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Research Article

DEVELOPMENT OF A NEW RESILIENCE SCALE: THE CONNOR-DAVIDSON RESILIENCE SCALE (CD-RISC)

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Resilience may be viewed as a measure of stress coping ability and, as such, could be an important target of treatment in anxiety, depression, and stress reactions. We describe a new rating scale to assess resilience. The Connor-Davidson Resilience scale (CD-RISC) comprises of 25 items, each rated on a 5-point scale (0–4), with higher scores reflecting greater resilience. The scale was administered to subjects in the following groups: community sample, primary care outpatients, general psychiatric outpatients, clinical trial of generalized anxiety disorder, and two clinical trials of PTSD. The reliability, validity, and factor analytic structure of the scale were evaluated, and reference scores for study samples were calculated. Sensitivity to treatment effects was examined in subjects from the PTSD clinical trials. The scale demonstrated good psychometric properties and factor analysis yielded five factors. A repeated measures ANOVA showed that an increase in CD-RISC score was associated with greater improvement during treatment. Improvement in CD-RISC score was noted in proportion to overall clinical global improvement, with greatest increase noted in subjects with the highest global improvement and deterioration in CD-RISC score in those with minimal or no global improvement. The CD-RISC has sound psychometric properties and distinguishes between those with greater and lesser resilience. The scale demonstrates that resilience is modifiable and can improve with treatment, with greater improvement corresponding to higher levels of global improvement. Depression and Anxiety 18:76–82, 2003.

Key words: ***resilience; stress coping; wellbeing; posttraumatic stress disorder; anxiety; depression***

INTRODUCTION

Resilience embodies the personal qualities that enable one to thrive in the face of adversity. Research over the last 20 years has demonstrated that resilience is a multidimensional characteristic that varies with context, time, age, gender, and cultural origin, as well as within an individual subjected to different life circumstances [e.g., Garmezy, 1985; Garmezy and Rutter, 1985; Rutter et al., 1985; Seligman and Csikszentmihalyi, 2000; Werner and Smith, 1992]. One theory for this variability was developed by Richardson and colleagues, who proposed the following resiliency model [Richardson et al., 1990; Richardson, 2002]. Beginning at a point of biopsychospiritual balance ("homeostasis"), one adapts body, mind, and spirit to current life circumstances. Internal and external stressors are ever-present and one's ability to cope with these events is influenced by both successful and unsuccessful adaptations to previous disruptions. In some situations, such adaptations, or protective

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factors, are ineffective, resulting in disruption of the biopsychospiritual homeostasis. In time, response to this disruption is a reintegrative process, leading to one of four outcomes: (1) the disruption represents an opportunity for growth and increased resilience, whereby adaptation to the disruption leads to a new, higher level of homeostasis; (2) a return to baseline homeostasis, in an effort to just get past or beyond the disruption; (3) recovery with loss, establishing a lower level of homeostasis; or 4) a dysfunctional state in which maladaptive strategies (e.g., self-destructive behaviors) are used to cope with stressors. Resilience may thus also be viewed as measure of successful stress-coping ability.

The clinical relevance of resilience and related constructs has been noted previously. Maddi and Khoshaba theorized that hardiness was an index of mental health [Maddi and Khoshaba, 1994] and recent data has supported this hypothesis [Ramanaiah et al., 1999]. Tsuang [2000] has emphasized the substantial clinical implications that follow a better understanding of the forces that mould resilience. With regard to trauma and posttraumatic stress disorder (PTSD), it has been shown that hardiness contributes to protection against developing chronic PTSD after combat [King et al., 1998; Waysman et al., 2001].

The growing focus on health promotion and well-being, shifting emphasis away from pathology and problem-orientation, provides an opportunity to revisit the role of resilience in health. Yet there is relatively little awareness about resilience or its importance in clinical therapeutics. Conventionally, therapeutic trials have focused more heavily on measuring morbidity, although quality of life elements are now included in many trials. A number of scales have been developed to measure resilience [Bartone et al., 1989; Wagnild and Young, 1993] or aspects of resilience [e.g., hardiness: Hull et al., 1987, Kobasa, 1979; perceived stress, Cohen et al., 1983]. However, these measures have neither been widely used nor applied to specific populations [Carlson, 2001; Mosack, 2002] and thereby lack generalizability. Of striking note, a textbook of psychiatric measures recently published by the American Psychiatric Association contains not a single resilience measure [American Psychiatric Association, 2000].

