

08-19-18

Connor-Davidson Resilience Scale (CD-RISC) © Manual

Further information about the scale can be obtained from the author at mail@cd-risc.com and at the www.cd-risc.com website.

Cite as: Davidson JRT. Connor-Davidson Resilience Scale (CD-RISC) Manual. Unpublished. 08-19-2018, accessible at www.cd-risc.com.

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Introduction

Our interest in resilience arose from long experience treating men and women with posttraumatic stress disorder (PTSD), as well as from our broad-range research into the disorder, which covered treatment assessment, diagnosis, biological characterization, cross-cultural study, epidemiology, risk factors and the development of measures for PTSD and other forms of anxiety.

Among the measures that we felt needed a stronger presence in the field of PTSD assessment was that of resilience. Although several scales addressing aspects of resilience have existed for some time, they had largely failed to penetrate into the world of clinical practice, treatment-outcome and biological research. We were further stimulated after including a brief single-item measure of stress vulnerability into one of our treatment outcome studies in PTSD. The results showed that an active medication allowed patients to deal better with stress than did a placebo. To the best of our knowledge, this was the first demonstration of such an effect, i.e., that a treatment for anxiety could boost stress coping/resilience more than a placebo control.

Authorized Versions of the CD-RISC

After a search of the resilience literature, which at that time was heavily influenced by contributions from the developmental psychology and child psychiatry fields, but with some important work in adults as well, we selected 17 domains, as outlined in Table 1 of our publication in 2003, and developed a 25-item scale (Connor KM, Davidson JRT. *Depression and Anxiety* 2003; 18: 71-82). This report presented psychometric data establishing validity and reliability of the scale (known as the Connor-Davidson Resilience Scale or CD-RISC), as well as briefly describing each of the 25 items (see Table 2 of that citation), and giving general scoring directions. However, the complete wording for each item and full directions did not appear in the report and the scale cannot be adequately reconstructed from the information given in this publication.

In the original validation study, mean scores in specific populations were reported as follows:

US general population	80.7
Primary care patients	71.8
Psychiatric outpatients	68.0
Generalized anxiety	62.4
PTSD samples	47.8/52.8

Many other studies have reported normative scores on the CD-RISC, the results of which are given below and summarized in [Tables 1a-c](#) for the 25-, 10-, and 2-item scales respectively. The mean and median scores as given for the US general population in Connor and Davidson (2003) are based on a sample of those who furnished complete responses to all items of the CD-RISC. *In the entire sample (i.e., complete responses and those with missing items), the mean score was 79.0 (12.9) and median (1,3 Q) was 81 (71, 89) (Davidson and Lee, unpublished data 2011).*

Besides the full 25-item CD-RISC (or CD-RISC 25), there are two briefer versions, the 10-item (CD-RISC 10) and 2-item (CD-RISC 2) scales. The 10-item version (score range 0-40) comprises items 1, 4, 6, 7, 8, 11, 14, 16, 17, and 19 from the original scale, and was developed by Drs. Campbell-Sills and Stein, at the University of California, San Diego, on the basis of factor analysis. In a community survey of 764 US adults, a mean score of 31.8 (SD = 5.4) was obtained for the CD-RISC 10 [Campbell-Sills L, Forde DR, Stein MB. J Psychiatric Research (2009), doi:10.1016/j.jpsychires.2009.01.013]. An almost identical mean score was obtained by Davidson (unpublished) in the US general population sample studied in the 2003 report above.

The CD-RISC 2 is based on items 1 and 8 (score range from 0-8), and was developed as a measure of “bounce-back” and adaptability by the original authors (Vaishnavi et al, 2007). In a general population survey of 458 US adults, mean CD-RISC 2 score was 6.91, while lower scores were observed in psychiatric groups with depression (5.12), GAD (4.96) and PTSD (4.70) (Vaishnavi et al, 2007) and in survivors of the Southeast Asian Tsunami of 2004 (Irmansyah et al, 2010).

For a summary of all reports with the CD-RISC-10 and CD-RISC-2, please refer to Tables 9 and 10 below.

Unauthorized Versions of the CD-RISC

The above three versions of the CD-RISC are the only ones which are authorized for use. Attention is drawn to the existence of unauthorized versions, created without permission and/or in violation of copyright. These altered versions of the CD-RISC have undergone significant modifications either in item wording, addition or removal of items, change in the scoring choices or blending with other items to create entirely new scales. They include scales known as A Modified CD-RISC: Including Previously Unaccounted Resilience Variables (27 items), CD-RISC Expanded Kinyarwanda version (34 items), 6 items from the CD-RISC subsumed in abbreviated form in the Positive Psychology Outcome Measure (PPOM), a 29-item Arabic translation of the scale, a 3-item version of the scale (2016), a Ghanaian 18-item scale, and a 17-item Spanish scale (2012).

The CD-RISC literature continues to grow: the scale has now been translated into many different languages and studied in a variety of populations, including large community samples, survivors of various traumas, Alzheimer's caregivers, adolescents, elders, patients in treatment for PTSD, members of different ethnic groups and cultures, and selected professional or athletic groups (e.g., university students, nurses, social workers, physicians, military medical personnel, medical students, missionaries, cricketers). The CD-RISC has been included in studies of functional neuroimaging, genotyping and treatment outcome. Psychometric properties of the RISC hold up well, although its factor structure of the RISC-25 and mean score varies with setting. For this reason, we do not recommend separate scoring of the RISC-25 factor subscales that were originally reported by Connor and Davidson, although we recognize that some interesting findings have been reported when specific factors or items were analyzed (e.g., Laff, 2008; Garcia-Izquierdo et al, 2009).

Directions for Scale Administration, Scoring and Interpretation of Score

Directions: The CD-RISC is designed as a self-rating scale, although where necessary, an assistant may read out each statement to the subject and record the answer. The subject is directed to respond to each statement with reference to the previous month, understanding that if a particular situation

has not arisen in this time, then the response should be determined by how the person thinks they would have reacted.

Scoring: Scoring of the scale is based on summing the total of all items, each of which is scored from 0-4. For the CD-RISC-25, the full range is therefore from 0 to 100, with higher scores reflecting greater resilience. We do not recommend other methods of scoring such as the subscales defined by factor analysis, any other derived subscales, item averaging, nor the adoption of a 1-5 scoring range for each item, as has been reported in some publications. We also do not support use of “partial” scales, such as items which have been determined by factor analysis or other statistical technique to produce a seemingly “purer” version of the CD-RISC.

For the CD-RISC-10, the total score ranges from 0-40, and for the CD-RISC-2, it ranges from 0-8.

Interpretation of Score: CD-RISC scores appear to be influenced by two main factors: location/region where data was obtained and nature of the sample. For the former, scores may vary according to country; for the latter, scores are generally lower in those with psychiatric problems and who are having difficulty coping with stress, as well as in younger adults, such as students, who may score lower than older adults. With those considerations in mind, we provide median and quartile scores obtained from the US and Hong Kong general populations as follows. The median score describes the midpoint of the frequency distribution. Quartiles describe four groups of equal number taken from the observed distribution of scores, with the first quartile (Q1) describing the score range for the lowest group (lowest 25% of the population), i.e. the least resilient, the second (Q2) and third (Q3) the intermediate scores, and the fourth (Q4) describing the highest or most resilient, i.e. above 75% of the population.

For the CD-RISC-25 in the US general population (n = 577), median score is 82, with Q1, Q2, Q3 and Q4 being 0-73, 74-82, 83-90, 91-100 (Connor and Davidson, 2003). Therefore, for example, a score of 55 would place the subject in the lowest 25% of the general population, and a score of 89 would fall in the 50-75% percentile, of third quartile: 25% would have a higher score than this.

For the CD-RISC-10 (n = 764), median score was 32, with lowest to highest quartiles being 0-29, 30-32, 33-36 and 37-40 (Campbell-Sills et al, 2009).

Similar results were obtained in another US population (n=577) by Davidson and Lee. A score of 26 would fall in the lowest 25% of the population, a score of 36 would be the third quartile and 25% of the population would score higher (i.e. 37-40).

For the CD-RISC-2 (n = 577), median score was 7, and quartiles were 0-5, 6, 7, 8 (Campbell-Sills, personal communication, 2015). (Groupings could not be made into equal quartiles of 25, 50, 75 and 100%, and represent respectively 15, 36, 54 and 100% of the sample).

Results from a general population survey in Hong Kong (n = 10,997) showed a median CD-RISC-25 score of 62, and Q1, Q2, Q3 and Q4 ranges being 0-53, 54-62, 63-71 and 72-100 (Ni et al, 2015 and personal communication, 2016).

For the CD-RISC-2 (n = 10,997), Ni et al (2015 and personal communication, 2016) found a median score of 5, with Q1, Q2, Q3 and Q4 ranges being 0-4, 5, 6, 7-8 respectively.

