Dyadic Coping in the U.S.: Psychometric Properties and Validity for Use of the English Version of the Dyadic Coping Inventory

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Abstract A majority of individuals living in the U.S. experience unhealthy levels of stress; however, romantic partners can help mitigate stress' deleterious effects by coping together (dyadic coping). The Dyadic Coping Inventory (DCI) measures coping behaviors when one or both partners experience stress. Specifically, the DCI measures a) partner's self-report of his/her own (*Self*) and their partner's (*Partner*) behavior, and b) *Common DC* during the experience of a common stressor. Despite its wide use, the DCI has not yet been validated for use in the United States (U.S.). The aim of this study was to address this gap in the literature. Using a sample of 938 individuals in the U.S. currently involved in a romantic relationship, we validated the English version of the DCI by analyzing its factorial structure and psychometric properties. Results supported the theoretically assumed factorial structure of the DCI. Convergent and discriminant validity, as well as measurement invariance across gender and culture using the original Swiss sample, was confirmed. The English version of the DCI is a valid self-report instrument for assessing couples' coping in the U.S.

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Being "stressed out" may be the new normal, according to the *Stress in America* survey published by the American Psychological American Psychological Association (2013). People in the U.S. experience unhealthy levels of stress, and report not being able to effectively manage their stress. For decades, research on stress has shown its ubiquitous negative effects on individual (Coyne and Downey 1991) and relational (Randall and Bodenmann 2009) well-being. While stress and coping have traditionally been considered individual constructs (Dohrenwend and Dohrenwend 1974; Hobfoll et al. 1994; Lazarus and Folkman 1984), recent theoretical models (e.g., Berg and Upchurch 2007; Kayser et al. 2007; Revenson et al. 2005) and empirical research (e.g., Falconier et al. 2014; Randall and Bodenmann 2009) support the notion of examining stress and coping as dyadic constructs.

Relationship researchers and clinicians interested in understanding stress from a dyadic perspective should take into consideration the origin of the stress (Randall and Bodenmann 2009). Stress that occurs outside one's relationship (external stress) may initially only affect one partner; however, the effects of this stress can spill-over into the relationship causing stress for both partners (internal stress; Bodenmann et al. 2007). For example, everyday stressors, such as having a bad day at work, can affect a person even after they have left the office, decreasing communication and time spent with one's partner when they arrive home (e.g., Repetti 1989). Couples that are able to positively cope with stress together (dyadic coping) can, however, alleviate stress' negative effects (Bodenmann et al. 2006; Bodenmann and Randall 2011; Merz et al. 2014; Papp and Witt 2010).

The Dyadic Coping Inventory (DCI; Bodenmann 2008) is a widely used self-report instrument designed to measure dyadic coping between partners (e.g., Austin and Falconier 2013; Heinrichs et al. 2011; Meuwly et al. 2012). The DCI measures partners' behaviors when one or both partners

experience stress: partner's report on his/her own (*Self*) and their partner's (*Partner*) behavior, as well as what happens when they both face a common stressor (*Common* DC). While the original German version of the DCI has been translated and validated in several languages (Donato et al. 2009; Falconier et al. 2013; Ledermann et al. 2010; Vedes et al. 2013), this measure has not been validated for use in the U.S. To address this gap, we used a sample of 938 individuals in the U.S. who are currently involved in romantic relationship to evaluate psychometric properties and validity of the English version of the DCI.

Theoretical Basis of the Dyadic Coping Inventory (DCI)

According to the *systemic-transactional model (STM)* of dyadic coping (Bodenmann 1995), stress and coping are considered systemic constructs. The STM is a multi-dimensional model that takes into consideration both partners' stress signals and reactions towards a stressful situation. Take for example a couple wherein Partner A is stressed and seeks support from Partner B; the STM of dyadic coping examines: (1) how Partner A communicates the stress verbally and/or nonverbally to his/her Partner (*Stress Communication*), (2) whether Partner B engages in supportive behaviors such as trying to understand or empathize with Partner A (*Emotion-Focused Supportive Dyadic Coping (SDC)*), (3) whether Partner B tries to find solutions or reframes the problem for Partner A (*Problem-Focused SDC*), (4) whether Partner B tries to subsume some of Partner A's responsibilities to help reduce the stress (*Delegated Dyadic Coping (DC)*), or (5) whether Partner B dismisses or minimizes Partner A's stressful experience (*Negative DC*). In addition, the STM conceptualizes partners' common coping resources when partners experience common stressors (e.g., financial or familial issues): (1) *Emotion-Focused Common Dyadic Coping (CDC)*, which includes sharing feelings about the stressor, and (2) *Problem-Focused* CDC), which includes seeking common solutions in an attempt to cope with the stressor.

Description of the DCI The DCI (Bodenmann 2008) is a 37-item self-report measure that was developed based on the STM of dyadic coping (Bodenmann 1995). The DCI is a theoretically based multi-faceted instrument that allows researchers and clinicians to work with the appraisals of each partner's coping behaviors and the couple's common coping behaviors, as measured by subscales and aggregate scales. In the original German version of the DCI (Bodenmann 2008), exploratory factor analyses confirmed a four factor structure for *DC* by *Self* and *Partner* (*Stress Communication, Positive Supportive DC, Delegated DC,* and *Negative DC*) and one factor structure for *CDC*. These factor structures were replicated using exploratory factor analysis in a study validating the DCI in Italian, French,

and German (Ledermann et al. 2010). However, studies using confirmatory factor analysis showed a slightly different structure after removing several items that load the least: five factors for *DC by Self* and *Partner* (*Stress Communication, Emotion-Focused SDC, Problem-Focused SDC, Delegated DC,* and *Negative DC*) and two factors for *CDC* (*Emotion-Focused and Problem-Focused*) for Italian (Donato et al. 2009), Spanish (Falconier et al. 2013), and Portuguese (Vedes et al. 2013). Thus it seems that by using confirmatory factor analysis, supportive DC can be differentiated into emotion-focused and problem-focused behavior.

