






RESEARCH

Validating the Couple Relationship Skills Inventory

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Abstract

Objective: We tested the validity of the factor structure and reliability of a new research-informed comprehensive inventory of key relationship skills predictive of couple quality, the Couple Relationship Skills Inventory (CRSI).

Background: The CRSI is based on the National Extension Relationship and Marriage Education Model, an evidence-derived framework developed as a guide for couple relationship education content. For internal consistency in assessing the effectiveness of programming for couples and for general use in practice and research with couples, an important next step is the design and validation of a comprehensive measure of these core behavioral/attitudinal skills.

Method: The analytic (or “training”) sample of ethnically and economically diverse adults included 824 (independent) men and women and two cross-validation samples ($n = 763$ and $n = 470$).

Results: Bayesian confirmatory factor analysis of individual measurement models informed refinement to a 32-item, nine-factor (seven-subscale) measure and indicated excellent fit of the model to the data. Reliabilities for the full scale and the subscales were good to excellent. Cross-validation study fit statistics and reliabilities were similar, and measurement invariance across samples was validated. Further, support for internal discriminant validity was implied by small to moderate covariances among the factors and concurrent and predictive validity was evidenced (i.e., significant associations among CRSI scores and measures of relationship quality and family harmony).

Implications: This measure provides an efficient assessment of core relational skills critical for healthy couple quality and may prove useful in practice and for future studies of couple relationships and couple relationship education.

KEYWORDS

couple relationship education, Couple Relationship Skills Inventory, couple relationships, validation

INTRODUCTION

A large body of research on couple relationships informs our understanding of what makes relationships “work” (i.e., relationships that are satisfying and stable; e.g., Adler-Baeder et al., 2004; Bradbury et al., 2000; Fincham & Beach, 2010; Gottman, 2004; Karney & Bradbury, 1995, 2005, 2020). Assessment of couple dynamics typically involve single construct measures, often of communication (e.g., Conflict Tactics Scale; Straus, 1979; Positive Interactions Scale; Huston & Vangelisti, 1991; Johnson & Bradbury, 2015) or are limited to operationalizing couple quality primarily in terms of subjective indicators of satisfaction (Karney & Bradbury, 2020). The study of the effectiveness of couple relationship education (CRE) programs has yielded mixed findings and opposing summaries regarding the efficacy of such programs (e.g., Karney et al., 2018; Stanley et al., 2020). Many factors, such as varying curricula, program design, participant characteristics, and facilitator characteristics are likely at play. It also may be that the predominant use of global indicators of relationship quality to examine the effectiveness of CRE programs rather than measures more directly related to the skills taught and attitudes emphasized in programs contributed to mixed findings.

Internal consistency between program content and outcome measures is critical in effective evaluation design. Further, efforts to expand the typical communication-satisfaction model of assessing relationship quality have emphasized the inclusion of couple attributes and other behavioral and cognitive indicators of relationship skills (e.g., admiration, understanding, generosity, fairness; Fawcett et al., 2013; Ogolsky et al., 2017). These factors better align with the skills and practices reinforced in CRE programs and may serve as more accurate measures of program effectiveness, as well as provide more nuance in the study of couple processes.

A working group of researchers and practitioners forming the National Extension Relationship and Marriage Education Network conducted extensive work over several years (2006–2013) to summarize the extant literature on predictors of couple quality. The focus was to provide a comprehensive research-informed framework for practice and assessment focused on couple functioning (Futris & Adler-Baeder, 2013). The group used a deductive process to categorize constructs and determine modifiable predictors that could be conceptualized as skills (i.e., patterns of thinking and behaviors) related to higher quality couple relationships. Predictors from the studies reviewed were thematically coded and conceptually distinguished using an extensive interrater reliability process. This resulted in the seven-factor National Extension Relationship and Marriage Education Model (NERMEM; Futris & Adler-Baeder, 2013).

The NERMEM was offered to the field of family science and family life education as an organizing tool for assessing the research base of the content and focus of existing couples interventions and educational programs. The NERMEM collection of factors extends the dominant emphasis typically placed in these interventions/programs on more limited communication behaviors that have been criticized for their viability in demonstrating impact on couple quality (Johnson & Bradbury, 2015). Consistent with other research on couples, the NERMEM also emphasizes the importance of relationship maintenance behaviors (Ogolsky et al., 2017), couple attributes (Fawcett et al., 2013), processes that lay the foundation for friendship and love (Gottman & Gottman, 2017), and individual health and well-being. Because of the vast array of attitudes and behaviors associated with couple functioning that predict couple quality, the emphasis in developing the NERMEM was on distilling the more prominent factors, keeping in mind a comprehensive but reasonable number that could be addressed in CRE programs. Subsequent to this effort, the model was used to design new CRE curricula for promoting healthy couple relationships (Futris et al., 2014; McGill et al., 2016; Schramm et al., 2013).

For internal consistency in assessing the effectiveness of programming and interventions for couples that include the NERMEM factors in program and intervention content, an important next step is the design and validation of a comprehensive measure of these core healthy couple skills. More broadly, a multidimensional, comprehensive measure of key couple relationship

skills tested with a diverse sample also can provide both practitioners and researchers more efficiency in data collection of multiple factors related to couple quality and satisfaction. Therefore, this study focuses on the validation of a new measure of seven core relationship skills and practices central to healthy couple functioning, the Couple Relationship Skills Inventory (CRSI), for use in clinical practice, self-assessment, couples research, and in the evaluation of CRE.

EXISTING MEASURES OF COUPLE RELATIONSHIP SKILLS

Our search for published instrument development studies of multidimensional measures of couple relationship skills resulted in a limited number of reports, with several of these studies published more than 3 decades ago. In the area of assessment of couple relationship dynamics and processes, measures tend to be unidimensional or skill-specific, rather than measuring relationship skills with a multidimensional approach. Further, the few published instrument validation studies of multidimensional couple process measures have not included large sample sizes, nor participants diverse across race, socioeconomic status, relationship status, and age.

For example, a well-used scale of interpersonal competence (Buhrmester et al., 1988) assesses five dimensions of interpersonal relationship skills (i.e., initiating relationships, self-disclosure, asserting displeasure with others' actions, providing emotional support, and managing interpersonal conflicts). The factor structure of this 40-item self-report instrument was assessed using three samples of mostly White college students. Huston and Vangelisti (1991) developed the 15-item Social Emotional Behaviors Scale and validated the three-dimensional factor structure (i.e., affectional expression, sexual interest, and negativity) using a sample of 106 predominantly White newly married couples. Similarly, the factor structure of the Couple Assessment of Relationship Elements (CARE; Worthington Jr. et al., 1997) was assessed with a sample of 121 college student couples. Seven items pertaining to couple behaviors were used to measure two dimensions: quality of couple skills and quality of global attraction.

A few more recently developed or adapted measures include the Marital Virtues Profile (MVP; Fawcett et al., 2013), Relational Maintenance Behavior Measure (RMBM; Stafford, 2010), and the updated Communication Patterns Questionnaire—Short Form (CPQ-SF; Futris et al., 2010). Although the 15-item MVP is described as capturing characteristics of partners, an examination of the items used to assess admiration, understanding, sacrifice, generosity, and fairness reveals that the majority assess behaviors of partners and could reasonably be considered as an assessment of relational skills and practices (e.g., “I sincerely compliment my partner on a regular basis”; “I make time to be with my partner”). The measure was validated with a sample of 150 mostly White, young, and highly educated married couples (Fawcett et al., 2013). The RMBM was developed to address structural and conceptual weaknesses in the original relational maintenance strategies measure (RMSM) and the revised seven-factor version (Stafford, 2010). The 26-item RMBM was validated with three samples of mostly White married individuals and couples and assesses seven relationship strategies (i.e., positivity, understanding, self-disclosure, relationship talks, assurances, sharing tasks, involvement with social networks). The CPQ-SF was originally developed by Christensen and Heavey (1990) as a self-report measure consisting of two underlying factors representing couples' use of demand-withdrawal (e.g., one partner tries to start a discussion while the other tries to avoid a discussion) and positive interaction behaviors (e.g., both spouses express feelings to each other) when issues or problems arise. Futris et al. (2010) validated the 11-item CPQ-SF with a large sample of predominately White, highly educated, married individuals (60% female) and found support for an alternative three-factor solution that included a distinct criticize-defend factor which had previously been subsumed within the demand-withdraw subscale.

