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ORIGINAL ARTICLE

The Dyadic Communicative Resilience Scale (DCRS): scale development, reliability, and validity

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Abstract

Purpose There has yet to be a quantitative measurement of communicative resilience processes as outlined in the Communicative Theory of Resilience (CTR). This study aims to determine the structure, reliability, and validity of the Dyadic Communicative Resilience Scale (DCRS) in cancer patients and partners.

Method The DCRS was administered to 584 participants, including 312 cancer patients and 272 partners of cancer patients along with the common coping subscale of the dyadic coping inventory, the cancer-related communication problems with couples scale, and the resilience promoting scale.

Results Exploratory and confirmatory factor analyses revealed nine dimensions of dyadic communicative resilience within the five resilience processes outlined in the CTR. Structure reliability was shown with Cronbach's alphas between .77 and .88 and good to excellent model fit for the nine factors. Convergent and discriminant validities were demonstrated by significant Pearson correlations with relevant, established coping/resilience measures.

Conclusions The DCRS has a clear nine factor structure and demonstrates good reliability. The measure has good convergent and discriminate validity indicating its utility in future research examining resilience in cancer populations.

Keywords Patient/partner communication · Resilience · Scale development · Communicative Theory of Resilience · Dyadic cancer communication

Introduction

The National Cancer Institute estimates approximately 1.7 million new cases of cancer in the USA in 2018 [1]. A cancer diagnosis significantly disrupts individuals' lives while also impacting close others (e.g., spouses/partners) as patients often turn to them for support [2]. Couples' communication is crucial as patients and partners adapt to the diagnosis [3]. Specifically, patients and partners report talking about topics related to disease management (i.e., treatment decision making, side effects and symptoms), their communication (i.e., telling others), their feelings (i.e., uncertainty), and the impact of cancer on their everyday activities (i.e., sexual intimacy, work/financial issues) [4].

Couples' cancer communication may result in both positive and negative outcomes. On one hand, social relationships have a strong impact on individuals' ability to adapt to adversity [5]. When couples are better able to cope with a health stressor, both patients and partners report better physical and/or emotional health outcomes [3, 6–8]. Furthermore, couples' communication can serve to improve intimacy and satisfaction and bolster resilience [9]. Thus, as couples communicate during the cancer experience, they may be simultaneously engaging in dyadic communicative resilience processes. However, not all couples' cancer communication is positive [10]. Given these complex findings, it is important to investigate which specific dyadic communication processes contribute to couples' ability to rebound from cancer-induced stress and improve their ability to demonstrate resilience.

Resilience has been operationalized in various ways within relational research. Historically, resilience literature has conceptualized resilience as a trait [11]. Recently, communication

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scholars have adopted a process perspective. Conceptualizing resilience as a process suggests that resilience rests in the everyday interactions in which individuals and families utilize communicative coping strategies to adapt to disruptions [12]. In the Communicative Theory of Resilience (CTR), Buzzanell [13] argues that resilience is created and sustained through interaction or discourse. In other words, rather than conceptualizing couples' communication as a coping strategy that lies within the individual or family, Buzzanell proposes that resilience is grounded in such communication. The CTR describes five processes through which resilience is created or enacted[1] (see Table 1). These five processes have been examined in a variety of contexts such as military deployment [14], job loss [15], and disaster relief workers [16].

In an effort to better understand how CTR's processes operate in couples' cancer communication, Lillie and colleagues [17] interviewed breast cancer survivors about their cancer-related communication patterns. Participants provided health-specific examples of the CTR processes. For example, participants' described the benefit of discussing beauty and engaging in humor, particularly when physically recovering from treatment, as alternative logics specific to breast cancer. Findings also extended prior conceptualizations of the CTR processes. For instance, certain communicative resilience processes (e.g., crafting normalcy) were perceived as helpful while others were sometimes seen as relationally damaging (e.g., lack of partner engagement in cancer-related conversation).

Although this study [17] provides important descriptive information about how couples communicatively construct resilience during the cancer experience, resilience or adjustment to cancer was not directly measured; the themes emerged from participant narratives. Thus, links between dyadic communicative resilience processes and potential relational and health outcomes (e.g., relational satisfaction, depression) cannot be assessed. To expand upon such prior descriptive work, and to respond to a call for research that advances communicative resilience scale development [18], we have quantified the key dyadic CTR processes and the resulting themes [17] within one scale, the Dyadic Communicative Resilience Scale (DCRS). To our knowledge, there is no current quantitative measure of dyadic resilience processes within cancer care. While not a goal of this study, an impetus for creating this scale is to allow researchers to establish statistical relationships between dyadic CTR processes and relevant outcome variables in future research. Furthermore, quantification of these processes promotes the ability to offer recommendations for how couples managing a range of cancer diagnoses can communicate in order to promote resilience.

