

1 **Do Concordances of Social Support and Relationship Quality Predict Psychological**  
2 **Distress and Well-being of Cancer Patients and Caregivers?**

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12

## 1 **Abstract**

2 This study examined concordances of cancer patients' received and caregivers' provided  
3 support and dyadic relationship quality, and their predictive utility in prospective  
4 psychological distress and well-being. A total of 83 Chinese cancer patient-caregiver dyads  
5 were recruited in two government-funded hospitals in Hong Kong. Participants reported  
6 received (patient)/provided (caregiver) emotional and instrumental support and dyadic  
7 relationship quality within six months after diagnosis (T1), and anxiety and depressive  
8 symptoms, positive affect, and life satisfaction at both T1 and 6-month follow-up (T2). We  
9 hypothesized that concordances at T1 would predict lower psychological distress and higher  
10 psychological well-being among both patients and caregivers at T2. Concordances were  
11 indicated by Gwet's AC<sub>2</sub> scores (possible range=-1.00–1.00) and as follows: emotional  
12 support:  $M=.92$ ,  $SD=.12$ , range=.25–.1.00; instrumental support:  $M=.92$ ,  $SD=.16$ , range=.08–  
13 1.00; and relationship quality:  $M=.63$ ,  $SD=.27$ , range=-.31–1.00. Hierarchical multiple  
14 regressions revealed that T1 concordances of perceived emotional and instrumental support  
15 and dyadic relationship quality positively predicted T2 anxiety symptoms [ $F(9, 74) = 6.725$ ,  
16  $\Delta R^2=.031$ ,  $p<.001$ ] and state positive affect [ $F(9, 74) = 3.436$ ,  $\Delta R^2=.042$ ,  $p=.001$ ], whereas  
17 inversely predicted T2 depressive symptoms [ $F(9, 74) = 4.189$ ,  $\Delta R^2=.042$ ,  $p<.01$ ].  
18 Significant associations were found only among caregivers, but not patients. (193 words)  
19 **Keywords:** Cancer caregiving; Concordance; Social support; Dyadic relationship quality;

## 1 Psychological distress and well-being

## 1 **Introduction**

2       How can the role of cancer patients as recipients and the role of caregivers as providers  
3 in social support processes be better understood? Are the dyadic social support and  
4 relationship processes associated with psychological adaptation? Social support has been  
5 consistently associated with adaptive psychological functioning among cancer patients  
6 (Helgeson & Cohen, 1996). Higher perceived emotional and instrumental support were  
7 concurrently and prospectively associated with lower generic psychological distress and  
8 psychiatric symptoms and higher psychological well-being including positive emotions and  
9 life satisfaction across newly diagnosed patients and long-term survivors with  
10 heterogeneous cancers (Boinon et al., 2014; Hou, 2010; Hou & Wan, 2012). In contrast,  
11 assisting patients on activities of daily living was found to impair cancer caregivers' social  
12 and psychological functioning (Girgis, Lambert, Johnson, Waller, & Currow, 2013; Rhee et  
13 al., 2008). Caregivers of advanced lung cancer patients regarded emotional support  
14 provision as the most difficult and time-consuming duty among other practical daily tasks  
15 (Bakas, Lewis, & Parsons, 2001). Building upon the preceding findings, the current study  
16 aims to examine whether and how concordances of social support and dyadic relationship  
17 quality would account for psychological adaptation among cancer patients and caregivers.

18       Subjective evaluations of social support refer to perceived availability of support and  
19 functions of providers and the provisions that are embedded within interpersonal

1 relationship, be it guidance, reliable alliance, reassurance of worth, and emotional closeness  
2 (Cutrona & Russell, 1987). Spouse caregivers of heterogeneous cancer patients reported  
3 difficulties in providing frequent emotional support; secure attachment with patients was  
4 associated with higher frequency of and less difficulties in emotional support, whereas  
5 avoidant attachment was associated with providing more instrumental support and  
6 experiencing more difficulties in emotional support (Kim & Carver, 2007). The  
7 interactionist perspective suggests that social support is best understood as interpersonal  
8 interactions between recipients and providers (Sarason, Pierce, & Sarason, 1990). Each  
9 party brings along her/his own personalities and experiences and participates in the ongoing  
10 interactions, and these personal characteristics impact both parties' subjective experiences  
11 of support processes. Both patients' and caregivers' perceptions of social support processes  
12 provide essential information for designing and implementing dyadic psychosocial  
13 education and intervention.