In addition, the Gottman's Sound Marital House Inventory (Gottman & Silver, 1999) has been used in several studies of couples (e.g., Babcock et al., 2013; Gottman et al., 2002, 2019). This inventory assesses a collection of practices related to couple quality. However, no published study of its development and factor structure and psychometric properties can be found.

Of the multidimensional measures available for the assessment of two or more couple relationship skills and practices, limited information is provided on how the dimensions were selected. The RMBM (Stafford, 2010) and the MVP (Fawcett et al., 2013) provide more detailed information on the research basis and conceptual distinction for the factor structure. Although the research basis is evident in the multidimensional measures that exist, it is unclear how comprehensive the measures are meant to be.

The validation of the CRSI uses the NERMEN conceptual framework that followed an explicit, deductive effort to broadly review the extant research on factors that influence couple quality and stability and distill the information to enhance inclusiveness consistent with an ecological systems framework for couple functioning. Because a truly comprehensive assessment of couple relationship skills predictive of couple quality is an expansive project, efforts were made to determine what were the more robust predictors of couple functioning (Futris & Adler-Baeder, 2013). This would increase capacity to address a reasonable number of couple skills in couple interventions and programs. The intent of this study was to provide the field a relatively comprehensive, yet efficient and reliable, measure that captures multiple couples skills typically targeted for intervention.

RESEARCH BASIS OF THE NERMEN COMPONENTS

Although there certainly can be variations in ways that couples interact and consider themselves in a healthy relationship, there emerges from research consistent patterns of interactions that appear to be fundamental for most couples in establishing and maintaining healthy relationships over the long term. With this important qualifier in mind, the NERMEN working group identified some of the primary predictors of couple relationship quality that could be considered modifiable. The group then detailed the research basis for each predictor and recommendations for their application in the publicly available NERMEN publication (Futris & Adler-Baeder, 2013).

Further, a theoretical framework was articulated, along with specific assumptions that were drawn from a collection of complementary theories and perspectives, including, ecological family systems theory (e.g., Bronfenbrenner, 1979; Saxbe et al., 2013), social exchange theory (e.g., Thibaut & Kelley, 1959), attribution theory (e.g., Bradbury & Fincham, 1990), and social learning theory (e.g., Bandura & Walters, 1977). See Futris and Adler-Baeder (2013) for additional information. Minimal information is provided on the relative importance of a given factor, since few basic science studies of couple relationship quality include all seven factors as predictors. The core assumption is that the seven factors are collectively predictive of relationship quality and stability (Futris & Adler-Baeder, 2013).

The model consists of seven core factors: *Self-Care* (originally titled *Care for Self*) defined as efforts to promote individual health and well-being; *Choose*, attitudes and efforts related to intentionality and prioritizing the relationship; *Know*, defined as attitudes and efforts that promote intimate knowledge between partners; *Care*, defined as attitudes and behaviors that promote other-oriented positivity; *Share*, defined as attitudes and behaviors that promote a sense of couple solidarity and "we-ness;" *Manage*, defined as attitudes and skills for managing stress and conflict; and *Connect*, defined as attitudes and efforts to embed the couple relationship in support networks. In what follows, we provide a brief summary of the research behind each construct as the basis for the items in each subscale in the CRSI. A more thorough description of these seven core factors, why they are important to promoting relationship quality, and

examples of how they can be translated into practice can be accessed for free online (Futris & Adler-Baeder, 2013; Schramm et al., 2013).

Self-care

There exists a large body of research documenting the critical link between healthy individual functioning and healthy couple functioning; so much so, that it is reasonable to identify *Self-Care* as a key couple relationship skill (Wiley et al., 2013). Individual studies and reviews of the research linking couple functioning and health conclude that healthy relationships have positive effects on health behaviors, health care access and use, and physical health and longevity (e.g., Carr & Springer, 2010; Duncan et al., 2006; Lee et al., 2005; Wood et al., 2007). Importantly, self-care is a quality of the relationship, not relationship status, that has the stronger connection to health (e.g., Carr & Springer, 2010; Kiecolt-Glaser & Newton, 2001; Wood et al., 2007). Although some research emphasizes the consequences of relational health on individual physical and mental health, other work provides evidence of the role of self-care behaviors and health as predictors of higher relationship quality (e.g., Coyne et al., 2002; Dehle & Weiss, 1998; Faulkner et al., 2005; Skerrett, 1998). Thus, a key component for intervention and measurement of skills related to couple relationship quality is an emphasis on self-care practices and attitudes, including identifying effective strategies for managing stress, promoting physical health (e.g., eating healthy, physical activity, adequate and consistent sleep), and enhancing emotional wellness (e.g., positivity, practicing mindfulness, emotion regulation).

Choose

Choose refers to intentional, deliberate, and conscious decisions that prioritize the couple relationship and its healthy development and stability. Higginbotham et al. (2013) summarized the body of evidence collected over several decades that healthy couples have feelings and attitudes and use practices that demonstrate commitment (e.g., Drigotas et al., 1999; Givertz & Segrin, 2005). Evidence suggests both that commitment influences reports of couple satisfaction (e.g., Kamp Dush & Amato, 2005; Schoebi et al., 2012; Wilcox & Nock, 2006) and that those satisfied in their relationship report higher commitment (Anderson et al., 2010; Kamp Dush & Taylor, 2012). The emphasis in translating this research into practice and measurement is on the efforts individuals make to demonstrate their commitment and prioritize their relationship. Thus, assessment focuses on the ratings of the degree to which a person gives attention to the direction of the relationship, intentionally makes time for the partner and their relationship needs and intentionally avoids situations that could harm the relationship.

Know

The research basis for the *Know* factor centers on the strong evidence for links between couple quality and efforts partners make to develop and maintain over time intimate knowledge about each other (Olsen et al., 2013). Understanding of one's partner and their world includes awareness of daily challenges and triumphs, as well as in-depth knowledge of preferences, aversions, background experiences, and hopes and goals for the future (e.g., Gottman & Silver, 1999; Harvey & Omarzu, 1997; McNulty & Karney, 2004; Pollmann & Finkenauer, 2009). This concept also includes a person's own willingness and skills for self-disclosure that encourage reciprocation by the partner (Gottman, 1998). Although these efforts are more normative during relationship development, research supports the value of continued efforts over the course of

the relationship (e.g., Gottman, 1998; Harvey & Omarzu, 1997; Neff & Karney, 2005). Practice and assessment emphasize the evidence of intimate knowledge and understanding of one's partner.

Care

A great deal of research documents the importance of a positive orientation toward partner and caring, compassionate behaviors for the creation and maintenance of stable, healthy couple relationships (Goddard et al., 2013). Included in the *Care* dimension are practices of using positive attributions to interpret partner's behavior (e.g., Fincham & Bradbury, 2004; Gottman et al., 2006; Hawkins et al., 2002) and general feelings of positive regard for the partner and the relationship (e.g., Murray et al., 2000). Research also clearly documents the value of effortful warm, supportive, respectful behaviors towards partner, offered without regard for reciprocity (Goddard et al., 2013; Gottman, 1999). Expressions of affection and appreciation are prominent predictors of couple quality (e.g., Goddard et al., 2013; Huston et al., 2001; Shapiro et al., 2000). Both the attitudinal and behavioral practices of caring are emphasized as key couple skills for intervention and assessment.

Share

The dimension of *Share* frames the research documenting the importance of efforts to create connection and unity in the couple relationship and to develop a couple identity (Brotherson et al., 2013; Marshall et al., 2013). A range of studies demonstrates the link between couple quality and attitudes and efforts that promote trust and friendship and a sense of "we-ness" (e.g., Gottman, 1994; Harris et al., 2008; Honeycutt, 1999). Without these efforts, research indicates a normative drifting apart towards isolation in the relationship, both attitudinally and behaviorally (e.g., Amato et al., 2007; Huston et al., 2001; Rainey & Rainey, 2003). Translation of this research base emphasizes focusing in intervention and in assessment on spending meaningful time together as a couple, creating and maintaining rituals and traditions, and establishing couple goals (Brotherson & Moen, 2011; Schramm et al., 2005).