Empirical Support for the DCI The DCI has been used in multiple research contexts across the world. One such area is relationship functioning, where the scale was used to examine the role of dyadic coping on relationship satisfaction (Bodenmann et al. 2006; Bodenmann et al. 2011; Herzberg 2013; Levesque et al. 2014; Papp and Witt 2010). The DCI has also been utilized in studies that have examined stress (Falconier et al. 2013; Falconier et al. 2014) and chronic illness (e.g., Badr et al. 2010; Zimmerman et al. 2011). Other studies have used the DCI to examine the role of dyadic coping with particular personality traits such as attachment (Meuwly et al. 2012), spirituality (Austin and Falconier 2013), and perception (Donato et al. 2009). The DCI has been used with middle-aged and elderly couples (Landis et al. 2013), and with heterosexual and same-sex couples (Meuwly et al. 2013; Weaver 2014). In sum, the DCI is a widely used measure amongst different demographics of couples, context of stressors, and countries.

Present Study

Given the epidemic of stress in the U.S., and evidence suggesting that partners can help to effectively cope with stress (dyadic coping), there is a need for an empirically validated self-report measure that assesses partners' dyadic coping behaviors. Using a sample of individuals currently in a committed romantic relationship, we tested the psychometric properties of the English version of the DCI. Based on prior validation studies (e.g., Vedes et al. 2013), we hypothesized that our analysis would result in a five-factor solution for DC for *Self* and *Partner* and two factors for *CDC*. In addition, we tested for measurement invariance (MI) between gender and across culture (Vandenberg and Lance 2000).

Method

Recruitment and Participants

Participants were recruited by undergraduate and graduate students at a large university in the Southwest. Students earned extra credit by passing a flyer on to other individuals

(e.g., friends, co-workers, and family members) who met the study criteria, or by participating in the study if they met the eligibility criteria. Participants had to meet the following criteria in order to participate: (1) over the age of 18, (2) married or cohabitating with their romantic partner for at least 2 years, and (3) living in the U.S. Informed consent was obtained from all individual participants included in the study.

The original sample consisted of 1207 individuals who agreed to participate; however, only 989 participants completed the relevant survey measures. Additionally, 51 participants were excluded from the current analyses because they did not meet our inclusion criteria of being in a relationship for at least 2 years. Our final sample included 938 individuals (29.2 % men and 70.8 % women) ranging in age from 18 to 75 years old (M_{Men} = 32.4, SD = 12.4; M_{Women} = 33.4, SD = 12.1). Approximately 51.1 % of the sample was married, 9.3 % reported being engaged, 27.3 % reported being in a committed heterosexual relationship and living with their partner, 9.8 % reported being in a committed heterosexual relationship but not living with their partner, and 2.1 % identified their relationship status as "other." Participants reported knowing their partner for an average of 12.5 years (SD = 11.9 years), and being in a relationship with their partner for an average of 10.8 years (SD = 10.1 years; range = 2 to 56 years). Additional descriptives are presented in Table 1.

Table 1 Descriptive statistics for all study variables

Variable	Men Percentage	Women Percentage
Ethnicity		
European American	30.3 %	24.4 %
African American	8.4 %	5.9 %
Asian American	2.6 %	3.6 %
Native Hawaiian or Pacific Islander	0.4 %	0.6 %
Non-Hispanic White	38.0 %	42.8 %
Other	19.3 %	22.1 %
Education		
Graduate Degree	7.3 %	7.7 %
Undergraduate Degree	25.2 %	23.2 %
Professional Program	3.3 %	3.3 %
Some College	49.6 %	57.2 %
High School	13.9 %	7.7 %
Less than High School	0.7 %	0.6 %
Yearly Household Income		
$0–$25,000	22.3 %	19.6 %
$25,000–$50,000	27.4 %	27.9 %
$50,000–$75,000	20.4 %	19.3 %
$75,000–$100,000	12.4 %	16.6 %
$100,000–$150,000	6.6 %	9.6 %
Greater than $150,000	10.2 %	6.9 %

Swiss Sample to test MI Across Culture In order to test for MI across culture, we used a sample of 368 couples (N = 736 individuals) from the German region of Switzerland where the DCI was originally developed. Participants' age ranged from 19 to 82 years old (M_{Men} = 49.3, SD = 18.3; M_{Women} = 47.3, SD = 18.4), with an average relationship duration of 21.4 years (SD = 18.2).

Procedures

All data collection took place online via a secure website. Participants received a study flyer detailing the eligibility criteria of the study, along with instructions to log on to the secure website to complete the survey. The first page of the survey contained the full disclosure agreement. Upon consent, participants were then directed to the survey, which contained standard demographic questions and the questionnaires listed below.

Measures

Dyadic Coping Inventory (DCI; Bodenmann 2008) For the purpose of our study, we translated the original German version of the DCI into English. The instrument was first translated from German to English by a native-English speaker, who is also fluent in German. The translated English version of the DCI was checked by two colleagues in the U.S. The finalized English version of the DCI was then back-translated into German by a German researcher and checked again by the author of the instrument.

The 37-item DCI is designed to assess *Self* (15 items) and *Partner's* coping behavior (15 items), CDC (5 items), and overall satisfaction with dyadic coping (2 items). Consistent with previous validations (e.g., Vedes et al. 2013), we did not include overall satisfaction with dyadic coping in the present analyses. The DCI has participants rate their responses using a five-point Likert scale (1 = *not at all/very rarely* to 5 = *very often*). The DCI assesses: (1) *Stress Communication (SC)* by *Self* (e.g., "I let my partner know that I appreciate his/her practical support, advice, or help") and *Partner* (e.g., "My partner lets me know that he/she appreciates my practical support, advice, or help"); (2) two types of *SDC*: (i) *Emotion-Focused* by *Self* (e.g., "I show empathy and understanding") and *Partner* (e.g., "My partner shows empathy and understanding"), and (ii) *Problem-Focused* by *Self* (e.g., "I tell my partner that his/her stress is not that bad and help him/her to see the situation in a different light") and *Partner* (e.g., "My partner helps me to see stressful situations in a different light"); (3) *Delegated DC* by *Self* (e.g., "I take on things that my partner would normally do in order to help him/her out") and *Partner* (e.g., "My partner takes on things that I normally do in order to help me out"); and (4) *Negative DC* by *Self* (e.g.,

"I blame my partner for not coping well enough with stress") and *Partner* (e.g., "My partner blames me for not coping well enough with stress"). The scales above are combined to create an aggregate scale of DC by *Self* and *Partner*. In addition, two types of *CDC* are assessed: (i) *Emotion-Focused CDC* (e.g., "We help each other relax with such things like massage, taking a bath together, or listening to music together") and (ii) *Problem-Focused CDC* (e.g., "We engage in a serious discussion about the problem and think through what has to be done"). In the current study, internal consistency ranged from acceptable to very good for all subscales and total scales of the DCI ($.68 \leq \alpha \geq .95$) with the exception of *Emotion-Focused SDC*, where internal consistency was inadequate ($\alpha_{Men} = .54$; $\alpha_{Women} = .45$; see Table 2).