The need for well-validated measures of resilience that are simple to use is thus evident. While several scales have been developed, they have not gained wide acceptance and no one scale has established primacy. With these considerations in mind, the Connor-Davidson Resilience Scale (CD-RISC) was developed as a brief self-rated assessment to help quantify resilience and as a clinical measure to assess treatment response.

METHODS

SCALE DEVELOPMENT

We recently became interested in the concept of resilience as being relevant to treatment outcome in anxiety, depression, and stress reactions. This interest arose in part from a finding that fluoxetine produced greater therapeutic benefit on stress coping than placebo in PTSD [Connor et al., 1999]. Furthermore, in reviewing the account of Sir Edward Shackleton's heroic expedition in the Antarctic in 1912 [Alexander, 1998], it was 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. Together, 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. From Kobasa's work with the construct of hardiness [Kobasa, 1979], items reflecting control, commitment, and change viewed as challenge were included. The following features were drawn from Rutter's work [Rutter, 1985]: developing strategy with a clear goal or aim, action orientation, strong self-esteem/confidence, adaptability when coping with change, social problem solving skills, humor in the face of stress, strengthening effect of stress, taking on responsibilities for dealing with stress, secure/stable affectional bonds, and previous experiences of success and achievement (these last two features may reflect the underpinnings of resilience). 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. Table 1 summarizes the salient features of resilience.

With the above considerations, the CD-RISC was constructed, with the following goals in mind: to develop a valid and reliable measure to quantify

TABLE 1: Characteristics of resilient people

Reference	Characteristic
Kobasa, 1979	View change or stress as a challenge/opportunity
Kobasa, 1979	Commitment
Kobasa, 1979	Recognition of limits to control
Rutter, 1985	Engaging the support of others
Rutter, 1985	Close, secure attachment to others
Rutter, 1985	Personal or collective goals
Rutter, 1985	Self-efficacy
Rutter, 1985	Strengthening effect of stress
Rutter, 1985	Past successes
Rutter, 1985	Realistic sense of control/having choices
Rutter, 1985	Sense of humor
Rutter, 1985	Action oriented approach
Lyons, 1991	Patience
Lyons, 1991	Tolerance of negative affect
Rutter, 1985	Adaptability to change
Current	Optimism
Current	Faith

TABLE 2: Content of the Connor-Davidson Resilience Scale

Item no.	Description
1	Able to adapt to change
2	Close and secure relationships
3	Sometimes fate or God can help
4	Can deal with whatever comes
5	Past success gives confidence for new challenge
6	See the humorous side of things
7	Coping with stress strengthens
8	Tend to bounce back after illness or hardship
9	Things happen for a reason
10	Best effort no matter what
11	You can achieve your goals
12	When things look hopeless, I don't give up
13	Know where to turn for help
14	Under pressure, focus and think clearly
15	Prefer to take the lead in problem solving
16	Not easily discouraged by failure
17	Think of self as strong person
18	Make unpopular or difficult decisions
19	Can handle unpleasant feelings
20	Have to act on a hunch
21	Strong sense of purpose
22	In control of your life
23	I like challenges
24	You work to attain your goals
25	Pride in your achievements

resilience, to establish reference values for resilience in the general population and in clinical samples, and to assess the modifiability of resilience in response to pharmacologic treatment in a clinical population.

The CD-RISC contains 25 items, all of which carry a 5-point range of responses, as follows: not true at all (0), rarely true (1), sometimes true (2), often true (3), and true nearly all of the time (4). The scale is rated based on how the subject has felt over the past month. The total score ranges from 0–100, with higher scores reflecting greater resilience. The individual items comprising the scale are listed in Table 2.