Manage

Decades of research point to the importance of skills for management of stress and conflict as a key predictor of couple relationship quality (Marshall et al., 2013). Inherent in this dimension and emphasized in research is the normalcy and commonality of stress and conflict in relationships and families (e.g., Gottman & Silver, 1999). Resolution is often not achieved; therefore, the emphasis is on the healthy management of stress and conflict that is critical for individual, couple, child, and family well-being (e.g., Gordon et al., 2009; Gottman et al., 1998). Specifically, research shows that skills for managing stress and conflict that are related to higher quality relationships include acceptance, empathy, self-regulation, forgiveness, and soothing (e.g., Fincham et al., 2007; Gordon et al., 2009; Gottman, 1998; Gottman et al., 1998; Marshall et al., 2013; Wiley, 2007). Skills also include the recognition and avoidance of destructive and abusive patterns of communication and conflict management that research has identified as corrosive to individual and relationship health (e.g., Gottman & Silver, 1999). For practice and for measurement, the research is translated to an emphasis on both positive engagement practices as well as avoidance of destructive relational dynamics.

Connect

Research consistently demonstrates that healthy couple relationships are associated with feelings and practices that embed and connect partners in a supportive network (Brotherson, Behnke, & Goddard, 2013). Establishing and maintaining a context of meaningful extrafamilial relationships is shown to strengthen the couple relationship by affirming positive elements in the couple and providing resources when couples face challenges (e.g., Amato et al., 2007; Baumeister & Leary, 1995; Beach et al., 1996; Karney & Bradbury, 1995). Research supports an additive model of intracouple and extrafamilial support and connection as predictive of health and vitality of couple relationships (e.g., Bradbury et al., 2000; Helliwell & Putnam, 2004; Smith, 2010). Importantly, this dimension encompasses both efforts to gain and to give support as helpful for couple functioning (Brotherson, Behnke, & Goddard, 2013). Practical translation of this research base informs measurement that centers on skills for engaging in mutually supporting networks outside the family.

Current study

The current study followed recommended practices for instrument development (DeVellis, 2017), using the research-based seven factor NERMEN as the conceptual framework (Futris & Adler-Baeder, 2013) for the seven subscales of the CRSI. We hypothesized that the proposed factor structure of the measure would be confirmed for seven latent constructs in a large sample of adults diverse in age, race, socioeconomic status, and relationship status. We expected internal discriminant validity among related dimensions of couple relationship skills, as well as concurrent and predictive validity through assessments of links between the CRSI and measures of couple quality. We also assumed invariance of the factor structure among the initial training sample and two cross-validation samples.

METHOD

Procedure

We used two groups of adults recruited separately for participation in studies of CRE in different states. In both of the groups, after informed consents were collected, individuals who agreed to participate in the research completed an online survey that assessed demographics and individual, relational, and parenting functioning at baseline. Each member of a couple was either sent a separate email with a link to the survey or provided with their own tablet during a group session or home visit to complete the survey independently from their partner. All respondents received a monetary incentive for completing the survey. The current measurement study included only those respondents who completed all items on the CRSI and who identified as being in a heterosexual couple relationship. Individuals in same-sex couple relationships (<1% of Group 1 and 4% of Group 2) were not included in the analyses because gender was used as the sorting variable to create the independent samples for the analyses described here. Sensitivity analysis were conducted to evaluate the robustness of CFA results using 20 multiply imputed datasets.

Group 1 respondents were recruited from the general community population via broad marketing (e.g., flyers, emails, social media, referral agencies, and word of mouth) to be a part of an efficacy study of two newly developed CRE curricula for couples (i.e., Futris et al., 2014; McGill et al., 2016). Of the original 1,828 individuals, 241 (13%) individuals with missing data and 12 (<1%) individuals in a same-sex couple relationship were removed from analyses; 1587

were retained for the study. Group difference tests to compare those with complete data on the CRSI and included in the study and those excluded revealed a significant difference for race: Those excluded from the study were more likely to report their race as Black than those included in the study (59% vs. 31%; $\chi^2 = 80.77$; $p < .001$).

Group 2 respondents were recruited via targeted marketing (e.g., flyers, emails, social media, word of mouth within the child welfare system) to participate in a descriptive study of the efficacy of a CRE program (Futris et al., 2014). Participants were included in the initial program and evaluation study if they either were parenting a child under 18 years of age and engaged in child welfare services (e.g., home visitation, financial assistance; 60.6%) or were foster caregivers (39.4%). Of the original 954 individuals, 55 (5.8%) individuals with missing data on the CRSI and 36 (3.8%) individuals in a same-sex couple relationship were removed from analyses; 863 were retained for the study. Group difference tests revealed only one between-group difference: Those who were married were more likely to have complete CRSI data and be included in the study sample (93.1% vs. 83.5%; $\chi^2 = 19.40$; $p < .001$).

Study participants

Group 1

Following guidelines for within-sample measurement validation (James et al., 2013), Group 1 ($n = 1,587$) was randomly split into two groups with independent data. The groups were the “training” sample, with participants’ responses used for the initial factor structure and refinement procedures, and the “test” sample, with participants’ responses used to cross-validate the factor structure of the refined measure (James et al., 2013). The training sample was created by randomly selecting half of the women ($n = 456$) and then excluding their partners from further analyses if the partner also completed the survey. This resulted in an independent test sample with only unrelated men and women (824 individuals; 55% identified as women; 45% identified as men). The sample for test or cross-validation consisted of the remaining unrelated men and women not selected for the training sample (763 individuals; 48% identified as women; 52% identified as men). Creating the training and cross-validation analytic data sets in this manner validated the independence assumption. Table 1 provides demographic information for both subsamples of Group 1. Participants were diverse in race, age, and income and included both married (69%) and nonmarried (31%) adults; all reported being in heterosexual relationships. Results of group comparisons revealed no significant between-group differences for income, age, race, relationship type, length of relationship, or CRSI sum score for the two subsamples.

Group 2

The second test or cross-validation sample was drawn from a separate diverse group of individuals who completed all CRSI items ($n = 863$). Similar to Group 1, this cross-validation sample was rendered independent by randomly selecting one partner from each couple. The resulting independent sample of 470 included 54% who identified as women and 46% who identified as men. As summarized in Table 1, participants were diverse in race, age, education, and income and included both married (72%) and nonmarried (28%) adults. Group difference comparisons across demographic characteristics and CRSI sum scores between those in Group 2 selected for cross-validation sample and those not selected revealed only one significant between-group differences: Those who were included in the study, on average, were in their couple relationship longer ($M = 11.3$ years) compared with those who were not included in the study

TABLE 1 Demographic information by sample

	Sample 1 training	Sample 1 test/ cross-validation	Sample 2 test/ cross-validation	<i>F</i> value or χ^2 value (<i>p</i> value)
Sample size	824	763	470	
Age				.14 (.87)
Range	19–90	19–78	18–72	
<i>M</i> (<i>SD</i>)	37.18 (12.02)	37.03 (11.79)	36.82 (10.04)	
Relationship length (years)				4.26 (.01)
Range	.5–52.33	.5–52.33	.6–40.0	
<i>M</i> (<i>SD</i>)	9.79 (10.20)	9.43 (9.69) ^a	11.11 (8.20) ^a	
Race (%)				17.14 (.00)
White	63% ^a	64% ^b	53% ^{a,b}	
Black	32% ^a	30% ^b	39% ^{a,b}	
Other minority	5% ^a	6%	8% ^a	
Education (%)				24.91 (.00)
High school, GED, or no degree	25% ^a	25% ^b	32% ^{a,b}	
Vocational, associate, or some college	33%	32% ^a	38% ^a	
Bachelor's	24% ^a	23%	18% ^a	
Advanced	18% ^a	20% ^b	12% ^{a,b}	
Annual household income (%)				4.41 (.62)
<\$25,000	30%	30%	27%	
\$25,000–39,000	17%	16%	20%	
\$40,000–74,999	28%	29%	27%	
>\$75,000	25%	25%	26%	
Relationship type (%)				2.48 (.29)
Married	69%	69%	73%	
Nonmarried	31%	31%	27%	
Parent status (%)				148.83 (.00)
Parent	73% ^a	73% ^b	100% ^{a,b}	
Nonparent	27% ^a	27% ^b	0% ^{a,b}	

Note: Analysis of variance and chi-square tests conducted to compare all three groups, with results summarized in the last column. Each subscript letter denotes post hoc comparisons showing samples that differ significantly from each other at the .05 level.