Development of the DCRS was guided by established scale development processes [19–21]. Items were designed to quantify CTR resilience processes [13] and the themes related to those processes [17]. Items were generated using both deductive and inductive approaches [22]. Deductive scale development involves creating items based on a thorough literature review and definition of the constructs to be measured [21]. Inductive scale development relies on data from a sample of the population targeted by the measure. This data typically is collected through interviews or focus groups [17, 22].

During the process of conceptualization, we identified potential subscales within the resilience processes (see Table 1). Subscales were informed by prior work examining CTR processes in couple communication [17]. Specifically, we posited that three of the CTR processes would result in subscales. First, we proposed crafting normalcy would include three subscales reflecting how participants (a) worked to keep their pre-cancer routines, (b) established new routines post-diagnosis, and (c) managed tensions that resulted from normalcy negotiations (e.g., expressions of resentment about creating a new normal). Second, we hypothesized that identity anchors would include three subscales reflecting how participants maintained their (a) individual identity, (b) identity as a couple, and (c) identity in the cancer community. Third, we proposed that alternative logics would include (a) attractiveness, (b) jokes/humor, and (c) being lucky. Finally, we proposed that communication networks and foregrounding productive action would each remain as one subscale.

To ensure that each content area would be represented in the final measure, we included a minimum of five items per anticipated subscale [19, 21]. Items were developed to be inclusive of male and female cancer patients and partners. The resulting item pool consisted of 76 candidate items. Items were constructed on a 5-point Likert type scale to maximize variability of responses while maintaining meaningful differences among scale points [20, 21].

Method

Participants and procedures

Cancer patients and partners (separately) were recruited using Amazon's Mechanical Turk (MTurk) and Centiment.co.[2] Both companies facilitate the compensation of participants

[1] The five processes include crafting normalcy, maintaining and using communication networks (hereafter 'communication networks,' identity anchors, validating negative emotion while foregrounding productive action (hereafter 'foregrounding productive action'), and putting alternative logics to work (hereafter 'alternative logics').

[2] Both companies facilitate the compensation of participants for survey completion. We first collected 350 responses from MTurk; because participants were predominantly Caucasian partners, we also collected data with Centiment.co, a research marketing company that allowed for greater targeting of participants (namely patients and ethnic diversity). Both platforms pay participants (workers) for tasks (i.e., completing surveys). Participants review brief task descriptions and select tasks to voluntarily complete.

Table 1 Description of Buzzanell's CTR processes [13], hypothesized DCRS subscales, and resulting subscales

Process	Shortened process name	Description	Hypothesized DCRS subscales	Resulting DCRS subscales
Crafting normalcy		Communicative efforts to maintain old normalcies or create new ones.	(1) Keeping pre-cancer routines	(1) Keeping pre-cancer routines
			(2) Creating new routines	(2) Creating new routines
			(3) Normalcy tensions	
Maintaining and using communication networks	Communication networks	Communicative efforts to build and utilize social relationships; this may mean developing new or enhancing old communication networks.	(1) Communicati-on networks	(1) Communication networks
Affirming identity anchors	Identity anchors	Communicative efforts to reinforce or enhance the formation of particular identities.	(1) Feel like me	(1) Identity anchors
			(2) Focus on being us	
			(3) Identity within the cancer community	
Putting alternative logics to work	Alternative logics	Communicative efforts to reframe the stressful situation.	(1) Attractiveness	(1) Attractiveness
			(2) Jokes/humor	(2) Jokes/humor
			(3) We are lucky	(3) We are lucky
Validating negative emotion while foregrounding productive action	Foregrounding productive action	Communicative efforts to focus on the positive feelings or effects of the stressor while backgrounding the negative aspects.	(1) Foregrounding productive action	(1) Constructing positivity together
				(2) Foregrounding productive action

for survey completion.[3] The process for recruitment was similar for both data platforms, and all participants were blind to the study goals. The study's description recruited individuals who have discussed chronic illness with their partner. Eligibility criteria included location within the USA; aged at least 18; race/ethnicity of Caucasian (non-Hispanic), African-American (non-Hispanic), and Hispanic; currently partnered with the same person during diagnosis and treatment; and diagnosis established within the past 10 years. Participant eligibility was determined through a series of demographic survey screening questions.[4] Eligible participants proceeded through the survey as either a patient or a partner. Participants completed the DCRS items, additional construct scales to allow for content validity of the DCRS (noted below), and participant demographics.

