covariates, the results showed the effects of selected predictors on resilience process among spousal caregivers of advanced cancer patients were partially different across time. Patients' function status had negative effects on resilience at all three time points, and the effect at the three months posttreatment had a bigger effect on resilience change than that at the first one-month posttreatment and at six months posttreatment. Social support only had a positive effect on resilience at three months posttreatment, and there was no significantly different effect on resilience change among the three time points. Coping self-efficacy had positive effects on resilience at all three time points, whereas it had no significantly different effect on resilience change among the three time waves. Spirituality had a positive effect on resilience at the first one- and three months posttreatment, and it had a more significant effect on resilience change at the first one-month posttreatment than that at the three months posttreatment. Mutuality only had a positive effect on resilience at the third month posttreatment, and it had a more significant effect on resilience change at the third month posttreatment than that at the first one-month posttreatment. Caregiver burden had a negative effect on resilience at the three- and six months posttreatment, and there was no significantly different effect on resilience change at three time points. Chinese familism had positive effects on resilience at all three time points, and it had a bigger effect on resilience change at the first one-month posttreatment than that at three months posttreatment. Therefore, hypothesis 2 was partially supported that the effects were different across time using the LGCM with time-variant and time-invariant covariates.

In sum, this chapter presented the characteristics of the participants and newly-diagnosed advanced cancer patients. Missing data, outlier, linearity, normality and multicollinearity were tested in the preliminary analyses and found acceptable under the assumption of a latent growth model [LGM]. A robust maximum likelihood estimator was applied for analyzing variables due to non-normal distribution. The unconditional LGCM was tested and showed an excellent goodness-of-fit indices in linear growth model ($\chi2 = 8.815$, $df = 3$, $\chi2/ df = 2.938$, CFI = .990, TLI = .990 and RMSEA = .079, SRMR = .060). The findings revealed a significant linear fashion over the first six months posttreatment (Ms= 1.982, SE = .231, $p < .001$). Furthermore, results revealed the final conditional LGCM showed a good fit ($\chi2 = 106.057$ (48), $p < .001$, $df = 48$, $\chi2/ df = 2.209$, CFI = .939, TLI = .900, RMSEA = .062, SRMR = .066). The effects of selected predictors on resilience process were partially different at 1, 3, and 6 months posttreatment. Compared to LGCM with time-invariant covariates and LGCM with time-variant covariates, the mean of slope for the time changed significantly, indicating the selected seven factors had effects on the trajectory of change in resilience.

CHARPTER 5
DISCUSSION AND CONCLUSION

This chapter includes three sections. First, it presents a summary of this study. Second, it discusses the findings related to the research hypotheses. Finally, it demonstrates strengths, limitations, implications, and recommendations.

Summary of the study

The goal of the present study was to investigate the trajectory of change in resilience over the first six months posttreatment, and to examine its predictors including social support, spirituality, mutuality, coping self-efficacy, caregiver burden, patients' functional status, Chinese familism impacting resilience among spousal caregivers of advanced cancer patients at three time points. A multistage random sampling technique was employed to recruit the sample of 360 spousal caregivers of patients with newly-diagnosis advanced cancer (stage III and stage IV) who were treated in the five regional hospitals in China. This study was conducted in a longitudinal design and data was collected at one month after initial treatment, three months after treatment, and six months after treatment. Finally, 312 participants completed the valid questionnaire in the follow-up survey losing 48 persons.

Research questionnaires consisted of a personal demographic record form and 8 instruments: CD-RISC, ADL-C, SSRS, CSES, FACIT-Sp, MS, ZBI, BCF. The Cronbach's alpha of these eight scales were .821, .964, .713, .884, .880, .917, .770 and .867, respectively in the pilot study. After data cleaning and assumption testing for data analyses, the sample of 312 participants was continued. The data analysis was conducted using descriptive analysis to show the demographic data of the participants and variables. An unconditional LGCM and GMM were used to test the level of resilience changing across times over the first six months post-treatment. Then, a conditional LGCM was employed to analyze the different effects of factors on resilience across time at 1, 3, and six months after initial treatment when patients were newly diagnosed with advanced cancer.

The average score of caregivers' resilience was 54.01 ± 7.68 at one month after initial treatment, 56.20 ± 6.38 at three months, and 57.97 ± 6.70 at six months. There were positive and significant relationships between different time points ($p< .01$), but the effect of correlation tended to decrease over time. In the unconditional LGCM, a linear growth model presented the best fit to the data and showed a significant slope mean (Ms= 1.982, SE = .231, $p< .001$), indicating caregivers' resilience scores increased significantly across the first six months after patients' initial treatment. There was a significant variation in the levels of resilience scores at baseline (Vi = 55.150, SE = 4.793, $p< .001$), and a significant variation in the rate of change in resilience scores over the course of patients' 6-month treatment (Vs = 13.884, SE = 1.347, $p< .001$). Moreover, there was a negative and significant correlation between the intercept and slope factor ($r = -.637$, $p< .001$), indicating that participants with a higher level of resilience at baseline showed less change in resilience during the follow-up period. In the unconditional GMM, there were two groups showing different values, including low resilience with fast-growth group and high resilience with slight-growth group. No matter what their level of resilience at baseline was, participants had an improvement in resilience during the first six months after initial treatment. The scores of resilience were statistically different over time and between subjects over the first six months of initial posttreatment.

A conditional LGCM showed that after controlling for time-invariant covariates, the effects of patients' function status, social support, coping self-efficacy, spirituality, mutuality, caregiver burden and Chinese familism on resilience had different effects on resilience across time at different time points. Selected factors associated with the resilience trajectories were partially supported by the study hypotheses. Patients' function status had a negative effect on the increase of resilience at all points in time ($p< .001$). Coping self-efficacy and Chinese familism had a positive effect on the increase of resilience at all points in time ($p< .05$). Other predictors including social support, spirituality, mutuality and caregiver burden were only significantly related to a high resilience score at one or two points in time. Moreover, after controlling time-invariant covariates, the effect of the slope for time was still significant ($\beta = 2.467$, $p= .003$); however, followed by controlling time-variant covariates, the effect of the slope for time was not significant ($\beta = 2.103$, $p= .243$). In the final conditional LGCM, the selected seven predictors were partially significantly related to changes in resilience scores over the first six months posttreatment.

Discussion of the findings

The findings demonstrated the trajectory of changes in resilience among spousal caregivers of patients with newly-diagnosed advanced cancer and the different effects of predictors on resilience across the first six months of initial posttreatment.

The trajectory of change in resilience among spousal caregivers

There were different levels of resilience among spousal caregivers at three-time points. The results revealed that the change in resilience increased significantly during the first six months period after the initial treatment of patients newly-diagnosed with advanced cancer. Moreover, there was a significantly different rate of increase in spouses' resilience scores over the course of the patients' six-month treatment period. After controlling for unchangeable factors (time-invariant covariates), the effect of the slope for time was still significant, but after controlling for changeable factors (time-variant covariates), the effect of the slope was not significant. These findings suggest that patients' function and caregivers' psychosocial factors may be important intervention factors which help foster resilience among spouses who were experiencing care for patients (Sun et al., 2021; Toledano-Toledano et al., 2021). Nurses should pay special attention to the spousal caregivers of patients with advanced cancer in terms of patients' health status, social support, coping ability, mutuality between spouses, spiritual well-being, caregiver burden, and beliefs in Chinese familism during the first six months of initial treatment.

In addition, linear growth models revealed participants with a higher level of resilience at baseline showed slight growth in resilience, whereas spousal caregivers with a lower level of resilience at baseline presented fast growth in resilience during the follow-up period. It implied that greater resilience was associated with stable patterns of trajectories over time. Just as Ungar (2018) said, a resilient individual presented relative stability in the mental state and a recovering individual showed an increased adaptation over time. These two patterns are resilience processes. Furthermore, the findings of this study indicated that the mean scores of caregivers' resilience during the first month after treatment began were the lowest in all measured time points, and the mean scores increased significantly from the first to the sixth month after initial treatment. Just as Meyers et al. (2020) conclusion, significant depressive symptoms were at baseline and depression scores decreased slightly through six months for their family caregivers of Neuroscience ICU patients. This finding supports the resilient outcome of the psychological resilience model (Opsomer et al., 2022). Consistent with the study hypotheses, the trajectory of changes in the different levels of resilience was found over time.

The overall means of resilience of spousal caregivers in the present study as measured by the CD-RISC at the three -time points (54.01 ± 7.68, 56.20 ± 6.37, and 57.97 ± 6.80, respectively) were all lower than the CD-RISC scores reported for the general population (80.4 ± 12.8) and primary caregivers (71.8 ± 18.4) as reported by Connor and Davidson (2003). Moreover, the mean scores observed in this study were lower than the Chinese general community (65.4 ± 13.9) (Yu & Zhang, 2007). However, the CD-RISC scores in the present study were similar to those reported in studies of family caregivers of stroke patients in North China (55.68 ± 11.01) (Fang et al., 2022) and family caregivers of patients with bipolar disorder in South China (57.34 ± 12.09) (Su et al., 2021), indicating that caregivers generally reported moderately low resilience at the early stages of a sudden or unexpected serious health event. This may be because a newly diagnosed advanced cancer is a huge trauma incident for families, and high degrees of sadness and anxiety are often viewed as “normal” responses to cancer diagnosis and treatment, so low resilience is due to unexpected ‘manageable’ sadness and preoccupation with the disease.

Our findings showed that the trajectory of change in resilience in spousal caregivers in our study was consistent with those reported in previous studies (Chen et al., 2020; Lee et al., 2022; Muscara et al., 2018; Sharp et al., 2022). For instance, Lee et al. (2022) found that the resilience scores of primary caregivers of patients with advanced head and neck cancer increased from the initial completion of treatment to peaking at six months post-treatment time point, and holding relatively steady until the 12-month point. In this study, changes in resilience showed significant growth during the first six months after the patient began treatment, but the rate of change became smaller over time. Sharp et al. (2022) presented a similar resilient trajectory in 71.5% of caregivers of children with cancer, with low PTSD symptoms at baseline which declined significantly over time with a significantly decreasing slope. In other words, the trajectory of change in resilience was growth, which is consistent with the general literature on human response to potentially traumatic events (Galatzer-Levy et al., 2018).

The current findings were inconsistent with one recent study (Heathcote et al., 2021), which found that the resilience of caregivers of acutely injured trauma patients reduced significantly from the patient's acute stage to the time point three months after patient discharge. Meanwhile, Chen et al. (2018) found the degree of family resilience in children of a parent with cancer decreased significantly over the four- to five-month time point, and the effect on family resilience was associated with the time that had passed since the parent's cancer diagnosis. In contrast, the score of resilience in mothers of children with cancer did not change between the 14 to 60 days following the diagnosis, nor between the time points three and six months later (Lau et al., 2020). Another study using family efficacy as an indicator of resilience in caregivers of children receiving pediatric stem cell transplants showed family efficacy was stable for nine months post-discharge in latent growth curve modeling (Tillery et al., 2018). These diverse findings support the theory that resilience is not a fixed characteristic, but rather, it is responsive to adversity and is therefore suitable to interventions.

Furthermore, considering the differences in caregiver roles and in the potentially traumatic events, it seems reasonable that trajectories of change in resilience were reported diversely. In this study, the mean scores of spousal caregivers' resilience from the one-month to three-month and six-month time points after the initial cancer treatment increased significantly, implying that growth in the resilience trajectory in this study was the most commonly observed change, which is similar to most existing research findings. Following the model developed by Opsomer et al. (2022), the resilience process in the context of the current study began with the diagnosis of advanced cancer and may lead to the improvement of caregivers' psychological well-being, benefit finding, and personal growth. However, the outcomes that are influenced by contextual factors may be related to the degree of potentially traumatic events that further take place in the course of caregiving.

Bonanno’s resilience temporal framework demonstrated that resilience was the most common feature of adults’ reaction to adverse events, identifying trajectories of response to potential trauma events including resilience, recovery, delayed onset, and chronic stress (Bonanno et al., 2015). That is, there exists a heterogeneity of responses to pronounced stressor events. By using the person-centered data latent variable modeling procedure, many researchers identified the trajectories of caregiver resilience over time. For example, Bonanno and Malgaroli (2020) found that 71% of individuals who had recently lost a spouse had a resilience trajectory measuring persistent complex bereavement disorder which declined slightly over time, and 58% of the sample was assigned to a resilience trajectory characterized by low grief symptoms measuring prolonged grief disorder which also declined slightly over time. The results of the present study support the evidence of their claims that the journey to resilience varied and increased gradually during the study period. The findings of this study further add empirical support to Bonanno et al.’s theoretical model proposing the trajectory of resilience in caregiver psychological recovery following a traumatic event. Meanwhile, according to Barakat et al. (2021), the specific trajectory of parental caregiver resilience in the face of their child’s cancer diagnosis and treatment has also been increasingly understood. A longitudinal study displayed a linear growth model found by measuring depressive symptoms from the baseline point before surgery, up to the six-month and 12-month post-surgery time points, in which parental caregivers of children with disorder of sex development showed considerable resilience in the face of their child’s illness (Mean Slope = -1.39, $p < .001$) (Perez et al., 2021). As shown in the literature, most people could show resilience stable or increase and become better equipped to handle future challenges (Sun et al., 2023). Therefore, we conceptualized resilience as a process in this study, then it is plausible that a person’s resilience can be increased in ways that help them in many aspects of their daily life.

There are two subgroups with similar outcome trajectories in participants at the three data collection waves, namely 42.9% of low resilience with fast-growth and 57.1% of high resilience with slight-growth. This contributes to the existing literature by demonstrating the heterogeneity of resilience trajectories in caregivers. In the identification of trajectories in existing longitudinal quantitative studies, most researchers have determined whether the trajectory is resilient or not according to their own subjective interpretations of the slope and intercept of the trajectory (Cosco et al., 2017). Consequently, a researcher may choose to dub a trajectory “recovery” rather than “resilient” due to personal interpretation rather than based on conceptual differences. For example, Elliott et al. (2014) identified “Resilient”, “Recovery”, and “Chronic” trajectories in caregivers of patients with a traumatic spinal cord injury based on previous research, but also according to their own judgment. Actually, the recovery class exhibited reduced clinical distress over time and presented psychological positive adaptation, which is consistent with the concept of resilience according to the definition of the American Psychological Association. Although the group defined as resilient in some other studies has not shown a significant slope, the mean scores of depressions presented different levels over time, indicating that resilience did not remain static (Oh et al., 2016; Perez et al., 2021; Price et al., 2016). The current study showed new patterns of change in resilience combining the “resilient trajectory” and “recovery trajectory”. The process of resilience when starting at a low level at the baseline point (i.e., the diagnosis of the patient’s advanced cancer) led to rapid growth through positive coping; meanwhile, participants starting from a high level of resilience at baseline tended to present little growth, but did remain relatively stable. These findings, in combination with those of prior research, contribute significantly to enhancing our understanding of caregivers’ psychological adaptation through the early months of their spouses’ illness after diagnosis.

According to Bonanno et al. (2015) an individual’s resilience process is influenced by a combination of genetics, personal history, environment and situational context. It is important to note that low-resilient caregivers showed rapid growth at an early time. A possible reason may be that they have more social resources, good relationships with patients or better coping skills. Conversely, some caregivers who had a little higher level of resilience may have more positive personality characteristics before adversity or genetic protective factors (Stainton et al., 2019). However, genetic protective factors may in fact mean that they are less susceptible to the effects of their environment which could lead to slow growth in social life (Stainton et al., 2019). The level of resilience in a newly-diagnosed advanced cancer event is influenced by one's baseline adjustment ability, referring to how one acted and adapted to other challenges prior to the diagnosis (Bonanno et al., 2015; Opsomer et al., 2023). Obviously, the findings reinforce resilience as a highly dynamic process that may vary according to time, circumstance and population. Therefore, it is crucial that future research could explore the mechanisms that foster resilience and develop a knowledge of how individuals engage with protective factors and utilize them to overcome a risk or adversity.