14 One line of work focuses on concordances between patient-reported and  
15 caregiver-reported social support and their psychosocial correlates. Low concordances have  
16 been identified in receipt/provision of advice and emotional support and the extent to which  
17 partners attempted to listen and understand among early-stage malignant melanoma patients  
18 and their partners, indicating a mismatch between patients' and caregivers' experience of  
19 social support (Lichtenthal, Cruess, Schuchter, & Ming, 2003). Patients reporting lower

1 concordances were found to adopt less emotional approach coping, which could facilitate  
2 dyadic communication through emotional processing and expression (Lichtenthal et al.,  
3 2003). Recently diagnosed and long-term breast cancer patients were found to provide more  
4 support to their husbands than they received from their husbands, while husbands' report of  
5 received support were lower than wives' report of provided support. Discrepancies could  
6 exist between patients' and caregivers' reports and there is a need to take into account both  
7 (Vinokur & Vinokur-Kaplan, 1990). In a prospective study of couples coping with  
8 heterogeneous cancers, high levels of concordances were identified in most supportive and  
9 unsupportive behaviors, ranging between 72% and 97% (Norton & Manne, 2007). Quality  
10 but not length of marriage predicted higher subsequent support concordances, whereas  
11 patients' report of physical impairment predicted lower concordances of unsupportive  
12 behaviors (Norton & Manne, 2007). In addition, Chinese cancer patients have been found to  
13 expect their family members to "mind-read" their needs, while they refrained from seeking  
14 help proactively in order to maintain relationship harmony in family (Hou, Lam, & Fielding,  
15 2009). Therefore, if caregivers could provide the right amount and quality of social support  
16 to satisfy patients' needs without over-burdening themselves, then both their own and the  
17 patients' mental health will be benefited.

18 It is worth noting that different statistics, namely effect size, *t*-tests, and Cohen's  
19 Kappa, have been adopted to indicate concordances. Among these indices, effect size and

1 *t*-tests are calculated with group means but not pairwise comparisons between individual  
2 dyads of patients and caregivers, discounting the appropriateness of these indices for  
3 indicating concordances. Cohen's Kappa is a valid and reliable measure of concordance.  
4 But interval items (i.e., never, rarely, sometimes, all the time) on emotional and  
5 instrumental supportive behaviors were recoded into dichotomous scores to indicate solely  
6 occurrences of the behaviors or not (Norton & Manne, 2007). Each rating scale can indeed  
7 represent distinctly different experiences and thus important information about the  
8 experiences was lost after dichotomizing the scores. In addition, emotional and instrumental  
9 support were aggregated into one measure of concordance (Norton & Manne, 2007). There  
10 is research showing that providing emotional support is more demanding and distressing  
11 than providing instrumental support (Bakas et al., 2001; Kim & Carver, 2007). More  
12 importantly, none of the existing studies analyzed support concordances as predictors of  
13 prospective psychological functioning. Social support and relationships have long been  
14 conceptualized as coping resources that predict both physical and mental health outcomes  
15 (House, Landis, & Umberson, 1988), while mounting evidence is available to show the  
16 deleterious psychosocial impact of informal cancer caregiving (Stenberg, Ruland, &  
17 Miaskowski, 2010).

18       With increasing demands on oncological supportive care and services, data on  
19 concordances of social support and relationship quality could be an important evidence base



1 for developing community-based self-help empowerment programs and interventions for  
2 patients and caregivers. Such programs and interventions could facilitate an effective social  
3 support system in dyads of patients and caregivers, improving in turn their physical and  
4 mental health.