($M = 9.5$ years; $F = 4.086$, $p = .044$). Analyses comparing the Sample 2 test/cross-validation sample ($n = 470$) to the Sample 1 training sample ($n = 824$) revealed anticipated differences (i.e., race, education, parent status) based on the populations recruited for each of the respective studies (see Table 1).

Measurement development process of the CRSI

DeVellis's (2017) guide to scale development was used in the current study. The first step of scale development includes determining the construct to be measured—using conceptual and empirical information to clearly define the construct. We relied on the deductive work explicated in the development of the research-based NERMEN (Futris & Adler-Baeder, 2013) to

conceptually delineate the seven factors, or core skills, that influence relationship satisfaction and stability as a first step in the process of developing the CRSI.

For the next step, the first three authors generated an item pool that reflected each of the factors/skills. More specifically, relevant items were either pulled from conceptually similar existing measures or written based on the description of the NERMEM concepts (see Table 2 for more details on items and origins). Specific attention was paid to developing clear, concise items that were appropriate for lower literacy populations. Next, a 7-point Likert scale was chosen as the format of the measure to provide ample variability in responses, as well as to allow for a neutral midpoint for respondents (Kulas & Stachowski, 2009). Scale responses were from 1 = *very strongly disagree* to 7 = *very strongly agree* for Self-Care, Choose, Know, Manage, and Connect and from 1 = *never* to 7 = *more often than once a day* for Share and Care. Higher scores on each of the subscales indicated higher level of or use of the relationship skill.

After the initial draft of the measure was constructed, the next step involved a review of the item pool for construct and face validity assessment by researchers in the field. To reach broad consensus on the face validity we desired, the CRSI also was shared with some of the original contributing authors of the NERMEM, as well as a team of CRE program staff for their assessment of whether the items appeared to measure the concept indicated, following recommendations for participatory research (Small & Uttal, 2005). The 34 program staff (50% female) were diverse in age and race, and all had at least a bachelor's degree. The reviewers subjectively assessed items for relevancy, clarity, and omissions and offered suggestions for enhancements. The primary adjustments suggested were for wording modifications to enhance clarity and to address potential literacy issues.

The CRSI was initially piloted in a study of 300 CRE participants as a 40-item measure (McGill et al., 2021). This preliminary use of the measure in an assessment of CRE program effects included reports of its full scale and subscale reliabilities and correlations between subscales. The subscales had good reliability ($\alpha = .72-.89$), mean scores were near the midpoint of the 7-point scales (range of $M = 3.92-5.66$), responses ranged from low to high scores ($M_{min} = 2.25$; $M_{max} = 6.78$) suggesting adequate variance, and subscales were slightly to moderately correlated with one another, indicating distinction between subscale constructs ($r = -0.13$ to -0.69 ; $M = 0.42$; see McGill et al., 2021 for more details). Using these respondents' data, we optimized scale length by evaluating interitem correlations and determining items that could be dropped to provide a more parsimonious subscale while still maintaining or enhancing reliability and construct validity. Four items were dropped resulting in the 36-item, seven-subscale measure tested in the current study.

Table 2 provides the details on the 36 items included in the measure for the current study and their sources. Eight *Self-Care* items assessed one's ability to attend to their well-being. Four *Choose* items assessed the level of intentionality and commitment in the relationship. Four *Know* items assessed the level of intimate knowledge individuals have about their partner. Four *Share* items assessed efforts individuals make to create a sense of togetherness. Four *Care* items assessed the demonstration of positive behaviors toward one's partner. Eight *Manage* items assessed the skills for managing conflictual and distressful situations. Four *Connect* items assessed the level of couples' connection and engagement with family, friends, and community.

Concurrent and predictive validity measures

Four measures of relationship quality were used to assess two types of criterion validity (i.e., concurrent and predictive) with the training sample. These types of validity tests use measures of expected outcomes of the factors assessed in the new measure rather than conceptually

TABLE 2 Couple Relationship Skills Inventory original 36 items and sources

Dimension and item			Source
Self-care			
SC1	Mng challenges	I have the power to manage the challenges in my life.	Individual Empowerment Scale (Adler-Baeder et al., 2010)
SC2	Ask for help	I ask for help from others when needed.	Individual Empowerment Scale (Adler-Baeder et al., 2010)
SC3	Recog strength	I recognize my strengths.	Individual Empowerment Scale (Adler-Baeder et al., 2010)
SC4	Mng stress	I manage the stress in my life.	Individual Empowerment Scale (Adler-Baeder et al., 2010)
SC5	Healthy meals	I eat healthy meals every day.	Developed by survey authors
SC6	Exercise	I exercise at least three or more times a week.	Developed by survey authors
SC7	Sleep	I get 7–8 quality hours of sleep every night.	Developed by survey authors
SC8	Quiet time	I have quiet time for myself every day.	Developed by survey authors
Choose			
CH1	Stay strong	I want this relationship to stay strong no matter what rough times we encounter.	Confidence & Dedication Scale (Stanley & Markman, 1992)
CH2	Effort	I commit effort every day to making my relationship work.	Developed by survey authors
CH3	Choices	I always think about how my choices could affect my relationship.	Developed by survey authors
CH4	Focus P strength	I always make an effort to focus on my partner's strengths.	Developed by survey authors
Know			
KN1	Partner stress	I know my partner's current life stresses.	Sound Marital House Questionnaire (Gottman & Silver, 1999)
KN2	Partner hopes	I know some of my partner's major aspirations and hopes in life.	Sound Marital House Questionnaire (Gottman & Silver, 1999)
KN3	Partner worries	I know my partner's current major worries.	Sound Marital House Questionnaire (Gottman & Silver, 1999)
KN4	Know partner	I know my partner pretty well.	Sound Marital House Questionnaire (Gottman & Silver, 1999)
Share			
SH1	Ideas	Had a stimulating exchange of ideas	Revised Dyadic Adjustment Scale (Busby et al., 1995)
SH2	Interests	Engage in and/or talk about outside interests together.	Revised Dyadic Adjustment Scale (Busby et al., 1995)
SH3	Touch base	Make time to touch base with each other.	Developed by survey authors
SH4*	Talk	Talk with each other about our day.	Developed by survey authors

(Continues)

TABLE 2 (Continued)

Dimension and item			Source
Care			
CR1	Say ILU	Say "I love you" to your partner.	Positive Interactions Scale (Huston & Vangelisti, 1991)
CR2	Phys affection	Initiate physical affection with your partner (e.g., kiss, hug).	Positive Interactions Scale (Huston & Vangelisti, 1991)
CR3	Share emotions	Share emotions, feelings, or problems with your partner.	Positive Interactions Scale (Huston & Vangelisti, 1991)
CR4	Say positives	Tell my partner things I appreciate about him/her and how much I care for him/her.	Positive Interactions Scale (Huston & Vangelisti, 1991)
Manage			
MN1	See point of view	I am able to see my partner's point of view and really understand it, even if I don't agree.	Interpersonal Competence Scale (Buhrmester et al., 1988)
MN2	Suggest calm	When things "get heated" I suggest we take a break to calm down.	Developed by survey authors
MN3	Forgive	I can easily forgive my partner.	Developed by survey authors
MN4	Shout	I shout or yell at my partner. (R)	Conflict Tactics Scale (Straus, 1979)
MN5	Blame criticize	I blame, accuse, or criticize my partner. (R)	Communication Patterns Questionnaire (Christensen & Heavey, 1990)
MN6 ^a	Physical	I hit, grab, or push my partner. (R)	Conflict Tactics Scale (Straus, 1979)
MN7 ^a	Express	I express my feelings to my partner.	Communication Patterns Questionnaire (Christensen & Heavey, 1990)
MN8 ^a	Avoid	I avoid discussing the problem. (R)	Communication Patterns Questionnaire (Christensen & Heavey, 1990)
Connect			
CN1	Common friends	Many of our friends are friends of both of us.	Couple Social Integration Measure (Stanley & Markman, 2007)
CN2	People care	We know people who care about us and our relationship.	Couple Social Integration Measure (Stanley & Markman, 2007)
CN3	Have help	If we were to need help getting by or encountered a crisis, we would have friends and family to rely on.	Couple Social Integration Measure (Stanley & Markman, 2007)
CN4	Help others	As a couple, we try to help others in need.	Couple Social Integration Measure (Stanley & Markman, 2007)

Abbreviations: Mng, manage; Recog, recognize; R, Reverse coded.

