The Connor–Davidson Resilience Scale

12

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One frequently used assessment of resilience in adults is the Connor–Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003). The CD-RISC is unique in that it was developed specifically for the purpose of assessing treatment effects of pharmacotherapy and other modalities and has shown sensitivity in detecting symptom changes associated with drug treatment. In the words of the authors (Connor & Davidson, 2003) their interest in resilience as a factor in the treatment of anxiety, depression and stress reaction "arose in part from a finding that fluoxetine produced greater therapeutic benefit on stress coping than placebo in PTSD (Connor et al., 1999). Change documented by the CD-RISC included initial symptom alleviation and subsequent changes in patient well-being.

The original CD-RISC is an instrument that consists of 25 self-rated items (Connor & Davidson, 2003). Each item is rated on a five point frequency response ranging from 0 (not at all true) to 4 (true nearly all of the time). The total score range is between 0 and 100. Higher scores correspond to greater resilience. The rating is based on how the subject has felt over the past month. The CD-RISC currently exists in a 25 item version as well as 10 and 2 item versions.

Approved translations of the CD-RISC currently exist in the following languages: Afrikaans, Bahasa Indonesian (2 and 10 item versions only), Chinese (Taiwan and Peoples Republic), Dutch, Farsi, Finnish, French (France, Belgium), German, Hindi, Italian, Japanese, Kiswahili, Korean, Norwegian, Portuguese (Europe, Brazil), Quechua, Russian, Serbian, Spanish (Europe, Caribbean, South America), Turkish, Urdu. An approved Arabic version of the CD-RISC2 also exists.

According to the authors, the CD-RISC builds upon the work of previous research on hardiness, action orientation, self-efficacy, confidence, adaptability, patience, and endurance in the face of adversity, as well as on the characteristics of historical figures who embody the concept of resilience. The authors report that in reviewing the account of Sir Edward Shackleton's heroic expedition in the Antarctic in 1912 (Alexander, 1998), they noted that the expedition's leader possessed many personal characteristics compatible with resilience and that this may perhaps have contributed to the successful survival of each member of the expedition in the face of overwhelming odds.

These observations prompted the authors to undertake the development of a short self-rated resilience measure. The content of the scale was drawn from a number of sources including Kobasa's work on the construct of hardiness

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(Kobasa, 1979). These items reflect control, commitment, and change viewed as challenge. Items were also drawn from the work of Rutter (1985). These items reflected the development of a strategy with a clear goal or aim, being action orientated, having a strong self-esteem/confidence, manifesting adaptability when coping with change, having social problem solving skills, showing humor in the face of stress, strengthening effect of stress, taking on responsibilities for dealing with stress, having secure/stable affection bonds, and previous experiences of success and achievement. From Lyons (1991), items assessing patience and the ability to endure stress or pain were included. Lastly, from Shackleton's experiences, it was noted that the role of faith and a belief in benevolent intervention ("good luck") were likely important factors in the survival of the expedition, suggesting a spiritual component to resilience," (Connor & Davidson, 2003).

The original samples in which the CD-RISC were tested included a general nonclinical group of 577 and four additional clinical groups; primary care outpatients ($n=139$); psychiatric outpatients in private practice ($n=43$); subjects in a study of generalized anxiety disorder ($n=25$); and subjects in two clinical trials of PTSD ($n=22$), (Connor & Davidson, 2003). Analysis of the 25 item version yielded strong psychometric properties (Connor & Davidson, 2003). The internal consistency of the CD-RISC for the original nonclinical group was good with a Cronbach's alpha coefficient of 0.89. Test-retest reliability for a small clinical sample was good with an intra-class coefficient of 0.87. Convergent validity was expressed for the CD-RISC by positive correlations with the Kobasa hardiness measure in psychiatric outpatients ($n=30$; Pearson $r=0.83$, $p<0.0001$) and negative correlations with the Perceived Stress Scale (PSS-10), ($n=24$; Pearson $r=-0.76$, $p<0.001$). The authors concluded, based on their initial studies (Connor & Davidson, 2003), that the CD-RISC exhibited validity relative to other measures of stress and hardiness, and reflected different levels of resilience in populations that were thought to be differentiated by their degree of resilience as well as other significant ways (e.g., general population vs. patients with anxiety disorders).