### 5 *The present study*

6 This prospective study aims to investigate concordances of patients' received and  
7 caregivers' provided social support (emotional and instrumental) and dyadic relationship  
8 quality, and the association of concordances with psychological distress and well-being  
9 among both cancer patients and caregivers. Gwet's  $AC_2$  ( $\gamma_2$ ) (Gwet, 2014) was adopted to  
10 measure the concordances due to the following advantages of the method. First, Gwet's  
11  $AC_2$  is able to generate concordance coefficient for interval data. Second, similar to Cohen's  
12 Kappa statistics, Gwet's  $AC_2$  accounts for chance agreement in the calculation. Third, while  
13 Cohen's Kappa is under the influence of skewness of data, Gwet's  $AC_2$  adjusts for chance  
14 agreement while validly and reliably assesses agreement without being influenced by data  
15 skewness (Gwet, 2008). We expected that cancer patients and caregivers would demonstrate  
16 high concordances of received and provided emotional and instrumental support and dyadic  
17 relationship quality. We also expected that concordances of social support and relationship  
18 quality at T1 would predict lower psychological distress and higher psychological  
19 well-being at T2 among both cancer patients and caregivers, controlling for demographic

1 and medical covariates, T1 patients' physical symptoms, and T1 psychological distress and  
2 well-being.

3

#### 4 **Methods**

##### 5 *Participants and procedure*

6 The present study is part of a larger longitudinal research among Chinese cancer  
7 patients and caregivers in Hong Kong. Upon obtaining Ethics Committees' approvals from  
8 the University and the Hospital Authority, recruitment was conducted in the outpatient  
9 clinics of two major government-funded hospitals, between January 2012 and May 2014.  
10 Inclusion criteria of patients were (i) 21 years of age or older, (ii) Cantonese fluency, (iii)  
11 histological diagnosis of a primary cancer of lung, colorectum, stomach, or liver, the four  
12 leading causes of cancer deaths with decreasing mortality rates in Hong Kong (Hong Kong  
13 Cancer Registry, 2016) within the past six months, and (iv) no prior malignancies and  
14 associated therapies. Exclusion criteria of both patients and caregivers were known medical  
15 history of psychiatric disorders, linguistic/intellectual difficulties, and existing medical  
16 condition(s). Psychiatric histories and existing medical conditions were chosen because the  
17 aim of this project is to establish an initial knowledge base about adjustment to cancer  
18 among Chinese people; these conditions and associated treatments may inadvertently  
19 confound self-reports.

1 Surgeons or clinical oncologists identified suitable patients based on the  
2 inclusion/exclusion criteria and introduced the study to them; voluntary participation and  
3 data confidentiality were emphasized. Upon obtaining patients' initial verbal consent,  
4 researchers confirmed eligibility of the potential participants based on hospital charts, fully  
5 apprised them of the study, and obtained their written informed consent. Each patient was  
6 asked to identify a caregiver who conducted and coordinated the majority of her/his daily  
7 home care needs without financial reimbursement for the care. A total of 186 caregivers  
8 were referred by the patients, among which 25 refused to participate. 152 dyads of cancer  
9 patients and caregivers were assessed at baseline (T1). Among them, 83 dyads were  
10 assessed at 6-month follow-up (T2). Chi-squared tests did not reveal significant differences  
11 in age and sex between the dyads at T1 ( $n = 152$ ) and those who refused participation ( $n =$   
12  $25$ ), and the dyads who were only assessed at T1 ( $n = 69$ ) and those assessed at both  
13 timepoints ( $n = 83$ ). The flow of participants is summarized in a CONSORT diagram  
14 (Figure 1). The demographic and medical characteristics of the patients and the caregivers  
15 are summarized in Table 1.

## 16 ***Measures***

17 ***Background characteristics.*** A standardized proforma was used to obtain demographic  
18 information including age, sex, marital status, current household size, education level,  
19 employment status, and household income level. A Chart Review Data Sheet was used to

1 obtain medical information (site/sub-site, stage, time since diagnosis, type and time of  
2 surgery, and adjuvant therapies) from hospital charts.