^aItem cross-loaded on more than one factor and dropped from final model analyzed.

similar measures (e.g., Price et al., 2017). These data were collected from Sample 1 participants during the initial baseline survey, 8 weeks later (postprogram), and again approximately 6 months later.

Couple quality

Three items from the Quality of Marriage Index (Norton, 1983) were used to assess participants' reports of relationship quality. Response options were on a 7-point Likert scale, ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*). An example item is "We have a good relationship." Mean scores were created and higher levels indicated higher relationship quality (Cronbach's α : baseline = .95; 6-month follow-up = 0.97).

Positivity and negativity

Two items from Fincham and Lindfield's (1997) Positive and Negative Quality in Marriage Scale were used to assess positive and negative feelings about the relationship. Response options ranged from 1 (*not at all negativelpositive*) to 10 (*extremely negativelpositive*). The items were used as individual items and were not combined. Higher scores indicated more positive or negative feelings.

Family harmony

The three-item Family Harmony Scale (Banker & Gaertner, 1998) assessed general family climate. Response options were on a 7-point Likert scale, ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*). An example item is "Overall, there are more happy feelings, than unhappy feelings in my home." Mean scores were created and higher scores indicated more harmony in the family (Cronbach's α : baseline = .81; 6-month follow-up = 0.81).

Analytical plan

First, confirmatory factor analyses were conducted individually for each measurement model (i.e., subscale). Resulting descriptive statistics, factor loadings, and goodness-of-fit indices were examined to inform decisions about further refinement before testing the factor structure of the full measure (DeVellis, 2017). Bayesian confirmatory factor analysis (CFA) were then employed to test the full model of the CRSI using "blavaan" package in R program (Merkle & Rosseel, 2018). A Bayesian approach is useful in testing factor structures (Levy & Mislevy, 2016). It addresses each parameter in the model as unknown and random and provides a distribution of values for population parameter instead of a true value. The underlying substantive theory of CFA can be represented more adequately with Bayesian approach compared to the traditional methods due to its flexibility in allowing approximate zero cross-loadings and error covariances, without assuming asymptotic normality (Levy & Mislevy, 2016; Muthén & Asparouhov, 2012).

From Sample 1, the training sample ($n = 824$) was used to evaluate factor structure and content validity of CRSI and the test/cross-validation sample ($n = 763$) was used to replicate the factor structure that emerged from the training sample. Subsequently, data from Sample 2 ($n = 470$) were used for another test/cross-validation of the factor structure of the CRSI scale. Model estimation was performed using Markov chain Monte Carlo and the Gibbs sampler with

50,000 iterations, where the first 25,000 was discarded as burn-in and the remaining 25,000 was used to estimate the posterior distribution. Chain convergence was monitored by using potential scale reduction factor (PSRF), in which PSRF less than 1.01 indicates model convergence, and trace and density, autocorrelation, and posterior predictive checking scatter plots were evaluated (not reported; available upon request). Noninformative priors were used and model fit was assessed by using posterior predictive p value (ppp), a Bayesian variant of the root mean square error of approximation (BRMSEA; Hoofs et al., 2018), and incremental fit indices including BCFI, BTLI, and BNFI. A ppp value around 0.10 (Cain & Zhang, 2019), a BRMSEA value smaller than 0.08 (Hoofs et al., 2018), and BCFI, BTLI, and BNFI values above 0.95 indicate good model fit and values above 0.90 indicating acceptable model fit (Asparouhov & Muthén, 2019).

Lastly, Bayesian multigroup CFA was conducted to determine measurement invariance across the test/cross-validation samples by using configural (same factor structure), metric (same factor loadings), and strong (same factor loadings and intercepts) invariance models. Model fit indices were evaluated, and widely available information criterion (WAIC), leave-one-out cross-validation (LOO), and Bayes factor were used to compare the difference of the fit between models (Liang & Luo, 2020).

Assessment of criterion validity was then conducted with the training sample. In the current study, we assessed two aspects of criterion validity (DeVellis, 2017): concurrent validity (i.e., associations between the CRSI and measures of relationship quality collected at the same time) and predictive validity (i.e., associations between CRSI scores and measures of relationship quality collected at a follow up time point). To assess concurrent validity, we examined the correlations between CRSI sum scores and our four measures of couple and family relationship quality at initial baseline (preprogram). For predictive validity, we used postprogram CRSI scores because we expected that CRE program participation would affect these scores from baseline to postprogram for the portion of the sample assigned to the program group and would affect the correlations between baseline levels of the couple relationship skills and later couple and family relationship quality. Predictive validity was best tested by fitting regression models assessing the association between postprogram CRSI scores and each couple and family relationship quality measure at the 6-month follow-up (i.e., 4 months after postprogram data collection) while controlling for reports of the same relationship quality measure at the immediate postprogram survey. Attrition at immediate follow-up was 13% and was 20% at the 6-month follow-up.

Binary logistic regressions were conducted to understand whether those who completed the follow-up surveys were different across each demographic characteristic compared with those who did not complete the survey. White ($B = 0.572, p = .023$) and older ($B = 0.031, p = .023$) respondents were more likely to respond at the immediate follow-up compared with their counterparts. Respondents with higher incomes ($B = 0.109, p = .043$) were more likely to respond at the 6-month follow-up compared with their counterparts.

RESULTS

Preliminary analyses: Individual measurement models

First, the results of the individual measurement models for the CRSI subscales based on the seven NERMEN factors or core principles indicated factor loadings were statistically significant and ranged from .33 to .84. Based on Hair et al.'s (1998) suggestion that coefficients greater than 0.30 with significant critical values should be retained, no items were pruned. Goodness of fit indices indicated adequate fit of the individual measurement models (SRMR < 0.08; Hu & Bentler, 1999); however, the *Self-Care* and *Manage* measurement models initially demonstrated comparatively poorer fit. As such, and using modification indices and construct validity

assessments, we determined a better fitting model for both latent constructs. We provide more information on the meaningfulness of these split dimensions in the following sections. Thus, the full model for the CRSI shifted from a seven-factor model to a nine-factor model.

Full measurement model

The next set of analyses examined the factor structure of the full measurement model for the CRSI, consisting of nine first-order factors (36 items) representing seven healthy couple relationship skills, using the training sample with noninformative priors and approximate zero cross loadings. The model fit was not satisfactory ($p < 0.001$; $BRMSEA = 0.063$; $BCFI = 0.872$; $BTLI = 0.842$; $BNFI = 0.841$) and four items cross-loaded on more than one dimension: (SH4) “Talk with each other about our day” cross-loaded with the *Care* factor; (MN6) “I hit, grab, or push my partner” cross loaded with the *Know* and *Connect* factors; (MN7) “I express my feelings to my partner” cross-loaded with the *Choose* and *Care* factors; and (MN8) “I avoid discussing the problem” cross loaded with the *Choose* factor. These four items were discarded.