Following data collection, we conducted extensive data cleaning.[5] The final sample included 584 participants of 312 (53.4%) patients and 272 (46.6%) partners (see Table 2). In an effort to provide a robust sample and obtain a parsimonious scale reflecting both patient and partner perspectives, data were combined to establish measures.

Measures

Participants completed the Dyadic Communicative Resilience Scale (DCRS) and three additional scales to access DCRS validity. SPSS 24 was used to generate descriptive statistics, screen for normality, and access final subscale reliability. For all scales, items were reversed coded as relevant; responses were averaged such that higher means indicate more of the variable. See Table 4 for scale psychometrics.

[3] Funding for participant compensation was awarded by the Central States Communication Association's Federation prize and Purdue University's Aspire grant. The authors do not have a financial relationship with the Central States Communication Association. The co-authors are Purdue University employees. No authors were involved in the funding decision-making process for either award.

[4] First, participants reviewed a list of 24 chronic illnesses, indicating per illness if they or their partner had been diagnosed with that illness. Selecting more than three chronic illnesses for themselves or separately for their partners disqualified participants. Furthermore, participants had to select that either they or their partner had been diagnosed with cancer. Finally, if individuals did not select the remaining eligibility criteria detailed above (e.g., race/ethnicity or length of time since diagnosis), they were disqualified and not permitted to continue.

[5] Participants (n = 111) were removed from the data based on the following criteria: survey completion under 9 min (the lowest 5th percentile of survey completion), survey straightlining, lack of consistency between items concerning age and time of diagnosis, partner deceased, and evaluation of qualitative items (i.e., coherent descriptions of treatment).

Table 2 Participant demographics and cancer characteristics ($n = 584$)

Variables	Patient ($n = 312$) n (%)	Partner ($n = 272$)
Gender		
Female	189 (60.6%)	119 (43.8%)
Male	71 (22.8%)	123 (45.2%)
Not determined	52 (16.7%)	30 (11%)
Relational status		
Married	255 (81.7%)	200 (73.5%)
Committed partnerships	45 (14.4%)	62 (22.8%)
Cohabitating	12 (3.8%)	10 (3.7%)
Ethnicity		
African-American (non-Hispanic)	56 (17.9%)	45 (16.5%)
Caucasian (non-Hispanic)	232 (74.4%)	200 (73.5%)
Hispanic	24 (7.7%)	27 (9.9%)
Education		
High school or less	38 (12.2%)	33 (12.13%)
Some college	113 (36.2%)	86 (31.6%)
4-year degree	103 (33.1%)	110 (40%)
Professional degree	19 (6.1%)	13 (4.8%)
Graduate degree	38 (12.2%)	21 (7.8%)
Participant report of cancer diagnosis		
Breast	105 (34.1%)	67 (25%)
Gastrointestinal	28 (9.1%)	31 (11.6%)
Genitourinary	83 (26.9%)	62 (23.1%)
Head and neck	23 (7.5%)	19 (7.1%)
Leukemia	5 (1.6%)	20 (7.5)
Lung	16 (5.2%)	34 (12.7%)
Lymph nodes	12 (3.9%)	10 (3.7%)
Musculoskeletal	4 (1.3%)	2 (0.7%)
Skin	32 (10.4%)	23 (8.6%)
Participant report of patient cancer stage		
Stage 1	101 (32.5%)	75 (27.7%)
Stage 2	85 (27.3%)	100 (36.9%)
Stage 3	58 (18.6%)	31 (11.4%)
Stage 4	24 (7.7%)	23 (8.5%)
Not staged	27 (8.7%)	23 (8.5%)
Not designated	16 (5.1%)	19 (7%)
	Mean (SD)	
Current age	47.34 (15.08)	39.26 (13.12)
Time together (in years)	20.45 (15.06)	13.14 (11.54)
General health of the patient (range 1–5)	2.90 (0.90)	2.81 (1.02)
Years since patient diagnosis	3.07 (2.83)	2.55 (2.63)