Relationship Assessment Scale (RAS; Hendrick et al. 1998) The RAS is a 7-item self-report instrument that requires participants to rate statements about their relationship using a five-point scale. The RAS measures how well the partner meets one's needs, general relationship satisfaction, relationship expectations, and love for one's partner, and it assesses the severity of problems in the relationship. For the purpose of our study, the RAS was used as a measure of convergent validity since the DCI has been shown to be a dyadic construct (Bodenmann 2008). The RAS has been widely used in

couples' research and shows good psychometric properties (e.g., Hendrick et al. 1998). In our study, the RAS showed good internal consistency for men ($\alpha = .90$) and women ($\alpha = .91$).

The Brief COPE (Carver 1997) The Brief COPE is a 28-item self-report measure designed to assess different individual coping strategies. Participants rate their responses using a four-point scale ($1 = I\ haven't\ been\ doing\ this\ at\ all$ to $4 = I've\ been\ doing\ this\ a\ lot$). For the purpose of our study, we used two subscales of the Brief COPE to measure discriminant validity. We assumed that dyadic coping is less associated with individual coping as it is a dyadic construct (Bodenmann 2008). First, we tested the two-item Active Coping subscale ("I've been concentrating my efforts on doing something about the situation I'm in," and, "I've been taking action to try to make the situation better"). This subscale showed acceptable internal consistency for men ($\alpha = .68$) and women ($\alpha = .75$), which is consistent with reliability from the original validation ($\alpha = .68$) (Carver 1997). Additionally, we tested the 10-item grouped subscale of Active Emotional Coping (venting, positive reframing, humor, acceptance, and emotional support subscales) based on recommendations by Schnider and colleagues (Schnider et al. 2007). This subscale also showed good internal consistency for men ($\alpha = .80$) and women ($\alpha = .83$).

Analytic Strategy

Factorial Structure Confirmatory factor analyses (CFA) were conducted to test the five-factor structure for *DC* by *Self* and *Partner* and the two-factor structure for *CDC*, which has been previously validated with Spanish (Falconier et al. 2013) and Portuguese (Vedes et al. 2013) couples. Common structural equation modeling indices were used to evaluate the model to data fit: the comparative fit index (CFI > .95), the root mean square error of approximation (RMSEA < .06), the standardized root mean square residual (SRMR < .08), and the chi-square (χ^2) test of exact fit (Hu and Bentler 2000; Kline 2004; Schermelleh-Engel et al. 2003). The subscales were non-normally distributed; therefore, the robust maximum likelihood estimator (MLR) in Mplus version 7.11 was used (Muthén and Muthén 2012).

Construct Validity In order to test the construct validity of the DCI, we tested for both convergent and discriminant validity. Based on prior research (Bodenmann 2008), we hypothesized that dyadic coping would be more strongly associated with a dyadic construct, such as relationship satisfaction (convergent validity), than with an individual coping construct (i.e., active coping, active emotional coping; divergent validity).

Table 2 Descriptive statistics, reliabilities, and mean differences on DCI

	Men			Women			M-W U
	M	*SD*	*α*	*M*	*SD*	*α*	*p*
Stress Communication (S)	3.64	0.93	.77	**3.88**	0.82	.68	.001
Stress Communication (P)	**3.70**	0.88	.72	3.35	1.01	.74	.000
Emotion-Focused SDC (S)	3.92	0.84	.82	**4.12**	0.70	.78	.001
Emotion-Focused SDC (P)	3.81	0.97	.86	3.80	0.94	.84	.794
Problem-Focused SDC(S)	3.63	0.75	.54	3.62	0.76	.45	.906
Problem-Focused SDC (P)	3.59	0.85	.68	3.59	0.95	.80	.639
Delegated DC (S)	3.73	0.77	.80	**3.90**	0.74	.80	.001
Delegated DC (P)	3.38	0.90	.80	3.45	0.98	.87	.243
Negative DC (S)	**2.21**	0.86	.81	1.83	0.72	.73	.000
Negative DC (P)	2.24	0.89	.80	2.12	0.84	.77	.074
Emotion-Focused CDC	3.32	1.07	.79	3.26	1.12	.77	.507
Problem-Focused CDC	3.72	0.84	.87	**3.86**	0.88	.91	.014
Evaluation of DC	3.72	1.01	.94	3.78	1.03	.95	.373
Total DC (S)	3.76	0.61	.86	**3.98**	0.52	.82	.000
Total DC (P)	3.67	0.68	.88	3.66	0.75	.91	.797
DC Total	3.67	0.60	.95	**3.79**	0.58	.94	.006

S Self, *P* Partner, *SCD* Supportive Dyadic Coping; *DC* Dyadic Coping, *CDC* Common Dyadic Coping, M-U W = Mann–Whitney *U* Test to test for differences between men and women. Bold values signify significant differences at *p* < .05