3 ***T1 concordances of social support and relationship quality.*** Nine items in the  
4 Chinese version of the Berlin Social Support Scale (BSSS) (Yao, Zheng, & Fan, 2015)  
5 assessed patients' received emotional support (6 items) and instrumental support (3 items)  
6 from caregivers and caregivers' provided emotional and instrumental support to patients.  
7 Each item was rated based on experience during the past week (1=*strongly disagree*,  
8 5=*strongly agree*). The Chinese BSSS has been found to be reliable ( $>.90$ ) and validly  
9 associated with psychological functioning among Chinese (Yao et al., 2015). Internal  
10 consistency for the two subscales was good in the current administration ( $\alpha>.80$ ) (Table 2).  
11 The 12-item family intimacy and family commitment subscales of Social Relational Quality  
12 Scale (SRQS) (Hou, Lam, Law, Fu, & Fielding, 2009) were adapted to assess dyadic  
13 relationship quality at T1 with wordings amended from "family" to "caregiver" and "ill  
14 family member" when administering to patients and caregivers, respectively. Patients and  
15 caregivers rated each item based on experience in the last week (1=*strongly disagree*,  
16 4=*strongly agree*). Three negatively worded items were reverse coded. The scale was found  
17 to be reliable ( $>.80$ ) and valid among different cancer samples (Hou, 2010; Hou, Law, Yin,  
18 & Fu, 2010; Hou & Wan, 2012). Alphas were .80 and .84 for patients and caregivers,  
19 respectively, in the current administration.

1        **Psychological distress.** Patients' anxiety and depressive symptoms at T1 and T2 were  
2 measured using the 14-item Chinese Hospital Anxiety and Depression Scale (Leung, Ho,  
3 Kan, Hung, & Chen, 1993). Seven items assessed anxiety and depressive symptoms  
4 respectively. Participants answered each item on a 4-point scale (e.g., 0=*not at all*, 1=*not*  
5 *very much*, 2=*quite a lot*, 3=*very much indeed*). Scores on anxiety/depression subscale were  
6 calculated by summing across the seven items (range=0–21). The scale has been shown to  
7 be reliable (>.70) and valid in Chinese cancer populations (Hou, 2010; Hou & Lam, 2014;  
8 Hou, Law, & Fu, 2010; Hou & Wan, 2012; Hou et al., 2010). Alphas for the anxiety and  
9 depression subscales were .82 and .64 at T1 and .78 and .62 at T2, respectively.

10        Caregivers' anxiety symptoms were assessed using the Chinese version of the 6-item  
11 state version of the State-Trait Anxiety Inventory (STAI-6) (Shek, 1988). Participants rated  
12 the frequency of being calm, tense, upset, relaxed, content, and worried, during the past two  
13 weeks (1=*not at all*, 2=*somewhat*, 3=*moderately*, 4=*very much*). Scores on the three  
14 positive-worded items were reverse coded. A total score was calculated by summing across  
15 the six items (range=6–24). Alphas were .82 at T1 and .77 at T2 in the current  
16 administration. Chinese version of the 21-item Beck-Depression Inventory-II (C-BDI-II)  
17 (Byrne, Stewart, & Lee, 2004) was used to assess caregivers' depressive symptoms in the  
18 past week on a 4-point scale (e.g., 0=*I do not feel sad*, 1=*I feel sad*, 2=*I am sad all the time*,  
19 3=*I am so sad or unhappy that I can't stand it*) (range=0–63). High internal consistency of

1 Chinese BDI-II was consistently demonstrated ( $>.90$ ) (Byrne et al., 2004). Alphas were .92  
2 at T1 and .80 at T2 in this study.