Reading Ease and Reading Grade Level

Flesch Reading Ease calculations indicate a range from 75-77 for the 2-, 10-, and 25-item CD-RISC versions. Flesch-Kincaid Grade scores are 5.1 for all three versions of the scale. Interpretation of the Flesch score indicates that the scale should be easily understood by 12 year olds, although it has been used successfully in younger populations. A Flesch-Kincaid score of 5 indicates that that the scale is expected to be understood by those with a fifth grade level education.

A review is provided of the psychometric data on validity, reliability and factor structure, obtained in the various studies worldwide.

Demographic Features of the CD-RISC

AGE:

Mean CD-RISC scores vary across populations and may be affected by age, in that some studies found weakly positive correlations (Gillespie et al, 2008; Campbell-Sills et al, 2009; Rosenberg et al, 2015; Terrill et al, 2016; Boell, 2016; Lee et al, 2017; Seib et al, 2018), weakly negative correlations in more narrowly defined age-specific adolescent and older cohorts (Jorgensen and Seedat, 2008; Lamond et al, 2008; Yu et al, 2011; Wu et al, 2016), as well as in caregivers with a relative who had Alzheimer's disease (Wilks, 2006), or no relationship with age in cohorts spanning a broad age range (Connor and Davidson, 2003; Huang, 2010; Gucciardi et al, 2011; Derakhshanrad et al, 2014; Bozikas et al, 2016) or a narrow age range (Ziaian et al, 2012; Ristevska-Dimitrovska et al, 2015a). Liu et al (2015) did not find that age was a determinant of score.

ETHNICITY:

Ethnicity was a determining factor in two studies in South Africa and the USA (Jorgensen and Seedat, 2008; Marwitz et al, 2017), but not in others (Connor and Davidson, 2003; Wilks, 2006; Campbell-Sills et al, 2009). However, in Chinese, Japanese, Korean, and Iranian samples, the mean score was below those found in US populations (e.g., Yu and Zhang, 2007, Khoshouei, 2009), although the samples were different in nature, i.e., they were not representative of the general population. Ethnicity did not affect resilience score in a multi-ethnic group of Australian adolescent refugees (Ziaian et al, 2012). White and non-white surgeons did not differ in their CD-RISC-10 scores (33.4 vs 33.6) (Warren et al, 2013).

GENDER & MARITAL STATUS:

The relationships between CD-RISC score and marital status and gender are inconsistent. No relationship was found for either by Connor and Davidson (2003), Wilks (2006), Lamond et al (2008), Jowkar et al (2010) or Derakhshanrad et al (2014), but lower scores were obtained in the widowed and in women by Campbell-Sills et al (2009), Yu et al (2011) and Levasseur et al (2017). Wu et al (2016) found marital status unrelated to resilience, but married subjects had higher resilience scores in one study of TBI (Marwitz et al, 2017). In a post-earthquake sample in Turkey, Karairmak found no difference in score between men and women (Karairmak, 2010), yet in a Chinese post-earthquake sample, men scored higher than women (Ni et al, 2015), as was the case in Nepalese earthquake survivors (Bhattarai et al,

2017). In Chinese medical students, Peng et al (2012) found significantly higher CD-RISC scores in men than in women, as did Kang et al (2013) in Korean college students (69.1 vs. 65.2): similar results were obtained in Canadian medical students (Rahimi et al, 2014) and US medical students (Houpy et al, 2017). In contrast, some studies have found higher scores in women than men: an Australian study showed that adolescent girls (median=70) scored higher than boys (median = 58) in a refugee sample (Ziaian et al, 2012). Male Nigerian nursing students had significantly higher scores on the CD-RISC-10 than did women (30.1 vs 27.3) (Aloba et al, 2016), and young male adults with diabetes had significantly higher scores on the CD-RISC-2 than did females (6.5 vs 5.8) (D'Emden et al, 2017). Bozikas et al (2016) found that women with schizophrenia-spectrum disorder had higher resilience than men. Female Air Force recruits had higher scores than did males (Bezdjian et al, 2016). Boell (2016) noted that in Brazilians with chronic medical disease women had higher scores than men. Ameen (2018) noted higher scores in traumatized Iraqi adolescent girls (64.7) than in boys (51.7).

A study of 100 university students in Iran failed to show a difference in score between men (58.9) and women (57.4) (Ebrahimi et al, 2012), as was also the case in 60 patients with spinal cord injury (Kilic et al, 2013). No differences were found comparing men and women surgeons (33.6 vs 32.7) in a US sample (Warren et al, 2013). No differences were found between men and women, and married vs. unmarried Korean psychiatric outpatients (Min et al, 2013). Notario-Pacheco et al found no differences between men and women with fibromyalgia in a Spanish sample (Notario-Pacheco et al, 2014). Male and female university freshmen had similar scores in an English sample (Allan et al, 2014), although RISC predicted academic success in females but not clearly in males. A study of government employee earthquake survivors in Japan found no difference in scores for men and women (Tsuno et al, 2014). Likewise, Liu et al (2015) and Zhong et al (2016) failed to show differences between men and women in large Chinese community samples. No differences between men and women were found in a sample with physical disability (Terrill et al, 2016), in healthy US volunteers participating in an MRI study (Gupta et al, 2016) or in US veterans of Afghanistan and Iraq (Brancu et al, 2017).

OTHER DEMOGRAPHIC VARIABLES:

A relationship has been found with level of education by Campbell-Sills et al (2009), Wu et al (2016), Marwitz et al (2017), and Brown et al (2018), but

not by Lamond et al (2008) or Boell (2016). Higher income was related to higher levels of resilience (Wu et al, 2016; Lee et al, 2017). Unemployed survivors of an earthquake had lower levels of resilience than did employed survivors (Bhattarai et al, 2017).

In one large (n=764) community study of the CD-RISC 10, demographic factors were found to account for no more than 10% of the variance in score (Campbell-Sills et al, 2009).

Mean Scores of CD-RISC in Different Populations

Community populations: In their original report, Connor and Davidson (2003) reported a mean (sd) of 80.4 (12.8), from a random digit dial telephone survey of a national sample of US adults. This score was based on the inclusion of only subjects who provided complete responses to the scale. When all subjects were included, the mean score was 79.0 (12.9). In a smaller study of non-psychiatric US combat veterans, a similar score of 83.4 (9.9) was obtained by Morey et al (2008). In a general community sample (n=764) from Memphis, the mean CD-RISC 10 score was 31.77 (5.47), which is almost identical with that obtained by Davidson et al (unpublished) in a US community population (n=458) of 32.1 (5.8). In a Chinese community cohort, the mean CD-RISC-25 score was 65.4 (13.9) (Yu, personal communication, 5/18/09), pointing to population or cultural determinants of the total CD-RISC score. In a non-randomly selected Portuguese general population sample (n=421), the mean scores for the 25-, 10-, and 2-item versions of the CD-RISC were 73.4 (12.0), 29.3 (5.7) and 6.50 (1.23) (Faria, personal communication 7/22/2010). In a study of factors that determined successful aging, Jeste et al (2013) reported mean scores on the CD-RISC 10 that ranged from 30.8-32.1 according to age decile (50-59 up to 90-99). An Australian community sample showed mean scores for the CD-RISC-25 ranging from 71.5-73.5 in different age groups (Liu et al 2015). (In the Liu study, reported scores were 25 points higher due to use of a 1-5 scoring algorithm, and have been corrected here). These and other scores are summarized in [Tables 1a-c](#).

Table 1a. Mean (SD) CD-RISC 25-Item Scores in General Population Samples

Authors	Scale	Number	Mean (SD)	Location	Comments
Connor et al (2003)	25	458	80.4 (12.8)	USA	National random digit dial sample
Lamond et al (2008)	25	1,395	75.7 (13.0)	USA	Community sample over age 60
Sutherland et al (2009)	25	64	82.7 (8.0)	USA	Women in university community; healthy controls in study of chemical dependency
Kavirajan et al (2011)	25	1,151	76.1 (12.6)	USA	Postmenopausal women in community
Goins et al (2012)	25	160	83.0 (13.4)	USA	Federally recognized Native American tribe
Yu et al (2009)	25	560	65.4 (13.9)	China	Community sample
Yu et al (2009)	25	326	71.0 (11.3)	China	Parents (healthy controls in a study of autism)
Peng et al (2012)	25	1,998	61.7 (10.6)	China	Medical Students
Ni et al (2015)	25	10,997	60.0(13.9)	China	Hong Kong general population
Zhong et al (2016)	25	214 215	64.8(13.8) 62.3(15.0)	China	Elderly (>60 years) community sample no mental illness or cognitive problems
Wu et al (2017)	25	3960	63.4(13.1)	China	New employees in Chinese communities
Ha et al (2009)	25	143	66.8 (12.7)	Korea	Healthy volunteers
Faria et al (2010)	25	421	73.4 (12.0)	Portugal	Community sample Lisbon
Solano & Neto (2012)	25	103	75.4 (72.6,78.3, 95% CI)	Brazil	Family member normative controls of subjects with chronic pain
Alemi et al (2018)	25	232	60.5 (13.9)	Afghanistan	Community sample of young adults 18-35
Ziaian et al (2012)	25	53 35 82	60 69 67	Australia	Refugees from Africa, Yugoslavia, Middle East
Liu et al (2015)	25	1,892 2,062 1,826	71.5 (12.5) 71.4 (13.4) 73.4 (13.6)	Australia	Australian community cohort - three age groups 28-32, 48-52 and 68-72
Law et al (2014)	25	79	71.3 (10.8)	Australia	Centenarians