Predictors of spousal caregivers' resilience over the first six months period after initial cancer treatment

This study found partial support for our hypothesis that the selected seven factors had significant effects on resilience across caregivers. This study proved that timing is essential when evaluating the effects of risk and protective factors. The effects of patients' function status, social support, coping self-efficacy, spirituality, mutuality, caregiver burden and Chinese familism on resilience change were partially different across time at different time points.

Patients' function status and resilience

Patients' function status was the most important time-variant covariate in the resilience trajectory as it predicted resilience decreased significantly and negatively at each time wave. As predicted, based on the previous longitudinal studies (Dunn et al., 2013; Foster et al., 2019; Heathcote et al., 2021; Lee et al., 2022), caregivers of patients with low health status were more susceptible to low resilience, indicating caregivers' resilience started out low and increased as patients' health status increased. The findings supported the previous literature. Dunn et al. (2013) predicted that one caring for a cancer patient with higher Karnofsky Performance Status scores was more in the resilient class than the subsyndromal class, suggesting that the ability to survive radiation therapy may be more related to the risk for depression and may negatively influence caregiver resilience. Similarly, Heathcote et al. (2021) found a significant reduction in levels of resilience from baseline to follow-up three months after patient discharge because caregiver resilience is positively and independently correlated with patient physical function, regardless of other contextual factors. Furthermore, Lee et al. (2022) found good cancer patients' performance status was a significant positive predictor for the trajectories in overall resilience and two aspects of resilience of primary caregivers including equanimity resilience and perseverance resilience. In a longitudinal qualitative study, Foster et al. (2019) stated that resilient parents were temporarily disrupted following their child's critical injury, but tended to regain their well-being quickly over time when children's physical and emotional recovery recovered. The primary concern of spouses of cancer patients was related to the physical health of the patients. Family caregivers are significantly impacted by the patients suffering, whether it be physical, psychosocial, or spiritual. However, interventions that focus on the relief of patients' suffering as a way to enhance caregiver well-being have rarely been studied. Therefore, cancer dyad-based interventions such as facilitating patients' physical function or reducing patient symptom severity during treatment may be conducted to improve caregivers' mental health.

On the contrary, there were some longitudinal studies that did not provide a significant outcome about patient physical health and function to affect caregivers' resilience (Aubin et al., 2022; Peay et al., 2016). For example, Peay et al. (2016) revealed important additional insights that children's functional status did not predict mothers' psychological adaptation two years later. Similarly, a prospective cohort study in the first months and after 6 and 12 months showed patients' functional status or stage of cancer was not significantly associated with family caregivers' psychological status at every time point (Aubin et al., 2022). A possible reason may be that whether patients' functional status affects the change in resilience also depends on the other illness contexts like patients' psychological and emotional issues.

According to the different effects across the three time points, worse patients' functional status at three months posttreatment had a bigger negative effect on spouses' resilience change than that at the first month and six months posttreatment. As we all know, caregivers caring for patients with functional decline experienced higher burden which negatively affected caregivers' psychological well-being and quality of life (Molassiotis & Wang, 2022). Patients with newly diagnosed cancer received active anticancer treatments such as surgery, chemotherapy, or radiotherapy. Following the initiation of the treatment process, patients were burdened by the side effects of multi therapies, and their symptom burden in functional impairment become heavier which may impact caregivers' health (Molassiotis &

Wang, 2022). Moreover, at the initial three months period of treatment, spousal caregivers may not have effective coping strategies. Thus, worsening patients' function status had a greater effect on resilience development in the middle phase of the survey.

Social support and resilience

Social support only had a positive effect on resilience at three months post-treatment (at T2), but had no significant effect on resilience at T1 and T3. Interestingly, numerous previous longitudinal studies showed that social support can directly influence the development of caregivers' resilience (Lee et al., 2022; Opsomer et al., 2022; Tang et al., 2013; Tillery et al., 2018). Generally, social support can help caregivers to find benefits and value. A supportive network from family to society is critical in developing a resilient outcome throughout the caregiving process.

The non-significant effect on caregivers' resilience at one month posttreatment and at six months posttreatment might be influenced by supportive network characteristics such as types of social support, and the quantity and quality of social support. At the early time of newly diagnosed cancer, spousal caregivers were simply too busy hunting for informational support from healthcare professionals rather than spending time on emotional and instrumental support from family members and friends. In this study, the instrument of social support mainly investigated family and peer support. These types of unprofessional support may not need to be provided at the same time but may need to be provided by taking into account individual preferences. Furthermore, when spouses were diagnosed with advanced cancer, husbands/wives rarely talked about their family issues with people from outside the family in Chinese culture. These might result in missing out on benefits gained from these kinds of support. After six months posttreatment, it became crucial to recognize the discrepancies between caregivers' perceptions of social support and actual social support. According to Thoits (2011), actually received social support can make the recipient feel dependent, or inept, while perceived social support can improve self-esteem and a sense of mastery. In other words, social support from family and friends was not always sufficient to improve caregivers' resilience, and the support function helped to enhance resilience only when it appeared to match the needs. Unfortunately, spousal caregivers at this stage may also feel isolated from friends and family owing to the long time and much effort spent in care provision. Caregivers are more likely to miss out on the advantages of social support than non-caregivers.

In the present study, the significant effects were observed for resilience at three months posttreatment. This is in accordance with Roper et al. (2019) who found social support can facilitate resilience in caregivers, but it became not necessary for resilience if the participants had other resources such as professional end of life care. At three months posttreatment, the amount and quality of the social support received by family and friends played a critical role in the caregiving burden. The caregivers at this time point, experienced more beneficial social support (e.g. perceived social support). Spousal caregivers needed enough support, especially financial and emotional support, to fulfill their caring role successfully, and to feel upon reflection that they have adapted and managed well. Good support did seem to make life easier for the caregivers and they needed to make use of other community and societal resources more explicitly and use any material resources they had effectively to mitigate the increased medical burdens.

On the other hand, social support is not always referred to as a resilience facilitator. For example, social support became less important for partners of advanced-stage melanoma at baseline than 6 months after the initial diagnosis (Engeli et al., 2016). Support is probably not a stable resource, but rather a dynamic and complex system. In the context of traumatic stress, support in terms of emotional or instrumental needs is a better predictor of positive mental health and resilience than simple social interactions (Sippel et al., 2015). This is because the effectiveness of social support depends on the match between the source, type, and timing of social support and the requirements and developmental level of the individual or system. The current study findings were consistent with the previous studies (Iacob et al., 2020; Sippel et al., 2015) which emphasized interventions promoting social support in caregivers at their needs time point to enhance resilience may be more appropriate, and additionally intervene in perceived social support better than received social support when improving or maintaining psychological health.

Coping self-efficacy and resilience

Coping self-efficacy had a stable positive effect on caregivers’ resilience at the early time in the present study. A higher coping self-efficacy of caregivers from the time of first month to six months posttreatment had a higher level of resilience among spousal caregivers. This is reinforced by previous research that affirmed coping was a strong predictor of continued resilience over time (Meyers et al., 2020). For spousal caregivers, effective coping ability was associated with lower levels of depressive symptoms at all time points, which is in accordance with previous studies in informal caregivers during discharge from the Neuro-ICU (Meyers et al., 2020). Coping ability had a direct positive effect on resilience and also had an indirect positive effect on resilience through self-efficacy among family caregivers supporting relatives with traumatic brain injury (Anderson et al., 2020), suggesting the beneficial effects of higher coping self-efficacy could enhance caregiver positive psychological adjustment. As time after the patients' treatment progresses, coping self-efficacy is an important strategy to improve coping skills, identify available resources, and develop mastery experiences during stressful or potentially traumatic events.

Of note, active coping about how to deal with the disease diagnosis and subsequent treatment and care was very important for caregivers to let life go on as usual, but high avoidant coping due to the caregiving role among spouse caregivers of cancer survivors was related to low or deteriorating mental health over the first five years after the diagnosis (Lambert et al., 2017). Surprisingly, in a longitudinal pediatric study, a significant increase in coping self-efficacy of mother caregivers did not predict psychological adaptation to a child's disease at the 2-year follow-up after controlling for the effects of participants' age and income (Peay et al., 2016). A possible explanation may be that coping self-efficacy decreased health information avoidance, however, avoiding health information increase can maintain positive emotions and reduce psychological discomfort (Hua & Howell, 2022).

Spirituality and resilience

Spirituality had a positive effect on resilience at the first month posttreatment and at the three months posttreatment. These findings are similar to those of Howard Sharp et al. (2020). They found that spirituality was significantly correlated with depression symptoms of mothers of children with cancer from diagnosis to one year but not at three- or five years. Spirituality may increase resilience for mothers of children newly diagnosed with cancer, suggesting that more spiritual mothers may show patterns of distress more in line with minimal-impact resilience. Furthermore, spirituality at the first month posttreatment had a more significant effect on resilience change than that at the three months posttreatment. This further supported that the role of spirituality may evolve over the illness trajectory (e.g. diagnosis versus after treatment) and thus spirituality may be predictive of changes in psychological adjustment (Schneider & Mannell, 2006). Identifying individuals with a strong sense of spirituality immediately or at an early time following trauma may help reduce the stress on healthcare providers in clinical settings.

Spirituality was a resource that strengthened caregivers' ability to cope and search for meaning in times of suffering. It corresponds to inner being, spirit, or soul that is the center of inspiration, intuition, and wisdom. In Chinese family culture, faith and spirituality are their foundation for hope, gratitude and love during times of uncertainty (Carroll & Lenehan, 2016). Gratitude, hope and religious faith assisted families to move forward in their journey after a cancer diagnosis. Those who were experiencing the worst effects of illness were more likely to engage in religious activities such as prayer and meditation. Many families find solace in their spiritual faith during all the chemotherapy, surgery recovery, painful physical therapy sessions and weeks in the hospital (Kim et al., 2011). Thus, spirituality could enhance positive psychological adaptation for spousal caregivers. For example, Newberry et al. (2013) found spirituality in family caregivers of patients with primary malignant brain tumors remained relatively stable over the course of the disease and depressive symptoms and anxiety were lower when they had higher spirituality. If spirituality did not vary across the illness trajectory, the related differently to resilience at various time points would become small. Similarly, Frost et al. (2012) also found that the spiritual well-being of spouses whose wives survived during this time remained stable and was strongly associated with multidimensional well-being. This is further supported by the decreased effect of spirituality between spirituality and resilience over time in the current study.

Mutuality and resilience

The results showed that mutuality was only a significant positive factor of caregivers' resilience at three months after initial treatment but not at one month and six months post-treatment. A possible reason might be less open communication and expression of feelings between Chinese couples. The finding confirms the family resilience framework model about the importance of family members' abilities to communicate and solve problems openly (Li et al., 2019; Walsh, 2003). The findings are congruent with those reported in previous longitudinal studies (Chien et al., 2018; Ross et al., 2020). For instance, Chien et al. (2018) found the relationship satisfaction of the partners was not related to prostate cancer-specific anxiety or fear of cancer recurrence in either the patients or their partners over time. This could be because the factors that influenced the couples' prostate cancer-related anxiety sprang mainly from the response of the patients, rather than from their individual factors such as relationship satisfaction. Similar to the study of Ross et al. (2020), family mutuality was not the predictor of loneliness over time in the multilevel linear mixed model. A possible explanation might be that family members have been demonstrated to cope with the stress of a parent having cancer and experience less depression when family communicates effectively with each other.

However, Kayser and Acquati (2019) stated the mutuality of involving both partners in common activities can draw the couple together to cope with the illness even at the expense of sacrificing personal boundaries and freedom. Zwahlen et al. (2008) found that higher marital quality in wives was associated with a higher QoL and lower rate of depression in a study of oral cancer patients and their wives. Moreover, Crothers et al. (2021) found relationship difficulties between the parent and child were significant predictors in the chronic group while the absence of relationship difficulties was predictive of parents being in the resilient group. The mutuality of husbands and wives illustrates that whether a family can successfully cope with stress is determined by the couple's ability to communicate the issues and mobilize resources to cope with the problems. Hence, further studies are needed to promote our knowledge of the mutual relationship between wives and husbands.

Caregiver burden and resilience

Caregiver burden had a negative effect on resilience at three months and six months posttreatment but not at the first month posttreatment. Most of spousal caregivers were primary caregivers taking care of the patients with advanced cancer. The prolonged caregiving situation might cause spousal caregivers to feel high burden although there is no actual burden increase, because the most important predictors of caregiver burden were the length of caregiving and the patient's dependency level (Lindt et al., 2020). It is congruent with those reported in multiple other studies (Choi et al., 2012; Tang et al., 2013; van Roij et al., 2021; Yu et al., 2021). For example, Yu et al. (2021) found that there was a dynamic reciprocal relationship between caregiver burden and mental health over time. Moreover, high depressive symptoms were associated with high trajectories for caregiving burden in caregivers of patients with primary malignant brain tumors (Choi et al., 2012). Compared to caregivers with low caregiver burden, caregivers of patients with advanced cancer who reported a high caregiver burden engaged less often in self-care and were less resilient in a prospective longitudinal study (van Roij et al., 2021). As Tang et al. (2013) stated, those who were highly burdened by caregiving were more likely to have higher levels of depression symptoms, that is, they could show depressive symptoms when they faced more disruptions in schedules, worsening health, and a stronger sense of family abandonment. These studies imply that spouse caregivers' burden is conversely correlated to resilience, particularly the longer duration of caregiving.

The present study showed that caregiver burden was not a significant factor of resilience at an early phase but was a significant factor of resilience at the later time. This could be because there is a relationship between treatment-related factors and caregiver burden over the course of cancer-related treatment (La et al., 2021). At the early cancer treatment phase, spousal caregivers focused on the new diagnosis of advanced cancer and accepted caregiving as a duty, so they neglected the effect of the caregiving burden on resilience change. Especially, spousal caregivers with resilience provided higher intensity assistance with weaker psychological resources, and had greater confidence in caregiving and perceived less caregiving burden (Tang et al., 2013). Similar to the study of Peay et al. (2016), the authors indicated that care-related burden did not predict psychological adaptation at a 2-year follow-up, possibly due to no association between patients' functional status and psychological adaptation. However, the role of perceived caregiver burden became larger when caregivers responded to demand fluctuations and contextual variations over time. For example, Heathcote et al. (2021) conducted a longitudinal study at baseline and 3 months after discharge. They found a significant reduction in levels of caregiver resilience independently negatively predicting caregiver burden and patient physical health and function at follow-up 3 months after acutely injured trauma patients discharge. It may explain how spousal caregivers who perceive caregiver burden could inhibit their resilience.

Chinese familism and resilience

The present study showed that Chinese familism had a positive effect on caregivers' resilience increase at three time points after patients' initial treatment. From the perspective of Confucians, Chinese culture views caregiving for an ill relative as a natural part of family life based on filial piety or loyalty. This specific culture, values, and resources in the Chinese context may have contributed to psychological health (Liu et al., 2012). A novel finding in this study is that familism as a culture-specific factor is an important aspect of caregivers' resilience at a particular point in time. In many different cultural contexts such as Greece (Kalaitzaki et al., 2022), Latinos (Corona et al., 2017) and Caucasian (Teahan et al., 2018), familism could enhance strong emotional ties with the family, feelings of loyalty and solidarity and it has been related to caregivers' resilience. For example, familism from Latinx cultural backgrounds plays a unique role, which may act as a buffer to caregiver mental health (Corona et al., 2017). Thanks to the core value of family-oriented Asian cultures, Chinese caregivers could get more personal support from families and relatives, especially adult children, than individual-oriented Western cultures (Zhang & Jia, 2018). The strong identification and attachment to nuclear and extended family is a motivating factor for coping with cancer event. For example, Marín-Chollom and Revenson (2022) found that there was a protective pattern of familismo against symptoms of depression in Latino adolescents and young adults of parental cancer.