3 ***Psychological well-being.*** Patients' and caregivers' positive affect at T1 and T2 was  
4 assessed using a 6-item state positive affect scale (Hou, 2010; Hou & Wan, 2012), on a  
5 5-point scale (0=*very slightly or not at all*, 1=*a little*, 2=*moderately*, 3=*quite a bit*, 4=*very*  
6 *much*). Summed scores were calculated (range=0–24), with higher scores indicating higher  
7 frequency of positive affective states experienced. In the current study, Cronbach's alphas  
8 were high among both patients (T1=.87, T2=.88) and caregivers (T1=.88, T2=.84). Patients'  
9 and caregivers' life satisfaction at T1 and T2 were assessed using the Chinese version of the  
10 5-item Satisfaction with Life Scale (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985), on a  
11 4-point scale (1=*strongly disagree*, 4=*strongly agree*). A summation score (range=5–20) was  
12 used. Cronbach's alphas were .66 (T1) and .76 (T2) for patients and .67 (T1) and .61 (T2) for  
13 caregivers.

14 ***Patient-reported covariate.*** Patients' cancer-specific physical symptoms at T1 were  
15 measured using physical symptom subscale of the Chinese version of Memorial Symptom  
16 Assessment Scale (Cheng, Wong, Ling, Chan, & Thompson, 2009). Participants rated 12  
17 common symptoms in the past week with respect to frequency, severity, and distress (e.g.,  
18 0=*none*, 1=*a little bit*, 2=*quite a bit*, 3=*very much*, 4=*almost all the time*). A total score was  
19 calculated by summing across the three dimensions (range=0–144). Alphas for the scale

1 were .79 in the validating study (Cheng et al., 2009) and .94 in the current administration.

## 2 *Analytic plan*

3 Missing data (<1% in each study variable) were replaced by multiple imputations using  
4 SPSS (Version 21; SPSS Inc., Chicago, IL) (Rubin, 2004). Outliers were detected using  
5 SPSS. Data that was three times the interquartile range of that variable, indicated by an  
6 asterisk (\*), were investigated to see whether there is any error. If not, the data was treated  
7 as individual differences and variability. All demographic (patients and caregivers  
8 respectively) and medical (patients only) variables were considered to be possible  
9 covariates (Table 1). Correlations and Mann-Whitney *U* tests were conducted to identify  
10 confounding variables of the outcomes. Gwet's AC<sub>2</sub> (Gwet, 2014) was used to measure the  
11 agreement of each identical item in each dyad of patient and caregiver. AC<sub>2</sub> scores were  
12 then averaged to indicate concordances of emotional support, instrumental support, and  
13 relationship quality, respectively (possible range=-1.00 to 1.00).

14 First, descriptive statistics were conducted for concordance indices of emotional and  
15 instrumental support and dyadic relationship quality. Bivariate correlations among the three  
16 concordance indices were conducted. Next, separate sets of hierarchical multiple  
17 regressions were conducted for each T2 outcome measure, namely anxiety symptoms,  
18 depressive symptoms, positive affect, and life satisfaction of cancer patients and caregivers.  
19 In all regression models, step one entered demographic and/or medical covariates, T1

1 patient-reported physical symptoms, and T1 scores on an outcome. Step two entered AC<sub>2</sub>  
2 scores on perceived emotional and instrumental support and relationship quality.

3

#### 4 **Results**

##### 5 *Concordances of perceived social support and relationship quality*

6       Gwet's AC<sub>2</sub> scores on perceived emotional support ranged between .25 and 1.00  
7 (M=.92, SD=.12). AC<sub>2</sub> scores on perceived instrumental support ranged between .08 and  
8 1.00 (M=.92, SD=.16). AC<sub>2</sub> scores on dyadic relationship quality ranged between -.31 and  
9 1.00 (M=.63, SD=.27). T1 AC<sub>2</sub> scores on perceived emotional support were strongly  
10 associated with T1 AC<sub>2</sub> scores on perceived instrumental support ( $r=.75, p<.001$ ) and  
11 moderately associated with T1 AC<sub>2</sub> scores on dyadic relationship quality ( $r=.31, p=.004$ ).  
12 All three AC<sub>2</sub> scores were negatively skewed, meaning that the majority of the scores were  
13 close to the full score (i.e., 1.00). About 90% of the dyads demonstrated concordances  
14 of .90 or above on perceived emotional and instrumental support. In contrast, concordance  
15 of relationship quality was lower with larger individual variability; two dyads demonstrated  
16 negative AC<sub>2</sub> scores.