The revised nine-factor model with 32 items showed a better model fit ($p < 0.001$; $BRMSEA = 0.058$; $BCFI = 0.907$; $BTLI = 0.879$; $BNFI = 0.878$). After inspecting interitem correlations, six residual correlations between items with highly similar wording were added to this model (e.g., KN1: “I know my partner’s current life stresses”; KN3: “I know my partner’s current major worries”). As shown in Figure 1, the model with residual correlations was selected as the most plausible model based on the conceptual clarity, interpretability, and model fit indices ($p < 0.001$; $BRMSEA = 0.043$; $BCFI = 0.949$; $BTLI = 0.932$; $BNFI = 0.920$). The standardized factor loadings ranged between 0.44 and 0.83, and latent factor correlations were low to moderately high (i.e., ranged from 0.28 to 0.75; see Table 3). Cronbach alpha coefficient for the CRSI was 0.92. Individual subscale reliabilities were moderate to high, ranging from 0.71 to 0.87 (see Table 4). Note that the two-dimension subscales for *Manage* and *Self-Care* have a reliability above 0.65 when items are combined across the two dimensions of each

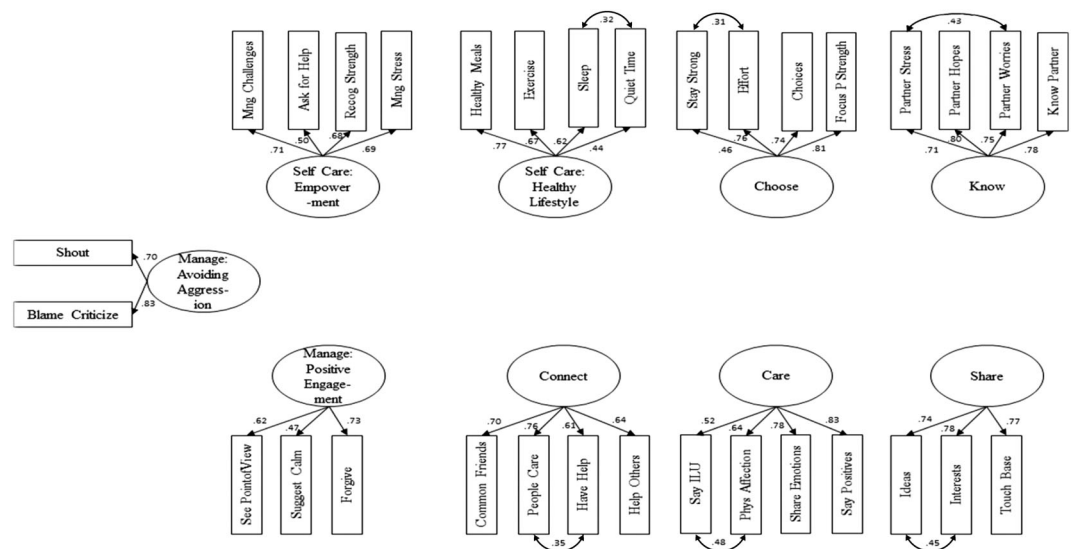


FIGURE 1 Full Bayesian Model of the Couple Relationship Skills Inventory. Covariances between the latent constructs are not shown in the figure but were accounted for in the model

concept. Sensitivity analysis using multiply imputed datasets ($n = 20$) showed identical results. Results are available upon request.

The revised model was then tested with the test and cross-validation independent samples to ensure that the nine-factor structure held. Consistent with the initial findings, the fit indices validated the CRSI measure with both test/cross-validation Group 1 (ppp < 0.001, BRMSEA = 0.044, BCFI = 0.949, BTLI = 0.933, BNFI = 0.918) and Group 2 (ppp < 0.001, BRMSEA = 0.053, BCFI = 0.923, BTLI = 0.896, BNFI = 0.874). The fit indices, standardized factor loadings for the CRSI for all samples are shown in Table 4. As well, the latent factor covariances were similar to those found with the training sample (i.e., ranged from 0.28 to 0.78 in Group 1 test and cross-validation and 0.14 to 0.76 in the Group 2 test and cross-validation; Table 3).

The last set of analyses examined measurement invariance across the test and cross-validation samples using noninformative priors. Configural invariance (ppp < 0.001; BRMSEA = 0.047; BCFI = 0.939; BTLI = 0.919; BNFI = 0.901), metric invariance (ppp < 0.001; BRMSEA = 0.047; BCFI = 0.938; BTLI = 0.920; BNFI = 0.898), and strong invariance (ppp < 0.001; BRMSEA = 0.048; BCFI = 0.934; BTLI = 0.917; BNFI = 0.893) models fit the data well. Bayes factor supported a strong invariance model (log

TABLE 3 Covariances between latent constructs in training, and test/cross-validation samples

	Self-care: Empowerment	Self-care: Healthy lifestyle	Choose	Know	Share	Care	Manage: Positive engagement	Manage: Avoiding aggression
Sample 1. Training								
Self-care: Healthy lifestyle	0.57							
Choose	0.52	0.34						
Know	0.54	0.26	0.63					
Share	0.49	0.34	0.55	0.60				
Care	0.44	0.31	0.61	0.63	0.75			
Manage: Positive engagement	0.63	0.41	0.62	0.59	0.62	0.59		
Manage: Avoiding aggression	0.35	0.31	0.51	0.31	0.31	0.37	0.63	
Connect	0.46	0.34	0.47	0.54	0.58	0.45	0.51	0.36
Sample 1. Test/cross-validation								
Self-care: Healthy lifestyle	0.59							
Choose	0.54	0.32						
Know	0.52	0.30	0.65					
Share	0.40	0.38	0.54	0.59				
Care	0.33	0.29	0.59	0.54	0.78			
Manage: Positive engagement	0.56	0.45	0.62	0.61	0.58	0.51		
Manage: Avoiding aggression	0.37	0.35	0.43	0.28	0.38	0.34	0.52	
Connect	0.50	0.38	0.47	0.62	0.56	0.44	0.60	0.36
Sample 2. Test/cross-validation								
Self-care: Healthy lifestyle	0.51							
Choose	0.42	0.21						
Know	0.40	0.21	0.24					
Share	0.26	0.33	0.37	0.62				
Care	0.14	0.23	0.27	0.33	0.76			
Manage: Positive engagement	0.39	0.25	0.26	0.37	0.51	0.38		
Manage: Avoiding aggression	0.18	0.16	0.17	0.16	0.26	0.21	0.30	
Connect	0.30	0.31	0.26	0.57	0.70	0.42	0.47	0.15

TABLE 4 Fit statistics, factor loadings, and reliabilities for final 32-item Couple Relationship Skills Inventory

		Sample 1 training	Sample 1 test/ cross-validation	Sample 2 test/ cross-validation
Full measurement model				
BRMSEA		0.06	0.04	0.05
BCFI		0.91	0.95	0.92
BTLI		0.88	0.93	0.90
BNFI		0.88	0.92	0.87
Cronbach α		0.92	0.92	0.91
Factor loadings				
Self-care				
Empowerment				
SC1	Mng challenges	0.71	0.70	0.65
SC2	Ask for help	0.50	0.42	0.55
SC3	Recog strength	0.68	0.75	0.72
SC4	Mng stress	0.69	0.73	0.78
Healthy lifestyle				
SC5	Healthy meals	0.77	0.74	0.67
SC6	Exercise	0.67	0.63	0.58
SC7	Sleep	0.62	0.52	0.56
SC8	Quiet time	0.44	0.56	0.55
Cronbach α		0.78	0.78	0.76
Choose				
CH1	Stay strong	0.46	0.41	0.46
CH2	Effort	0.76	0.83	0.78
CH3	Choices	0.74	0.79	0.56
CH4	Focus P strength	0.81	0.81	0.55
Cronbach α		0.81	0.82	0.83
Know				
KN1	Partner stress	0.71	0.77	0.68
KN2	Partner hopes	0.80	0.81	0.83
KN3	Partner worries	0.75	0.78	0.70
KN4	Know partner	0.78	0.80	0.75
Cronbach α		0.87	0.88	0.85
Share				
SH1	Ideas	0.74	0.70	0.72
SH2	Interests	0.78	0.73	0.79
SH3	Touch base	0.77	0.77	0.76
Cronbach α		0.85	0.83	0.83
Care				
CR1	Say I love you	0.52	0.56	0.62
CR2	Phys affection	0.64	0.66	0.70
CR3	Share emotions	0.78	0.82	0.83
CR4	Say positives	0.83	0.83	0.79
Cronbach α		0.82	0.84	0.85