As stated above, the DCRS was developed to assess the CTR's resilience processes. Sample items for retained subscales are provided in Table 3; sample items for proposed subscales that were not retained following analysis are provided in text. Crafting normalcy (19 items) contained three subscales: keeping pre-cancer routines (7 items), creating new routines (7 items), and normalcy tensions (6 items; sample item, "Managing cancer has made it hard for us to be ourselves"). Communication networks included 11 items and represented one subscale. Identity anchors (15 items) contained three subscales: feel like me (5 items; sample item, "My partner has helped me feel like the person I was before the cancer"), focus on being us (5 items; sample item, "My partner and I have not let the cancer take away who we are as a

Table 3 Final DCRS subscale items and EFA/CFA factor loadings

DCRS subscales	Scale items	EFA/CFA factor loadings
Keeping pre-cancer routines	1. My significant other and I have talked about ways to keep our pre-cancer routines.	.71/.73
χ^2 (2, 584) = 7.9, $p < .05$	2. My significant other and I found ways to still maintain our pre-cancer life together.	.72/.64
CFI = .99	3. My significant other and I have talked about how to still do the activities that are important to us as a couple.	.77/.74
TLI = 0.97		.67/.65
RMSEA = .07	4. My significant other and I have talked about how to maintain traditions and habits during cancer management.	
Creating new routines	5. My significant other and I have created new routines since the cancer diagnosis.	.80/.74
χ^2 (2, 584) = 2.05, n.s.	6. My significant other and I have found new things to do together since the cancer diagnosis.	.75/.68
CFI = 1.0	7. Since the diagnosis, my significant other and I have developed new traditions.	.78/.71
TLI = 1.0		
RMSEA = .007	8. My significant other and I have adjusted our habits in response to the cancer diagnosis.	.66/.61
Communication networks	9. I have not held back my feelings about cancer-related issues from my significant other.	.64/.62
χ^2 (14, 584) = 24.85, $p = .04$	10. Even when it is difficult, my significant other has encouraged me talk about cancer-related issues.	.69/.62
CFI = .99	11. I can talk to my significant other about the cancer whenever I want to.	.79/.80
TLI = 0.99	12. I have talked to my significant other about the cancer more than I talk to others (e.g., friends, extended family).	.69/.63
RMSEA = .04	13. My significant other and I have been able to bring up any cancer-related topics with each other.	.80/.74
	14. I am able to share my fears about cancer with my significant other.	.81/.81
	15. I can tell my significant other anything I am thinking or feeling about the cancer.	.81/.84
Identity anchors	16. I still do the things that make me "feel like me" (e.g., be a parent, be a partner, work, have my hobbies).	.69/.61
χ^2 (20, 584) = 48.47, $p < .001$	17. My partner and I have talked about how I can still do the things that make me "feel like me" (e.g., be a parent, be a partner, work, have my hobbies).	.76/.75
CFI = .99	18. My partner has supported my doing the things that make me "feel like me."	.77/.73
TLI = 0.98	19. My partner has helped me feel like the person I was before the cancer.	.75/.74
RMSEA = .05	20. My partner has told me that cancer does not change how he/she sees me.	.73/.71
	21. My partner and I have not let the cancer take away who we are as a couple.	.68/.63
	22. It has been important for us to focus on other aspects of our life as a couple.	.73/.67
	23. My partner and I have talked about how we can still do the things that make us "feel like us" (e.g., keeping our hobbies).	.72/.70
Attractiveness	24. My partner tells me that I am still attractive; *I have told my partner that he/she is still attractive.*	.89/.90
χ^2 (2, 584) = 4.06, n.s.	25. My partner has made me feel attractive; *I have tried to make my partner feel attractive.*	.86/.82
CFI = .99	26. My partner and I have communicated to each other that we are still attracted to one another; *My partner and I have communicated to each other that we are still attracted to one another.*	.82/.72
TLI = 0.99	27. My partner says positive things about my appearance; *I have said positive things about my partner's appearance.*	.75/.84
RMSEA = .04		
Jokes/humor	28. My partner and I have made jokes about cancer-related issues.	.79/.71
χ^2 (2, 584) = .87, n.s.	29. My partner and I have tried to find humor in cancer-related activities.	.86/.83
CFI = 1.0	30. When faced with cancer-related challenges, my partner and I have tried to find humor in the situation.	.83/.77
TLI = 1.0	31. My partner and I have found ways to laugh together about cancer-related issues.	.85/.80
RMSEA = .001		
We are lucky	32. My partner and I have talked about how we are fortunate we are.	.82/.78
χ^2 (5, 584) = 24.06, $p < .001$	33. My partner and I count our blessings.	.81/.76
CFI = .98	34. In spite of the cancer, we have talked about how lucky we are.	.81/.77
TLI = 0.97	35. My partner and I have talked about how things could have been worse.	.69/.60
RMSEA = .08	36. My partner and I have focused on how blessed we are to be alive.	.83/.79
Constructing positivity together	37. My partner and I have chosen to focus on other things than the cancer.	.63/.52
	38. My partner and I have tried to not dwell on the negative aspects of cancer management.	.74/.67
χ^2 (14, 584) = 24.29, $p < .05$	39. My partner and I have focused on positive things other than cancer in our conversations.	.71/.69