Measurement Invariance (MI) We examined MI to determine if the five-factor structure for *Self* and *Partner* and the two-factor structure for *CDC* held between gender and across culture. Specifically, we used the following steps to determine the different levels of invariance for these models: First, to test for configural invariance, we kept the same factor structure across groups (i.e., across genders or nations) but none of the parameters in the models were restricted to be equal. This is the weakest form of MI, indicating that the pattern of DC is invariant across groups. Second, to test for metric invariance, loadings were constrained to be equal across groups. Statistically equivalent loadings indicate that the increase of one unit on the latent factor of one group represents an increase of one unit in the other group (Brown 2006; Vandenberg and Lance 2000) allowing us to test the association across gender and culture (i.e., the association between DC and relationship satisfaction). Third, to test for scalar invariance, intercepts were additionally constrained to be equal. This indicates that both groups would have equivalent observed scores on an indicator at a given level of the latent factor (Brown 2006) and mean differences in DC can directly be compared between gender/culture. Lastly, given that full MI could not be found, we examined partial scalar invariance, which allowed the intercepts of some items to be estimated freely across groups (Byrne, Shavelson, & Muthen, 1989). We followed Schwarz and colleagues' suggestions (Schwartz et al. 2014), which propose that the assumptions of full scalar invariance can be retained if fewer than half of the intercepts vary freely across groups. Finally, we evaluated the invariance of the metric and scalar invariance model with the baseline model (i.e., the configural model) using the recommended procedure detailed in Chen's (2007) Monte Carlo study (for unequal sample size): an increase in the CFI of $\geq$ .010 or an increase of RMSEA of $\geq$ .015 indicates a failure of invariance. All analyses were computed using the lavaan 0.5–16 package (Rosseel 2012) in R (R version 3.1; R Core Team 2014).

Results

Descriptive Statistics

Descriptive statistics, mean differences and reliabilities between genders of the DCI can be found in Table 2. Result show that participants report relatively high levels of dyadic coping, with exception of negative DC. All subscales showed acceptable to good internal consistency, ranging from .68 to .95 with the exception of *Problem-Focused SDC* (α_{Men} = .54; α_{Women} = .45). Inter-correlations among the subscales ranged from ($-.80 < r > .92$) for both genders (see Table 3), which indicates that subscales share common variance but do not correlate perfectly.

Factor Structures

We examined the same structure used in prior validation studies with Spanish (Falconier et al. 2013) and Portuguese (Vedes et al. 2013) samples, which included a five-factor solution for *Self* and *Partner* and a two-factor solution for *CDC*. Multiple models were built in order to identify the best-fitting structure. The first model included 15 items and represented the five-factor structure (DC by *Self* or *Partner*) for men and women. The fit indices did not indicate acceptable fit for men, women, oneself, and one's partner (see Table 4). For DC by *Self*, two items from the *Stress Communication* by *Self* subscale presented low factor loadings. Item 2 ("I ask my partner to do things for me when I have too much to do" (λ_{men} = .52; λ_{women} = .53)) and item 3 ("I show my partner through my behavior when I am not doing well or when I have problems" (λ_{men} = .45; λ_{women} = .29)) showed the lowest loadings in their subscales. Similarly, the equivalent items from *Stress Communication* by *Partner*, items 17 and 18, showed low factor loadings. Item 17 ("My partner asks me to do things for him/her when he/she has too much to do" (λ_{men} = .48; λ_{women} = .38)) and item 18 ("My partners shows me through his/her behavior that he/she is not doing well or when he/she has problems" (λ_{men} = .39; λ_{women} = .26)) showed the lowest loadings. Additionally, the RMSEA indices did not show good fit; RMSEA ranged from .058 to .080 for men and .053 to .060 for women.

Based on the results above, items 2 and 3 (from the DC by *Self* structure) and items 17 and 18 (from the DC by *Partner* structure) were removed (Figure 1). We tested model 2 (including 13 items each), and the fit indices improved compared to model 1, but still did not show good fit (e.g., for DC by *Partner* in men RMSEA = 0.071). Additionally, results showed one more item with a low loading. Item 24 from *Emotion-Focused SDC* by *Self* ("I listen to my partner and give him/her space and time to communicate what really bothers him/her" (λ_{men} = .65; λ_{women} = .58)) and the corresponding item 9 from *Emotion-Focused SDC* by *Partner* ("My partner listens to me and gives me the opportunity to communicate what really bothers me" (λ_{men} = .79; λ_{women} = .79)) showed the lowest loadings in their subscales. Items 24 and 9 were removed and model 3 was examined. This final model, which included 12 items each, showed the best fit of the data to the model as indicated by fit indices (see Table 4). Standardized factor loadings for *Self* and *Partner* for this final model are presented in Figure 2. In addition, we examined a two factor structure for *CDC* including five items (model 4). Results showed acceptable fit (see Table 4). In summary, the five-factor and two-factor structure of this validation using a U.S. sample is comparable with prior validations given that the same factor structure was confirmed.

Table 3 Inter-correlations among DCI Subscales for Men and Women

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Stress Communication (S)		.42	.54	.50	.40	.52	.43	.48	-.34	-.35	.47	.53	.51	.68	.55	.70
2. Stress Communication (P)	.46		.48	.62	.40	.52	.41	.53	-.29	-.44	.47	.54	.59	.50	.76	.72
3. Emotion-Focused SDC (S)	.54	.40		.45	.49	.39	.52	.37	-.57	-.39	.40	.54	.51	.81	.52	.72
4. Emotion-Focused SDC (P)	.52	.57	.42		.36	.62	.35	.54	-.35	-.53	.50	.59	.62	.53	.81	.78
5. Problem-Focused SDC(S)	.34	.28	.33	.28		.36	.56	.24	-.25	-.22	.31	.47	.35	.62	.36	.53
6. Problem-Focused SDC (P)	.48	.47	.36	.60	.33		.32	.62	-.24	-.37	.45	.62	.57	.43	.73	.69
7. Delegated DC (S)	.30	.24	.42	.25	.36	.25		.33	-.32	-.28	.25	.50	.41	.67	.43	.58
8. Delegated DC (P)	.45	.44	.27	.58	.31	.53	.25		-.24	-.37	.46	.53	.55	.40	.70	.64
9. Negative DC (S)	-.34	-.29	-.48	-.35	-.18	-.35	-.28	-.26		.63	-.27	-.38	-.40	-.80	-.52	-.67
10. Negative DC (P)	-.42	-.51	-.38	-.66	-.20	-.47	-.18	-.50	.54		-.30	-.48	-.54	-.57	-.80	-.74
11. Emotion-Focused CDC	.42	.44	.39	.41	.28	.46	.21	.38	-.31	-.32		.53	.61	.44	.51	.63
12. Problem-Focused CDC	.57	.52	.49	.61	.37	.58	.37	.51	-.39	-.52	.49		.70	.60	.67	.81
14. Total DC (S)	.68	.47	.75	.51	.57	.49	.60	.41	-.76	-.52	.46	.61	.57		.65	.86
15. Total DC (P)	.58	.73	.46	.84	.34	.73	.29	.74	-.48	-.86	.49	.68	.77	.62		.92
16. DC Total	.69	.69	.61	.78	.47	.72	.41	.67	-.61	-.77	.62	.80	.80	.82	.92	