On the other hand, as was shown in cross-cultural studies of Korean, Korean American, and White American dementia caregivers, Korean caregivers with the highest familism showed higher levels of depression and of anxiety than White American caregivers with the lowest familism, suggesting cultural beliefs and values in the familism did not guarantee any more positive reaction to the assumed caregiver role (Youn et al., 1999). This could be because the role expectation of traditional culture for spousal caregivers may lead to more caregiving stress, more emotional distress, and a decline in quality of life and resilience in this population. Thus, greater familism responsibilities among spouses may also make them vulnerable to psychological distress. Therefore, Chinese familism plays a more important role in resilience increase at the early time of treatment than at the later time.

In summary, the finding from spousal caregivers of patients with newly diagnosed advanced cancer showed that the level of caregivers’ resilience increased significantly during the first six months after patients’ cancer initial treatment. Moreover, the seven time-variant factors had partially different effects on resilience change at all three-time points after controlling for time-invariant covariates. However, after controlling for seven time-variant factors again, the change in the growth of resilience was not significant over time. This is further supported by the present study that the selected seven time-variant factors could influence the trajectory of resilience process.

Strengths and limitations of the study

The strengths of this study employed the use of longitudinal data to explore the resilience process and multiple measures of caregivers' psychosocial factors. Another contribution is the application of the latent growth curve model and growth mixture model to identify classes of individuals who display similar characteristics of resilience. More importantly, the present study provides a better understanding of the change in resilience and its predictors. These findings pave the way to develop appropriate interventions of the modifiable factors which could improve resilience and better health at a special time in the advanced cancer caring context.

There are some limitations to the current study that should be acknowledged. One important to consider is the length of the follow-up period. The current study entailed three waves of data collection over the first six months following the patients’ initial treatment, meaning that, only latent linear and latent basis models could be tested. Future research should add more follow-up time points to gain further knowledge and insight about the trajectories of the resilience process. The second notable limitation is the generalizability of the current findings to other groups or other countries, as the resilience and the other modifiable variables in the spousal caregiver sample were gathered from the eastern part of China. Future studies should use more accurate objective assessments in different samples, regions, and languages to identify changes in resilience. Third, self-reporting instruments should be another limitation to explain the nature of resilience and predictors, for example, all items in the Chinese social support rating scale mainly is used to collect support from family, friends colleagues or neighbors but ignore the professionals. Thus, more optimal assessment instruments are required to better explore the predictors and trajectory of resilience in spousal caregivers of patients with advanced cancer. Fourth, due to financial and time limitations, this study did not examine other potential many contextual factors on resilience outcomes such as personality traits. Larger datasets are needed to properly explain the role of contextual factors in cancer settings. Finally, the current study was only based on quantitative data which is unable to provide other in-depth personal insights into the factors and processes that affect caregivers' adaptation. Hence, a longitudinal prospective qualitative design could provide a more comprehensive understanding of resilience change to particular caregivers over time in the future.

Implications and future studies

The findings of the study have important theoretical and clinical implications, including implications for nursing research, nursing practice and health policy.

Implications for nursing research

This study investigated resilience over a longitudinal time span rather than focusing on a single time point; this provided implications for the perception of dynamic resilience process in current resilience research. In particular, the findings offer new knowledge about change patterns in resilience among spousal caregivers over a six-month period after patients' initial cancer treatment. Furthermore, this study provided great insights into the trajectory of change in spousal caregivers' resilience in the early phase of patient treatment. In light of the evidence that resilience is a dynamic process over time, it is crucial to monitor psychological adjustment from numerous perspectives. The findings of this study, as well as those from previous existing literature, suggest that further focus on the process of resilience could help to identify caregivers at risk for mental disorders at various points in time, and could promote the development of novel prevention programs and treatment options. In addition, this study comfirmed the significant relationships between patients' health and spouses' resilience. For extend the new knowledge, an actor-partner interdependence model to analyze interactions between husbands and wives could be used to evaluate the relationship between two related persons.

Implications for nursing practice

The findings of this study provided new knowledge about the pattern of change in resilience among spousal caregivers of patients with newly diagnosed advanced cancer over time. Participants with a low level of resilience presented significant growth from one month after patients' initial treatment to six months posttreatment. It is important for nurses to be aware that spouses of patients with advanced cancer could be positively adaptative to disease-related challenges. However, the relevant factors, in particular patients' functional status and caregiver burden, are predictors of unfavorable caregivers' resilience trajectory. Nurses who take care of advanced cancer patients should monitor resilience process of spousal caregivers if the conditions of patients worsen and could maintain and promote resilience for spousal caregivers by alleviating the burden as the disease progresses. In addition, the results of the study encourage a more dynamic assessment approach during the patient's treatment phase to identify the factors related to the development of spousal caregivers' resilience. For example, social support and mutuality had only a positive effect on resilience at three months post-treatment but not at one month and six months, whereas coping self-efficacy, spirituality, and Chinese familism had a positive effect on resilience at all three- time points. These findings provide viewpoints on nursing care. It is important and necessary for nursing practice to strengthen mental health among caregivers by intervening at special time points. A newly diagnosed advanced cancer is a tragedy for the family and is also a potential trauma event. A change during the cancer treatment period should establish routine cares not only related to patient care but also to family care management of spouses themselves and even other family members. Moreover, nurses should assess resilience and be aware of caregivers' resilience levels in different stages of patients' cancer and treatment. Nurses could guide intimate spousal caregivers to reduce their psychological distress or change their negative feelings into positive adjustment because it is likely to affect patients' suffering. Overall, these findings support a shift in holistic care from a disease model to one of health promotion, from patients to family, from the hospital to the community.

Implications for health policy

The current study supported the National health policy entitled "Healthy China 2030" strategy for family well-being in critical illness on health promotion and prevention. Policy-makers should be aware of urgent needs of families having patients with cancer services in the health care system. The healthcare system needs to develop healthcare programs for the family as the unit of services, especially in families having patients with advanced cancer. This could be done by increasing support factors, providing coping skills, creating the correct values, and providing program intervention. The participants in this study were spouses who were the most important stakeholders in chronic disease management and in the primary health care setting. Developing dyadic adjustments between caregivers and care receivers can help guide nurses in planning appropriate interventions to promote psychological adaptations. This may have implications for nurses not only focusing on patients' health but also paying attention to the health of their caregivers who may be also at risk of elevated burden over time. Information about cancer therapy, symptom management, individual counseling, and support groups such as prayer services or social donations for families are also vital resources that can help the caregivers cope and increase their understanding and knowledge of the diseases. In addition, because of circumstances such as the COVID-19 pandemic leading to necessary limitations in social interactions, economic impacts, and uncertainties, policy-makers need to pay more attention to family caregivers' well-being to reduce their levels of psychological distress such as depression and anxiety about their loved one's illness. For example, offering telemedicine visits is an alternative to some in-person appointments at the special time; and health and social care systems set up support with managing treatment-related problems, communicating, educating, encouraging and empowering the patients to take care of themselves.

Recommendations for future research

The findings from this study provide guidance for future research as follows:

1. In the identification of the trajectory of resilience, this study only conducted three waves of data collection in the linear growth model which cannot capture the nonlinearity in trajectory models of resilience such as the quadratic growth curve model or Gompertz curve growth model (needing more than four-time points). Taking into this consideration, the need for a wider time follow-up can capture more detailed patterns of trajectories of change in resilience. Future research will increase the follow-up time points to describe a nonlinear change in resilience over time, for example, through the inclusion of the whole treatment course perspectives. Continued work in this area of study would gain more knowledge about the trajectories of the resilience process and provide greater insights into the dynamic nature of resilience to adverse events.

2. The results obtained from this study suggested that there was a significant relationship between gender and the change in resilience over time. These findings should be taken into account in designing gender-responsive actions aimed at providing adequate support to family caregivers. Further gender-specific investigation of resilience in husband and wife caregivers during their loved one’s treatment may help know the long-term psychological issues in the spouses. From a gender perspective, a gender cohort survey is warranted to unravel the complex associations among spouse gender, caregiver factors, and resilience in the context of family care. Moreover, gender-specific interventions for enhancing resilience in family caregivers with low resilience could promote family functioning to provide optimal support for the patients during cancer treatment.

3. The findings recommended developing and evaluating nursing interventions in order to enhance caregivers’ resilience at different time points. For example, nursing intervention should target strengthening cherished relationships and support resources to provide solutions for spousal caregivers to cope with having patients with advanced cancer. As the disease progresses, reducing caregiver burden through reinforcing preparedness for caregiving might enhance self-efficacy in coping strategies. In addition, religious activities and strong family atmospheres might help caregivers to have spirituality that can facilitate their resilience promotion. Another

interesting intervention for future study to enhance resilience is mindfulness training, which is a psychological paradigm that has been linked to resilience and can also facilitate social functioning.

Conclusion

The present study investigated changes in the level of resilience among spousal caregivers of patients with advanced cancer from one month to six months after patients' initial cancer treatment. The results of this study provide information regarding the trajectory of change in resilience of participants and different predictors affecting resilience process during the study period. In addition, it identified the different effects of patients' functional status, spirituality, mutuality and Chinese familism on resilience at different time points, especially in the three months posttreatment. These findings provided valuable opportunities for prevention and targeted interventions to promote resilience in spousal caregivers at a special time. Furthermore, the novel knowledge gained from this study could be used as a source for the development of healthcare policy in the future.

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APPENDICES

APPENDIX A

Institutional review board

สำเนา

ที่ IRB3-124/2564

เอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์

มหาวิทยาลัยบูรพา

คณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา ได้พิจารณาโครงการวิจัย

รหัสโครงการวิจัย : G-HS081/2564
โครงการวิจัยเรื่อง : Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients in China
หัวหน้าโครงการวิจัย : MRS.SUN HAI YAN
หน่วยงานที่สังกัด : คณะพยาบาลศาสตร์

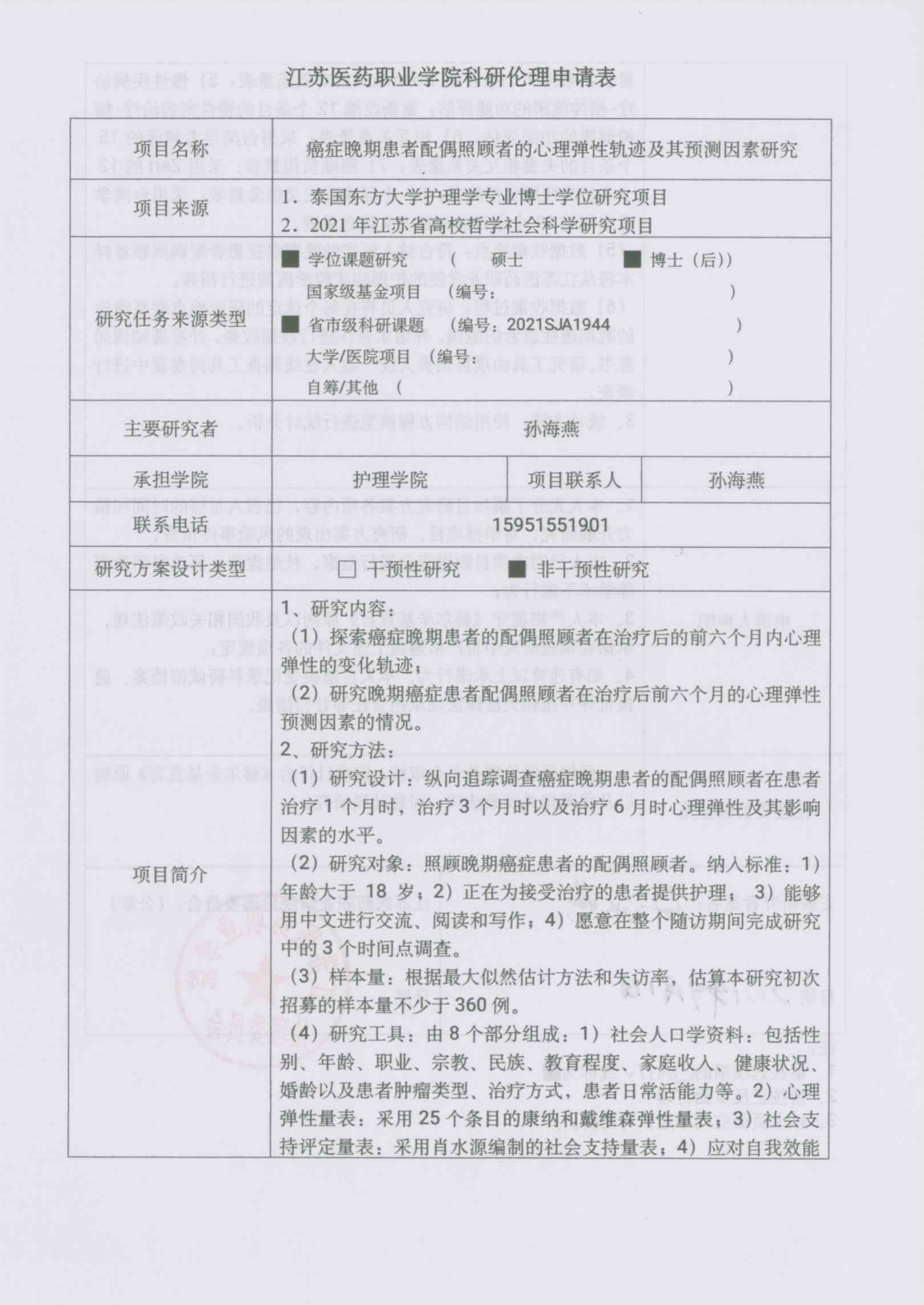
BUU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which the researchers respect human's right and honor, do not violate right and safety, and do no harms to the research participants.