Based on these findings, Connor and Davidson (2003) suggested that the CD-RISC had demonstrated good internal consistency and test-retest reliability in both community and clinical samples. When compared to other measures, the scale exhibited validity relative to stress and hardiness and reflected different levels of resilience in differentiated populations. The general population mean was established as a total score of 80. Lower mean scores are observed in various treatment-seeking populations: primary care, 72; psychiatric outpatients, 68; generalized anxiety disorder, 62; major depression, 58; and PTSD, 50. Clinical improvement was found associated with up to a 25% increase in resilience, depending on the level of global improvement. Improvements in CD-RISC score were noted in proportion to overall clinical global improvement. The greatest increase was noted in subjects with the highest global improvement; CD-RISC scores decreased or remained unchanged in individuals with minimal or no global improvement. According to its developers, the CD-RISC findings helped to demonstrated that resilience is quantifiable, modifiable, and can improve with pharmacologic and psychotherapeutic interventions.

Additional construct validity was reported by Campbell-Sills, Cohan, and Stein (2006) who found that resilience was negatively associated with neuroticism, and positively related to extraversion and conscientiousness. In addition, CD-RISC scores manifested statistically significant and salient relationships with three of the five factor model personality constructs. Correlations of resilience with neuroticism, extraversion, conscientiousness, openness, and agreeableness were (–) 0.65, 0.61, 0.46, 0.20, and 0.15, respectively. These correlations indicate that resilience demonstrates a strong inverse relationship with neuroticism and strong positive relationships with extraversion and conscientiousness (all $p<0.001$) (see Campbell-Sills et al., 2006).

Coping styles also predicted variance in resilience beyond the contributions of the personality traits mentioned above. Task-oriented coping was positively related to resilience and mediated the

relationship between conscientiousness and resilience. Emotion-oriented coping was associated with low resilience. Examination of regression coefficients showed that both task-oriented coping and emotion oriented coping contributed significantly to the prediction of resilience. Resilience was shown to moderate the relationship between a form of childhood maltreatment (emotional neglect) and current psychiatric symptoms (Campbell-Sills et al., 2006).

Most remarkably, however, Connor and Davidson (2003) found that significant increases in CD-RISC scores were found for patients who showed significant overall clinical improvement, and the increase in resilience score was proportional to the increase in global improvement. These findings were remarkable for several reasons. CD-RISC scores were demonstrated to be sensitive to real changes in patient well-being, suggesting that improved resilience is related to patient improvement in other ways than symptom reduction. Also, findings indicated that resilience was subject to change resulting from pharmacotherapy and cognitive behavioral therapy.

Connor and Davidson (2003) hypothesized possible physiological pathways associated with their findings. First the hypothesis was offered that there are biologic aspects of resilience that may be affected by drug treatment and that the CD-RISC was tapping the subject's experience of these changes. Physiological underpinnings of changes associated with drug treatment were hypothesized as follows. Resilience is characterized by a response profile to major stress in which low baseline catecholaminergic activity is transformed into high catecholamine production, along with increased tissue-specific response (e.g., glucose levels) and an attenuated cortisol response (Dienstbier, 1991). The authors had shown previously that fluoxetine has an improving effect in PTSD (Connor et al., 1999). Connor et al. (1999) reported greater attenuation of stress responsivity with fluoxetine than with placebo, leading them to speculate that serotonergic antidepressants may have resilience-enhancing or "saliostatic" properties in the treatment of PTSD. It was also hypothesized that relationships exist between resilience and central serotonergic function (Andrews, Parker, & Barrett, 1998; Healey & Healey, 1998).