S Self, *P* Partner, *SCD* Supportive Dyadic Coping; *DC* Dyadic Coping, *CDC* Common Dyadic Coping. All correlations are significant at *p* < .01. Men's correlations are presented above the diagonal and women's correlations are presented below the diagonal

Construct Validity

Overall, our results suggest that the DCI subscales and aggregate scales are more correlated with relationship satisfaction than with active (individual) coping, which supports the construct validity of the DCI (see Table 5). Results show that the DCI subscales and aggregate scales correlated significantly with relationship satisfaction ($-.59 < r_{men} < .73$; $-.63 < r_{women} < .72$). These results suggest the DCI shows convergent validity when compared to relationship satisfaction. In contrast, results for discriminant validity show that DCI subscales and aggregate scales are less correlated with Active (individual) Coping ($-.08 < r_{men} < .13$; $-.09 < r_{women} < .20$)

and Active Emotional coping ($.03 < r_{men} < .15$; $-.02 < r_{women} < .15$).
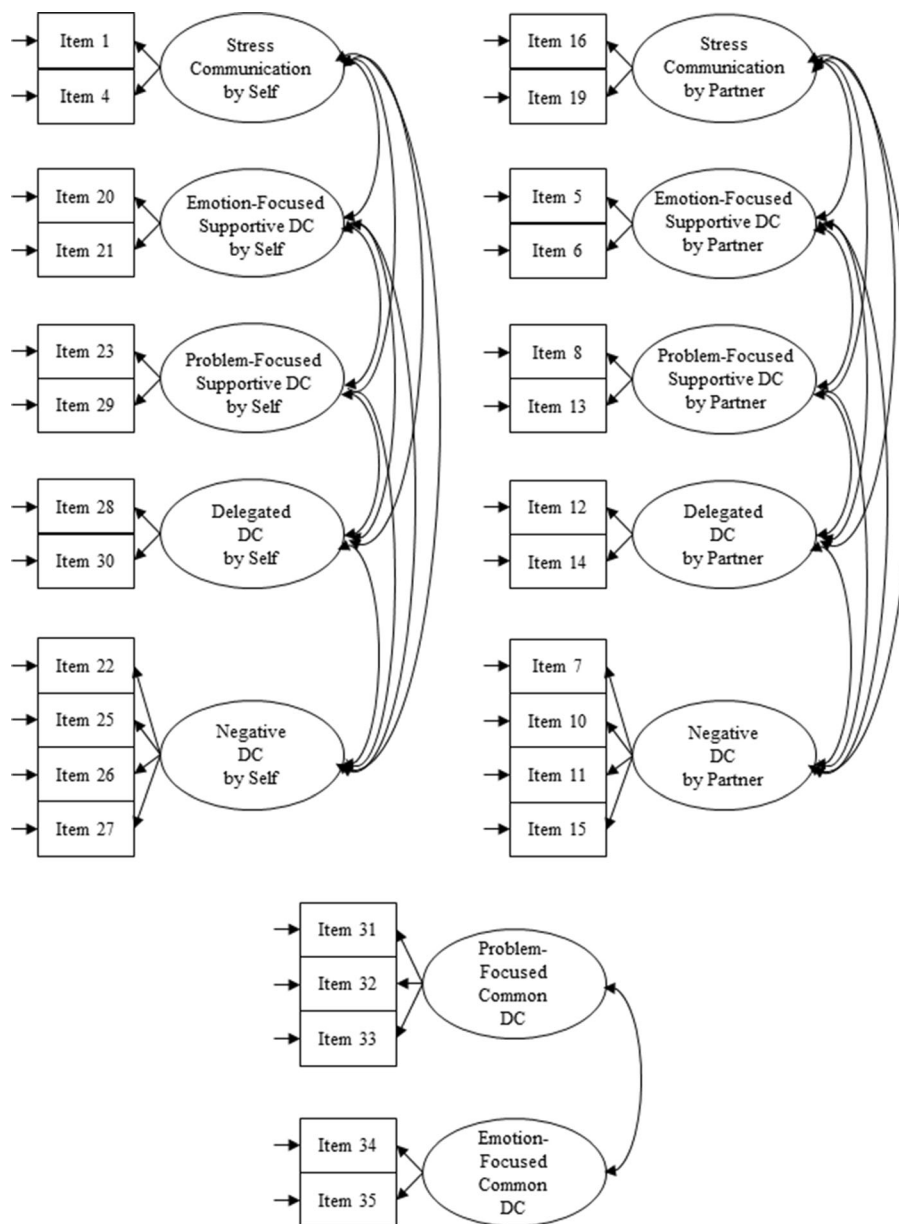
Measurement Invariance

MI Across Gender Table 6 shows the invariance analyses across gender for all models. Configural invariance was tested across men ($N = 274$) and women ($N = 664$) with unconstrained factor loadings and intercepts. The invariant form models show good model to data fit for all three models: *DC by Self*, *DC by Partner*, and *CDC* indicating configural invariance. All changes in CFI and RMSEA for invariant loadings and intercepts were below the critical value (Chen and Li

Table 4 Goodness of fit indices for the confirmatory factor analyses of DC by self and by partner and CDC for men's and women's report