Therefore, the research protocol is approved (See attached)

1. Form of Human Research Protocol Submission Version 2 : 12 December 2021
2. Research Protocol Version 1 : 18 November 2021
3. Participant Information Sheet Version 2 : 12 December 2021
4. Informed Consent Form Version 1 : 18 November 2021
5. Research Instruments Version 2 : 12 December 2021
6. Others (if any) Version - : -

วันที่รับรอง : วันที่ 21 เดือน ธันวาคม พ.ศ. 2564
วันที่หมดอายุ : วันที่ 21 เดือน ธันวาคม พ.ศ. 2565

ลงนาม *นางสาวรมร แย้มประทุม*
(นางสาวรมร แย้มประทุม)
ประธานคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา
ชุดที่ 3 (กลุ่มคลินิก/ วิทยาศาสตร์สุขภาพ/ วิทยาศาสตร์และเทคโนโลยี)



江苏医药职业学院科研伦理申请表

项目名称	癌症晚期患者配偶照顾者的心理弹性轨迹及其预测因素研究		
项目来源	1．泰国东方大学护理学专业博士学位研究项目 2．2021 年江苏省高校哲学社会科学研究项目		
研究任务来源类型	■ 学位课题研究 （ 硕士 ■ 博士（后）） 国家级基金项目 （编号： ） ■ 省市级科研课题 （编号：2021SJA1944 ） 大学/医院项目 （编号： ） 自筹/其他 （ ）		
主要研究者	孙海燕		
承担学院	护理学院	项目联系人	孙海燕
联系电话	15951551901		
研究方案设计类型	□ 干预性研究 ■ 非干预性研究		
项目简介	1、研究内容： （1）探索癌症晚期患者的配偶照顾者在治疗后的前六个月内心理弹性的变化轨迹； （2）研究晚期癌症患者配偶照顾者在治疗后前六个月的心理弹性预测因素的情况。 2、研究方法： （1）研究设计：纵向追踪调查癌症晚期患者的配偶照顾者在患者治疗 1 个月时，治疗 3 个月时以及治疗 6 月时心理弹性及其影响因素的水平。 （2）研究对象：照顾晚期癌症患者的配偶照顾者。纳入标准：1）年龄大于 18 岁；2）正在为接受治疗的患者提供护理； 3）能够用中文进行交流、阅读和写作；4）愿意在整个随访期间完成研究中的 3 个时间点调查。 （3）样本量：根据最大似然估计方法和失访率，估算本研究初次招募的样本量不少于 360 例。 （4）研究工具：由 8 个部分组成：1）社会人口学资料：包括性别、年龄、职业、宗教、民族、教育程度、家庭收入、健康状况、婚龄以及患者肿瘤类型、治疗方式，患者日常活能力等。2）心理弹性量表：采用 25 个条目的康纳和戴维森弹性量表；3）社会支持评定量表：采用肖水源编制的社会支持量表，4）应对自我效能		

	量表：采用 7 个条目的 Bosmans 应对效能量表；5）慢性疾病治疗-精神健康的功能评估：重新改编 12 个条目的慢性疾病治疗-精神健康的功能评估；6）相互关系量表：采用台湾学者翻译的 15 个条目的夫妻相互关系量表；7）照顾负担量表：采用 Zari 的 12 个条目的照顾负担简表；8）中国家庭主义信念量表：采用台湾学者编制的 31 个条目的家庭主义信念量表。 （5）数据收集地点：符合纳入标准的晚期癌症患者配偶照顾者样本将从江苏医药职业学院的护理临床教学医院进行招募。 （6）数据收集过程：研究人员将在每个选定的研究地点联系确诊的晚期癌症患者的配偶，并请求合作进行数据收集，并签署知情同意书。研究工具由项目负责人统一输入在线调查工具问卷星中进行调查。 3、统计方法：使用结构方程模型进行统计分析。
申请人声明	1、本人充分了解项目研究方案各项内容，已投入足够的时间和精力开展研究，对申报项目、研究方案出现的风险事件负责； 2、本人已对本项目数据安全进行监察，杜绝捏造、篡改科研数据等学术不端行为； 3、本人严格遵守《赫尔辛基宣言》原则以及我国相关政策法规，承诺在调查研究中将严格遵循上述文件的各项规定； 4、如有违背以上承诺行为，本人自愿接受记录科研诚信档案、通报批评并按相关法律法规承担责任等处罚措施。
伦理委员会意见	经校医学伦理委员会审核，该项目符合《赫尔辛基宣言》原则以及我国相关政策法规，同意开展研究。
主要研究者签名：孙[illegible]燕 日期 2021年9月1日	江苏医药职业学院伦理委员会：（公章） 日期

注：

1、请在选项前的□内打✓或标为■

2、请按正反双面打印

3、以上页面空间不足，可附页。

APPENDIX B

Participant information and consent form

AF 06-02

เอกสารชี้แจงผู้เข้าร่วมโครงการวิจัย
(Participant Information Sheet)

รหัสโครงการวิจัย : ....

(สำนักงานคณะกรรมการพิจารณาจริยธรรมในมนุษย์ มหาวิทยาลัยบูรพา เป็นผู้ออกรหัสโครงการวิจัย)

โครงการวิจัยเรื่อง :Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients in China

Dear Participants,

I am Mrs. Sun Haiyan, a postgraduate student at Faculty of Nursing, Burapha University Thailand. My study is "Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients in China". The objectives are to assess change of resilience among Chinese spousal caregivers of advanced cancer patients during treatment and examine influencing factors of resilience change in spousal caregivers at 1 month, 3 months, 6 months patients posttreatment of patients in Yancheng, China.

This study is a survey study. Your agreement to participate in this study is voluntary. You will be asked to answer questionnaires which take approximately 40-50 minutes to complete. You could choose any kind of data collection methods based on your preference, such as using face-to-face, phone, social media (WeChat App) or by email. During data collection, the researcher will clarify questions raised. Your information will be kept confidential and will not be disclosed. You will not get any direct benefits from participation in this study. However, your given information would be useful for developing a caring model or intervention in order to provide better care to the caregivers of advanced cancer.

You have the right to end your participation in this study at any time, and no necessary to inform the researcher, and it will not affect the quality of services you receive from the hospitals. Any information collected from this study, including your identity, will be kept confidential. A coding number will be assigned to you and your name will not be used. Findings from the study will be presented as a group of participants and no specific information from any individual participant will be disclosed. All data will be accessible only to the researcher which will be destroyed one year after publishing the findings.

The research will be conducted by Mrs. Haiyan Sun under the supervision of my major-advisor, Associate Professor Dr. Pornpat Hengudomsub. If you have any questions, please

BUU-IRB Approved
21 Dec 2021

contact me at mobile number: + 8615951551901 or by email 15951551901@139.com, and/or my advisor's e-mail address pornpath@buu.ac.th Or you could contact Institutional Review Board of Burapha University (BUU-IRB), Thailand via telephone (+66-3810-2620) or its email address (buuethics@buu.ac.th). Your cooperation is greatly appreciated. You will be given a copy of this consent form to keep.

Sun Haiyan

BUU-IRB Approved
21 Dec 2021

เอกสารชี้แจงผู้เข้าร่วมโครงการวิจัย
(Participant Information Sheet)
参与者信息表

研究代码：……………………………………………………

泰国东方大学伦理评审委员会办公室负责研究项目代码发行者

标题： 中国晚期癌症患者配偶照顾者心理弹性轨迹及其预测因素

亲爱的参与者：

我是孙海燕，泰国布拉法（Burapha）大学护理学院的研究生。我的研究是“中国晚期癌症患者配偶照顾者心理弹性轨迹及其预测因素“。研究目的是评估中国盐城地区晚期癌症患者配偶照顾者在治疗期间心理弹性的变化，并检查配偶照顾者在患者治疗后 1 个月、3 个月、6 个月心理弹性变化的影响因素。

这项研究将是一项调查研究。参加这项研究是自愿的。如果您同意参加此研究，您将需要回答以下问卷，大约每次需要 40-50 分钟。您可以根据自己的喜好选择任何一种数据收集方式，如面对面、电话、社交媒体(微信)或电子邮件。在数据收集过程中，研究人员将向参与者提出的任何问题作以解释，研究人员将澄清参与者提出的关于语言或内容的任何问题。参加这项研究不会给你带来任何直接的好处。然而，从这项研究中收集的信息对于开发护理模型和干预措施可能很有价值，这些模式和干预措施可以帮助医院和卫生保健工作者在劳动的潜伏阶段为部分人员提供先进和更好的护理。参与研究的人不会任何确定的身体和心理风险，也不会对社会造成任何风险。

您有权随时结束参与此项研究，也无需通知研究人员，并且不会影响您从医院获得的服务质量。从这项研究中收集的任何信息，包括您的身份，都将保密。将有一个编码号码分配给您，并且不会使用您的姓名。研究结果将以一组参与者的形式呈现，不会披露任何参与者的具体信息。所有数据将只

提供给研究人员访问，这些数据将在研究结果公布一年后销毁。如果您愿意，您将在研究完成后得到对研究性质的进一步解释。

这项研究将由孙海燕进行，我的主要导师，副教授泊帕特·瀚格珰桑（Pornpat Hengudomsub）博士将会指导。如果您有任何问题，请拨打手机号码联系我：+8615951551901或通过电子邮件15951551901@139.com，或者我导师的电子邮箱联系pornpat12@yahoo.com。或者您也可以联系布拉法大学机构审查委员会（BUU-IRB）电话号码（+66-3810-2620），电子邮件地址是buuethics@buu.ac.th。非常感谢您的合作。我们将向您提供一份本同意书的副本保留。

孙海燕

AF 06-03.1

เอกสารแสดงความยินยอม
ของผู้เข้าร่วมโครงการวิจัย (Consent Form)

รหัสโครงการวิจัย : ....
(สำนักงานคณะกรรมการพิจารณาจริยธรรมในมนุษย์ มหาวิทยาลัยบูรพา เป็นผู้ออกรหัสโครงการวิจัย)

โครงการวิจัยเรื่อง: Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients in China

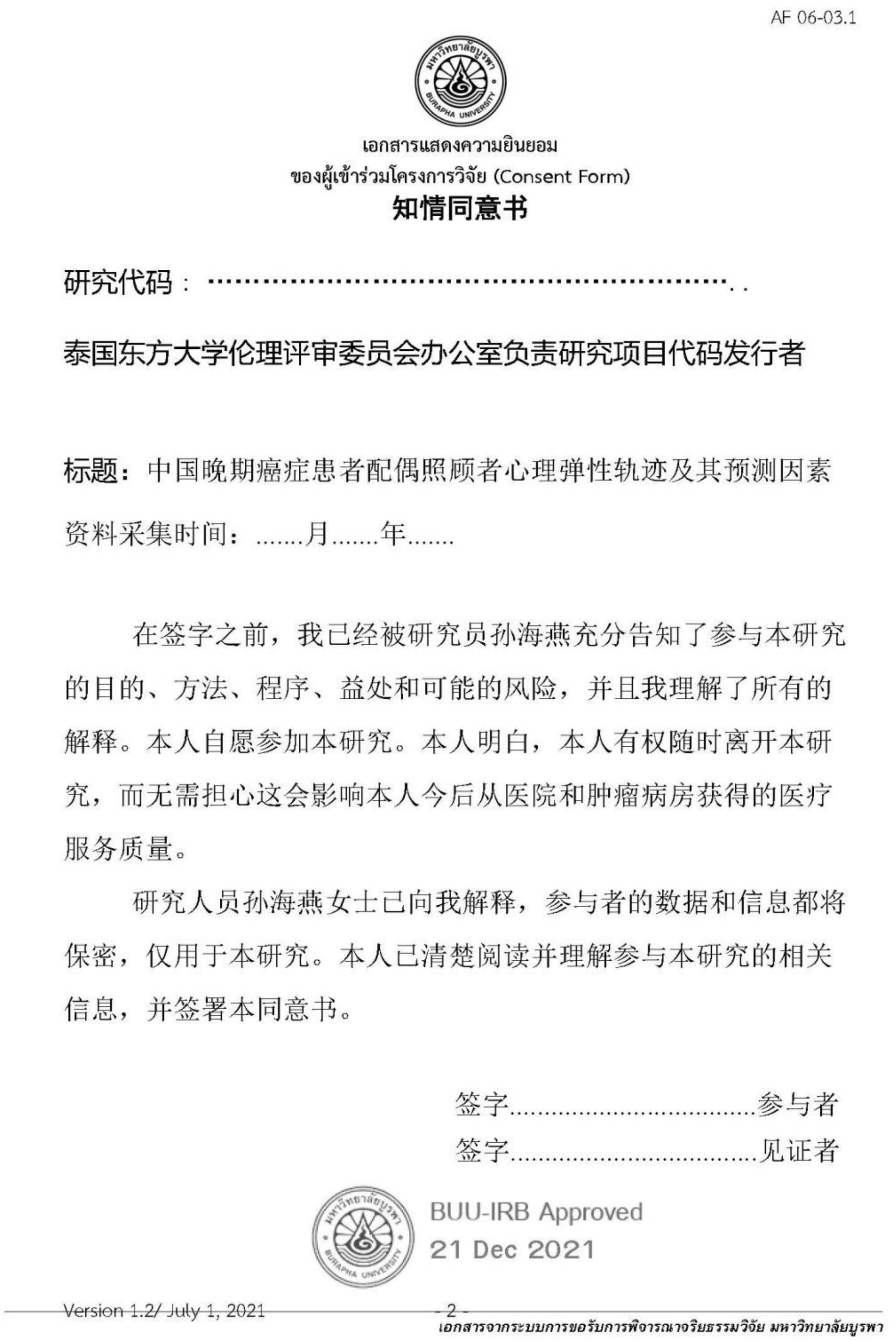
Date of data collection ....Month..........................Year ....

Before giving my signature below, I have been informed by the researcher, Mrs. Sun Haiyan, about the purposes, method, procedures, benefits, and possible risks associated with participation in this study thoroughly for which I understood all explanations. I consent voluntarily to participate in this study. I understand that I have the right to leave the study any time I want, without fearing that it might affect the quality of health care services that I will receive from the hospital and oncology ward.

The researcher, Mrs. Sun Haiyan, has explained to me that all data and information of the participants will be kept confidentially and only be used for this study. I have read and understood the information related to participation in this study clearly and I am signing this consent form.

Signature .... Participant
(...)
Signature .... Witness
(...)

BUU-IRB Approved
21 Dec 2021



AF 06-03.1

เอกสารแสดงความยินยอม
ของผู้เข้าร่วมโครงการวิจัย (Consent Form)
知情同意书

研究代码：…………………………………………………………..

泰国东方大学伦理评审委员会办公室负责研究项目代码发行者

标题：中国晚期癌症患者配偶照顾者心理弹性轨迹及其预测因素

资料采集时间：.......月.......年.......

在签字之前，我已经被研究员孙海燕充分告知了参与本研究的目的、方法、程序、益处和可能的风险，并且我理解了所有的解释。本人自愿参加本研究。本人明白，本人有权随时离开本研究，而无需担心这会影响本人今后从医院和肿瘤病房获得的医疗服务质量。

研究人员孙海燕女士已向我解释，参与者的数据和信息都将保密，仅用于本研究。本人已清楚阅读并理解参与本研究的相关信息，并签署本同意书。

签字...................................参与者
签字...................................见证者

BUU-IRB Approved
21 Dec 2021

Version 1.2/ July 1, 2021 - 2 -
เอกสารจากระบบการขอรับการพิจารณาจริยธรรมวิจัย มหาวิทยาลัยบูรพา

APPENDIX C

Questionnaires

Part I. Personal Information

Below information regarding your personal, demographic data and your patient.

Please fill in __ and tick (√) information that appropriate with you.

1. Initial number (ID):__ **(**Researcher assignment to follow-up**)**

2. Age: __(year)

3. Gender: ☐ Male ☐ Female

4. Duration of marriage： _(year)

5. Ethnic： ☐Han ☐Others：_

6. Religion： ☐No ☐Others：_

7.Educational level： ☐Elementary school ☐Intermediate school ☐High school ☐ College

8. Occupation: ☐No/Retired ☐Part-time job ☐Full-time job

9. Family income (RMB/monthly): ☐<2000 ☐2000-4000 ☐4000-6000 ☐>6000

10. How is your current health status:： ☐Very poor ☐Poor ☐Average ☐Good ☐Very good

Patients' Personal Information

1. Age: __(year)

2. Religion: ☐No ☐Others:__

3. Cancer type:__

4. Staging(TNM): ☐III ☐IV

5. Therapeutic Method: ☐Chemotherapy ☐Surgery ☐Radiotherapy

☐Alleviative treatment ☐Chemotherapy+Surgery

☐Surgery+ Radiotherapy ☐Radiotherapy+Chemotherapy

☐Surgery + Chemotherapy + Radiotherapy ☐Others:______.

Part II. Activity of Daily Living Scale [ADL-C]

Please circle the number that best describes your care-recipient’s condition.

Items	Performs without difficulty or help	Performs with difficulty	Perform with assistance	Unable to perform
1. Taking public transportation	1	2	3	4
2. Walking	1	2	3	4
3. Meal preparation	1	2	3	4
4.	1	2	3	4
5.	1	2	3	4
6.	1	2	3	4
7. Dressing	1	2	3	4
8. Grooming	1	2	3	4
9.	1	2	3	4
10.	1	2	3	4
11.	1	2	3	4
12.	1	2	3	4
13. Using of telephone	1	2	3	4
14. Money management	1	2	3	4

Part III. Conner Davidson Resilience Scale-25 [CD-RISC-25]

Instruction: For each of the statements below, please **CIRCLE OR TICK (√)** the one that best fits you based on your situation over the past month. There is no right or wrong answers to these questions.