(Continues)

TABLE 4 (Continued)

		Sample 1 training	Sample 1 test/ cross-validation	Sample 2 test/ cross-validation
Manage				
Positive Engagement				
MN1	See point of view	0.62	0.68	0.68
MN2	Suggest calm	0.47	0.38	0.47
MN3	Forgive	0.73	0.67	0.67
Avoiding Aggression				
MN4	Shout	0.70	0.70	0.52
MN5	Blame criticize	0.83	0.79	0.93
<i>Cronbach α</i>		0.73	0.67	0.67
Connect				
CN1	Common friends	0.70	0.61	0.68
CN2	People care	0.76	0.73	0.74
CN3	Have help	0.61	0.69	0.51
CN4	Help others	0.64	0.69	0.63
<i>Cronbach α</i>		0.79	0.80	0.76

Note: Mng = manage; Recog = recognize.

BF = -109.317), whereas WAIC (-22.485 , $SE = 8.959$) and LOO (-22.188 , $SE = 9.947$) favored a metric invariance model indicating that the number of factors and factor loadings were equal, but intercepts were different across samples. Put differently, the same items can be used to create each latent construct, and the meaning of each construct was interpreted similarly by participants across samples. Although Bayes factor supported the strong invariance model, the other fit indices supported a less restrictive model suggesting the item means likely differ across samples.

Concurrent and predictive validity

An initial examination of concurrent validity assessment was then conducted by examining the correlations between CRSI sum scores and concurrent measures of relationship quality using the training sample. Results indicated full scale CRSI sum scores were associated in the expected direction with participants' reports of couple relationship quality ($r = 0.67$, $p < .001$), positivity ($r = 0.53$, $p < .001$), negativity ($r = -0.52$, $p < .001$), and family harmony ($r = 0.63$, $p < .001$). Additionally, the 7 CRSI subscale scores were associated with each measure of relationship quality ($r = |0.27\text{--}0.54|$, $p < .001$; Table 5). Predictive validity was indicated from the results of regressions predicting measures of relationship quality collected at 6-month follow-up (i.e., 4 months after postprogram follow-up survey), controlling for immediate postprogram measures of relationship quality and including immediate postprogram CRSI sum scores. CRSI sum scores at postprogram were associated in the expected direction with participants' reports of later couple relationship quality ($\beta = .22$, $p < .001$), positivity ($\beta = .28$, $p < .001$), negativity ($\beta = -.19$, $p < .001$), and family harmony ($\beta = .23$, $p < .001$). Additionally, each of the seven CRSI subscale scores at postprogram were associated with later relationship quality ($\beta = .09\text{--}.16$, $p < .05$), positivity ($\beta = .18\text{--}.37$, $p < .01$), negativity ($\beta = -.15$ to $-.23$), $p < .05$), and family harmony ($\beta = .07\text{--}.14$, $p < .05$) in the expected direction.

TABLE 5 Correlations between CRSI subscales and measures of couple relationship quality for test sample (*n* = 824)

	Self-care	Choose	Know	Share	Care	Manage	Connect	QMI	Pos.	Neg.	FH
Self-care	1										
Choose	0.393*	1									
Know	0.366*	0.511*	1								
Share	0.406*	0.453*	0.484*	1							
Care	0.296*	0.493*	0.428*	0.609*	1						
Manage	0.480*	0.564*	0.459*	0.473*	0.448*	1					
Connect	0.385*	0.399*	0.426*	0.462*	0.355*	0.417*	1				
QMI	0.399*	0.510*	0.471*	0.555*	0.489*	0.487*	0.500*	1			
Pos.	0.266*	0.399*	0.372*	0.447*	0.424*	0.390*	0.429*	0.565*	1		
Neg.	-0.327*	-0.402*	-0.315*	-0.367*	-0.350*	-0.431*	-0.407*	-0.605*	-0.382*	1	
FH	0.401*	0.493*	0.413*	0.500*	0.430*	0.512*	0.500*	0.778*	0.530*	-0.602*	1

Abbreviations: CRSI, Couple Relationship Skills Inventory; FH, family harmony; Neg., negativity; Pos., positivity; QMI, quality of marriage index.
**p* > .01.

DISCUSSION

Although multiple measures of couple relationship skills exist, most are unidimensional and have been validated using smaller, more homogeneous samples. The purpose of this study was to validate the CRSI, a new multidimensional instrument that measures a collection of behavioral and attitudinal relationship skills determined by decades of research to be key predictors of healthy couple relationships. The CRSI comprises items both from various existing scales and items developed by the inventory authors that tap components of seven core practices related to healthy relationships identified in the NERMEM framework (Futris & Adler-Baeder, 2013). The Bayesian CFA model confirmed a very good fit of the data and validated its factor structure. Cross-validation with two large, samples—diverse in age, race, socioeconomic status, and relationship status—verified the robustness of the initial test. Further, assessment of concurrent and predictive validity support the CRSI's link with multiple measures of couple and family relationship quality. The final inventory comprises 32 items and nine factors and provides an efficient, reliable, and valid measure of seven key couple relationship skills for use in research and in practice involving diverse samples.

Refinement of the model

Although we hypothesized that the factor analysis would confirm seven factors that map onto the NERMEM, results indicated that *Self-Care* and *Manage* comprised two subdimensions each. Upon review, the items clustered in two areas that were fairly easy to conceptually distinguish as aspects of the *Self-Care* and *Manage* skills. The first *Self-Care* dimension was labeled *Self-Care: Empowerment* because items that loaded on this factor were more cognitive in nature and focused on an individual's ability to seek help and make efforts to handle challenges in their life. The second dimension of *Self-Care* was labeled *Self-Care: Healthy Lifestyle* because the items that loaded on this factor were all related to physical health-promoting behaviors (e.g., healthy eating, regular exercise). Validating two distinct but related dimensions of *Self-Care* is consistent with current research emphasizing “dimensions of wellness” (Stoewen, 2017). The relatedness can be framed by expectations that self-efficacy and feelings of empowerment are often the precursors to healthy behaviors (Bandura, 2005).

Thus, our interpretation is that the measurement of the *Self-Care* dimension should include the items that indicate both dimensions of the *Self-Care* construct in keeping with the original concept and because the covariance between the two dimensions is moderate ($\sigma = 0.57$) and the reliability of the two-dimension subscale is good (Cronbach's $\alpha = .78$).

Similarly, analyses showed that *Manage* comprised two dimensions that we labeled *Manage: Positive Engagement* and *Manage: Avoiding Aggression*. These linked yet distinct aspects of the concept of “management skills” in couple relationships are consistent with the literature summarized in the NERMEM (Marshall et al., 2013) suggesting that positive, healthy management of conflict in couple relationships requires that partners monitor reactivity and regulate negative emotions, as well as proactively engage in strategies to see their partners' perspective during conflict, accept differences, and soothe tensions (Fincham et al., 2007). Although these are distinct factors, indicators of each can reasonably be combined to compute one overarching subscale score for *Manage*, consistent with other multidimensional, conflict management measures that suggest one scale score (e.g., Christensen & Heavey, 1990; Futris et al., 2010). Our test sample results also inform this suggestion to use the five items that indicate the two factors and compute a subscale score for *Manage* since the two factors covary at a moderately high level ($\sigma = 0.63$) and the two-factor subscale has acceptable reliability (Cronbach's $\alpha = .73$).

Together with the *Self-Care* and *Manage subscales*, the CRSI measures five additional relationship skills conceptualized as *Choose*, *Know*, *Share*, *Care*, and *Connect*. Each relationship

skill subscale represents a somewhat distinct set of practices that an accumulation of research suggests are influential in developing and maintaining a healthy couple relationship (Futris & Adler-Baeder, 2013). We put this assumption in the NERMEM to the test by conducting an initial examination of the link between scores on the CRSI (both the global score and the subscale scores) and various measures of couple relationship quality reported at the same time as the CRSI (i.e., concurrent validity), as well as in the future (i.e., predictive validity). Our results confirmed these expected associations.