Table 3 (continued)

DCRS subscales	Scale items	EFA/CFA factor loadings
CFI = .99	40. My partner and I have talked about the positive things going on in our lives.	.76/.71
TLI = 0.99	41. My partner and I have tried to find ways to move forward in life.	.73/.71
RMSEA = .04	42. When faced with cancer challenges, my partner and I have tried to find ways to make life better.	.74/.73
	43. My partner and I have tried to be positive when in public.	.74/.71
Foregrounding productive action	44. My partner has encouraged me to stay positive when talking about cancer-related issues.	.71/.60
χ^2 (2, 584) = 4.39, n.s.	45. My partner has encouraged me to talk about my negative feelings.	.81/.77
	46. My partner is open to listening to my negative feelings.	.79/.74
	47. My partner has let me vent about cancer.	.76/.67
CFI = .99		
TLI = 0.99		
RMSEA = .05		

For the attractiveness subscale, patients and partners were asked slightly different versions of the survey items. Items in non-italics were included in the patient version only; items in *italics* were included in the partner version only

n.s. not significant

couple"), and identity within the cancer community (5 items; sample item, "My partner and I have been active in the cancer community"). Foregrounding productive action included 16 items. Alternative logics (15 items) contained three subscales: attractiveness (5 items), jokes/humor (5 items), and we are lucky (5 items). Responses ranged from 1 (*very rarely*) to 5 (*very often*). Following reliability analyses (see results) responses for each resulting factor were averaged; higher scores represent increased enforcement of each resilience process (see Table 3).

The common coping subscale of the dyadic coping inventory [23] (DCI; 5 items) measured how participants and their partners talked with each other during cancer management. A sample item included, "We help one another to put the problem in perspective and see it in a new light." Responses ranged from 1 (*very rarely*) to 5 (*very often*).

The cancer-related communication problems with couples scale [24] (CRCP; 15 items) measured the frequency of communication problems when discussing cancer-related topics. A sample item included, "I don't talk about cancer problems because my significant other gets upset when I do." Responses included 1 (*not true*), 2 (*sometimes true*), and 3 (*often true*).

The resilience-promoting communication scale [25] (RPCS; 26 items) measured elements of resilience. Items were slightly modified to include the language "about cancer" or "cancer-related issues." A sample item included, "Laughing together is one way my significant other and I cope with stressful events." Responses ranged from 1 (*strongly disagree*) to 7 (*strongly agree*).

Participant demographics included self-identified age, gender, ethnicity, educational attainment, relational status, and time with partner. Participants provided patient cancer characteristics including cancer diagnosis and stage, years since diagnosis, and patient general health. Patient general health [3] is a one-item measure assessing the patient's current health from 1 (*poor*) to 5 (*excellent*) (see Table 2).

Data analysis

A two-step procedure was employed to determine the component structure of the DCRS. First, an exploratory factor analyses (EFA) was conducted in SPSS 24 using the principal component analysis with a promax rotation. This analysis determines the best initial factor structure for each communicative resilience process.[6] Second, confirmatory factor analyses were conducted using StataIC 15 to further analyze and refine the component structure. Using the results from the EFA, measurement models were conducted for each of the nine factors. Measurement models were estimated using maximum likelihood with missing values.[7] Additionally, when necessary, likelihood ratio (LR) tests were run to further confirm that the factor structures for each resilience process should remain. In other words, for processes where more than one factor emerged, we tested to see if the items fit better together as one factor or separated into more than one factor. Finally, post-hoc *t*-test analyses were used to determine if the DCRS

[6] Several criteria were used to determine the most appropriate factor solution: (1) eigenvalues greater than 1, (2) individual item loadings were .40 or higher on the primary factor loading and lower than .40 on all other factors [21], (3) percentage of variance accounted for by each component, and (4) a qualitative assessment of item meaningfulness as it related to the factor.