STUDY SAMPLE

Subjects were drawn from the following study samples: a random-digit dial based general population sample [i.e., non help-seeking (Group 1, $n = 577$; included subjects with complete data only); primary care outpatients (Group 2, $n = 139$); psychiatric outpatients in private practice (Group 3, $n = 43$); subjects in a study of generalized anxiety disorder (GAD; Group 4, $n = 25$); and subjects in two clinical trials of PTSD (Group 5, $n = 22$; Group 6, $n = 22$)]. Of note, subjects in Group 6 are included only for between-group diagnostic comparisons and in the assessment of pre- to post-treatment change. Each study protocol was approved by the Duke University Medical Center Institutional Review Board and all subjects provided informed consent.

Demographic characteristics of Groups 1–5 ($n = 806$) were as follows: female 65% ($n = 510$), male 35% ($n = 274$); white 77% ($n = 588$), non-white 23% ($n = 181$); and mean (*sd*) age 43.8 (15.3) years ($n = 763$). Some missing data occurred for all of these comparisons, which explains why the figures do not total 806 in the various comparisons (e.g., data were not always available for gender, ethnic status, etc.).

DATA ANALYSIS

The data were analyzed with the following objectives: (1) to establish reference scores for the CD-RISC and to assess whether scores were affected by clinical category or demographic factors, (2) to assess the reliability and validity of the scale, (3) to assess the factor composition of the CD-RISC in the general population, and (4) to assess the extent to which CD-RISC scores can change with clinical improvement with treatment and over time.

Given that several of the samples were not normally distributed, median CD-RISC scores were calculated for each group and pairwise comparisons were performed using the Wilcoxon Rank Sum test, with $P < .05$ being regarded as significant. A Bonferroni correction was used for multiple comparisons to derive the z score. Of note, mean CD-RISC scores are also presented for clinical reference. A Kruskal-Wallis test was used for multiple group comparisons, with the expectation that degrees of resilience would be lower in psychiatric outpatients than in the general population or primary care patients.

Descriptive statistics were used to characterize CD-RISC scores in the full sample by gender, ethnicity, and age. Analysis of variance was used to analyze categorical variables (e.g., gender and ethnicity) and correlation with the continuous measure of age.

The reliability and validity of the scale were assessed as follows. Test retest reliability was examined in subjects from Groups 4 and 5 in whom no clinical change was noted between two consecutive visits. Internal consistency was evaluated by using Cronbach's alpha for the total and item-total scores in subjects from Group 1. Convergent validity was assessed in various groups by correlating the CD-RISC with measures of hardiness [Kobasa Hardiness Scale; Kobasa et al., 1979], perceived stress [Perceived Stress Scale (PSS-10); Cohen et al., 1983], and stress vulnerability [Stress Vulnerability Scale (SVS); Sheehan et al., 1990], as well as measures of disability [Sheehan Disability Scale(SDS); Sheehan et al., 1983] and social support [Sheehan Social Support Scale (SSSS); Sheehan, 1990]. Divergent validity was assessed by correlating CD-RISC scores with the Arizona Sexual Experience Scale [ASEX; McGahuey et al., 2000] in subjects from Group 4.

An exploratory factor analysis using an ORTHOMAX rotation was conducted by using data from the general population sample (Group 1).

The effects of time and treatment on resilience were assessed by comparing pre- and post-treatment CD-RISC scores in treatment responders and non-responders in the clinical trial samples (Groups 4, 5, and 6) by using a repeated measures analysis of variance (ANOVA), with response as the grouping variable and time as the repeated measure. Response was defined by a Clinical Global Improvement (CGI-I; Guy; 1976) score of 1 (very much improved) or 2 (much improved).

RESULTS

CD-RISC SCORES BY CLINICAL CATEGORY AND DEMOGRAPHIC GROUP

Mean (*sd*) and median (1st, 4th quartile) CD-RISC scores were calculated for the full sample (Groups 1–5) and for the individual study groups (Table 3). Results of pairwise comparisons are listed in Table 4 and significant differences were found for the following groups: general population (Group 1) vs. each of the other groups, primary care (Group 2) vs. GAD (Group 4), and primary care vs. PTSD (Groups 5 and 6). Statistical significance was obtained in the overall multiple comparison model ($\chi^2 = 142.80$, $df = 5$, $P < .0001$).