##### 17 *Predictive utility of concordances of support and relationship quality*

18       Hierarchical multiple regressions revealed significant associations between  
19 concordances and outcomes among caregivers only. Concordances of perceived emotional



1 and instrumental support and dyadic relationship quality significantly predicted T2 anxiety  
2 symptoms [ $F(9, 74) = 6.725, \Delta R^2 = .031, p < .001$ ], depressive symptoms [ $F(9, 74) = 4.189,$   
3  $\Delta R^2 = .042, p < .001$ ], and state positive affect [ $F(9, 74) = 3.436, \Delta R^2 = .042, p = .01$ ]. T1  
4 AC<sub>2</sub> scores on perceived instrumental support were positively associated with T2 anxiety  
5 symptoms ( $\beta = .28, p = .046$ ). T1 AC<sub>2</sub> scores on dyadic relationship quality were inversely  
6 associated with T2 depressive symptoms ( $\beta = -.22, p = .034$ ). T1 AC<sub>2</sub> scores on perceived  
7 emotional support were positively associated with T2 state positive affect ( $\beta = .33, p = .040$ ).  
8 AC<sub>2</sub> scores did not predict any of the outcomes among patients ( $\beta = -.10-.09, p = .518-.910$ ).  
9 The results on patients and caregivers are summarized in Table 3 and Table 4 respectively.

10

## 11 **Discussion**

12 This study sets out to extend the current literature by examining concordances of  
13 patients' received and caregivers' provided emotional and instrumental support and dyadic  
14 relationship quality. The majority of the dyads reported high concordances of emotional and  
15 instrumental support. Concordance of relationship quality was lower and more variable  
16 across individual dyads. Regression analyses found significant associations between  
17 concordances and outcomes only in caregivers. T1 concordance of perceived emotional  
18 support predicted higher T2 positive affect, while T1 concordance of relationship quality  
19 predicted lower T2 depressive symptoms. Contrary to our expectation, T1 concordance of

1 perceived instrumental support predicted higher T2 anxiety symptoms.

2       Our findings suggest that there could be discrepancies in perceptions of social support  
3 between cancer patients and their caregivers. There is evidence showing that perceived  
4 emotional and instrumental support but not relationship quality could synchronize within  
5 most if not all patient-caregiver dyads (Lichtenthal et al., 2003; Norton & Manne, 2007;  
6 Vinokur & Vinokur-Kaplan, 1990). This study extends the current literature by showing the  
7 positive association between concordance of emotional support and positive affect among  
8 cancer caregivers. Previous studies have found varying needs reported by patients across  
9 sex, ethnicity, cultural backgrounds, and timing in the cancer process (Merluzzi, Philip, Yan,  
10 & Heitzmann, 2015) and caregivers' difficulties in providing emotional support than  
11 dealing with practical tasks for patients (Bakas et al., 2001; Kim & Carver, 2007). Because  
12 we calculated concordances across all levels, it was possible that some dyads reported  
13 consistently low levels of support whereas others reported consistently high levels, with  
14 varying levels of patients' needs and caregivers' difficulties. Therefore, our results suggest  
15 the possibility that it is concordance instead of the emotional support caregivers provided  
16 that relates to psychological adaptation of caregivers. Even at higher levels of emotional  
17 support provision, caregivers may turn out to experience more positive emotions if patients  
18 acknowledge receiving similar levels of emotional support.