Model		Men's reports						Women's reports					
		χ^2	df	p	CFI	SRMR	RMSEA (90 % CI)	χ^2	df	p	CFI	SRMR	RMSEA (90 % CI)
DC by Self and by Partner	Model 1 (5 factors - 15 items)												
	Self	153.1	80	.00	.947	.056	.058 (.044, .071)	228.6	80	.00	.934	.048	.053 (.045, .061)
	Partner	221.3	80	.00	.911	.064	.080 (.068, .093)	273.5	80	.00	.946	.056	.060 (.053, .068)
	Model 2 (5 factors - 13 items)												
	Self	88.8	55	.00	.972	.038	.047 (.028, .065)	95.4	55	.00	.980	.029	.033 (.022, .044)
	Partner	130.8	55	.00	.947	.047	.071 (.055, .087)	129.3	55	.00	.978	.030	.045 (.035, .055)
	Final- Model 3 (5 factors - 12 items)												
	Self	72.5	44	.00	.975	.037	.049 (.027, .068)	73.5	44	.00	.984	.027	.032 (.018, .044)
	Partner	88.7	44	.00	.964	.043	.061 (.042, .079)	104.9	44	.00	.979	.030	.046 (.034, .057)
CDC	Model 4 (2 factors - 5 items)	9.9	4	.04	.986	.023	.073 (.013, .132)	7.3	4	.12	.997	.010	.035 (.000, .075)

DC Dyadic Coping, *CFI* Comparative Fit Index, *SRMR* Standardized Root Mean Square Residual, *RMSEA* Root Mean Square Error of Approximation; 90 % CI: 90 % Confidence Interval for RMSEA

Fig. 1 Five-factor structure for DC by *Self*, five-factor structure for DC by *Partner*, and two-factor structure for *Common DC*


) indicating full metric and full scalar invariance across gender for all subscales.

MI for Men Across Culture Table 7 shows the invariance analyses for men across culture for all models. Configural invariance was tested across U.S. males (*N*=274) and Swiss males (*N*=368) with unconstrained factor loadings and intercepts. The invariant form models showed good model to data fit for the three models: *DC* by *Self*, *DC* by *Partner*, and *CDC* indicating configural invariance. In terms of changes in CFI and RMSEA for invariant loadings and intercepts, we found full metric invariance for all

models and partial invariant intercepts for *DC* by *Self* (free intercepts of two items), full invariant intercepts for *DC* by *Partner*, and partial invariant intercepts for *CDC* (free intercepts of one item).

MI for Women Across Culture Table 8 shows the invariance analyses for women across culture for all models. Configural invariance was tested across U.S. women (*N*=664) and Swiss women (*N*=368) with unconstrained factor loadings and intercepts. The invariant form models showed good model to data fit for all three models: *DC* by *Self*, *DC* by *Partner*, and *CDC* indicating configural

Fig. 2 Constrained standardized factor loadings for men's and women's DC for a five-factor model (by *Self* and *Partner*) and a two-factor model for *Common DC*. All factor loadings are statistically significant at the $p < .05$ level
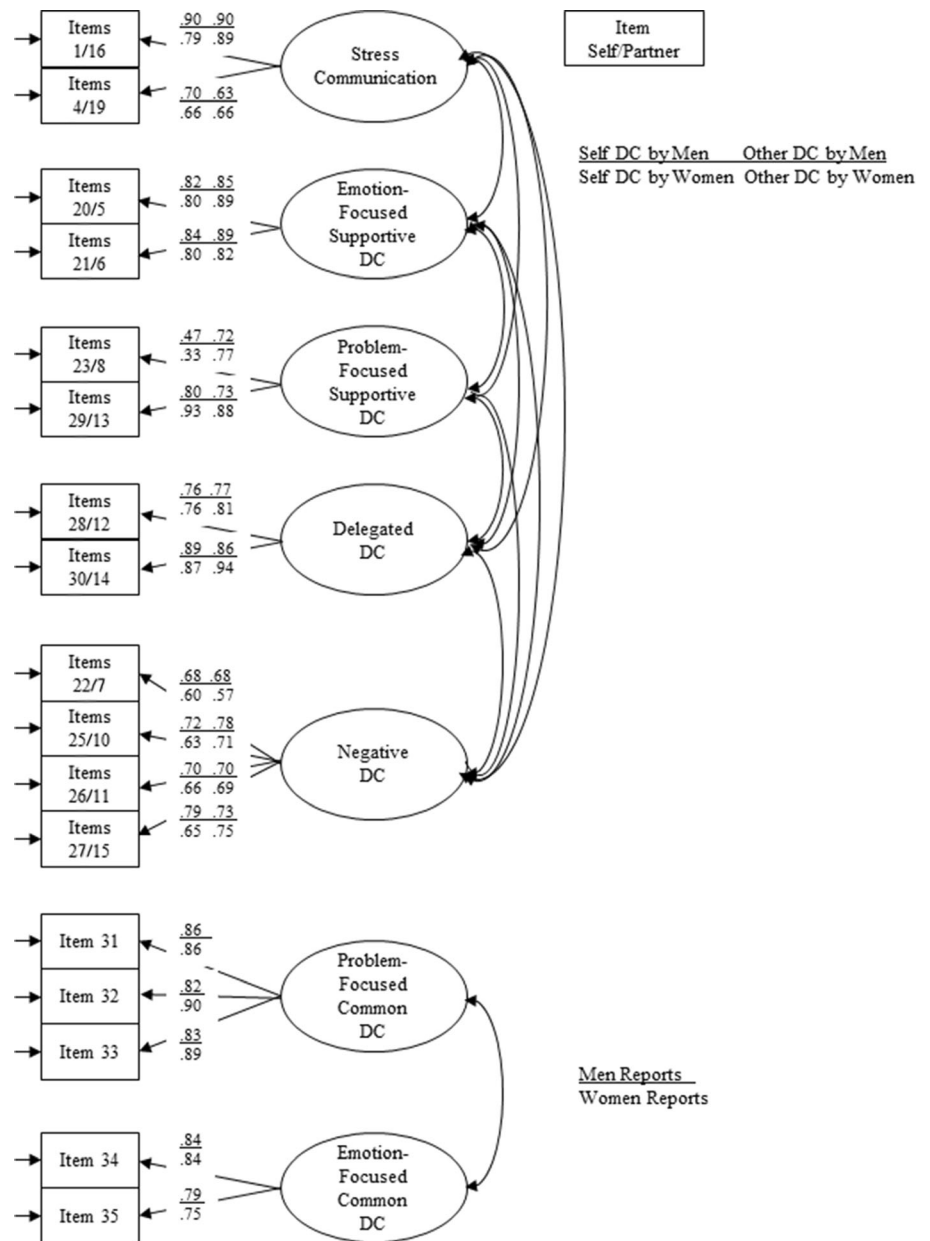
invariance. In terms of changes in CFI and RMSEA for invariant loadings and intercepts, we found partial invariant intercepts for all three subscales.