Table 1b. Mean (SD) CD-RISC 10-Item Scores in General Population Samples

Authors	Scale	Number	Mean (SD)	Location	Comments
Davidson (2003)	10	458	32.1 (5.8)	USA	National random digit dial sample
Campbell-Sills et al (2008)	10	764	31.8 (5.4)	USA	Community random digit dial sample in Memphis
Goins et al (2012)	10	160	33.5 (6.2)	USA	Federally recognized Native American tribe
Jeste et al (2013)	10	1,006	30.8(7.0) to 32.1(6.2) range by age group	USA	Community sample of older people ages 50-99
Levasseur et al (2017)	10	4541	31.0 (0.1) 32.0 (0.1)	Canada	Older age community sample
Faria et al (2011)	10	421	29.3 (5.7)	Portugal	Community sample Lisbon
Lopes and Martins (2011)	10	463	29.1 (5.5)	Brazil	Adult sample
Antunez et al (2015)	10	1,922	29.0 (0.1)	Spain	Adult sample

Table 1c Mean (SD) CD-RISC 2-Item Scores in General Population Samples

Authors	Scale	Number	Mean (SD)	Location	Comments
Vaishnavi et al (2008)	2	458	6.91(1.5)	USA	National random digit dial sample
Lee et al (2008)	2	1,969	6.47 (1.37)	USA	National RDD violent trauma sample different from above
Campbell-Sills et al (2008)	2	764	6.62(1.33)	USA	Community random digit dial in Memphis
Faria et al (2011)	2	421	6.50 (1.23)	Portugal	Community sample Lisbon
Ni et al (2015)	2	10,997	5.03(1.37)	China	Hong Kong general population
Rapacciuolo et al (2016)	2	571	5.87(1.69)	Italy	Community sample of over 60 years age in Naples

Adolescents, Students and Young Adults: There have been a number of reports from children, adolescents, university students and young adults, summarized in [Table 2](#). Scores ranged in one South African study from 56.3 (19.4) - 71.1 (15.8) according to ethnic group (Jorgensen and Seedat, 2006), and were 65.9 (18.5) in another South African study (Bruwer et al, 2008). In a third South African study, Fyncham et al (2009) reported the mean score to be 63.7 (15.9) in over 700 students of mean age 16.7 years. An Iranian study of undergraduates revealed a mean score of 68.3 (17.5) (Khoshouei, 2009). In young Australian adults and undergraduates (Benetti & Kambouropoulos, 2008), the mean score was 68.3 (12.3). Clauss-Ehlers and Wibrowski (2007) studied a group of high school graduates transitioning to college, and reported a mean (sd) CD-RISC score of 73.1 (14.1) before a preparation course.

Russian schoolchildren (mean age 13 years) who survived a terrorist attack had a mean score of 70.1 (14.0) (Vetter et al, 2010). Dutch undergraduate students (mean age 19.6 years) showed a mean score of 66.4 (10.8).

Incoming college students in Texas had a mean score of 67.7 (10.0) before a four-week resiliency program (Steinhardt and Dolbier, 2008).

Ito et al (2009) have reported a mean (sd) CD-RISC score of 55.8 (14.8) in Japanese university students (mean age 20.1), and 64.3 (16.7) in adults (mean age 38.9) who took a university course.

In 79 Dutch undergraduate volunteers (mean age 19.6 years), the mean CD-RISC score was 66.4 (10.8) (Giesbrecht et al, 2009), while in a later study from the same country, the mean score was 63.9 (14.2) (Markovitz et al, 2014).

Otto and colleagues (2010) studied 856 college students in Arizona, average age 18.9, and found the mean CD-RISC score to be 72.9 (13.5).

A cohort of 220 first year psychology students yielded a mean score of 28.0 (5.7) on the CD-RISC 10 (Shlomi, 2010).

A somewhat older college population (n=51, mean age 31.2 years) was studied 19 months following a major earthquake in Pakistan. The mean CD-RISC score was 81.2 (12.3) (Ahmad et al, 2010).

A group of 401 Australian university students, mean age 23.6, demonstrated a mean CD-RISC score of 69.1 (13.4) (Bitsika et al, 2010).

Among 2,914 Chinese adolescents (mean age 14.4, range 13-17) sampled in Chengdu following a major earthquake, the total score mean was 69.6 (13.2 sd) (Yu et al, 2011).

In a Canadian study of homeless youth (mean age 18.2, range 15-21), resilience was higher in those with the longest period of homelessness, and was a significant protector against suicidal ideation (Cleverley and Kidd, 2011).

In a group of 190 Singaporean adolescents, the mean scores were 71.1, 27.9 and 5.76 for the 25-, 10- and 2-item scales (Lim et al, 2011).

Brown and Tylka (2011) observed a mean score of 76.0 (13.2) in 290 African American students.

Notario-Pacheco et al (2011) reported good psychometric properties for the CD-RISC 10 in Spanish university students. The mean score was 27.4.

Stephens (2012) evaluated 70 adolescent nursing students, grouped by whether they were randomized to a treatment or non-treatment cohort. Their mean baseline scores were 75.2 and 74.5.

Hartley (2012) assessed a student counseling clinic sample of college students with a history of mental illness (n=121) and a group of classroom subjects (n=605). Significantly lower RISC-10 scores were noted in the

former group: 19.6 (8.2) vs. 30.1 (5.2). The 10-item scale performed better than the 25-item scale in this study.

Ziaian et al (2012) studied 170 refugees from Bosnia, Serbia, Iran, Iraq, Afghanistan, Sudan and Liberia, and found a low mean CD-RISC score (62.2). Significantly lower scores were observed in males, recent arrivals and those with depression or behavior disturbance. Exposure to trauma and area of origin were not factors that affected level of resilience.

These and other scores are summarized in [Tables 2a-c](#).

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Table 2a. Mean (SD) CD-RISC 25-Item Scores in Students and Young Adults

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Clauss-Ehlers and Wibrowski (2007)	25	95	73.1 (14.1)	USA	High school graduates
Steinhardt and Dolbier (2008)	25	27 30	70.6 (12.3) 67.7 (10.0)	USA	College freshmen undergoing either treatment or control group
Otto et al (2010)	25	856	72.9 (13.5)	USA	College students
Johnson et al (2011)	25	45 M 43 F	77.8(10.3) 73.6(11.0)	USA	College students in a study of alcohol use habits
Hartley (2011)	25	605	75.7(11.9)	USA	Undergraduate students
Brown and Tylka (2011)	25	290	76.0(13.2)	USA	African American students
Stephens (2012)	25	70	74.5 75.2	USA	Nursing students control group Nursing students pre treatment
Bezdjian et al (2016)	25	53,672	83.6(11.0)	USA	Air Force recruits (mean age 20.1 yrs)
Wamser-Nanney et al (2017)	25	429	69.8 (17.6)	USA	Trauma-exposed college students mean age 19
Benetti and Kambourooulos (2008)	25	240	64.3 (12.3)	Australia	Adult undergraduates
Bitsika et al (2010)	25	401	69.1 (13.4)	Australia	University students
Gucciardi et al (2011)	25	199	73.0 (10.9)	Australia	Teenage cricketers
Ziaian et al (2012)	25	170	62.2 (20.40)	Australia	Adolescent refugees
Pidgeon and Keye (2014)	25	141	90.7 (12.6)	Australia	University students
Innes (2016)	25	194	65.0(12.9)	Australia	Chiropractic students
Jorgensen and Seedat (2006)	25	701	64.8 (18.9)	South Africa	School sample adolescents
Bruwer et al (2008)	25	502	65.9 (18.6)	South Africa	Convenience sample of high school students mean age 16.2
Rogers (2016)	25	62	77.4	South Africa	Clinical associate students
Fyncham et al (2009)	25	787	63.7 (17.9)	South Africa	Secondary school sample
Yu et al (2011)	25	2,914	69.6 (13.2)	China	Adolescent earthquake survivors
Peng et al (2012)	25	1,998	61.7 (10.6)	China	Medical students
Fu et al (2013)	25	2,132 1,988	50.5 (19.9) 50.2 (19.5)	China	Adolescent and child survivors of earthquake
Chen et al (2014)	25	32	49.3 (6.5) 52.7 (17.9)	China	Adolescent earthquake survivors who lost a parent: pre-treatment scores
Shi et al (2016)	25	2,968	68.2 (14.3) 70.4 (14.4)	China	College freshmen "left behind" College freshmen controls
Lü et al (2016)	25	82	63.5 (18.7)	China	Healthy college students
Lu et al (2017)	25	474	57.9 (13.2)	China	Community sample of elderly adults
Chen et al (2018)	25	310	64.3 (13.2)	China	College students
Khoshouei et al (2008)	25	323	68.3 (17.5)	Iran	Undergraduates
Ebrahimi et al (2012)	25	100	58.1 (7.4)	Iran	University students
Zakiei et al (2017)	25	260	80.9	Iran	University students
Ameen & Cinkara (2018)	25	223	63.7 (12.0)	Iraq	Adolescent refugees Syria and Iraq
Ameen (2018)	25	143	54.7 (10.3)	Iraq	Displaced adolescents Iraq
Ito et al (2009)	25	220 434	55.8 (14.8) 64.3 (16.7)	Japan	Undergraduates mean age 20 Undergraduates mean age 39
Sidheek et al (2017)	25	606	61.6 (13.5)	India	Low income girls ages 16-18
Allan et al (2014)	25	1,534	75.1 (12.8)	England	University freshmen
Giesbrecht et al (2009)	25	79	66.4 (10.8)	Netherlands	Undergraduates
Markovitz et al (2014)	25	254	63.9 (14.1)	Netherlands	Dutch students