[7] Model fit was assessed using the obtained chi-square (χ^2), Confirmatory Fit Index (CFI), Tucker Lewis Index (TLI), and root mean square error of approximation (RMSEA) [37, 38]. When model fit was poor, items were iteratively deleted based on low beta weights and low R^2 values.

subscales were consistent or different between (1) MTurk and Centiment.co participants and (2) patient and partner participants.

Finally, Pearson correlations between the DCRS and relevant established measures were conducted to determine convergent and discriminant validities of the DCRS. Convergent validity is indicated by a significant positive correlation between theoretically similar constructs [20, 21]. Discriminant validity, also termed divergent validity, is "the instrument's capability to differentiate or discriminate between constructs that are theoretically different" (p. 159) evidenced by low or non-significant correlations between the measure and a theoretically distinct construct [26]. Discriminant validity is important as a means of establishing that the method of measurement does not account for a significant amount of the variance in the measure, which would be the case if theoretically unrelated constructs were significantly correlated [20].

Results

Scale reliability

The EFAs resulted in nine factors within the five conceptual variables (i.e., resilience processes) of the DCRS (see Table 3). First, crafting normalcy resulted in three factors as predicted: factor 1 (keeping pre-cancer routines), factor 2 (creating new routines), and factor 3 (normalcy tensions). However, qualitative review of factor 3 items questioned whether these items measured disturbance or stress in the relationship or, instead, resiliency processes in the face of these stressors. This questionable face validity resulted in the removal of this factor from the final scale. Factor 1 confirmatory factor analyses (CFA) results suggested eliminating three items to reach acceptable model fit (see Table 3 for fit statistics). Factor 2 demonstrated excellent fit. The LR test between model 1 (all items for normalcy loaded onto one latent variable) and model 2 (normalcy items separated into a two-factor structure, as predicted) revealed that the more parsimonious model was model 2, χ^2 (1, 584) = 56.44, $p < .001$. Thus, crafting normalcy resulted in two factors.

Second, EFA results for maintaining communication networks confirmed that items loaded onto one factor. CFA results required four items to be removed to achieve good model fit.

Contrary to prediction, identity anchor EFA results did not support three factors. Results supported retaining only one factor, titled identity anchors, consisting of nine items, removing six items. CFA results removed an additional item to achieve good model fit.

As predicted, alternative logics consisted of three factors: factor 1 (attractiveness), factor 2 (humor/jokes), and factor 3 (we are lucky). Factor 1 CFA results suggested removing one item to achieve excellent model fit. Model fit for factor 2 was excellent and acceptable for factor 3. The LR test between model 1 (alternative logic items loaded onto one latent variable) and model 2 (items separated into a three-factor structure, as predicted) revealed that the more parsimonious model was model 2, χ^2 (3, 584) = 1082.12, $p < .001$. Thus, all three factors were retained.

Contrary to prediction, foregrounding productive action EFA results produced three factors rather than the one predicted: factor 1 (constructing positivity together), factor 2 (foregrounding productive action), and factor 3 (tensions between the positive and negative). Qualitative review of factor 3 questioned whether the factor measured resilience processes or disturbances. Thus, this factor was removed. CFA results revealed a strong fit for factors 1 and 2. The LR test between model 1 (all items for foregrounding productive action loaded onto one latent variable) and model 2 (foregrounding productive action items separated into a two-factor structure, as predicted) revealed that the more parsimonious model was model 2, χ^2 (1, 584) = 149.49, $p < .001$. Thus, foregrounding productive action resulted in two factors.

Finally, *t*-tests were run for all of the retained DCRS factors (hereafter "subscales") to determine if differences occurred between data sources (i.e., MTurk versus Centiment.co data) and between patient and partner reports. Results revealed that MTurk and Centiment.co data differed significantly in four of the nine DCR subscales,[8] suggesting that the data were more alike than different. Additionally, results revealed significant differences for patient and partner data for two subscales: creating new routines and foregrounding productive action.[9]

Scale validity

Convergent and discriminate validity were assessed with Pearson's *r* correlations. Correlations between all scales and subscales were significant at $p < .001$. Tests of convergent validity correlated DCRS subscales with the RPCS total score and the DCI common coping subscale. Correlation values between the DCRS subscales with the RPCS ranged from .44 to .74, $p < .001$ and with the DCI common dyadic coping subscale from .46 to .65, $p < .001$. Thus, results support the convergent validity of the DCRS. Discriminant validity was established using the CRPC total score; all DCRS subscales/factors demonstrated strong to moderate negative correlations, and values ranged from − .36 to − .65, $p < .001$ (see Table 4).