N0.	**Item**	**Not true at all**	**Rarely true**	**Sometimes true**	**Often true**	**True nearly all the time**
1	I am able to adapt when changes occur.	0	1	2	3	4
2	I have one close and secure relationship.	0	1	2	3	4
3	Sometimes fate or God helps me.	0	1	2	3	4
4	....	0	1	2	3	4
5	....	0	1	2	3	4
6	....	0	1	2	3	4
7	....	0	1	2	3	4
8	....	0	1	2	3	4
9	I believe most things happen for a reason.	0	1	2	3	4
10	I make my best effort, no matter what.	0	1	2	3	4
11	....	0	1	2	3	4
12	....	0	1	2	3	4
13	....	0	1	2	3	4
14	....	0	1	2	3	4
15	....	0	1	2	3	4
16	....	0	1	2	3	4
17	....	0	1	2	3	4
18	....	0	1	2	3	4
19	....	0	1	2	3	4
20	....	0	1	2	3	4
21	....	0	1	2	3	4

N0.	Item	Not true at all	Rarely true	Sometimes true	Often true	True nearly all the time
22	....	0	1	2	3	4
23	I like challenges.	0	1	2	3	4
24	I work to attain goals.	0	1	2	3	4
25	I take pride in my achievements.	0	1	2	3	4

Part IV. Social Support Rating Scale [SSRS]

Instructions: The following questions are designed to measure your support received in society. Depending on the fact, please finish the rating scale in accordance with the specific requirements of each issue. Thank you for your cooperation.

1. How many intimate friends do you have, from whom you can receive support and help? (Exclusive Choice)

(1) None

(2) 1~2

(3) 3~5

(4) no less than 6

2. Over the past year, you______(Exclusive Choice)

(1) stay away from family, and live alone

(2) often move the residence, and most of time live together with strangers

(3) live together with students, colleagues or friends

(4) live together with family

3. With your neighbors, you______(Exclusive Choice)

(1) have a speaking acquaintance and never care about each other

(2) maybe have a little concern when meeting trouble

(3) are deeply concerned by some of them

(4) are deeply concerned by most of them

....

....

....

....

....

9. What is the way of seeking help when you are in trouble? (Exclusive Choice)

(1) just rely on myself, and do not accept the help of others

(2) rarely ask someone for help

(3) sometimes ask someone for help

(4) ask family, friends or organizations for help when facing troubles

10. Organized activities for groups (such as, party and youth league organizations, religious organization, trade union, student union and etc.), you ________. (Exclusive Choice)

(1) never attend

(2) occasionally attend

(3) often attend

(4) take the initiative to attend and are active with

Part V. Coping Self-Efficacy Scale [CSES-7]

The following questions ask about your perceived ability to cope effectively with life challenges when you face the stress. First, each item asks you to answer how much capacity you are able to deal with stressful demands. Please circle(O) the number of the response that best describes your feeling. Respondents answered items based on a 7-point scale ranging from 1 (not at all capable) to 7 (totally capable).

No	Item wording	How much
		Not at all Capable (1) Totally Capable (7)
1.	Dealing with the impact that the traumatic experience has had on my life.	1 2 3 4 5 6 7
2.	Carrying on with my everyday life.	1 2 3 4 5 6 7
3.	....	1 2 3 4 5 6 7
4.	....	1 2 3 4 5 6 7
5.	....	1 2 3 4 5 6 7
6.	....	1 2 3 4 5 6 7
7.	Being emotionally strong.	1 2 3 4 5 6 7

Part VII. Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing [FACIT-Sp-12]

Listed below is a list of statements that provide a quality-of-life battery to tap into both traditional religiousness dimensions and spiritual dimensions. By circling one number per line, please indicate how true each statement has been for you during the past 7 days.

Item	Not at all	A little bit	Some what	Quite a bit	Very much
1. I feel peaceful	0	1	2	3	4
2. I have a reason for living	0	1	2	3	4
3. My life has been productive.	0	1	2	3	4
4.	0	1	2	3	4
5.	0	1	2	3	4
6.	0	1	2	3	4
7.	0	1	2	3	4
8.	0	1	2	3	4
9.	0	1	2	3	4
10. I find strength in my faith or spiritual beliefs.	0	1	2	3	4
11. Patient's illness has strengthened my faith or spiritual beliefs.	0	1	2	3	4
12. I know that whatever happens with patient's illness, things will be okay.	0	1	2	3	4

Part VII. Mutuality Scale [MS]

Instructions: This questionnaire lists some attitudes and behaviors which people reveal in their close relationships. Now we would like you to let us know how you and your family member feel about each other at the current time. Please circle or mark one number that best describes you and your family member. There is no right or wrong answers.

Item	Not at all	A little	Some	Quite a bit	A great deal
1. To what extent do the two of you see eye to eye (agree on things)?	0	1	2	3	4
2. How often do you feel physically close to him or her?	0	1	2	3	4
3. How much do you enjoy sharing past experiences with him or her?	0	1	2	3	4
4.	0	1	2	3	4
5.	0	1	2	3	4
6.	0	1	2	3	4
7.	0	1	2	3	4
8.	0	1	2	3	4
9.	0	1	2	3	4
10.	0	1	2	3	4
11.	0	1	2	3	4
12.	0	1	2	3	4
13.	0	1	2	3	4
14. To what extent do you enjoy the time the two of you spend together?	0	1	2	3	4
15. How often does he or she express feelings of warmth toward you?	0	1	2	3	4

Part VIII. Caregiver Burden Interview [ZBI-12]

The questions below reflect how persons sometimes feel when they are taking care of another person. After each statement, please circle (O) or tick (√) the response the best describes how often you feel that way. There is no right or wrong answers.

Item	**Never (0)**	**Rarely (1)**	**Some times (2)**	**Quite freque ntly (3)**	**Nearly always (4)**
1. Do you feel that because of the time you spend with your patients that you don't have enough time for yourself?	0	1	2	3	4
2. Do you feel stressed between caring you're your patient and trying to meet other responsibilities (work/family)?	0	1	2	3	4
3. Do you feel angry when you are around your patient?	0	1	2	3	4
4.	0	1	2	3	4
5.	0	1	2	3	4
6.	0	1	2	3	4
7.	0	1	2	3	4
8.	0	1	2	3	4
9.	0	1	2	3	4
10.	0	1	2	3	4
11.Do you feel you should be doing more for your patient?	0	1	2	3	4
12. Do you feel you could do a better job in caring for your patient?	0	1	2	3	4

Part IX. Beliefs in Chinese familism scale [BCF]

Please read the following items carefully and indicate below the approximate extent of disagreement or agreement in the familistic belief, cognition, and knowledge. Please answer each item according to your true feelings, without considering others' opinions.

Item	Strongly disagree	Quite disagree	Somewhat Disagree	Somewhat agree	Quite agree	Strongly agree
1. Although family situation is not good, the individual should be patient and no complaint.	1	2	3	4	5	6
2. Revitalizing family property is the greatest joy in life.	1	2	3	4	5	6
3. Let sleeping dog lie so as not to increase the troubles of family members.	1	2	3	4	5	6
4.	1	2	3	4	5	6
5.	1	2	3	4	5	6
6.	1	2	3	4	5	6
7.	1	2	3	4	5	6
8.	1	2	3	4	5	6
9.	1	2	3	4	5	6
10.						
11.	1	2	3	4	5	6
12.	1	2	3	4	5	6
13.	1	2	3	4	5	6
14.	1	2	3	4	5	6
15. The person should cultivate the next generation well to be worthy of their ancestors.	1	2	3	4	5	6
16. In personal behavior, family interests should be considered first.	1	2	3	4	5	6
17. Having an unfilial kid in a family is the greatest shame in life.	1	2	3	4	5	6

18.	1	2	3	4	5	6
19.	1	2	3	4	5	6
20.	1	2	3	4	5	6
21.	1	2	3	4	5	6
22.	1	2	3	4	5	6
23.	1	2	3	4	5	6
24.	1	2	3	4	5	6
25.	1	2	3	4	5	6
26.	1	2	3	4	5	6
27.	1	2	3	4	5	6
28.	1	2	3	4	5	6
29. When a dispute occurs in the family, it should be minimized.	1	2	3	4	5	6
30. The person should avoid doing things that are disapproved of by the family.	1	2	3	4	5	6
31. The person should work hard to fulfill the expectations of family.	1	2	3	4	5	6

APPENDIX D

Permission instruments

Permission of Using Connor-Davidson Resilience Scale (Chinese Version)

Dear Sun Haiyan,

Thank you for your interest in the Connor-Davidson Resilience Scale (CD-RISC). We are pleased to grant permission for use of the Chinese CD-RISC-25 in the project you have described under the following terms of agreement:

1. You agree (i) not to use the CD-RISC for any commercial purpose unless permission has been granted, or (ii) in research or other work performed for a third party, or (iii) provide the scale to a third party without permission. If other colleagues or off-site collaborators are involved with your project, their use of the scale is restricted to the project described, and the signatory of this agreement is responsible for ensuring that all other parties adhere to the terms of this agreement.

2 You may use the CD-RISC in written form, by telephone, or in **secure electronic format whereby the scale is protected from copying, downloading, alteration, repeated use, unauthorized distribution or search engine indexing. In all use of the CD-RISC, including electronic versions, the full copyright and terms of use statement must appear with the scale. The scale should neither be distributed as an email attachment, nor appear on social media, nor in any form where it is accessible to the public and should be removed from electronic and other sites once the activity or project has been completed. The RISC can only be made accessible in electronic form after subjects have logged in through a link, password or unique personal identifier.**

3 Further information on the CD-RISC can be found at the www.cd-risc.com website. The scale's content may not be modified, although in some circumstances the formatting may be adapted with permission of either Dr. Connor or Dr. Davidson. If you wish to create a non-English language translation or culturally modified version of the CD-RISC, please let us know and we will provide details of the standard procedures.

4 Three forms of the scale exist: the original 25 item version and two shorter versions of 10 and 2 items respectively. When using the CD-RISC 25, CD-RISC 10 or CD-RISC 2, whether in English or other language, please include the full copyright statement and use restrictions as it appears on the scale.

5. A **student-rate** fee of $ 30 US is payable to Becky Williams at 936 Ridgeway Avenue, Signal Mountain, TN 37377, USA either by PayPal (www.paypal.com, account beckytolme@gmail.com), cheque or bank wire transfer (in US $$). Money orders are not accepted.

6. Complete and return this form via email to risc.beckywilliams@gmail.com. **The scale will only be sent after the signed agreement has been returned.**

7. In any publication or report resulting from use of the CD-RISC, you do not publish or partially reproduce items from the CD-RISC without first securing permission from the authors.

If you agree to the terms of this agreement, please email a signed copy to the above email address. Upon receipt of the signed agreement, we will email a copy of the scale. For questions regarding use of the CD-RISC, please contact Becky Williams at risc.beckywilliams@gmail.com. We wish you well in pursuing your goals.

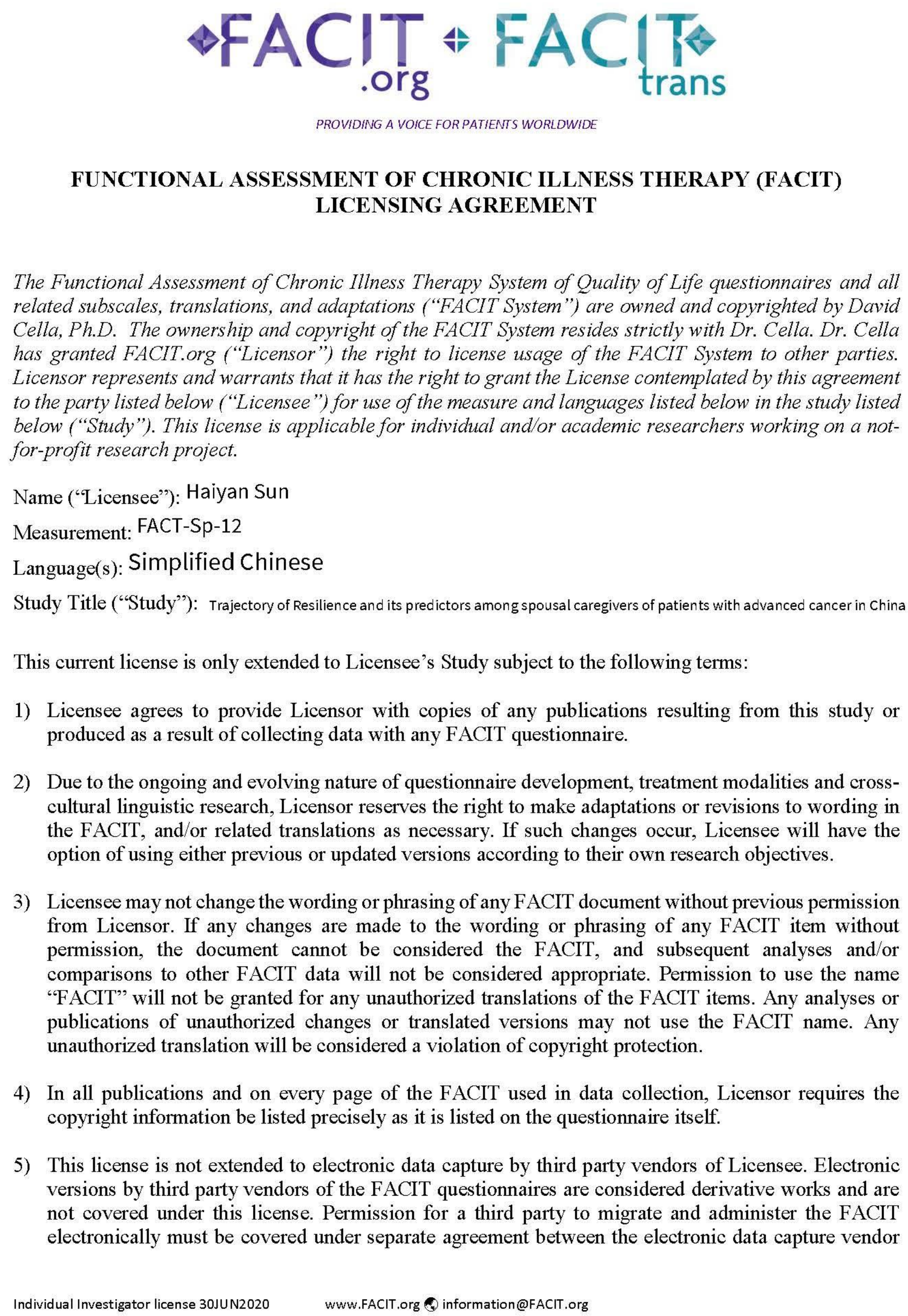
Sincerely yours,

Becky Williams.