Vetter et al (2010)	25	94	70.1 (14.0)	Russia	Schoolchildren ages 10-16 who survived a terrorist attack in Ossetia, some of whom had PTSD
Cleverley and Kidd (2011)	25	47	60.9 (18.9) 53.1 (19.0)	Canada	Homeless youth (male) Homeless youth (female)
Lim et al (2011)	25	190	71.13	Singapore	Adolescents mean age 12.8 (range 12-16)
Kang et al (2013)	25	321	67.2 (12.7)	Korea	College students

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Table 2b. Mean (SD) CD-RISC 10-Item Scores in Students and Young Adults

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Campbell-Sills et al (2007)	10	131	27.2 (5.8)	USA	College undergraduates
Hartley (2012)	10	605	30.1 (5.3)	USA	Normative student sample
Jones et al (2017)	10	39	33.5(18.4) 24.1(6.3) 26.4(18.3)	USA	Juvenile male healthy controls Juvenile sexual offenders Juvenile child sexual abuse offenders
Reyes et al (2017)	10	20	31.8 (5.3)	USA	Student veterans
Shlomi (2010)	10	220	28.0 (5.7)	Canada	Psychology students
Rahimi et al (2014)	10	155	28.8 (4.4) 31.2 (5.2)	Canada	Medical students – female < male scores
Lim et al (2011)	10	190	27.88	Singapore	Adolescents mean age 12.8 (range 12-16)
Lee et al (2016)	10	1094	25.8 (8.0) 30.8 (9.2) 26.3 (8.0) 24.2 (7.3)	Korea	All students (n=1094) Morning type (n=52) Intermediate type (n=656) Evening type (n=350)
Skrzypiec et al (2018)	10	2050	29.3 (7.3)	China	School pupils aged 10-15
Chow et al (2018)	10	678	24.0 (5.7)	China/Hong Kong	Student nurses
Notario-Pacheco et al (2011)	10	681	27.4 (6.4)	Spain	University first year students mean age 20.1 (18-30)
Markovitz et al (2014)	10	254	25.7 (6.8)	Netherlands	Dutch students
Leventhal et al (2015)	10	1,730 737	20.8 22.2	India	Rural schoolgirl population mean age 12.9 years
Mathad et al (2017)	10	194	26.3(6.3)	India	Nursing students
Montero-Marin et al (2014)	10	314	27.8 (6.7)	Spain	Dental students
Farkas & Orosz (2015)	10	465	28.0 (0.6)	Hungary	Students
Orosz et al (2018)	10	343	28.2	Hungary	High school and university students
DiFabio & Saklofske (2014)	10	164	24.8 (6.2)	Italy	High school students
Aloba et al (2016)	10	449	26.7	Nigeria	Student nurses
Chamberlain et al (2016)	10	240	32.0 (5.7)	Australia	Third year student nurses

Table 2c. Mean (SD) CD-RISC 2-Item Scores in Students and Young Adults

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Lim et al (2011)	2	190	5.76	Singapore	Adolescents mean age 12.8 (range 12-16)
Markovitz et al (2014)	2	254	5.61 (1.44)	Netherlands	Dutch students
Lu et al (2016)	2	218	6.46 (1.72)	Taiwan	Student athletes
Heo et al (2018)	2	1866	5.6 (1.7)	Korea	Adolescents in school system

Psychiatric Groups: Mean (SD) scores in a range of psychiatric groups are listed in [Tables 3, 4, and 5](#). These have been grouped into PTSD/Severe trauma, depression/suicide, and other diagnoses.

Several studies have examined the CD-RISC in populations with posttraumatic stress disorder (PTSD) (see [Tables 3a-c](#)). It is evident that

scores in those with PTSD are much below the normative population scores. One study in China assessed cutoff scores using ROC curves in 115 rehabilitation patients, and found that scores of 45.5 and 19.5 for the CD-RISC-25 and CD-RISC-10 respectively provided best discrimination at AUC values of 0.76 and 0.78. The CD-RISC-2 failed to separate (Peng et al, 2014), but did discriminate between groups in a Korean study of firefighters (Jeong et al, 2015).

Table 3a. Mean (SD) CD-RISC 25-Item Scores in Post-Traumatic Stress Disorder & Subjects Exposed to Severe Trauma

Authors	Scale	Number	Mean (SD)	Location	Comments
Connor et al (2003)	25	22	47.8 (19.5)	USA	Treatment seeking cases
Connor et al (2003)	25	22	52.8 (20.4)	USA	Treatment seeking cases
Davidson et al (2007)	25	100 94	57.0 (16.0) 54.2 (16.2)	USA	Tiagabine group pre-treatment Placebo group pre-treatment
Morey et al (2009)	25	20	66.7 (15.8)	USA	OIE/OEF veterans
Mansfield et al (2011)	25	1,843 1,226	76.2 (16.0) 72.8 (16.6)	USA	Navy personnel Marines All were mandatory pre-separation assessments
Tsai et al (2012)	25	86 76	59.6 (19.1) 72.0 (14.3)	USA	OEF/OIF Veterans with PTSD Other Rx seeking OEF/OIF veterans
Anderson and Bang (2012)	25	52 16	74.2 (15.0) 61.1 (14.7)	USA	Asymptomatic abuse survivors Abuse survivors with PTSD
Krystal et al (2014)	25	20	62.0 (19.8)	USA	PTSD civilian clinical trial sample
Green et al (2014)	25	1,981	72.7 (18.4)	USA	Post 9/11 US veterans
Asnaani et al (2015)	25	118	68.4 (20.7)	USA	PTSD clinical sample with nicotine withdrawal
Elliott et al (2015)	25	127	80.9(14.0) 61.8(21.5) 61.9(18.9)	USA	Resilient cluster – OEF/OIF veterans Overcontrolled cluster Undercontrolled cluster
Davidson et al (2006)	25	161	55.7 (18.4)	International	Prior to receiving drug
Davidson et al (2006)	25	168	53.0 (17.2)	International	Prior to receiving placebo
Thabet et al (2011)	25	99	81.9 (18.0)	Gaza	Women survivors of domestic abuse: not all had PTSD
Mehta et al (2018)	25	48 48	68.2 (1.2) 79.1 (0.9)	Australia	Non-PTSD combat veterans PTSD combat veterans
Connell et al (2013)	25	54	72.1 (12.2)	South Africa	Combat veterans, 33% with PTSD
Marx et al (2017)	25	22 31	60.8 (15.4) 80.7 (11.1)	South Africa	PTSD – psychiatric patients Healthy controls
Blanc et al (2016)	25	167	66.4 (18.4)	Haiti	Earthquake survivors
Tsuno et al (2014)	25	825	48.5 (16.1)	Japan	Government employees exposed to East Japan Earthquake
He et al (2013)	25	410	67.8 (11.7)	China	Burn injury patients
Ying et al (2014)	25	788	55.0	China	Adolescent (12-19 years) earthquake survivors
Chen et al (2014)	25	32	51.8 (13.2) 49.3 (6.5) 52.7 (17.9)	China	Bereaved adolescent earthquake survivors assigned to three treatment groups