Mean (*sd*) scores were also calculated by demographic grouping, and no differences were observed in the characteristics evaluated. A gender comparison revealed a mean score of 77.1 (16.3) for women and 77.2 (14.2) for men ($P = .63$). Mean CD-RISC scores by racial group were as follows: white subjects, 77.4 (14.8) and non-white subjects, 76.7 (18.1) ($P = .83$). The mean (*sd*) age of the full sample was 43.8 (15.4) years, and no correlation was found between age and CD-RISC score (Pearson $r = .06$, n.s.).

RELIABILITY AND VALIDITY

Internal consistency. Cronbach's α for the full scale was 0.89 for Group 1 ($n = 577$) and item-total correlations ranged from 0.30 to 0.70 (Table 5).

TABLE 3: Connor-Davidson Resilience Scale scores by study group

Study group	Group no.	*N*	Mean (*sd*)	Median (1st, 4th Q)
General population	1	577	80.4 (12.8)	82 (73, 90)
Primary care	2	139	71.8 (18.4)	75 (60, 86)
Psychiatric outpatients	3	43	68.0 (15.3)	69 (57, 79)
GAD patients	4	24	62.4 (10.7)	64.5 (53, 71)
PTSD patients	5	22	47.8 (19.5)	47 (31, 61)
	6	22	52.8 (20.4)	56 (39, 61)

GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder.

TABLE 4: Pairwise comparisons of Connor-Davidson Resilience Scale scores

Group*	Mean rank difference	Critical rank difference	Statistically significant difference**
Group1 vs.			
Group2	114.70	66.36	Yes
Group3	193.80	111.02	Yes
Group4	290.50	146.31	Yes
Group5	362.80	152.56	Yes
Group6	329.70	152.56	Yes
Group2 vs.			
Group3	79.10	122.55	No
Group4	175.80	155.24	Yes
Group5	248.10	161.15	Yes
Group6	215.00	161.15	Yes
Group3 vs.			
Group4	96.70	178.95	No
Group5	169.00	184.09	No
Group6	135.90	184.09	No
Group4 vs.			
Group5	72.30	207.29	No
Group6	39.20	207.29	No
Group5 vs			.
Group6	33.10	211.75	No

*Group 1=general population; Group 2=primary care; Group 3=psychiatric outpatients; Group 4=GAD clinical trial subjects; Groups 5 and 6=PTSD clinical trial subjects.

** $\alpha < .05$; Bonferonni correction used to derive z score; $z = 2.94$

GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder.

Test–retest reliability. Test–retest reliability was assessed in 24 subjects from the clinical trials of GAD (Group 4) and PTSD (Group 5) in whom little or no clinical change was observed from time 1 to time 2. The mean (*sd*) CD-RISC scores at time 1 [52.7 (17.9)] and time 2 [52.8 (19.9)] demonstrated a high level of agreement, with an intraclass correlation coefficient of 0.87.

Convergent validity. CD-RISC scores were positively correlated with the Kobasa hardiness measure in psychiatric outpatients (Group 3, $n = 30$; Pearson $r = 0.83$, $P < .0001$). Compared to the Perceived Stress Scale (PSS-10), the CD-RISC showed a significant negative correlation (Group 3, $n = 24$; Pearson $r = -0.76$, $P < .001$), indicating that higher levels of resilience corresponded with less perceived stress. The Sheehan Stress Vulnerability Scale (SVS) was similarly negatively correlated with the CD-RISC (Spearman $r = -0.32$, $P < .0001$) in 591 subjects from the combined sample. This result also indicates that higher levels of resilience correspond to lower levels of perceived stress vulnerability. As a measure of disability, the CD-RISC demonstrated a

TABLE 5: Item-total correlations and rotated factor pattern for the Connor-Davidson Resilience Scale