We believe an important aspect of the study, particularly compared with other measurement studies that used primarily small, homogeneous samples (e.g., Fawcett et al., 2013; Stafford, 2010), is that the measure was validated in two large samples that used distinctly different recruitment methods and were diverse in age, race, socioeconomic status, and relationship status. The first sample came from a project that used a general, community-based outreach system for inviting couples into a study of CRE programs, with the couple self-identifying as “committed” as the only inclusion criterion. The second sample came from a project using a formal referral system for inviting couples who were managing enhanced challenges and were engaged in child welfare services as parents or foster parents to participate in a descriptive study of CRE program effectiveness. Both samples, however, were diverse in terms of age (range 18–90 years), race (37% and 47%, respectively, were non-White), and relationship status (31% and 28%, respectively, were nonmarried). Furthermore, as a group, both samples could be considered lower resource based on education (i.e., 57% and 70%, respectively, had less than a college degree) and annual household income (46% and 47%, respectively, reported less than \$40 K). Although both samples differed in terms of race, education, relationship length, and parenting status, the factor structure was validated in both samples, and measurement invariance was confirmed. Thus, our study meets a higher standard for measurement development (DeVellis, 2017) and researchers and program evaluators can have more confidence in the utility and validity of the use of the CRSI for a wide range of couples.

Practical implications

The CRSI is offered as an efficient 32-item assessment of multiple couple skills/practices and is completed, on average, in 15 min. This may be a welcome addition to the “toolkit” of researchers and program implementers alike. As noted, evaluators often rely on more global assessments of relationship quality and satisfaction as the primary CRE outcomes. Although we expect that quality/satisfaction is related to couple relationships skills, actual assessment of skills as outcomes and mediators of enhanced relationship quality provides improved internal consistency in study design. Because most assessments of couple relationship dynamics and practices tend to be unidimensional, researchers, particularly those engaged in evaluation of CRE programs that cover a broad spectrum of relationship practices, would likely have to spend considerable time assessing and selecting a collection of measures of skills to match program topics. These may be individually efficient; however, a survey composed of multiple individual measures may be collectively lengthy, risking respondent fatigue and threatening validity of the data collected (DeVellis, 2017; Raykov et al., 2015). Further, because the conceptual basis of the CRSI measure is the NERMEM framework, it can be considered relatively inclusive of the most common practices taught in CRE, further enhancing internal consistency between program content and measurement of expected outcomes. This is highly valuable for logic model planning and implementation (McDavid & Hawthorn, 2006).

In using the CRSI, researchers and practitioners have several options. Because our study only used participants who had completed all items on the measure, we calculated sum scores, which enhances the variability. For future studies, researchers can make informed choices regarding scoring using either sum scores for complete data or data rendered complete through

valid imputation methods, or mean scores of item responses in data sets with missing data. Decisions will also be made as to whether a global CRSI score will be used or whether the seven subscale scores will be used as individual measures. There are advantages to both approaches and will depend on the research questions of interest.

We expect that use of subscale scores may be particularly informative for intervention and evaluation research. Our results indicate that the subscales are more moderately correlated suggesting that individuals will have different start-points in each area. Subsequently, interventions and programs may have more or less effect in different couple skills areas. This could be uncovered by using the subscale scores as individual measures. Future evaluations could explore the relative change in each skills area following intervention. Areas of lesser change could inform efforts to assess and modify the corresponding portion of the program or clinical intervention.

Further, our concurrent and predictive validity tests indicated variation in the strength of the relationships between subscale scores and established indicators of relationship quality. Tests of the relative potency of the couple relationship skills as predictors of relationship quality over time will serve to inform our research base on couple relationships, as well as help practitioners make decisions about prioritizing program content and intervention focus. Using the global CRSI score would subsume and mask the nuances that exist among types of couple relationship skills. Further, utilizing this type of measure can inform process evaluations that investigate mechanisms of change after participation in CRE. Researchers can explore the relationship among skill areas over time, which can serve to inform models of best practice regarding sequencing of information (Rossi et al., 2019). This is relevant for basic sciences studies of couples as well. The authors of the NERMEM framework note that the collective nature of the model and emphasize the value of research that will better inform our understanding of temporal processes among the skill areas and relationship quality (Futris & Adler-Baeder, 2013).

Limitations and future directions

Although there are many strengths to the current study, there are also some limitations that should be addressed. First, the CRSI was developed in the context of applied research projects rather than solely as a measurement study, we expedited item selection by consolidating mostly higher loading items from separate established instruments (69%) that measured conceptually similar skills, as well as items we developed, and that aligned conceptually with the NERMEM subscales/skills (i.e., determined strong face validity). Our analyses of these items yielded good model fit. Still, recent efforts to develop and refine assessments of relational functioning in the family science field have encouraged the application of item response theory (IRT) rather than the classical test theory approach we used because of several advantages it offers for creating short, precise, and reliable measures (e.g., Anderson & Miller, 2020). Although typically used for developing singular dimension measures and involving a greater number of items, future research that employs IRT and tests the inclusion of additional items for each of the latent constructs could further enhance and refine the CRSI. As well, future research can consider the use of observational data as well as data from conceptually similar and empirically validated measures that assess the underlying constructs captured in each CRSI dimension in order to further test the convergent and discriminant validity of the CRSI (e.g., multitrait–multimethod comparisons). Third, although each of the participants was in a couple relationship, the current analyses include reports of one partner and thus represents a self-report measure. Guidance regarding scale development (DeVellis, 2017) suggests that scales used with couples first be validated with individuals and then validated dyadically to ensure factor structure is invariant across partners. This initial validation study did not assess dyadic validity and tests of measurement invariance between men and women, and we recommend future efforts to provide this

next step. Establishing dyadic validity of the measure will be useful for researchers and practitioners who collect data from both partners in a couple relationship and who may conduct dyadic data analyses (e.g., multilevel modeling, actor–partner interdependence modeling).

In addition, recommendations for strengthening measures of couple dynamics include incorporating a partner's perspective to obtain a richer and more detailed understanding of the couple (DeVellis, 2017; Skinner et al., 2000), particularly on observable behaviors, and we encourage future efforts to explore uses of the CRSI as a multiinformant measure. Further, data used to test the factor structure of the measure were collected at a single timepoint and we focused on factor structure invariance across samples. We did not examine stability of the factor structure within samples over time and recommend future research to focus on this next step. Relatedly, although the predictive validity results are similar to the associations between the CRSI and relationship quality measures at baseline (i.e., concurrent validity), the results should be interpreted with some caution because attrition (20% at 6 months) resulted in a slightly older, higher income, and proportionally more White sample than baseline. Lastly, although the samples were large and diverse, participants were all from two southern states in the United States and the representation of other (non-Black) minority groups was minimal in our sample. As such, findings may not be generalizable to individuals who live in other regions or countries. We encourage replication studies using samples from other populations. We also encourage future studies that assess whether CRSI scores differ across demographic groups and what factors explain or predict CRSI scores.

CONCLUSION

Couple relationship skills and practices are most often studied and measured singularly (e.g., Huston & Vangelisti, 1991; Straus, 1979). Although beneficial in some studies, other studies, particularly those assessing more complex models of predicting couple relationship quality and those evaluating multidimensional couple interventions will benefit from an efficient assessment of multiple couple relationship skills and practices. This study provides evidence that the CRSI is a useful, valid, and reliable tool that can be used with a broad range of couples. The CRSI includes subscales that represent modifiable relationship maintenance and enhancement skills linked to couple and family relationship quality that can be addressed in CRE programs in general, and particularly programs based on the NERMEN framework (e.g., Futris et al., 2014). Our intent was to aid in scholarly efforts to better understand and promote healthy couple relationships and family climate.

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ETHICS STATEMENT

The research received ethics approval from the Institutional Review Board of the authors' universities.

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