19       Instrumental support provision, on the other hand, may impair psychological

1 adaptation of cancer caregivers even with high patient-caregiver concordance in it. Cancer  
2 caregivers' psychological distress is closely related to managing a multitude of tasks for  
3 patients' everyday life, including personal care, transportation, management and  
4 coordination of medical care, social activities, shopping, and meal preparation (Girgis et al.,  
5 2013; Rhee et al., 2008). Caregivers have indicated significant supportive care need for  
6 managing patients' over-dependence (Shin et al., 2011). Concordance of instrumental  
7 support might reflect heavier daily caregiving burden or higher patients' over-dependence,  
8 which could occur at different levels of support provision/receipt, contributing to higher  
9 anxiety symptoms of caregivers. Another possible explanation is that higher concordance of  
10 instrumental support across different levels might reflect caregivers' sensitivity to their ill  
11 social partners' practical needs and thus higher anxious feelings. In addition, there is  
12 evidence showing that provision of social support could result in negative support,  
13 arguments, or conflict (Kinsinger, Laurenceau, Carver, & Antoni, 2011; Jutagir et al, 2016).  
14 This explains why a higher concordance of instrument support between patients and  
15 caregivers might contribute to arguments and conflict, which in turn result in higher anxiety  
16 among caregivers.

17 The possibility of improving cancer caregivers' psychological functioning through  
18 dyadic assessment and intervention of patient-caregiver relationship should be considered.  
19 Patient-caregiver relationship quality could be a unique factor of adjustment independent of

1 cancer-specific demands and social support. Caregivers' perceived relationship quality with  
2 advanced-stage cancer patients has been found to be unrelated to caregiving burden (Francis,  
3 Worthington, Kypriotakis, & Rose, 2010). There is evidence showing that caregivers in  
4 general reported good relationship quality with patients, which is positively associated with  
5 their quality of life and psychological functioning (Eisemann, Waldmann, Rohde, &  
6 Katalinic, 2014; Litzelman, Kent, & Rowland, 2016). Provisions of dyadic relationship  
7 could buffer caregivers of psychological distress as well. Among couples coping with  
8 head/neck or lung cancers, dyadic cancer-specific emotional intimacy and disclosure about  
9 thoughts, feelings, and information have been found to be reciprocally associated with each  
10 other, contributing in turn to lower psychological distress (Helgeson & Cohen, 1996).  
11 However, no study to date has assessed provisions of social relationships between cancer  
12 patients and caregivers. The current study shows that caregivers experienced less  
13 subsequent depressed mood if ill social partners shared more similar perceptions of dyadic  
14 intimacy and commitment. Future research and interventions could assess more specific  
15 dimensions of social provisions, such as guidance, reliable alliance, reassurance of worth,  
16 and emotional closeness (Cutrona & Russel, 1987), and provide corresponding dyadic  
17 intervention.

18       Insignificant associations of concordances with T2 patient-reported psychological  
19 outcomes suggest that patients' own perceptions of support and relationships could be more

1 relevant to their psychological distress and well-being. Higher satisfaction with the  
2 matching between wanted and received social support has been associated with higher  
3 cross-sectional and prospective psychological well-being among breast cancer survivors  
4 (Arora, Finney Rutten, Gustafson, Moser, & Hawkins, 2007; Reynolds & Perrin, 2004). In  
5 face of a life-threatening disease like cancer, patients could overly focus on cancer-related  
6 stressors, their own physical and psychological distress, and how to cope with the stressors  
7 and their own distress (Hou et al., 2009). Support interactions with caregivers could be less  
8 relevant to their psychological functioning.

### 9 *Study limitations*

10 A number of limitations warrant attention. First, this study was conducted in a small  
11 convenient sample of Chinese cancer patients and their caregivers ( $n = 83$  dyads). Small  
12 sample size and sociocultural characteristics could limit generalizability of the findings to  
13 other patient and caregiver populations especially those in other cultural contexts. Second,  
14 this study consisted of patients with lung, colorectal, stomach, and liver cancers and their  
15 caregivers but not other common cancer types such as breast and prostate.  
16 Representativeness of the findings is compromised. **Third, different instruments were used**  
17 **to assess patients' and caregivers' anxiety and depressive symptoms. Hospital Anxiety and**  
18 **Depressions Scale (HADS) was developed and designed to assess anxiety and depressive**  
19 **symptoms in medical patients (Leung et al., 1993; Zigmond and Snaith, 1983). On the other**