[8] Specific information about the *t* test results are available by request from the corresponding author.

[9] Partners ($M = 3.76$, SD = .74) reported more crafting normalcy communication than patients ($M = 3.53$, SD = .88), t (582) = 3.36, $p < .001$. Patients ($M = 3.94$, SD = .85) reported more foregrounding positive action communication than partners ($M = 3.78$, SD = .73), t (582) = 2.32, $p < .05$.

Table 4 Scale psychometrics and Pearson correlations for all scales and subscales

Variable	α	Mean (SD)	Range	1	2	3	4	5	6	7	8	9	10	11
1. DCRS: keeping pre-cancer routines	.78	3.90 (0.74)	1–5	1.00										
2. DCRS: creating new routines	.77	3.64 (0.82)	1–5	0.62	1.00									
3. DCRS: communication networks	.88	3.93 (0.79)	1–5	0.69	0.49	1.00								
4. DCRS: identity anchors	.88	4.08 (0.67)	1–5	0.81	0.52	0.74	1.00							
5. DCRS: attractiveness	.86	4.07 (0.88)	1–5	0.67	0.46	0.65	0.76	1.00						
6. DCRS: humor/jokes	.85	3.74 (0.93)	1–5	0.51	0.44	0.48	0.50	0.48	1.00					
7. DCRS: we are lucky	.85	4.16 (0.75)	1–5	0.65	0.41	0.63	0.75	0.60	0.44	1.00				
8. DCRS: constructing positivity together	.85	4.14 (0.60)	1–5	0.73	0.48	0.65	0.81	0.66	0.45	0.74	1.00			
9. DCRS: foregrounding productive action	.79	3.87 (0.80)	1–5	0.71	0.53	0.80	0.74	0.67	0.53	0.60	0.62	1.00		
10. DCI: common dyadic coping	.84	3.71 (0.89)	1–5	0.65	0.52	0.61	0.65	0.67	0.46	0.52	0.55	0.63	1.00	
11. CRCP	.79	2.31 (0.37)	1–3	− 0.54	− 0.36	− 0.65	− 0.59	− 0.55	− 0.39	− 0.47	− 0.46	− 0.64	− 0.64	1.00
12. RPCS	.88	5.19 (0.75)	1–7	0.66	0.44	0.64	0.74	0.65	0.44	0.61	0.70	0.63	0.62	0.63

(1) *N* for all scales was 584. (2) DCRS is the Dyadic Communicative Resilience Scale. DCI is the dyadic coping inventory. CRCP is the cancer-related communication problems with couples scale. RPCS is the resilience-promoting communication scale. (3) All correlations were significant at $p < .001$

Discussion

The primary goal of this study was to examine the structure, reliability, and validity of the DCRS. Data supported a 47-item scale representing nine subscales offering an assessment of dyadic communicative resilience processes [13] in the cancer context. Several key findings from this study merit note. First, while supporting the five resilience processes outlined in the CTR, through the development of subscales, this study offers further clarification of cancer patients' and partners' communicative resilience behaviors. In what follows, we discuss implications of results that were consistent as well as inconsistent with study predictions, convergent and discriminant validities, and study strengths and limitations.

Results for three CTR processes were consistent with study predictions. First, crafting normalcy supported a two-factor structure suggesting that normalcy includes both dyadic communication about preserving aspects of couples' lives before cancer diagnoses and negotiating a new normal that involves changing pre-cancer routines to adapt to life after cancer. This finding is consistent with work discussing the importance of couples' maintaining normalcy within relational talk about cancer [27]. For upper gastrointestinal and gynecological cancer patients, "seeking a new normal" post-treatment was essential as they adjusted to physical, social, and psychological changes [28]. Our results provide a more defined and representative operationalization of this communicative resilience process. Second, results supported the one-factor structure for communication networks. Patients' and partners' ability to turn to each other about cancer-related concerns is important for relational stability [29]. Finally, alternative logics supported a three-factor structure, reflecting three specific areas in which couples can use alterative logics to support each other (i.e., attractiveness, humor/jokes, we are lucky). First, cancer patients report distress following physical changes incurred by cancer treatment [30, 31] and dyadic efforts to manage tensions regarding physical and sexual identity changes that influence attractiveness reduce distress [29]. Second, humor is an effective coping strategy in a variety of contexts, including health [32–34]. Humor about cancer expressed between patients and partners can serve to promote resilience for couples. Finally, despite distress created by a cancer diagnosis, patients and partners often cope via positivity [35] and couples' ability to focus on positive aspects of life to promote their resilience.