A large multicenter study of PTSD patients showed that relative to placebo, venlafaxine extended release (ER) produced significantly greater enhancement of resilience (Davidson et al., 2006). Davidson et al. found that significant differences between treatment and placebo groups in symptom severity occurred by week 4 whereas cognitive changes occurred between week 4 and week 12 suggesting that "saliostatic" effects of pharmacologic treatment take longer time to occur than improvement in core PTSD symptoms. The authors suggested further that that pharmacotherapy for PTSD with venlafaxine ER, as well as floroxatine as found previously, accomplishes more than symptom reduction through improvement of function and quality of life. Davidson et al. suggested that this effect might generalize across other antidepressants to the extent that physiological changes facilitated by drug treatment allowed cognitive changes to occur.

Davidson et al. (2005, 2008) extended this analysis with a study looking at improvement in patients with PTSD as reflected in effect size of changes at the item level of the CD-RISC as well as for the total score. Among the 25 items of the CD-RISC, 14 items showed the strongest effect sizes, arbitrarily taken as 0.25 or greater. Five of the items showing the most change reflected hardiness (items 7, 1, 14, 19, and 16). Three of the items showing the most change reflected tenacity (items 24, 12, and 11). Three of the items that were sensitive to change reflected belief in a benevolent world (items 3, 9, and 20), and three were difficult to classify (items 5, 13, and 15).

Factor Analytic Studies, 10 Item and 2 Item Versions

Additional research using the CD-RISC has indicated that the factor structure has varied according to setting. For instance, the original five factors have been supported in one Australian study of nurses (Gillespie, Chaboyer, & Walli, 2007).

However, in a US sample of community-dwelling older women, a four factor solution was observed. Factor 1 (9 items) included items related to goal orientation, tenacity, and personal control. Factor 2 (10 items) included tolerance for negative affect and adaptability. Factor 3 (4 items) included items on leadership and acting on a hunch. Factor 4 (2 items) involved spiritual orientation, (Lamond et al., 2008). Additionally, a Chinese study of the CD-RISC failed to verify the original factor structure through confirmatory factor analysis (CFA) and reported three factor solutions through exploratory factor analysis: Tenacity, Strength, and Optimism (Yu & Zhang, 2007). Singh and Yu (2010) found in a study of Indian college students that the data failed to replicate the 5-factor model obtained among American samples. These authors found that for this sample a 4 factor solution was easier to interpret and recommended that cross-cultural differences in the meaning of resilience needed to be considered.

Campbell-Sills and Stein (2007) conducted a reanalysis of the factor structure of the CD-RISC. First, they suggested that it should be determined whether the CD-RISC measures resilience as a unitary dimension or multiple latent dimensions. Second, if the CD-RISC has a multifactorial structure, it must be established that this structure is stable across independent samples and that each factor can be reliably and validly measured. These authors used a sequential approach with three independent samples that consisted of (a) an initial EFA, (b) replication of EFA findings in an independent sample, and (c) CFA which indicated that the CD-RISC had an unstable factor structure across two demographically equivalent samples. Based on the results of the two EFAs, they could not confidently specify a model for CFA that contained the full 25 items. Problems with the 25-item CD-RISC included (a) several items that displayed inconsistent loadings across the two EFAs (items 5, 15, 18, 23, and 25), (b) an item that had no salient loading in either EFA (item 20), (c) a factor that was consistently defined by too few items (faith), and (d) a factor that was consistently defined by four items but was difficult to interpret because it contained two disparate themes (social support/purpose).