1 hand, State-Trait Anxiety Inventory (STAI) and Beck Depression Inventory (BDI) were  
2 developed to assess anxiety and depressive symptoms in general population (Beck, Ward,  
3 Mendelson, Mock, & Erbaugh, 1961; Spielberger, Gorsuch, & Lushene, 1970). Hence, we  
4 decided to use different measures to assess the anxiety and depressive symptoms of cancer  
5 patients and their caregivers. Nevertheless, this might limit comparisons on the associations  
6 between concordances and these symptoms between patients and caregivers.

7 Notwithstanding the above limitations, this study together with some recent ones (Hou  
8 et al., 2017; Hou et al., 2016) point to feasible directions for dyadic psychosocial education  
9 among cancer patients and caregivers. They could be instructed on skills of seeking,  
10 providing, and acknowledging timely support for each other with reference to differential  
11 exposure to cancer stress (Northouse, Katapodi, Song, Zhang, & Mood, 2010). Such dyadic  
12 training protocols would best be administered to patients and caregivers during the initial  
13 stage of cancer process. Patients with advanced-stage diagnosis and their caregivers could  
14 be equipped with the necessary interpersonal skills for enhancing psychological and social  
15 well-being when facing deteriorated health or palliative treatments. Those with better  
16 prognosis could validly apply the acquired skills to cope with emerging life changes or  
17 cancer-related stressors like recurrence in the course of survivorship.

18 (Word count: 4,142 excluding references, tables and figure)

19

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1 **Table 1.** Demographic and medical characteristics of the participants

	<b>Patients (<i>n</i> = 83)</b>	<b>Caregivers (<i>n</i> = 83)</b>
Mean age ( <i>SD</i> )	67.50 (9.90)	52.64 (13.41)
Range	48–90	19–80
Sex (female/male)	34/49	57/26
Marital status		
Married	64 (77.1%)	70 (84.3%)
Single	1 (1.2%)	11 (13.3%)
Divorced/separated	5 (6.0%)	2 (2.4%)
Widowed	13 (5.7%)	0 (0%)
Education level		
No formal education	13 (15.7%)	3 (3.6%)
Primary education	33 (39.8%)	13 (15.7%)
≥ Secondary education	37 (44.5%)	67 (80.7%)
Monthly household income (HKD) <sup>†</sup>		
≤ \$10,000	42 (50.6%)	17 (20.5%)
\$10,001–\$20,000	24 (28.9%)	31 (37.3%)
\$20,001–\$30,000	8 (9.6%)	10 (12%)
\$30,001–\$40,000	6 (7.2%)	13 (15.7%)
> \$40,000	3 (3.6%)	12 (14.5%)
Employment status		
Full-time/part-time employed	14 (16.9%)	45 (54.2%)
Unemployed	10 (12%)	1 (1.2%)
Retired	44 (53%)	19 (22.9%)
Housewives	15 (18.1%)	18 (21.7%)

Cancer type		
Colon	38 (45.8%)	-
Rectum	20 (24.1%)	-
Lung	20 (24.1%)	-
Stomach	3 (3.6%)	-
Liver	2 (2.4%)	-
Cancer stage <sup>††</sup>		
I	6 (7.2%)	-
II	22 (26.5%)	-
III	39 (47%)	-
IV	16 (19.3%)	-
Mean day(s) since diagnosis ( <i>SD</i> )	38.17 (32.31)	-
Curative/palliative surgery received	64 (77.1%)	-
Adjuvant treatment		
T1	23 (27.7%)	-
T2	51 (61.4%)	-
Caregivers' relationship with patients		
Spouse	-	45 (54.2%)
Daughter/son	-	31 (37.3%)
Relative/friend	-	7 (8.4%)

1 † US\$1 ≈ HK\$7.80

2 †† Based on the American Joint Committee on Cancer staging system