Discussion

The goal of the present study was to validate the English version of the Dyadic Coping Inventory (DCI; Bodenmann 2008), which is a widely used self-report measure designed to assess coping behavior between partners based on the STM of dyadic coping (Bodenmann 1995). In accord with prior validation studies (Falconier et al. 2013; Vedes et al. 2013), we found a five-factor structure for DC by *Self* and *Partner*

and a two-factor structure for *CDC* after six items were removed to reach a good model to data fit (3 items for *Self*, 3 items for *Partner*). After testing MI in the final model, the results showed that the abbreviated version of the DCI (i.e., 31 item scale) can be used for cross-cultural comparisons.

Construct Validity

Both the convergent validity and discriminant validity supported the construct validity of the DCI. Specifically, the DCI was found to be highly correlated with relationship satisfaction, which is in accord with prior empirical literature (Bodenmann et al. 2006; Bodenmann et al. 2011; Falconier et al. 2013; Ledermann et al. 2010; Levesque et al. 2014;

Table 5 Correlations of the DCI subscales with RAS and brief COPE subscales

	RAS		Brief COPE		Brief COPE	
	Relationship satisfaction		Active coping		Active emotional coping	
	Men (r)	Women (r)	Men (r)	Women (r)	Men (r)	Women (r)
Stress Communication (S)	.45	.49	**.09**	.20	**.10**	.14
Stress Communication (P)	.51	.47	**.12**	**.05**	**.09**	**.02**
Emotion-Focused SDC (S)	.45	.41	.13*	.15	**.09**	.12
Emotion-Focused SDC (P)	.60	.61	**.03**	.09*	**.05**	.10*
Problem-Focused SDC(S)	.35	.27	.13*	.14	.15*	.13
Problem-Focused SDC (P)	.47	.54	**.03**	.12	.13*	.15
Delegated DC (S)	.38	.22	**.08**	.17	**.03**	.15
Delegated DC (P)	.42	.47	**.04**	**.04**	**.08**	.11
Negative DC (S)	−.46	−.43	**−.08**	−.09*	**.03**	−.01
Negative DC (P)	−.59	−.63	**−.05**	**−.07**	**.08**	−.02
Emotion-Focused CDC	.44	.43	**.03**	**.05**	**.09**	**.06**
Problem-Focused CDC	.60	.63	**.12**	.12	**.07**	.15
Total DC (S)	.57	.52	**.11**	.20	**.06**	.11
Total DC (P)	.67	.69	**.09**	.09*	**.05**	**.07**
DC Total	.73	.72	**.12**	.13	**.08**	.10

S Self, *P* Partner, *SCD* Supportive Dyadic Coping; *DC* Dyadic Coping, *CDC* Common Dyadic Coping, All correlations are significant at *p* < .01 with the exception of the items marked with an asterisk (*), which are significant at *p* < .05, and the **bold** values are *ns*

Vedes et al. 2013). The DCI showed good discriminant validity in comparison with the Active Coping and Active Emotional Coping subscales (venting, positive reframing, humor, acceptance, etc.) of the Brief COPE (Carver 1997), which demonstrates that dyadic coping includes additional strategies above and beyond individual coping strategies (Bodenmann 2005; Herzberg 2013; Papp and Witt 2010).

Measurement Invariance

For each measure, we tested three types of invariance: configural, metric, and scalar invariance. We found full metric and full scalar invariance across gender and full metric and full/partial scalar invariance across culture for men and women. Specifically, we found invariance of identical loadings and

Table 6 Invariance tests for DCI across gender

Invariance Level	df	MLR χ^2	CFI	RMSEA	Model Comparison	Δdf	ΔCFI	ΔRMSEA
	5 Factor structure DC by self							
1. Invariant Form	88	140.3	.981	.037				
2. Invariant Loadings	95	150.1	.980	.036	2 vs. 1	7	.001	.001
3. Invariant Intercepts	102	164.5	.978	.037	3 vs. 1	14	.003	.000
	5 Factor Structure DC by Partner							
1. Invariant Form	88	191.7	.974	.052				
2. Invariant Loadings	95	201.3	.973	.050	2 vs. 1	7	.001	.002
3. Invariant Intercepts	102	216.8	.971	.051	3 vs. 1	14	.003	.001
	2 Factor Structure CDC							
1. Invariant Form	8	19.4	.993	.054				
2. Invariant Loadings	11	22.1	.993	.047	2 vs. 1		.000	.007
3. Invariant Intercepts	14	24.5	.993	.041	3 vs. 1		.000	.013

df degrees of freedom, *MLR χ2* robust maximum likelihood estimation of chi square, *CFI* comparative fit index, *RMSEA* root mean square error of approximation, *CDC* Common Dyadic Coping