Agreed to by:

Becky Williams ___ August 29, 2021___
Signature (printed) Date

Permission of Using FACIT-Sp-12 (Chinese Version)



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FUNCTIONAL ASSESSMENT OF CHRONIC ILLNESS THERAPY (FACIT) LICENSING AGREEMENT

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Name ("Licensee"): Haiyan Sun
Measurement: FACT-Sp-12
Language(s): Simplified Chinese
Study Title ("Study"): Trajectory of Resilience and its predictors among spousal caregivers of patients with advanced cancer in China

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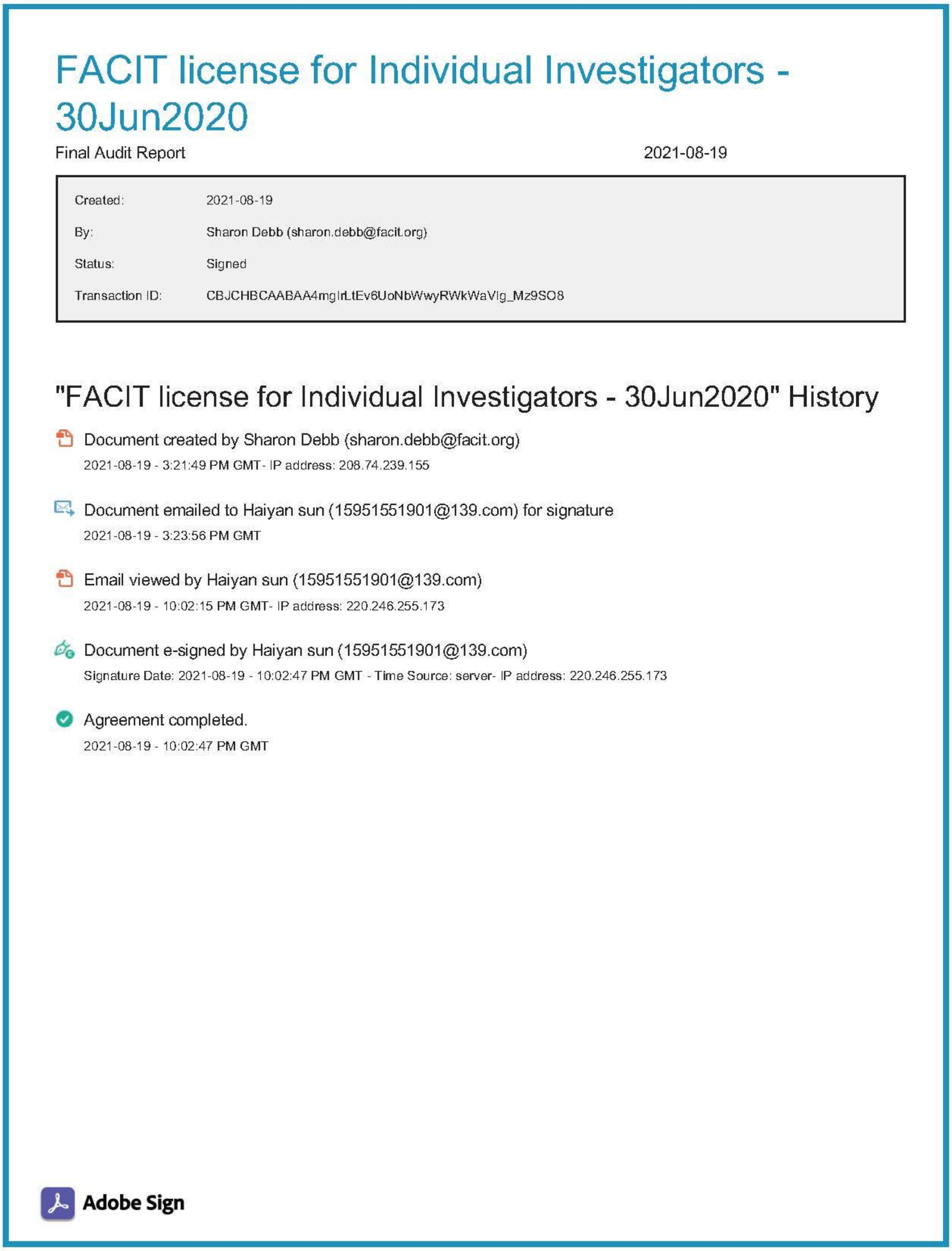
Email: 15951551901@139.com



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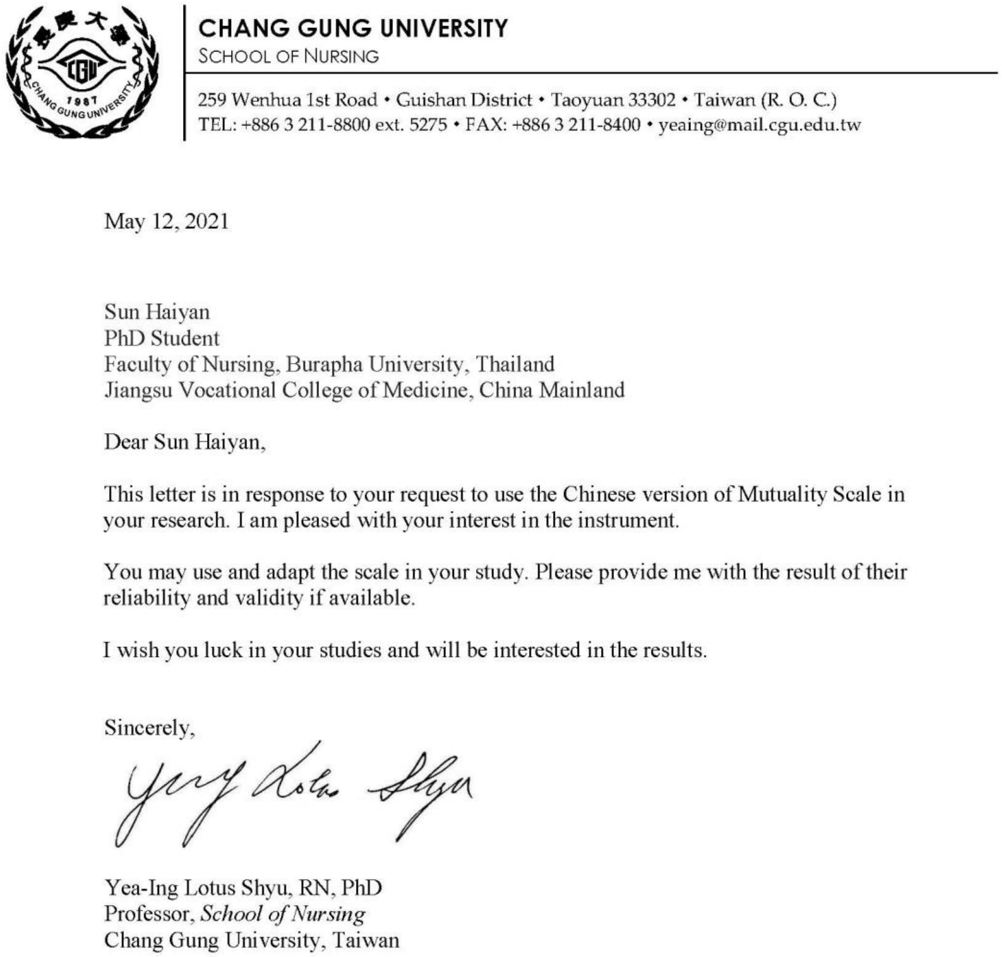
The Permission for Using of the Mutuality Scale



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May 12, 2021

Sun Haiyan
PhD Student
Faculty of Nursing, Burapha University, Thailand
Jiangsu Vocational College of Medicine, China Mainland

Dear Sun Haiyan,

This letter is in response to your request to use the Chinese version of Mutuality Scale in your research. I am pleased with your interest in the instrument.

You may use and adapt the scale in your study. Please provide me with the result of their reliability and validity if available.

I wish you luck in your studies and will be interested in the results.

Sincerely,

Yea-Ing Lotus Shyu, RN, PhD
Professor, *School of Nursing*
Chang Gung University, Taiwan

The Permission for Translation and Use of the Coping Self-Efficacy Scale

SV: Ask for permission of using 7-item Coping Self-Efficacy Scale

From: [redacted]

Date: Thursday, August 19, 2021 6:58 AM

To: Sun/Haiyan <sun_haiyan@139.com>

Dear Sun

the CSE-7 is free for use so you can translate it for your study: you do not need permission (I was the PI of this study). Success with your study.

Kind regards

Dr. Peter van der Velden
Centerdata
Tilburg, The Netherlands

The Permission for Use of Chinese version of Activities of Daily Living scale

Subjective: Ask for permission of using the Chinese Version of Activities of Daily Living Scale (ADL-C)

From: [redacted]

Date: Sunday, August 22, 2021 21:22 PM

To: Sun/Haiyan from WeChat ID: sun15951551901

Hello. The instrument is on the Handbook of Psychiatric Rating Scales. You can use it freely as much as you like.

He Yanling

The Permission for Use of The Chinese Social Support Rating Scale

Subjective: Ask for permission of using the Chinese Social Support Rating Scale (SSRS)

From: [redacted]

Date: Sunday, September 5, 2021 21:43 PM

To: Sun/Haiyan <sun_haiyan@139.com>

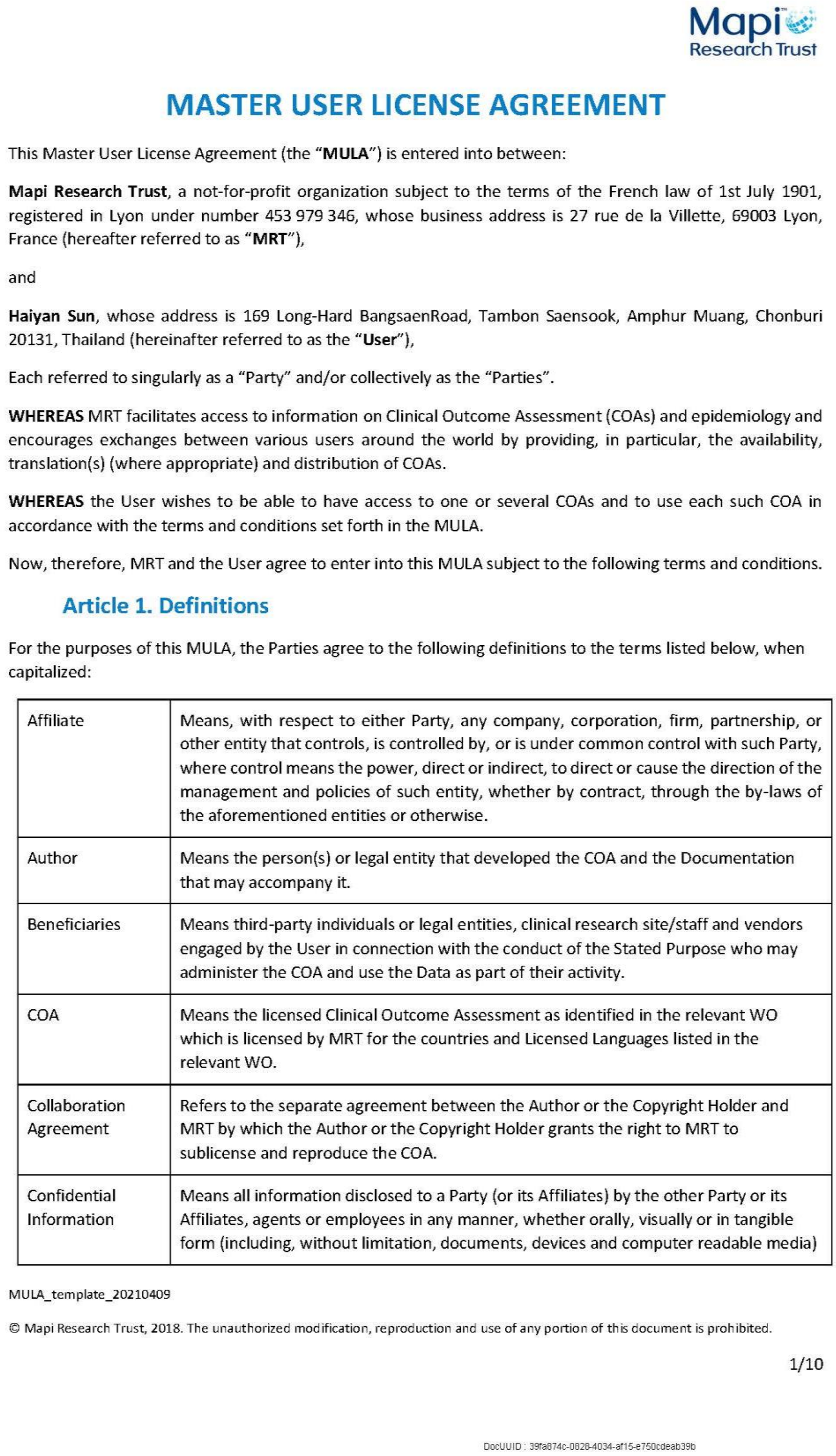
Dear Haiyan,

The instrument is freely available. You can use it.

Good luck with your research.

Xiao Shuiyuan

The Permission for Using of Caregiver Burden Interview



Mapi Research Trust

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and

Haiyan Sun, whose address is 169 Long-Hard BangsaenRoad, Tambon Saensook, Amphur Muang, Chonburi 20131, Thailand (hereinafter referred to as the "**User**"),

Each referred to singularly as a "Party" and/or collectively as the "Parties".

WHEREAS MRT facilitates access to information on Clinical Outcome Assessment (COAs) and epidemiology and encourages exchanges between various users around the world by providing, in particular, the availability, translation(s) (where appropriate) and distribution of COAs.

WHEREAS the User wishes to be able to have access to one or several COAs and to use each such COA in accordance with the terms and conditions set forth in the MULA.

Now, therefore, MRT and the User agree to enter into this MULA subject to the following terms and conditions.

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For the purposes of this MULA, the Parties agree to the following definitions to the terms listed below, when capitalized:

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Stated Purpose	Means the context of use of the COA by the User, as detailed in the relevant WO. It refers to all types of studies, clinical trials, research projects or any other project, as

	defined by the Parties within the WO, for which MRT grants the User the right to use the COA.
User	Means the user of the COA as defined herein.
Work Order or WO	Means each individual written agreement between MRT and the User, a sample of which is attached hereto as Appendix A, related to a specific licensed COA. Each Work Order will incorporate all of the terms and conditions of this MULA, in addition to the specific details of the Stated Purpose and the conditions specific to the COA set forth in the WO.

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2.1 Each COA is proprietary content, information and material that is protected by applicable intellectual property and other laws, including but not limited to copyright. The User shall not use the COA except for the Stated Purpose as permitted pursuant to this MULA and the relevant WO.

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2.4 Through the Collaboration Agreement, the Author and/or the Copyright Holder have granted MRT the right to sublicense, and have authorized MRT to grant, on a non-exclusive basis, a portion of these rights to the Users interested for specific purposes, and in particular to the User for the Stated Purpose.

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3.1 Subject to the terms and conditions of this MULA and payment of the Licensing Fee detailed in the relevant WO, MRT hereby grants to the User and the User accepts, the following non-exclusive, non-transferable, non-assignable, non-sublicensable worldwide license, during the WO term:

i. To use the COA for the Stated Purpose in the authorized Modes and Licensed Languages, including the right to communicate it to the Beneficiaries and/or the Sponsor only; and

ii. To reproduce the COA for the Stated Purpose in the Authorized Modes and Licensed Languages, including the right to physically establish the COA or to have it physically established, on any paper, electronic, analog or digital medium, and in particular documents, articles, studies, observations, publications, websites whether or not protected by restricted access, CD, DVD, CD-ROM, hard disk, USB flash drive, for the Beneficiaries and/or the Sponsor only; and

iii. To translate the COA or have it translated when the COA has not been translated into the Licensed Language(s),

hereafter, the “**License**”.

Article 4. Work Orders

4.1 The Parties shall execute a separate WO in respect of each COA to be licensed pursuant to this MULA. A User Affiliate may execute a WO in its own name with MRT provided such Affiliate acknowledges and agrees to be bound by the terms of this MULA. In such event, for the purpose of the WO between the User's Affiliate and MRT, the term "User" as used in this MULA shall refer to the Affiliate identified in the applicable WO.

4.2 Upon full execution of the relevant WO, and payment of the Licensing Fee if applicable, MRT will provide the COA and related Documentation as set forth in the relevant WO. Each WO will incorporate all of the terms and conditions of this MULA, in addition to the specific conditions of the COA set forth in the relevant WO. To the extent any terms and conditions of this MULA conflict with the terms and conditions of any WO, the terms and conditions of this MULA will control unless the WO expressly and specifically states an intent to supersede the MULA on a specific matter (but then only with respect to such particular WO and with respect only to such matter).