		Factor (Eigenvalue)				
Item	Item-total correlation*	1 (7.436)	2 (1.563)	3 (1.376)	4 (1.128)	5 (1.073)
24	0.61	**0.70870**	0.14250	0.04339	0.19253	0.01779
12	0.62	**0.63998**	0.22255	0.20851	0.05018	0.11083
11	0.62	**0.62497**	0.11656	0.13206	0.21732	0.06408
25	0.56	**0.60385**	0.04385	0.14600	0.22531	0.11798
10	0.52	**0.59601**	0.17001	0.16642	−0.03336	0.10776
23	0.59	**0.55800**	0.32628	0.00758	0.12202	−0.04681
17	0.70	**0.40381**	0.35512	0.12714	0.35236	0.00409
16	0.62	**0.39651**	0.37804	0.26274	0.18958	0.03547
20	0.40	0.08774	**0.67393**	0.05234	−0.06238	0.23265
18	0.58	0.29395	**0.57585**	−0.01006	0.19034	0.08147
15	0.57	0.29967	**0.53047**	0.04440	0.23134	−0.01552
6	0.58	0.11507	**0.52564**	0.40443	0.12267	0.03711
7	0.55	0.14586	**0.46703**	0.30584	−0.01699	0.27429
19	0.64	0.17227	**0.43428**	0.27115	0.39728	−0.01199
14	0.64	0.25215	**0.42942**	0.26572	0.36228	−0.10734
1	0.55	0.07334	0.08512	**0.75885**	0.10762	0.03223
4	0.64	0.07074	0.19156	**0.61921**	0.40002	0.02811
5	0.69	0.26961	0.37932	**0.55332**	0.09561	0.08239
2	0.36	0.23482	−0.08203	**0.53775**	−0.14060	0.31552
8	0.67	0.34423	0.34073	**0.43996**	0.16462	0.04038
22	0.63	0.21396	0.12493	0.09219	**0.77469**	0.02935
13	0.62	0.15177	0.03725	0.20513	**0.54772**	0.40077
21	0.64	0.36495	0.15438	−0.02278	**0.53186**	0.32889
3	0.30	0.01386	0.01460	0.15972	0.15786	**0.77820**
9	0.40	0.12061	0.24612	−0.00029	0.05145	**0.73662**

*Calculated from standardized variables; Chronbach's α=0.93.

significant negative correlation with the Sheehan Disability Scale (SDS) (Pearson $r = -0.62$, $P < .0001$) in psychiatric patients (Groups 3 and 4, $n = 40$). Lastly, the Sheehan Social Support Scale (SSS) correlated significantly with the CD-RISC in 589 subjects (Spearman $r = ; 0.36$, $P < .0001$). Thus, greater resilience, as expected, is associated with less disability and greater social support.

Discriminant validity. The CD-RISC was not significantly correlated with the ASEX at baseline (Group 4, $n = 23$; $r = -0.34$, $P = .11$) or at endpoint ($n = 19$; $r = -0.30$, $P = .21$).

FACTOR ANALYSIS

Analysis of data from subjects in the general population sample yielded five factors whose eigenvalues were, respectively, 7.47, 1.56, 1.38, 1.13, and 1.07. These factors could be broadly interpreted in the following manner. Factor 1 reflects the notion of personal competence, high standards, and tenacity. Factor 2 corresponds to trust in one's instincts, tolerance of negative affect, and strengthening effects of stress. Factor 3 relates to the positive acceptance of change, and secure relationships. Factor 4 was related to control and Factor 5 to spiritual influences. The factor pattern for the scale is presented in Table 5.

SENSITIVITY TO THE EFFECTS OF TREATMENT

In subjects with PTSD (Groups 5 and 6), nonresponders ($n = 30$) had mean (*sd*) pre and post treatment scores of 54.0 (16.5) and 54.9 (18.8), respectively. Among responders ($n = 19$), mean pre- and post-treatment scores were 56.8 (18.4) and 68.9 (19.8), respectively. Significant effects were observed for time ($F = 17.36$; *df* 1, 47; $P < .0001$) and for time × response category ($F = 12.87$; *df* 2, 47; $P < 001$), indicating that CD-RISC scores increased significantly with overall clinical improvement.