Table 7 Invariance tests for DCI Men across U.S. and Swiss culture

Invariance level	df	MLR χ^2	CFI	RMSEA	Model comparison	Δdf	ΔCFI	ΔRMSEA
5 Factor Structure DC by Self								
1. Invariant Form	88	127.9	.978	.038				
2. Invariant Loadings	95	127.4	.982	.033	2 vs. 1	7	.004	.005
3. Invariant Intercepts	102	173.1	.961	.047	3 vs. 1	14	.017	.009
4. Partial Invariance Intercepts (item 22, 25)	100	151.2	.972	.041	3 vs. 1	12	.006	.003
5 Factor structure DC by partner								
1. Invariant Form	88	136.6	.976	.042				
2. Invariant Loadings	95	145.7	.975	.041	2 vs. 1	7	.001	.001
3. Invariant Intercepts	102	165.5	.968	.045	3 vs. 1	14	.008	.003
2 Factor structure CDC								
1. Invariant Form	8	15.4	.992	.054				
2. Invariant Loadings	11	21.8	.989	.056	2 vs. 1		.003	.002
3. Invariant Intercepts	14	57.8	.954	.100	3 vs. 1		.038	.046
4. Partial Invariance Intercepts (item 31)	13	25.8	.987	.056	3 vs. 1		.005	.002

df degrees of freedom, MLR χ2 robust maximum likelihood estimation of chi square, CFI comparative fit index, RMSEA root mean square error of approximation, CDC Common Dyadic Coping

intercepts for MI across gender in all three factor models (DC by Self, DC by Partner, and CDC), indicating that observed score differences are due to true differences on the factor mean. According to MI for men across culture, results showed invariance of identical loadings and full/partial invariance of intercepts (full scalar invariance for DC by Partner, partial scalar invariance for DC by Self and CDC). Finally MI for women across culture indicated invariance of identical loadings and partial invariance of intercepts for all three factor

models (DC by Self, DC by Partner, and CDC). Overall, these findings suggest there are different underlying latent factors of coping behavior within dyads. In all cases of partial scalar invariance we were below the critical criterion (Schwartz et al. 2014), indicating that the assumption of full scalar invariance can be retained. Thus, observed score differences between gender and across culture are due to true differences on the factor mean. The results of testing for MI across gender and culture showed that invariance findings were robust.

Table 8 Invariance tests for DCI Women across U.S. and Swiss culture

Invariance Level	df	MLR χ^2	CFI	RMSEA	Model Comparison	Δdf	ΔCFI	ΔRMSEA
5 Factor structure DC by self								
1. Invariant Form	88	146.2	.978	.036				
2. Invariant Loadings	95	167.4	.972	.039	2 vs. 1	7	.006	.003
3. Invariant Intercepts	102	233.1	.949	.051	3 vs. 1	14	.029	.015
4. Partial Invariance Intercepts (item 21, 26, 27)	99	169.5	.973	.038	3 vs. 1	11	.006	.008
5 Factor structure DC by partner								
1. Invariant Form	88	176.2	.979	.045				
2. Invariant Loadings	95	213.1	.972	.050	2 vs. 1	7	.007	.005
3. Invariant Intercepts	102	353.9	.941	.071	3 vs. 1	14	.038	.026
4. Partial Invariance Intercepts (item 5, 13, 14)	99	224.2	.971	.051	3 vs. 1	11	.008	.006
2 Factor structure CDC								
1. Invariant Form	8	16.4	.995	.052				
2. Invariant Loadings	11	35.1	.987	.063	2 vs. 1		.008	.011
3. Invariant Intercepts	14	78.1	.966	.095	3 vs. 1		.029	.043
4. Partial Invariance Intercepts (item 31, 35)	12	38.1	.986	.065	3 vs. 1	4	.009	.013

df degrees of freedom, MLR χ2 robust maximum likelihood estimation of chi square, CFI comparative fit index, RMSEA root mean square error of approximation, CDC Common Dyadic Coping

Overall, this indicates that the DCI in English is a good and reliable instrument for assessing self-reported dyadic coping behavior in the U.S. and allows for comparison between gender and across culture.

Limitations

Limitations of the current study must be noted. First, we used a recruitment method commonly found in romantic relationship research (e.g., Totenhagen et al. 2012); however, results were based on a convenience sample of students affiliated with undergraduate and graduate courses, which may limit the generalizability of our results to individuals connected to a University. Despite this, our participants were diverse in terms of age, relationship length, and type, as compared to those typically found in research pools limited to undergraduate courses (e.g. Psychology 101). Second, our sample included a majority of individuals that identified either as Non-Hispanic White or European American with some college education. Therefore, the generalizability of the results to all individuals in a romantic relationship living in the U.S should be carefully considered. We must recognize and acknowledge the diversity of cultural and ethnic backgrounds in the U.S., which could have differential effects on the types of stressors individuals, couples, and families may face, as well as the types of coping resources that are common to specific cultures or sub-cultures. As the DCI has already been validated in Latino couples in the U.S. (Falconier et al. 2013), findings on African-Americans, Asian-Americans, Native-Americans and other minorities are lacking. Third, our measures did not include a question regarding the type of relationship (e.g., opposite or same-sex). Therefore, we are unable to explicitly speak to whether or not individuals in same-sex relationships completed the survey, which is an important area for future research. Fourth, while the use of cross-sectional self-report data is appropriate for our study, future studies should gather data across multiple time points (i.e., longitudinal data) in order to assess test-rest reliability and the predictive validity of the DCI across multiple stressful situations (e.g., financial, health, significant life events, etc.). Fifth, although this study utilized participants that were currently in a romantic relationship for at least two years, our results should be tested using varying dyadic data to determine the psychometric properties of the DCI with couples in the U.S.

Implications and Conclusion

Dyadic coping research has important implications for relationship education programs (*Couples Coping Enhancement Training (CCET)*; Bodenmann and Shantinath 2004), and therapeutic interventions (*Coping-Oriented Couple Therapy (COCT)*; Bodenmann et al. 2008). Empirical research has supported the efficacy of utilizing dyadic coping components

in treatment, such as stress disclosure and empathic understanding, for ameliorating couples' concerns (Bodenmann and Randall 2011; Randall et al. 2010). This research highlights additional key components in dyadic coping, such as collaboration in daily decisions, couple identity, relationship awareness, mutuality, and authenticity that can be emphasized in clinical practice with couples.

Stress has become an epidemic that affects millions of Americans each year (American Psychological American Psychological Association 2013). For adults, both theoretical and empirical research point to the notion that coping with stress should be reflective of a relational process between partners (Bodenmann 1995, 1997), which calls for assessments that can measure this interdependent coping process. The results of this study show that the Dyadic Coping Inventory (DCI; Bodenmann 2008) - a self-report measure developed to assess partners' coping resources under stress – is a useful measure for evaluating the ways in which individuals in the U.S. cope with stress.

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