Article 5. Obligations of the User

5.1 General obligations

For each COA licensed pursuant to this MULA, and unless otherwise stated in the relevant WO, the User shall:

- Insert the Copyright Holder's copyright notice on the COA (paper or e-Version);
- Not amend, modify, condense, adapt, reorganize the COA in any Mode whatsoever, even minor, without MRT's specific written consent;
- Refrain from using or reproducing the COA in any way and on any format whatsoever, with the exception of doing so for the purpose of fulfilling a requirement for the Stated Purpose;
- If the COA is to be used in a publication, website or context other than research or clinical study:
    - Cite the reference publications of the COA
    - Indicate the details of MRT for any information on the COA, as follows: "[NAME OF COA] contact information and permission to use: Mapi Research Trust, Lyon, France, https://eprovide.mapi-trust.org"
    - Not include any full copy of the COA, but a sample protected version with the indication "sample copy, do not use without permission"
    - Provide MRT, as soon as possible, with a copy of any publication regarding the COA, for information purposes.

5.2 Translation of the COA

The User undertakes not to translate the COA nor have it translated by any means whatsoever other than those means stipulated in the MULA or the relevant WO.

a. For academic or non-commercial Stated Purposes

The WO shall describe the requirements for translation of the COA, unless otherwise stated.

b. For commercial Stated Purposes

The translation shall be performed by a company specialized in translation/linguistic validation of COAs. There are two cases:

i. When the Copyright Holder has granted ICON LS exclusive rights to translate the COA, the User shall sign a linguistic validation agreement with ICON LS

ii. When the User is free to work with the translation company of its choice, the conditions of translation will be specified in the WO.

In addition, specific terms and conditions that apply to the translation of the COA are stipulated in the relevant WO.

5.3 Obligations for the use of an e-Version of the COA

a. For academic or non-commercial Stated Purposes

In the case of use of an eCOA for academic or non-commercial Stated Purposes, the User undertakes to submit the Screenshots of all the electronic pages where the e-Version of the COA appears to MRT to ensure compliance with section 5.1. Electronic migration guidelines will be provided to the User and/or the IT Company.

When the migration of the COA in e-Version is performed by an IT Company, the User shall ensure that the IT Company has signed the necessary license agreement with MRT before developing the e-Version of the COA.

b. For commercial Stated Purposes

For the use of an e-Version of the COA for commercial Stated Purposes, the User may:

- Develop its own e-Version without the involvement of a Third-Party, or
- Contract with an IT Company to develop such e-Version. In such case, the IT Company shall sign a specific license agreement ("License Agreement with IT Company") or a Master IT Company License Agreement ("MITLA") with MRT.

In each case, the User shall ensure that the User and/or IT Company complies with any electronic migration guidelines and specifications provided by MRT to the User and/or the IT Company.

Article 6. Ownership of Data

6.1 Except as otherwise specified in the WO, the Parties hereby agree that the Data will be the sole property of the User.

Article 7. Beneficiaries and Sponsor

7.1 The User shall authorize, under its sole responsibility, the Beneficiaries and/or the Sponsor to use the COA and the Data as necessary in strict adherence to their function in the context of performing the Stated Purpose. Such use gives no rights to the Beneficiaries to use the COA beyond the use contemplated by this MULA and the relevant WO(s).

7.2 The User guarantees that the Beneficiaries and/or the Sponsor will comply with the terms and conditions of this MULA and in particular the undertakings regarding confidentiality, and accepts liability for any breach of this MULA by the Beneficiaries and/or the Sponsor.

Article 8. Price and Payment Terms

8.1 Price

In consideration for the License granted under the relevant WO, the User agrees to pay the Licensing Fee, if applicable, specified in the relevant WO. The amount of the Licensing Fee will be determined based on the information given by the User in the relevant WO. In case of modifications of this information (i.e. additional administrations, additional Licensed Languages), the User shall inform MRT and a Change Order shall be executed.

8.2 Payment Terms

The User may pay the Licensing Fee by bank transfer, cheque or bank card. The User shall be responsible for all taxes applicable to the User and the User's place of residence relating to the Licensing Fee collected under the relevant WO. Licensing Fees listed in each WO are exclusive of any sales taxes; value added taxes, duties or other withholding.

The User undertakes to pay the amounts due within a period of thirty (30) days from the date indicated on the invoice. Upon delivery of the COA to the User, the Licensing Fee is non-refundable.

8.3 Delivery

The User understands and agrees that the COA and related Documentation will be delivered by MRT upon full payment of the Licensing Fee.

Article 9. Term and termination

9.1 Term

This MULA shall be effective as of the Effective Date and shall continue for a period of ten (10) years (the "Initial Term") unless terminated earlier by the Parties as permitted in this Article 9.

At the end of the Initial Term, this MULA shall automatically renew for additional one (1) year periods (each, a "Renewal Period") unless written notice of non-renewal is provided to MRT by the User at least ninety (90) days prior to the expiration of the then-current Initial Term or Renewal Period.

The User may submit WOs only during the Term. If the WO term extends beyond the termination or expiration date of this MULA, the applicable terms and conditions of this MULA will extend automatically to such WO until such WO's termination or expiration date. Each WO term shall be as set forth in the relevant WO after which such WO and the license granted thereunder in respect of such WO shall terminate.

The confidentiality and non-disclosure obligations stipulated in Article 11 of this MULA shall survive expiration or termination of this MULA.

9.2 Termination

a. Termination due to financial disruption of the Parties

If for any reason whatsoever, one or both Parties ceases to conduct all business activities, the MULA shall terminate immediately and without either penalty or any compensation being owed by either of the two Parties to the other.

b. Termination for breach

In the case of breach by a Party of one or more of its obligations pursuant to this MULA, the other Party may terminate this MULA with immediate effect if the breaching Party has not rectified the breach detailed in a registered letter with confirmation of receipt within a period of thirty (30) days from the date indicated on the registered letter.

c. Termination of the Collaboration Agreement

In addition, in the event of termination of the Collaboration Agreement between the Copyright Holder of a COA and MRT, any WO related to such COA may consequently also be terminated immediately.

d. Consequences of the termination

In the event of termination of the MULA for whatever grounds, the User shall remove, return or destroy, as instructed by MRT, all copies of the COA and Documentation and other materials, documents, data and information in its possession, whether held electronically or by other means, in relation to the MULA, within a period of thirty (30) days after such termination. However, the User may keep a single copy of such materials for the purposes of archiving information necessary for legal, tax or regulatory inspection and may use the Data as it deems fit, in accordance with the MULA and the relevant WO.

Article 10. Personal data

The Parties shall comply with all relevant data protection obligations.

Article 11. Confidentiality

11.1 Disclosure of Confidential Information

In relation to this MULA or any WO, a Party or its Affiliates may disclose Confidential Information (as defined in the definition section) ("Discloser") to the other Party, its agents, officers and/or Affiliates ("Recipient"). All such Confidential Information shall remain the property of the Discloser disclosing it and nothing in this MULA shall be construed as granting to the Recipient any license and/or other rights with respect to the Confidential Information of the Discloser or any part thereof, except as provided for in this MULA. The Recipient agrees that any such Confidential Information disclosed to it will only be used in connection with the legitimate purposes of this MULA and/or WO. The Recipient shall be entitled to disclose Confidential Information only to those agents, officers, Affiliates, contractors and third parties (excluding any competitors of the Discloser) who have a need to know it and are obligated to keep same in confidence, and safeguard it with all reasonable care.

11.2 Non-Disclosure-Period

In respect of Confidential Information disclosed in relation to this MULA or any WO, the obligations and rights of confidentiality as set out herein apply during the period of the applicable WO and for a period of five (5) years thereafter, in respect of Confidential Information otherwise disclosed under this MULA the obligations and rights of confidentiality as set out herein apply during the period of the MULA and for a period of five (5) years thereafter.

11.3 Binding Other Parties

The Recipient is responsible for ensuring its servants or agents, or any other persons or parties who receive Confidential Information through it, are bound to terms substantially similar to those set out in this MULA.

11.4 Exclusions

The confidentiality obligations of the Recipient in Sections 11.01 to 11.03 do not extend to Confidential Information or any other information which:

- is or becomes generally available to the public otherwise than by reason of a breach by the Recipient of Sections 11.1 to 11.3 above; or

- is known to the Recipient and is at its free disposal prior to its receipt from the Discloser as established by written evidence; or
- is subsequently disclosed to the Recipient by a third party who the Recipient had no reason to believe was under a duty of confidence to the Discloser.

11.5 Disclosure by Law

Confidential Information may also be disclosed by the Recipient to the extent required by law (including statutory, regulatory, or similar legislative requirements), court orders and similar, provided that the Recipient making the disclosure of the Discloser's Confidential Information gives the maximum practical advance notice of same to the Discloser.

11.6 The User understands that MRT is entitled to give a copy of the MULA and the WOs to the Author and/or to the Copyright Holder and/or to give access to the Author and/or the Copyright Holder to information related to User's requests, and may do so without infringing this confidentiality obligation.

Article 12. Intellectual property

12.1 The User shall not do or authorize any third party to do any act which would invalidate or be inconsistent with any intellectual property rights regarding the COA(s).

12.2 The User shall promptly give notice in writing to MRT in the event that it becomes aware of any claim brought by a third party that the COA infringes the intellectual property rights of such third party.

12.3 MRT acknowledges that, to the best of its knowledge, neither the COA nor the Documentation infringe any third party rights and that it has the rights required to enter into this MULA and any relevant WO.

12.4 Except as to willful misconduct, negligence or breach of this MULA by the User, MRT undertakes in particular to indemnify the User, its officers, directors, employees and agents from any loss, damage, cost or expense, settlement, fines, disbursements (including reasonable legal fees) ("Loss") arising from any third party claim against the User for any damage caused by a breach or misappropriation by MRT of the copyright existing in the COA.

12.5 The User shall indemnify MRT and its Affiliates and their officers, directors, employees and agents from any Loss arising from any third party claim relating to or which arises from: (i) the User's negligence or intentional misconduct; or (ii) the use / non-use or administration of the COA by or on behalf of the User, unless such Loss is caused by a breach or misappropriation by MRT of the copyright existing in the COA.

Article 13. Limitation of liability

13.1 The User understands and agrees that the COA is provided "as is" with, as the case may be, its instruction manual, and that MRT and the Author and/or Copyright Holder accept no responsibility for any expenses, losses or actions incurred or undertaken by the User as a result of its use of the COA for the Stated Purpose.

13.2 MRT may not be held liable for the termination of a WO due to the termination of the Collaboration Agreement on the COA where MRT is not at fault for the termination of the Collaboration Agreement.

13.3 Neither Party (including its affiliates) shall be liable to the other Party (including its Affiliates) for any indirect, consequential, special or incidental loss or damage or any loss of profits (whether direct or indirect), arising from or as a result of any claim or liability in contract, tort (including without limitation negligence and breach of statutory or other duty), for delay or failure to perform, or otherwise howsoever arising in relation or pursuant to this MULA or any WO. The foregoing limitation applies even if the loss, cost or damage was foreseeable or in the contemplation of either Party.

13.4 Notwithstanding anything to the contrary suggested or contained in this MULA (but without prejudice to section 13.03) and to the fullest extent permissible under applicable law but in any case excluding personal injury claims; the maximum aggregate liability of MRT to the User (including its Affiliates) in contract, tort (including negligence, breach of statutory or other duty), misrepresentation, representation, restitution, delay, failure to perform, claims under the indemnification obligations in this MULA and/or the WO or otherwise howsoever arising in relation to this MULA and/or the WO shall not exceed the amount of the fees paid under the individual WO giving rise to any such liability.

Article 14. Force Majeure event

14.1 If the performance of the MULA or any WO is stopped or delayed further to a force majeure event such as third party strikes, third party lockouts, third party labor troubles, restrictive regulatory authority actions, orders or decrees, riots, insurrection, war, acts of God, severe inclement weather or other similar reason or cause which is unforeseeable or beyond the reasonable control of such Party, the Party affected by the force majeure event must (i) inform the other Party of the same immediately and (ii) take all appropriate measures in order to reduce or remove the impact of the force majeure event, and endeavor to recover the performance of the obligations which have been deferred or prevented by such event.

14.2 Neither Party will be held liable for the delays or hindrances in performing its obligations due to a force majeure event, when the delay or hindrance is the result of such force majeure event.

14.3 If a force majeure event affects one of the Parties and continues for more than thirty (30) days, either Party may by notice in writing to the other Party terminate the MULA or the relevant WO.

Article 15. Miscellaneous

15.1 If any provision of this MULA or any WO is held to be unenforceable and/or legally invalid, the validity and enforceability of the enforceable portion of any such provision and/or the remaining provisions shall not be affected thereby. The Parties shall replace such unenforceable and/or legally invalid provision by an enforceable and legally valid provision that comes closest to the original commercial intent of such unenforceable and/or legally invalid provision (or part thereof).

15.2 No modification of this MULA shall be deemed effective unless in writing and signed by each of the Parties hereto and no waiver of any right or delay in enforcing such right set forth herein shall be deemed effective unless in writing and signed by the Party against whom enforcement of the waiver is sought.

15.3 The User may not transfer or assign the MULA, any WO and the resulting rights and obligations, outside of the context of the Stated Purpose without MRT's prior written consent.

15.4 This MULA may be executed in any number of counterparts, each of which will be deemed to be an original, and all of which together will constitute one and the same agreement. Each Party acknowledges that an original signature or a copy thereof transmitted by facsimile or by PDF will constitute an original signature for purposes of this MULA.

Article 16. Jurisdiction and Applicable Law

16.1 This MULA is subject to Swiss law. The Parties will endeavor to settle their differences on an out-of-court basis prior to referring their case to the courts. In the case of disputes regarding the validity, interpretation or performance of the MULA, exclusive jurisdiction is granted to the court with jurisdiction located in Basel, Switzerland, notwithstanding several defendants or the introduction of third parties, even for summary proceedings or proceedings on petition.

IN WITNESS WHEREOF, each of the parties has caused this MULA to be executed by its authorized representative in its name and on its behalf.