Ni et al (2015)	25	495		China	Sichuan earthquake survivors five years follow-up
Zhang et al (2017)	25	222	56.9(16.0)	China	Parents bereaved of their only child. Randomized stratified community sample Changsha
Ssenyonga et al (2013)	25	426	51.9 (15.0) PTSD 51.5 (17.8) No PTSD	Uganda	Congolese refugees with and without PTSD
Ameen	25	143	54.7 (17.1)	Iraq	Adolescents displaced and/or loss of home and family
Ghisi et al (2013)	25	76	61.3 (17.3) 74.2 (10.0)	Italy	Industrial accident victims (39% with PTSD) and matched controls
Brunetti et al (2017)	25	19 19	66.7 (8.9) 72.2(13.9)	Italy	PTSD Trauma +ve/No PTSD
Fu et al (2013)	25	2,132 1,988	50.5 (19.9) 50.2 (19.5)	China	Child and adolescent survivors of Sichuan earthquake. Mean age 11.7 years (range 6-16). Control and intervention groups were studied.
Bhattarai et al (2017)	25	82	64.8(14.0)	Nepal	Earthquake survivors with spinal cord injury
Kukihara et al (2014)	25	241	50.8 (19.6)	Japan	Older adult survivors of Fukushima earthquake, tsunami and nuclear accident; 53% PTSD and 67% depression
Jeon et al (2017)	25	10	50.0 (15.8) 57.6 (18.3)	Korea	Ferry sinking survivors before and after treatment

Table 3b. Mean (SD) CD-RISC 10-Item Scores in Post-Traumatic Stress Disorder & Subjects Exposed to Severe Trauma

Authors	Scale	Number	Mean (SD)	Location	Comments
Grattan et al (2011)	10	71	29.1 (6.1)	USA	Deepwater Horizon Oil Spill
	10	23	29.9 (5.9)	USA	
	10	47	30.0 (6.5)	USA	
	10	47	28.5 (5.5)	USA	
Melvin et al (2012)	10	60	31.0 (6.5)	USA	Combat veteran couples
McCanlies et al (2014)	10	114	29.9 (6.3)	USA	Police officers post Hurricane Katrina
Rainey et al (2014)	10	110	31.3	USA	Traumatic injury; hospitalized patients
Pietrzak et al (2014)	10	1,686	30.3 (6.6)	USA	National sample of older veterans age 60-96
Wingo et al (2017)	10	246	23.6(7.9)	USA	Veterans with PTSD and depression
Davidson et al (2008)	10	329	20.1	International	Prior to drug treatment
			19.9	International	Prior to receiving placebo
Klasen et al (2010)	10	330	22.7 (8.3)	Uganda	Former child soldiers aged 11-17
Tran et al (2013)	10	84	25.9 (6.7) 31.1 (6.1)	Austria	WW II survivors with PTSD WW II survivors without PTSD
Wang et al (2010)	10	341	24.8 (7.4)	China	Earthquake survivors – whole group PTSD group Non-PTSD controls
			20.8 (6.3)		
			26.8 (6.3)		
Wu et al (2015)	10	318	24.8 (7.5)	China	Earthquake survivors (Results given in paper based on 1-5 scoring algorithm, and are corrected here)
Duan et al (2015)	10	95	25.5 (4.9)	China	University students with PTSD and posttraumatic growth
Okuyama et al (2014)	10	1,973	20.5 (0.7)	Japan	Adolescent survivors of Great East Japan Earthquake

Table 3c. Mean (SD) CD-RISC 2-Item Scores in Post-Traumatic Stress Disorder & Subjects Exposed to Severe Trauma

Authors	Scale	Number	Mean (SD)	Location	Comments
Davidson et al (2008)	2	329	4.53	International	Prior to receiving drug Prior to receiving placebo
			4.56	International	
Jeong et al (2015)	2	222	6.0 (1.2)	Korean firefighters	Control group PTSD or depression alone PTSD with depression
			5.1 (1.5)		
			4.4 (1.5)		
Langhinrichsen-Rohling et al (2017)	2	120	3.94 5.66 6.03	USA primary care/behavioral health	PTSD PTSD possible PTSD unlikely

Eight studies looked at depression and five studies have examined resilience scores in relation to a history of suicide attempts or ideation. In depression, the scores have ranged from 39-63, perhaps affected by the sample, phase of illness and level of recovery at the time of assessment. Minor depression was associated with scores intermediate between wellness and major depression.

Those who went on to respond poorly to treatment had lower scores than did those who responded well (Camardese et al, 2007). A small study of 9 outpatients with depression and/or anxiety prior to group therapy showed a very low mean CD-RISC score of 39.0 (12.2) (Dodding et al, 2008). Their non-symptomatic significant other partners (n=11) scored 62.8 (11.7).

In a sample of abstinent substance abusers who either had, or had not, attempted suicide, the mean scores were 49.8 and 62.7 respectively (Roy et al, 2006). Subsequent studies comparing suicide-attempters (SA) with non-attempters have consistently found lower CD-RISC scores in the former group. Nruham et al (2010) found Norwegian schoolchildren with depression and a history of SA showed lower resilience (55.4 (13.4) than depressed adolescents with no SA (62.4 (13.6). In veterans of OIF and OEF, Pietrzak et al (2009b) reported scores of 60.9 (2.8 s.e.) in those with SA and 75.5 (1.0 s.e.) in those without such history. In 903 Italian prisoners, the CD-RISC score was lower among those with a history of SA (56.4 (16.0)) than in those without (65.1(13.1)) (Sarchiapone et al, 2009). Liu et al (2014) found that low CD-RISC scores predicted suicide attempts in a large community sample.

These scores are summarized in [Table 4](#).

Table 4a. Mean (SD) CD-RISC 25 Scores in Subjects with Depression, Suicide Attempts or Suicidality

Authors	Scale	N	Mean (SD)	Location	Comments
Davidson et al (2005)	25	41	57.1 (13.3)	USA	Major depression outpatient sample
Pietrzak et al (2009b)	25	34	60.9 (2.8 se)	USA	Suicide attempting OIF/OEF veterans
Vahia et al (2010)	25	401 137	71.7 (12.5) 63.4 (14.7)	USA	Community sample post-menopausal women with sub threshold depression Community sample post-menopausal women with major depression
Lavretsky et al (2010)	25	20 20	60.2 (16.7) 66.6 (17.7)	USA USA	Alzheimer's Caregivers Alzheimer's Caregivers
Lavretsky et al (2011)	25	36 37	60.5 (14.0) 56.9 (13.4)	USA	Depressed older subjects to receive tai chi or health education
Laird et al (2018)	25	337	58.2 (16.0)	USA	MDD in older subjects mean age = 70.4
Soczynska et al (2017)	25	29 46	43.3 (15.3) 57.1 (19.1)	Canada	Depressed bipolar Euthymic bipolar
Singh et al (2014)	25	90	77.4 CT 55.5 RA 47.7 DP	India	Psychogeriatric and medical geriatric OP sample. Depression < Rheumatoid arthritis < Healthy controls
Roy et al (2006)	25	41	49.8	Italy	Suicide attempting substance abusers

Camardese et al (2007)	25	102	53.3 (15.2) 41.2 (19.5)	Italy	Major depression which responded to treatment Depression which failed to respond.
Roy et al (2007)	25	30	39.7 (3.7 se)	Italy	Suicide attempting substance abusers, some with history of depression
Sarchiapone et al (2009)	25	131	56.4 (16.0)	Italy	Prisoners with history of suicide attempt
Bauriedl-Schmidt et al (2017)	25	45	71.7(13.9) 48.5(20.3) 44.3(17.1)	Germany/ Austria	Healthy controls > Chronic and episodic depression; chronic = episodic depression
Min et al (2012)	25	80	46.1 (18.7)	Korea	Major depression, dysthymia or depression NOS
Seok et al (2012)	25	52	43.9 64.9	Korea	Major depressive disorder Healthy controls
Min et al (2013)	25	230	47.4(20.2)	Korea	Outpatients with depression and/or anxiety disorder
Um et al (2014)	25	254	46.0 (20.8)	Korea	Depressed outpatients
Choi et al (2015)	25	62 62	60.5 72.8	Korea	Euthymic bipolar disorder patients Healthy controls
You & Park (2017)	25	2034	50.2(15.9)	Korea	Community sample of elders: in men high CD-RISC score protected against suicidal behavior
Ristevska-Dimitrovska et al (2015a)	25	218	79.1 68.2 56.4	Macedonia	Not depressed breast cancer Subthreshold depression breast cancer Major depression breast cancer
Dodding et al (2008)	25	9	39.0 (12.2)	Australia	Major depression
Nrugham et al (2010)	25	76 176	55.4 (13.4) 62.4 (13.6)	Norway	Depressed teenagers with history of suicide attempt Depressed subjects without suicide history
Lewis et al (2017)	2	697	5.8(1.7)	England	Subthreshold depression in primary care

Table 4b. Mean (SD) CD-RISC-10 and CD-RISC-2 Scores in Subjects with Depression, Suicide Attempts or Suicidality

Authors	Scale	n	Mean (SD)	Location	Comments
Poole et al (2017a)	10	277 3413	22.3(7.6) Dep 31.0 Non-dep	Canada	Primary care
Lewis et al (2017)	2	697	5.8(1.7) Subthr depression	England	Primary care

CD-RISC scores have been reported in subjects with other psychiatric disorders or pathology, including generalized anxiety, generalized social anxiety, substance use problems, bipolar disorder, pain, insomnia and schizophrenia, as shown in [Tables 5a](#) and [5b](#).