Greater improvement was noted in CD-RISC score in proportion to the degree of global clinical improvement. For example, in subjects with a CGI-I score of 1 ($n = 7$), there was a mean increase of 19.9 (26.6%) in the CD-RISC score, compared to an increase of 7.9 (16.2%) for those with a CGI-I score of 2 ($n = 7$), and a deterioration of 0.8 (1.3%) in those with a CGI-I of 3 or more (minimal or no improvement; $n = 18$) ($F = 3.42$, *df* 2, $P < .05$). Significant effects for time ($F = 14.82$; *df* 2, 29; $P = .006$) and for

time × CGI group effect ($F = 7.70$; df 2, 29; $P = .002$) were noted.

DISCUSSION

The CD-RISC has been tested in the general population, as well as in clinical samples, and demonstrates sound psychometric properties, with good internal consistency and test–retest reliability. The scale exhibits validity relative to other measures of stress and hardiness, and reflects different levels of resilience in populations that are thought to be differentiated, among other ways, by their degree of resilience (e.g., general population vs. patients with anxiety disorders). Clinical improvement with even short-term pharmacotherapy in patients with PTSD, a condition with a propensity toward heightened vulnerability to the effects of stress, is accompanied by up to 25% or greater increase in resilience, depending upon level of global improvement. Furthermore, subjects with PTSD who showed very much improvement attained CD-RISC scores close to the mean of the general population. To the authors' knowledge, this is the first demonstration that increased resilience, as operationally defined, can be associated with a pharmacologic intervention.

Three areas can be identified where the CD-RISC might be usefully applied. A number of investigators have considered possible biologic aspects of resilience. For example, 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]. Gormley [2000] has opined that SSRI drugs may facilitate this process in depressive, obsessive-compulsive, and panic disorders but provides no actual evidence in support of his assertion. The authors have shown previously that fluoxetine has such an effect in PTSD [Connor et al., 1999]. It is also possible that relationships exist between resilience and central serotonergic function [Andrews et al., 1988; Healey and Healey, 1996]. Thus, the CD-RISC might prove useful in studies of the biology of resilience.

A second application of the scale could be in clinical practice with contemporary resiliency interventions. Such interventions explore resilience qualities with individuals, identify them, and nurture them [Rak, 2002]. In focusing on strengths and positive attributes, an individual tends to become engaged in more adaptive pursuits, and their problems tend to diminish. The CD-RISC is compatible with such interventions, as an aid to identifying resilient characteristics but also in assessing response to the intervention.

A third potential application of the scale might be in studies designed to investigate adaptive and maladaptive strategies for coping with stress, and as a tool to assist in screening individuals for high-risk, high-stress activities or occupations. For example, resilience (hardiness) was identified as a strong predictor of protection from PTSD in a cohort of Vietnam veterans [King et al., 2000]. Lyons [1991] noted a strengthening effect of extreme trauma in many trauma survivors and a scale such as the CD-RISC might be useful in studying such individuals.

The authors note several limitations of this report. The CD-RISC is a wave two resilience measure, using the scheme outlined by Richardson [Richardson, 2002], assessing characteristics of resilience, and does not assess the resiliency process or provide information about the theory of resilience. While divergent validity was demonstrated, the measure used to assess divergence (ASEX, a measure of sexual functioning) was weakly, albeit nonsignificantly, correlated with CD-RISC and this finding most likely reflects the heterogeneity of the resilience construct. The CD-RISC has not been validated against an objective (i.e., behavioral or third party) measure, or against biological measures of resilience, such as neuropeptide Y responses to extreme stress [Morgan et al., 1999]. The authors also recognize that it is possible to perform well in one area in the face of adversity (e.g., work) but to function poorly in another (i.e., interpersonal relationships). Would such a person be considered resilient? Furthermore, resilience may either be a determinant of response or an effect of exposure to stress. Assessment of such directional factors was not undertaken in this report. A prospective study would be able to inform whether resilience predated exposure to trauma, protected against post-trauma problems, or, if through circumstances, some survivors developed further resilience post-trauma.

CONCLUSIONS

The CD-RISC is a brief, self-rated measure of resilience that has sound psychometric properties. By using the CD-RISC, the findings of this study demonstrate the following: resilience is quantifiable and influenced by health status (i.e., individuals with mental illness have lower levels of resilience than the general population); resilience is modifiable and can improve with treatment; and greater improvement in resilience corresponds to higher levels of global improvement. The CD-RISC could have potential utility in both clinical practice and research.

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