Results for two CTR processes were contrary to study predictions. Prior research [17] suggests three salient identity anchors. Study results did not support a three-factor structure. Instead of reinforcing or enhancing cancer as part of an individual's, couple's, or social identity, cancer patients and partners may view these areas as woven into one larger identity anchor of life with cancer. Future research should continue to explore the role of social identity and group identification as a communicative resilience process [36].

We predicted that foregrounding productive action would represent one factor, but results suggested a two-factor structure. Foregrounding productive action involved couples working together to construct positive frameworks of the challenges faced while coping with cancer, as well as participant perceptions that their partner supported expressions of both positive and negative emotions related to the cancer. It is important to note that for this resilience process and for the process of crafting normalcy, the measure failed to reliably capture the tensions between communicative resilience processes and distress that was present in the qualitative data [17]. One

explanation is that the scale items were not effective at capturing the more nuanced ways in which tensions function in couple cancer communication. Similarly, qualitative data may be better suited to understand how these processes interact as couples communicate about cancer topics. An alternative explanation may be that this sample experienced these two processes differently than the qualitative sample. However, given the importance of stress or disturbance for the experience of resilience [25], we encourage future research to examine further how, if at all, previously observed tensions among and between resilience processes can be captured in quantitative data.

Preliminary evidence of the DCRS's convergent and discriminant validities was established. Specifically, moderate to strong significant, positive correlations were obtained between the DCRS subscales and the RPCS and DCI common dyadic coping subscale. The DCRS was developed to create a quantitative measure of dyadic communicative resilience in health contexts, and these findings suggest that the resulting subscales align with prior literature establishing general resilience (not necessarily communicative) and coping in other contexts. Additionally, moderate to strong significant, negative correlations were obtained between the DCRS subscales and the CRPC. These findings further support the validity of the DCRS.

Finally, there are several key issues that are important in the continued development of the DCRS. First, the research design did not account for the possibility of dyads completing surveys, and it is plausible that some participants were partnered. Future research will specifically collect partnered (i.e., dyadic) data to examine these processes. Second, data were collected from two different data sources (MTurk and Centiment.co). Tests of difference between the two data sources and participant role of either patient or partner indicate that the data was more similar than different. Differences in the data may be a result of the patient/partner make-up of the data sets. For example, MTurk data was 62% partners while Centiment.co data was 70% patients. Although there was not a significant difference in the general health or severity of current cancer status between the two samples, Centiment.co participants reported greater health management (i.e., coping) and years together with their significant others. Future research will have to further investigate how participant characteristics contribute to resilience processes.

Another potential limitation of this study is the three moderately high correlations between DCRS subscales. Specifically, the correlations between identity anchors and pre-cancer routines ($r = .81$) and constructing positivity ($r = .81$) and between foregrounding productive action and communication networks ($r = .80$) may suggest that these subscales are too similar hence measuring the same construct. Thus, three post-hoc LR test analyses were performed separately examining significant differences between two models: (1) with all items for each above correlations loaded onto one latent variable and (2) with items separated into the two respective subscales. All tests confirmed the most parsimonious models were the ones with separate subscales.[10] Theoretically, these relationships may be highlighting ways in which CTR's resilience processes have been shown to interact to influence each other [17]. For example, cancer patient reports revealed a tension between open communication and remaining positive when discussing cancer topics with their partner. This tension was successfully navigated by some patients through the process of foregrounding productive action [17]. Future research should continue to examine ways in which these tensions in the qualitative data can be better captured in quantitative data.

Despite these limitations, this study offers new insights about the communicative resilience progresses among cancer patients and their partners. This study also is the first to provide a quantitative assessment of CTRs resilience processes, thus offering theoretical contributions.

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Compliance with ethical standards

Conflict of interest Authors have full control of the primary data. Authors agree to allow the journal to review their data if requested.

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[10] Specifically, identity anchors/pre-cancer routines, χ^2 (1, 584) = 10.43, $p < .001$; identity anchors/constructing positivity, χ^2 (1, 584) = 44.16, $p < .001$; and foregrounding productive action/communication networks, χ^2 (1, 584) = 17.34, $p < .001$.

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