Table 5a. Mean (SD) CD-RISC 25-Item Scores in Groups with Other Psychiatric Disorders

Authors	Scale	Number	Mean (SD)	Location	Comments
Connor et al (2003)	25	24	62.4 (10.7)	USA	Generalized anxiety disorder
Simon et al (2009)	25	103	48.7 (15.6)	USA	Generalized social anxiety disorder
Sutherland et al (2009)	25	64	63.8 (17.7)	USA	Chemical dependency
Elliott et al (2016)	25	127	81.0(14.0) 61.9(18.6) 61.8(21.4)	USA	Resilient personality Undercontrolled personality Overcontrolled personality
Baslet et al (2017)	25	46	55.9 (18.1) 67.8 (17.3)	USA	Psychogenic seizures & altered responsiveness Psychogenic seizures & no altered responsiveness
Roy et al (2006)	25	59	62.7	Italy	Abstinent substance abusers
Roy et al (2007)	25	70	62.9 (2.5 se)	Italy	Abstinent substance abusers
Carli et al (2011)	25	1,420	64.3 (14.7)	Italy	1,427 prisoners, 568 with insomnia – RISC was lower in the insomnia group (data not given).
Carli et al (2013)	25	1,356	65.1 (14.1)	Italy	Male prisoners – 51% with Axis I disorder (Substance use disorder in 39%)
Callegari et al (2016)	25	91 56 50	66.2(1.3se) 62.4(1.6) 56.4(1.7)	Italy	Older adults in community In nursing home Psychiatric nursing home group – mainly depressed or psychotic
Deane and Andresen (2006)	25	24	60.3 (18.5)	Australia	Schizophrenia
Deane and Andresen (2006)	25	119	63.0 (18.3)	Australia	Schizophrenia
Hansen and Thomassen (2010)	25	15	57.1 (14.4)	Norway	Schizophrenia
Torgalsbøen (2012)	25	15	61.3 (13.3)	Norway	Schizophrenia in recovery or remission
Bozikas et al (2016)	25	48 81	61.6(21.0) 71.2(10.4)	Greece	Schizophrenia spectrum Healthy controls
Jafari et al (2010)	25	27	53 (10) 52 (5)	Iran	Males with substance dependence
Zakiei et al (2017)	25	260	80.9	Iran	University students assessed for obsessive-compulsive personality disorder
Min et al (2012)	25	41	53.6 (21.0)	Korea	GAD, panic, OCD, SAD mostly
Solano & Neto (2012)	25	108 41	57.7 52.1	Brazil	Anxiety Borderline Personality Disorder
Schibalski et al (2017)	25	676	61.1(12.7)	Germany	Elevated psychiatric symptoms in representative population survey
Obbarius et al (2018)	25	521	56.1 (17.2)	Germany	Psychosomatic disorder patients
Jiao et al (2016)	25	208	57.6 (15.9)	China	Methadone maintenance treatment patients
Lee et al (2016)	25	68 68	60.5 (18.4) 69.3 (11.1)	China	Euthymic bipolar disorder patients Healthy controls
Hoseiny et al (2015)	25	30 30	38.1 (2.2) 37.1 (3.3)	Iran	Opiate dependence
Marulanda and Addington (2014)	25	40 40	59.2 (15.0) 70.6 (11.5)	Canada	High risk for psychosis College student controls
Marx et al (2017)	25	40 31	58.2 (17.2) 80.7 (11.1)	South Africa	Social anxiety disorder psychiatric patients Healthy controls

Table 5b. Mean (SD) CD-RISC 10-Item Scores in Groups with Other Psychiatric Disorders

Authors	Scale	Number	Mean (SD)	Location	Comments
Hartley (2012)	10	121	19.6 (8.2)	USA	Student counseling clinic sample
Lee et al (2018)	10	110 92	23.4 (8.2) 33.1 (5.7)	USA	Schizophrenia Healthy controls
Solano et al (2016)	10	575	25.8(9.1)	Brazil	Psychiatric outpatients
Poole et al (2017b)	10	606 3100	24.7(7.3) 31.4(6.4)	Canada	High vs not high anxiety on GAD-7 in primary care patients

Table 5c. Mean (SD) CD-RISC 2 Item Scores in Groups with Other Psychiatric Disorders

Authors	Scale	Number	Mean (SD)	Location	Comments
Draper et al (2014)	2	210	5.9 (2.0)	Australia	Geriatric in- and outpatients; 36% depressed

Mean CD-RISC scores have been reported as follows: generalized anxiety disorder 62.4 (10.7) (Connor and Davidson, 2003); PTSD 47.8 (19.5), 52.8 (20.4) (Connor and Davidson, 2003), 55.7 (18.4), 53.0 (17.2) (Davidson et al, 2006) and 66.7 (15.8) (Morey et al, 2008).

In a group of Korean patients with GAD or panic mostly, the mean CD-RISC was 53.6 (21.0) (Min et al, 2012). A later study by that group found lower scores in depression and/or anxiety (Min et al, 2013).

Bipolar patients with depression scored lower than euthymic bipolar patients (Soczynska et al, 2017).

In a geriatric group, community subjects had higher resilience scores than did a nursing home cohort, and the lowest scores were found in a third group of psychogeriatric nursing home patients, with depression, psychosis, personality disorder or dementia (Callegari et al, 2016).

In two groups of Australian patients with schizophrenia (mainly), corrected mean scores were 60.3 (18.4) and 63.0 (18.3) (Deane and Andresen, 2006; Andresen et al, 2006). (*Note comment on required scoring corrections in these two publications in citations section below*). A small cohort of recovered or remitted patients with schizophrenia was studied by Torgalsbøen in Norway, and found to have a mean CD-RISC score of 61.3. Their scores correlated significantly with global function and global relational function. Another study from the same group found a mean score

of 57.1 in a small group of patients with schizophrenia (Hansen and Thomassen, 2010). A group of subjects at high risk for developing psychosis scored lower (59.2 (15.0)) than student controls (70.6 (11.5)), and lower RISC scores were associated with more negative symptoms and poorer role function (Mirulanda and Addington (2014). In Greece, Bozikas et al (2016) observed a score of 61.6 in schizophrenia-spectrum patients, which was lower than healthy controls (71.2). A study in the US, using the CD-RISC-10, found lower scores in schizophrenia than in healthy controls (Lee et al, 2018).

In Texas, women with chemical dependency (n=64) have lower CD-RISC scores (63.8 (17.7)) than those without (82.7 (9.0)) (n=64) (Sutherland et al, 2009).

Simon and associates (2009) reported on a cohort of 103 US patients with generalized social anxiety disorder (GSAD), and found the mean CD-RISC to be 48.7 (15.6). Lower scores on SAD (58.2) were also observed by Marx et al (2017), relative to healthy controls (80.7) in a South African cohort.

In 1,265 incarcerated Italian males, Carli et al (2010) noted the mean CD-RISC score to be 65.3 (14.1). In another cohort (n=1,420) of Italian prisoners with significant insomnia, the mean score was 64.3(14.7) (Carli et al, 2011). It is unclear whether these are two separate groups or whether there was some overlap between them. A third report by the group (Carli et al, 2013) evaluated the relationship between resilience (mean score = 65.1(14.1), aggression and impulsivity.

Treatment seeking veterans from OIF and OEF were found to have mean CD-RISC scores of 70.0 (16.5) and 50.9 (15.2) when divided into those without and those with suicidal ideation respectively (Pietrzak et al, 2010).

Green and colleagues (2010) found a mean CD-RISC score of 72.0 (17.5) in 497 veterans who had served since 9/11/2001.

Jafari et al (2010) noted low scores in Iranian males with substance dependence (medians of 53 and 52 in two groups entering treatment).

Brazilian subjects with anxiety and borderline personality disorder had mean (95% CI) scores of 57.7 (53.8-61.5) and 52.1 (44.6-59.6) (Solano and Neto, 2012).

Medical groups: Studies have been carried out in patients with a variety of medical problems, as shown in [Tables 6a-c](#).