MAPI RESEARCH TRUST

Signature: ______ Laure-Lou Perrier

Laure-Lou Perrier, Senior Manager

Name: ______ 07 Oct 2021 16:41:055+0000

REASON: I approve this document

Title: ______

aa3a230b-...0ac-9968-f17dc634cb58

Date: ______

Haiyan Sun

Signature: ____Haiyan sun__________

Name: ___Haiyan Sun_________________

Title: _Apply for ZBI-12 Chinese version____

Date: _08 Oct 2021___________________

APPENDIX E

Testing for assumption

Table E-1 Results of standardized variables for testing univariate outlier

Z-score of variables	N	Minimum	Maximum
Patients function status at T1	312	-1.64567	3.12328
Patients function status at T2	312	-1.94310	3.24096
Patients function status at T3	312	-1.85389	2.41787
Resilience at T1	312	-2.60546	2.21232
Resilience at T2	312	-3.01099	2.16363
Resilience at T3	312	-2.93913	2.50524
Social support at T1	312	-2.82788	3.18259
Social support at T2	312	-2.51483	3.13436
Social support at T3	312	-2.79453	3.01624
Coping self-efficacy at T1	312	-2.48393	3.00687
Coping self-efficacy at T2	312	-3.04610	3.08695
Coping self-efficacy at T3	312	-3.13670	3.12712
Spirituality at T1	312	-2.14072	2.49444
Spirituality at T2	312	-2.53416	3.17926
Spirituality at T3	312	-2.60414	3.03028
Mutuality at T1	312	-2.40753	3.00867
Mutuality at T2	312	-2.56120	3.08125
Mutuality at T3	312	-1.98061	3.04701
Caregiver burden at T1	312	-1.68953	3.16391
Caregiver burden at T2	312	-2.73297	3.35646
Caregiver burden at T3	312	-2.59606	3.11308
Familism at T1	312	-2.19158	2.25400
Familism at T2	312	-2.08615	2.23562
Familism at T3	312	-2.29284	2.31322

Table E-2 Normality of distribution for selected variables at three time points

Variables	Skewness	Std. Error	Z(α)	Kurtosis	Std. Error	Z(α)
Patients function status at T1	**0.534**	**0.138**	**3.869**	**0.598**	**0.275**	**2.174**
Patients function status at T2	0.262	0.138	1.898	0.473	0.275	1.720
Patients function status at T3	-0.026	0.138	-0.188	-0.711	0.275	-2.585
Resilience at T1	-0.16	0.138	-1.159	-0.751	0.275	-2.730
Resilience at T2	-0.272	0.138	-1.971	-0.464	0.275	-1.687
Resilience at T3	-0.156	0.138	-1.130	-0.108	0.275	-0.392
Social support at T1	0.227	0.138	1.644	0.208	0.275	0.756
Social support at T2	0.148	0.138	1.072	0.045	0.275	0.163
Social support at T3	0.159	0.138	1.152	0.107	0.275	0.389
Coping self-efficacy at T1	-0.496	0.138	-3.594	-0.083	0.275	-0.301
Coping self-efficacy at T2	-0.233	0.138	-1.68	0.484	0.275	1.760
Coping self-efficacy at T3	**-0.151**	**0.138**	**-1.094**	**0.749**	**0.275**	**2.723**
Spirituality at T1	-0.123	0.138	-0.891	-0.474	0.275	-1.723
Spirituality at T2	0.084	0.138	0.608	0.337	0.275	1.225
Spirituality at T3	0.249	0.138	1.804	0.061	0.275	0.221
Mutuality at T1	-0.196	0.138	-1.420	-0.132	0.275	-0.480
Mutuality at T2	0.270	0.138	1.956	0.178	0.275	0.647
Mutuality at T3	0.261	0.138	1.891	0.213	0.275	0.774
Caregiver burden at T1	0.265	0.138	1.920	0.295	0.275	1.072
Caregiver burden at T2	**0.659**	**0.138**	**4.775**	**0.573**	**0.275**	**2.083**
Caregiver burden at T3	0.241	0.138	1.746	0.417	0.275	1.516
Familism at T1	-0.161	0.138	-1.166	-0.288	0.275	-1.047
Familism at T2	-0.051	0.138	-0.369	-0.43	0.275	-1.563
Familism at T3	-0.208	0.138	-1.507	-0.355	0.275	-1.290

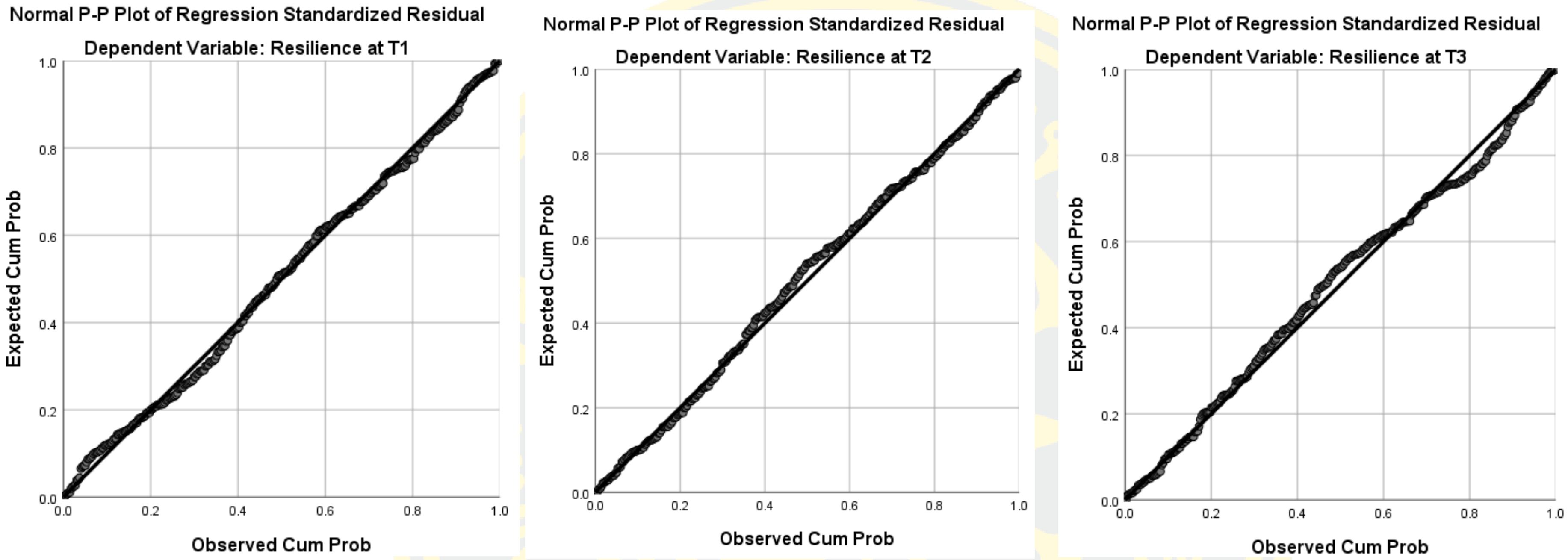


Figure E-1 Normal P-P plot of regression standardized residual of resilience at three time points

Table E-3 Pearson's correlation matrix for selected variables at T2 (n = 312)

Variables	**Resilience**	**Patients function status**	**Social support**	**Coping self-efficacy**	**Sprituality**	**Mutuality**	**Caregiver burden**	**Chinese familism**
Resilience	1							
Patients function status	-.296**	1						
Social support	.387**	-.203**	1					
Coping self- efficacy	.493**	-.177**	.408**	1				
Sprituality	.487**	-.258**	.374**	.423**	1			
Mutuality	.369**	-.373**	.298**	.194**	.445**	1		
Caregiver burden	-.219**	.310**	-.014	-.207**	-.122*	-.248**	1	
Chinese familism	.201**	-.128*	.069	.225**	.090	.159**	-.280**	1

Note. **p <0.01, *p <0.05

Table E-4 Pearson’s correlation matrix for selected variables at T3 (n=312)

Variables	**Resilience**	**Patients function status**	**Social support**	**Coping self- efficacy**	**Sprituality**	**Mutuality**	**Caregiver burden**	**Chinese familism**
Resilience	1							
Patients function status	-.439**	1						
Social support	.324**	-.182**	1					
Coping self- efficacy	.369**	-.154**	.445**	1				
Sprituality	.466**	-.498**	.334**	.380**	1			
Mutuality	.403**	-.532**	.300**	.246**	.569**	1		
Caregiver burden	-.341**	.514**	-.081	-.112*	-.326**	-.368**	1	
Chinese familism	.151**	-.144*	.020	.028	.105	.194**	-.267**	1

Note. **p <0.01, *p <0.05

Table E-5 Testing for multicolinearity of demographic characteristics of participants

Variable	**T1**		**T2**		**T3**	
	Tolerance	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**
Gender	.689	1.452	.679	1.474	.676	1.479
Spouse age	**.023**	**43.413**	**.024**	**42.159**	**.023**	**43.393**
Marriage year	**.057**	**17.527**	**.058**	**17.256**	**.057**	**17.603**
Religion	.825	1.212	.805	1.242	.806	1.241
Education level	.398	2.514	.405	2.467	.397	2.521
Job status	.365	2.740	.356	2.809	.368	2.721
Income monthly	.408	2.452	.423	2.363	.427	2.344
Health status	.741	1.350	.706	1.417	.711	1.407
Patient age	**.040**	**24.989**	**.040**	**24.764**	**.040**	**24.909**
Cancer type	.865	1.157	.893	1.119	.896	1.115
Cancer stage	.775	1.291	.758	1.319	.767	1.303
Treatment	.878	1.139	.890	1.124	.889	1.124
Patients function status	.576	1.736	.632	1.583	.466	2.147
Social support	.667	1.500	.660	1.514	.642	1.557
Coping self- efficacy	.357	2.805	.588	1.702	.654	1.530
Sprituality	.462	2.163	.590	1.694	.504	1.985
Mutuality	.451	2.216	.614	1.629	.517	1.934
Caregiver burden	.510	1.963	.736	1.360	.628	1.592
Chinese familism	.711	1.406	.845	1.184	.861	1.161

Note. VIF = Variance inflammation

APPENDIX F

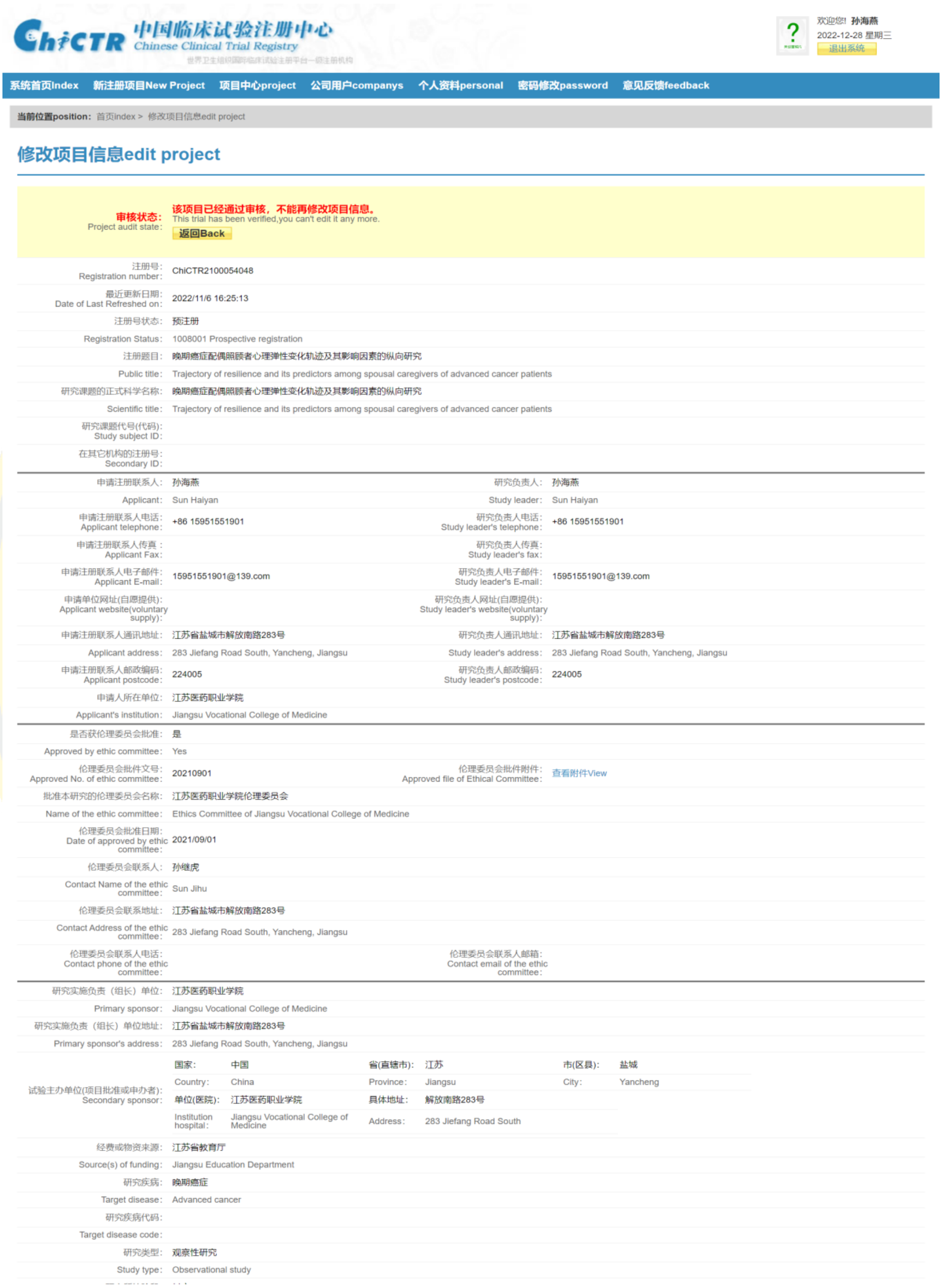
Expert panel

EXPERT PANEL

NO.	Name	Institution
1.	Yang Yeqin, Ph.D	School of Nursing, Wenzhou Medical University
2.	Wilai Limthawaranun, Ph.D	Oriental of Department, Humanities and Social Science, Burapha University
3.	Liu Chunmei, Ph.D	School of Public Fundamental Subject, Jiangsu Vocational College of Medicine
4.	Zhang Qiuyue, Ph.D	School of Public Fundamental Subject, Jiangsu Vocational College of Medicine

APPENDIX G

Clinical Trial Registration



修改项目信息edit project

审核状态：
Project audit state：

该项目已经通过审核，不能再修改项目信息。
This trial has been verified,you can't edit it any more.

注册号： Registration number：	ChiCTR2100054048		
最近更新日期： Date of Last Refreshed on：	2022/11/6 16:25:13		
注册号状态：	预注册		
Registration Status：	1008001 Prospective registration		
注册题目：	晚期癌症配偶照顾者心理弹性变化轨迹及其影响因素的纵向研究		
Public title：	Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients		
研究课题的正式科学名称：	晚期癌症配偶照顾者心理弹性变化轨迹及其影响因素的纵向研究		
Scientific title：	Trajectory of resilience and its predictors among spousal caregivers of advanced cancer patients		
研究课题代号(代码)： Study subject ID：			
在其它机构的注册号： Secondary ID：			
申请注册联系人：	孙海燕	研究负责人：	孙海燕
Applicant：	Sun Haiyan	Study leader：	Sun Haiyan
申请注册联系人电话： Applicant telephone：	+86 15951551901	研究负责人电话： Study leader's telephone：	+86 15951551901
申请注册联系人传真 ： Applicant Fax：		研究负责人传真： Study leader's fax：	
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申请单位网址(自愿提供)： Applicant website(voluntary supply)：		研究负责人网址(自愿提供)： Study leader's website(voluntary supply)：	
申请注册联系人通讯地址：	江苏省盐城市解放南路283号	研究负责人通讯地址：	江苏省盐城市解放南路283号
Applicant address：	283 Jiefang Road South, Yancheng, Jiangsu	Study leader's address：	283 Jiefang Road South, Yancheng, Jiangsu
申请注册联系人邮政编码： Applicant postcode：	224005	研究负责人邮政编码： Study leader's postcode：	224005
申请人所在单位：	江苏医药职业学院		
Applicant's institution：	Jiangsu Vocational College of Medicine		
是否获伦理委员会批准：	是		
Approved by ethic committee：	Yes		
伦理委员会批件文号： Approved No. of ethic committee：	20210901	伦理委员会批件附件： Approved file of Ethical Committee：	查看附件View
批准本研究的伦理委员会名称：	江苏医药职业学院伦理委员会		
Name of the ethic committee：	Ethics Committee of Jiangsu Vocational College of Medicine		
伦理委员会批准日期： Date of approved by ethic committee：	2021/09/01		
伦理委员会联系人：	孙继虎		
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试验主办单位(项目批准或申办者)：
Secondary sponsor：

国家：	中国	省(直辖市)：	江苏	市(区县)：	盐城
Country：	China	Province：	Jiangsu	City：	Yancheng
单位(医院)：	江苏医药职业学院	具体地址：	解放南路283号		
Institution hospital：	Jiangsu Vocational College of Medicine	Address：	283 Jiefang Road South		

经费或物资来源：	江苏省教育厅
Source(s) of funding：	Jiangsu Education Department
研究疾病：	晚期癌症
Target disease：	Advanced cancer
研究疾病代码：	
Target disease code：	
研究类型：	观察性研究
Study type：	Observational study

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