Ten Item Version

Problems with stability of factor structure for the original scale led Campbell-Sills and Stein (2007) to propose a shorter version of the CD-RISC. They dropped all items that had either inconsistent or non-salient loadings, as well as items corresponding to factors that were poorly defined. Campbell-Sills and Stein (2007) repeated EFA in Samples 1 and 2 using this shorter version of the CD-RISC before conducting CFA that identified two predominant factors corresponding with "hardiness" and "tenacity" (the other two factors identified in the analysis, corresponding to "social support" and "faith" were weaker, and did not contribute items to the 10-item scale). A series of empirically driven modifications was made. The hardiness factor was defined by items 1, 4, 6–8, 14, 16, 17, and 19. The persistence factor was defined by items 10–12 and 24. The correlation of the hardiness and persistence factors was 0.63. The 10-item version of the CD-RISC scale combines scores on items 1 ("Able to adapt to change"), 4 ("Can deal with whatever comes"), 6 ("See the humorous side of things"), 7 ("Coping with stress strengthens"), 8 ("Tend to bounce back after illness or hardship"), 11 ("You can achieve your goals"), 14("Under pressure, focus and think clearly"), 16 ("Not easily discouraged by failure"), 17 ("Think of self as strongperson"), and 19 ("Can handle unpleasant feelings"). These authors reduced the two factor model to a one factor model of resilience for the 10 item version based on the finding that the items loading on the persistence factor were redundant, introducing error into the model. The abridged CD-RISC therefore contained only items that had consistent, salient loadings on the hardiness and persistence factors in the Sample 1 and Sample 2 EFAs.

Campbell-Sills and Stein (2007) conceded that it might be argued that their elimination of items resulted in important features of resilience being left out of the measure such as faith, social support, and self-efficacy. They acknowledged that the reasons for excluding them from the CD-RISC were primarily statistical in nature. It is possible that if each of these domains was

represented by a sufficient number of items, they would emerge as reliable and valid dimensions of resilience (p. 1027). These authors concluded that rather than reflect negatively on the CD-RISC, the results of their investigation were positive in demonstrating that resilience can be reliably assessed with a subset of the CD-RISC items. These authors went on to use the CD-RISC-10 in future research arguing that the two instruments measured essentially the same thing as the original version (Campbell-Sills, Forde, & Stein, 2009).

A community study was conducted by Campbell-Sills et al. (2009) using the CD-RISC-10, in a nonrepresentative sample of community residents in the vicinity of New York City in the aftermath of 9/11 terrorist attack. Results suggested that approximately 11% of the variance in resilience as measured by the 10 item version was explained by demographic characteristics and an additional 2% of the variance in resilience was explained by history of childhood maltreatment. Salient demographic predictors included being female, having a lower education level and a lower level of income. The authors noted that (1) many other possible contributors to resilience were not measured in this study; and (2) 87% of variance in resilience was left unexplained, leaving much room for factors other than demographic characteristics and childhood maltreatment to "explain" a person's level of resilience. The authors also acknowledged that under-representation of minorities and administration of the CD-RISC-10 may have limited generalizability of their findings. The samples were homogeneous in terms of age and educational level and were predominantly Caucasian women, African American students were underrepresented. In addition, some potentially important demographic features (e.g., income level) were not assessed.

Two Item Scale

A 2-item version of the CD-RISC scale was developed by Vaishnavi, Connor, and Davidson (2007). The 2-item CD-RISC version combined scores on items 1 ("Able to adapt to change") and 8 ("Tend to bounce back after illness or hardship"). These items were selected by the originators of the scale as etymologically capturing the essence of resilience, i.e., the ability to spring back and successfully adapt to change. The two items of the CD-RISC2 were thought by the authors to reflect resilience and thus were felt to likely overlap similar concepts such as "hardiness," "stress vulnerability," and "perceived stress." The authors reported that there are several limitations to this report. First, the CD-RISC2 items were chosen out of the full CD-RISC based on what items were thought to capture the essence of resilience, a subjective approach, rather than based on empirical criteria. Second, the CD-RISC2 assesses the characteristics of resilience, but does not assess the resiliency process or provide information about the underpinnings of resilience.

Discussion

The CD-RISC provides an example of an assessment tool developed in a research environment with a specific purpose of assessing improvements over and above symptom reduction in patients with PTSD associated with drug treatment. The item selection appears to have had a good theoretical basis. As the result of factor instability in equivalent but nonrepresentative samples, items were reduced from 25 to 10. It was acknowledged that the instability of factor structure might have been related to insufficient numbers of items covering various aspects of the original construct and that the reduction was guided by statistical rather than theoretical principles. It has been suggestion however, that factor structure differences would be expected in studies of groups that varied culturally and demographically. It is possible that factor analyses of samples that have been systematically selected to represent specific populations would render more structural stability within populations.

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