Table 6a. Mean (SD) CD-RISC 25-Item Scores in Groups with Medical Problems

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Connor et al (2003)	25	139	71.8 (18.4)	USA	Primary care patients
Sexton et al (2009)	25	40	68.1 (14.3)	USA	Women with infertility
Steinhardt et al (2009)	25	16	83.1 (8.5)	USA	Patients with diabetes
White et al (2010)	25	42	82.2 (9.4)	USA	Spinal cord injury
Loprinzi et al (2011)	25	12 8	73.6(10.1) 78.2(10.5)	USA	Breast cancer survivors in controlled trial
McCauley et al (2013)	25	46 29	81.1(21.1) 82.5(16.7)	USA	Mild TBI Orthopedic non-head injuries
Graham et al (2013)	25	41 26	60.6(24.3) 77.7(18.8)	USA	OIF/OEF Veterans with TBI Controls without TBI
Senders et al (2014)	25	117	73.4 (15.8)	USA	Multiple sclerosis
Cohen et al (2014)	25	14 42	93 (82-93) 87 (76-95)	USA	Pre lung transplant Post lung transplant
Sexton et al (2015)	25	214	76.6(13.6)	USA	Postpartum women
Fernandez et al (2015)	25	120	72.8 (16.0)	USA	End stage liver disease – transplant candidates
Kreutzer et al (2016)	25	160	76.8(17.3)	USA	Mild TBI
Elliott et al (2016)	25	127	67.5(20.1) 70.8(19.6)	USA	TBI +ve OEF/OIF Veterans TBI –ve OIF/OEF Veterans
Hanks et al (2016)	25	67	75.9 (16.9)	USA	Mild TBI
Marwitz et al (2017)	25	192	76.8 (17.2)	USA	TBI
Park et al (2017)	25	154 102	72.2(15.0) 77.3(12.7)	USA	IBS Healthy controls
Jalilianhasanpour et al (2018)	25	50 45	63.2 (16.5) 78.7 (12.1)	USA	Functional neurological d/o Healthy controls
Reid et al (2018)	25	165	75.4 (16.4)	USA	DoD/VA with mTBI
Arbour et al (2017)	25	8 5	70 (15) 80 (4)	Canada	Young with mod/severe TBI Mid-age with TBI
McKillop et al (2017)	25	70	65.1 (16.7)	Canada	Chronic back pain patients
Shin et al (2012)	25	24 12	89.9(15.8) 89.4(11.9)	Korea	Spinal cord injury males SCI females
Min et al (2013)	25	83 69	64.5(13.1) 77.1(12.6)	Korea	Metastatic cancer with distress Cancer without emotional distress
Singh et al (2014)	25	90	77.4 HC 55.5 RA 47.7 DEP	India	Geriatric sample RA < HC; RA > DEP
Huang et al (2010)	25	345	74.9 (14.8)	Taiwan	Diabetes

De Robert et al (2010)	25	37 71	77.9 (11.5) 68.8 (12.7)	Argentina	Hypertension (HT) Non-HT control Low resilience with chronic stress increased odds for hypertension
O'Hanlon et al (2011)	25 25	27 27	72.0 (13.5) 70.1 (13.5)	UK	Parents with cleft lip/palate Control parents
West et al (2012)	25	31 36	64.9(15.4) 69.8(16.3)	Australia	Chronic pain Family controls
Guest et al (2016)	25	88	75.6 (14.8)	Australia	Spinal cord injury
Kohler & Loh (2016)	25	29	73.7(12.9)	Australia	Geriatric orthopaedic fracture patients
Solano & Neto (2012)	25	132 100 103	76.3 77.3 75.4	Brazil	Surgical OP pre-anesthesia workup Chronic pain Chronic pain group family controls
Solano et al (2016a)	25	20 24	74.0 88.5	Brazil	Colorectal cancer with depression Cancer without depression
Boell et al (2016)	25	412 191	79.8 (78.5-81.0) 67.5 (64.8-70.2)	Brazil	Type 2 diabetes Chronic kidney disease
Bodde et al (2013)	25	26	73.3(11.7)	Netherlands	Amputees with complex regional pain syndrome type 1.
He et al (2013)	25	410	67.8 (11.7)	China	Burn injury patients
Jiao et al (2016)	25	208	57.6 (15.9)	China	Methadone maintenance patients
Wu et al (2016)	25	213	61.0 (12.3)	China	Women with breast cancer
Bhattarai et al (2017)	25	82	64.8(14.0)	Nepal	Earthquake survivors with spinal cord injury
Abolghasemi et al (2013)	25	40 40	82.1 (13.0) 59.3 (14.2)	Iran	Fertility clinic male population – fertile Fertility clinic – infertile males
Derakhshanrad et al (2014)	25	63	58.4(15.5)	Iran	Stroke survivors
Derakhshanrad & Piven (2017)	25	25	74.7 (15.8)	Iran	Cognitively oriented stroke survivors
Setareh et al (2017)	25	100 100	65.1 (13.0) 57.5 (17.9)	Iran	Multiple sclerosis < resilient than healthy controls
Markovitz et al (2015)	25 25	253 211	68.8 (14.6) 68.0 (11.9)	Belgium	Breast cancer patients Healthy control women
Ristevska-Dimitrovska et al (2015a)	25	218	74.7(17.0)	Macedonia	Breast cancer patients. (see table 4 also)
Fradelos et al (2017)	25	144	65.3(17.9)	Greece	Breast cancer patients
Crosta et al (2018)	25	153	66.8 (12.1) 72.2 (9.8)	Italy	Psoriasis patients Healthy controls
Dubey et al (2015)	25	68	74.4 (12.6)	Switzerland	Cancer patients
Spies and Seedat (2014)	25	95	81.7	South Africa	Women with HIV
Roos et al (2014)	25	142	69.5 (17.2)	South Africa	Pregnant women at antenatal clinic

Table 6b. Mean (SD) CD-RISC 10-Item Scores in Groups with Medical Problems

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Wingo et al (2010)	10	792	34.0 (median) (0-40 range)	USA	Primary care/gynecology groups
Dodd (2010)	10	102	32.4(5.4)	USA	Inpatients in rehabilitation post injury

Wrenn et al (2011)	10	233 534	30 (12) median 35 (8) median	USA	PTSD primary care patients Non-PTSD primary care patients
Mascolini (2012)	10	42 20	27.0 31.0	USA	HIV positive older subjects HIV negative older subjects
Bradley et al (2013)	10	971	31.6(7.7)	USA	African-American OB/GYN outpatients
Lukow et al (2015)	10	96	22.0 (8.8)	USA	Mild to severe TBI
Rosenberg et al (2015)	10	1,782	31.4(6.6)	USA	Hematopoetic cell transplantation survivors
Dale et al (2014a)	10	138	28.3(7.8)	USA	HIV+ve women
Dale et al (2014b)	10	85	29.3(7.8)	USA	HIV+ve women
Terrill et al (2016)	10	1862	28.0(7.1)	USA	Long term physical disabilities
Battalio et al (2016)	10	1574	29.0(7.0)	USA	Neurological disabilities – internet sample
Carlsen et al (2017)	10	73	30.4(5.5)	USA	Adolescents with IBD
Koelmel et al (2016)	10	163	26.8(6.2)	USA	Multiple sclerosis
Scali et al (2012)	10	238	27 (22-32 1,3Q)	France	Mammography subjects with and without breast cancer
Matzka et al (2016)	10	343	29.3(7.0)	Austria	Cancer patients
Kilic et al (2013)	10	60	29.5(7.2)	Australia	Spinal cord injury
Li et al (2016)	10	231	26.9 (6.6)	China	Pregnant women
Hayter & Dorstyn (2013)	10	97	25.6(8.1)	Australia	Spina bifida
Black & Dorstyn (2013)	10	196	27.0(7.1)	Australia	Multiple sclerosis
Lyons et al (2016)	10	357	27.0(7.7)	Australia	HIV+ve men
Seib et al (2018)	10	278	30 median	Australia	Women with cancer
Markovitz et al (2014)	10 10	101 107	27.6 (5.9) 27.4 (6.8)	Belgium Belgium	Breast cancer patients Control women
Notario-Pacheco et al (2014)	10	191	24.7(10.8)	Spain	Fibromyalgia
McGlone (2010)	10	27	29.3(6.2)	Canada	Epilepsy
Poole et al (2016)	10	3836	30.3(7.1)	Canada	Primary care population
Walsh et al (2018)	10	241	29.0 (7.5)	Ireland	Post treatment for prostate cancer
Sharma et al (2018)	10	131	27.0 (7.0)	Nepal	Chronic pain

Table 6c. Mean (SD) CD-RISC 2-Item Scores in Groups with Medical Problems

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Vinaccia and Quiceno (2011)	2	40	6.8 (1.8)	Colombia	COPD
Vinaccia et al (2012)	2	40 41	7.5 (1.0) 7.0 (1.4)	Colombia	Chronic kidney disease Rheumatoid arthritis
d.Emden et al (2017)	2	151	6.1(1,5)	Australia	Type 1 diabetes
Markovitz et al (2014)	2	101 110	6.2 (1.2) 5.9 (1.5)	Belgium Belgium	Cancer patients Control women

A primary care sample in North Carolina was found to have a mean (sd) CD-RISC score of 71.8 (18.4) (Davidson and Connor, 2003). Seven hundred ninety two mainly African American gynecological or primary care outpatients were studied by Wingo et al (2010) in the US. Using the CD-RISC 10, the authors found a median score of 34 (range 0-40). The same group reported a median score of 30 in 233 PTSD cases among inner city primary care patients who had been exposed to trauma, compared to a median score of 35 in the non-PTSD group, a significant difference ($p < 0.0001$) (Wrenn et al, 2011).

Sexton et al (2009) studied infertility in 40 women, and reported a mean score of 68.1 (14.3), with the scale proving to be reliable and valid, showing convergent validity against other measures, and correlating positively with active coping.

In African American diabetics, the mean resiliency score was 83.1 (8.5) (Steinhardt et al, 2009). Huang (2010) studied 345 diabetic patients in Taiwan, and found the mean CD-RISC score to be 74.9 (14.8).

Forty-two patients with spinal cord injury showed a mean CD-RISC 25 score of 82.2 (9.4) (White et al, 2010).

Inpatients in rehabilitation after injury reported a mean score of 32.4 (5.4) on the CD-RISC 10 (Dodd, 2010).

Shin (2010) studied resilience in Korean patients with cardiovascular disease, validating their new cardiovascular resilience scale against the CD-RISC, with which it correlated.

Twenty-seven subjects with epilepsy had a mean (sd) score of 29.26 (6.23) on the CD-RISC 10 (Jeanette McGlone et al, personal communication, 4/5/10).

Parents with cleft lip or palate did not differ from a matched control group in respect of CD-RISC 25 scores, which were 72.0 and 70.1 respectively (O'Hanlon et al, 2011).

In an Australian sample, patients with chronic pain showed low resilience (64.9) compared to healthy controls (West et al, 2011).

Mascolini (2012) showed that older subjects who were HIV +ve (n=42) had lower RISC-10 scores than those who were HIV -ve (n=20) ($p=0.06$) and that resilience was lowest in the HIV +ve group with impaired activities of daily living.

West et al (2012) found that chronic pain (n=31) was associated with reduced RISC-25 scores, which were lower than a comparison group (n=36) of relatives without pain. Although the authors state that the RISC scores were “above average,” in point of fact both groups (64.9 and 69.8) scored well below the US general population mean. A Brazilian group with chronic pain and their normal control family members scored 77.3 and 75.4 respectively (Solano and Neto, 2012), which were higher than their Australian counterparts. In Nepalese earthquake survivors with spinal cord injury (SCI), those with severe pain had lower resilience than those without (Bhattarai et al, 2017).

A Korean study found high levels of resilience in 36 patients 6 months post SCI (Shin et al, 2012). Paraplegics had higher resilience than quadriplegics in a group of Nepalese earthquake survivors with SCI (Bhattarai et al, 2017).

In a US study of 75 subjects with mild TBI or other orthopedic injuries, mean CD-RISC scores were normal (81 and 82 respectively) (McCauley et al, 2013). However, in a group of veterans with mild TBI, the CD-RISC score was significantly lower than that of controls (60.6 vs. 77.7) (Graham et al, 2013), although it was affected by the 5HTTLPR genotype. A study of those with mild to severe TBI found the mean CD-RISC-10 to be substantially lower (22.0) than that of the US population (Lukow et al, 2015).

Eighty three Korean patients with metastatic cancer who were depressed and anxious according to the HADS scale, showed lower levels of resilience (64.5) compared to those (n=69) without emotional distress (77.1) (Min et al, 2013).

Studies by Dorstyn and colleagues (Hayter & Dorstyn, 2013; Black & Dorstyn, 2013), showed respectively lower scores on the CD-RISC-10 in spina bifida and multiple sclerosis respectively.

A study of amputees with complex regional pain syndrome type 1 showed that those with continuing symptoms were less resilient (median 71, IQR:

64,87) than those who were symptom free (median 81, IQR: 76,83). The authors believed that resilience might be a key factor helping amputees patient to accept and adapt to their new situation (Bodde et al, 2013).

Other studies have investigated subjects with burn injury (He et al, 2013), multiple sclerosis (Senders et al, 2014; Setareh et al, 2017), HIV+ve status (Dale et al, 2014; Spies and Seedat, 2014), and a group of patients assessed before or after lung transplantation (Cohen et al, 2014). In the last mentioned, the unusually high CD-RISC scores indicated a highly resilient group, perhaps due to the stringent selection criteria for transplant eligibility. The authors noted that resilience appeared to protect against psychological distress post-operatively.

Patients with breast cancer in a Macedonian sample were least resilient (56.4) if they had major depression, intermediate with mild depression (68.2) and highest with no depression (79.1) (Ristevska-Dimitrovska et al, 2015a).

Solano et al (2016a) found higher scores in a sample of non-depressed Brazilian patients with colorectal cancer (88.5) as compared to a depressed sample (74.0), and that resilience correlated inversely with depression and positively with measures of hope and independence. In another study from Brazil, Boell (2016) noted that patients with type 2 diabetes scored within a normal range (79.8), whereas those with chronic kidney disease were lower in resilience (67.5).

Ristevska-Dimitrovska et al (2016b) found that resilience was negatively related to severity of symptoms, side-effects of treatment, and to body image, in Macedonian breast cancer survivors; positive correlations were found relative to quality of life and functioning.

Non-treatment Seeking Trauma Survivors:

[Tables 7a-c](#) display these scores.

Table 7a. Mean (SD) CD-RISC 25-Item Scores in Non-Treatment Seeking Trauma Survivors

Authors	Scale	Number	Mean (SD)	Location	Comments
Morey et al (2009)	25	20	83.4 (9.9)	USA	Combat trauma veterans without PTSD

Pietrzak et al (2009a)	25	272	73.8 (16.1)	USA	National Guard soldiers from OIF/OEF
Pietrzak et al (2009b)	25	233	75.5 (1.0 se)	USA	OIF/OEF combat veterans
McTighe (2009)	25	139	75.7 (10.9)	USA	Social workers in the vicinity of terrorist attacks in NYC 9/11/01
New et al (2009)	25	42	80.4 (9.5) 82.0 (17.7) 62.3 (23.1)	USA	Healthy controls Trauma exposed non-PTSD PTSD
Johnson et al (2011)	25	225	71.6 (16.2)	USA	Active duty Marines
Anderson et al (2012a and b)	25	37	75.0	USA	Women who survived intimate partner abuse
Nugent et al (2012)	25	2,915	80.8 (17.1)	USA	Traumatized low income African American sample from primary care and OB-GYN clinics
Elbogen et al (2012)	25	1,388	75.1 (18.3)	USA	Iraq and Afghanistan War veterans
Youssef et al (2013b)	25	178	76.7(15.7)	USA	Iraq/Afghanistan War veterans followed for three years
Wamser-Nanney et al (2017)	25	429	69.8 (17.6)	USA	Students who experienced trauma
Brancu et al (2017)	25	3247	72.6 (18.4)	USA	Afghanistan and Iraq veterans
Daniels et al (2012)	25	70	68.9 (15.3)	Canada	Acute trauma survivors (mainly traffic accidents) seen in hospital ED
Goldstein et al (2013)	25	93	66.9 (16.1)	Canada	Young adults transitioning from welfare
Karairmak et al (2010)	25	246	70.1 (14.1)	Turkey	Earthquake survivors
Bensimon (2012)	25	500 76	67.7 (11.0)	Israel	College students exposed to trauma
Fu et al (2013)	25	2,132	51.9	China	Children ages 6-16 (mean 11.7) who survived earthquake

Table 7b. Mean (SD) CD-RISC 10-Item Scores in Non-treatment Seeking Trauma Survivors

Authors	Scale	N	Mean (SD)	Location	Comments
Wang et al (2010)	10	341	26.8 (6.3)	China	Schoolteachers affected by earthquake
Kang et al (2018)	10	227	28.9 (6.7)	China	Ambulance personnel: MD, RN, EMT
Hammermeister et al (2012)	10	351	28.1 (0.8 SE)	USA	Stryker Battalion combat troops

Table 7c. Mean (SD) CD-RISC 2-Item Scores in Non-treatment Seeking Trauma Survivors

Authors	Scale	N	Mean (SD)	Location	Comments
Nicholls et al (2006)	2	770	5.6 (2.6)	USA	Trauma survivors who contacted Anxiety Disorders Association of America
Irmansyah et al (2010)	2	1,466	4.67	Indonesia	Tsunami survivors

Osofsy et al (2011)	2	452	6.87(2.04)	USA	Deepwater Horizon Oil Spill area residents
Davidson & Lee (2015)	2	240 106 134	6.42(1.39)All 6.69(1.26) F 6.20(7.0) NF	USA	Violent trauma survivors in US general population. Random digital sample. Forgivers (F) > Non-forgivers (NF).

A cohort of National Guard returnees from Iraq and Afghanistan was found to have a mean score of 73.8 (16.1) (Pietrzak et al, 2009a).

The mean CD-RISC scores in 139 clinical social workers living and working in New York City on 9/11/2001 were reported as 75.7 by McTighe (2009).

In 341 primary and secondary school teachers of mean age 39.0, who were assessed after the Wenchuan earthquake, the mean CD-RISC 10 score in those without PTSD was 26.8 (6.3 sd) (Wang et al, 2010).

246 survivors of the Marmara and Bolu earthquakes in Turkey were studied by Karairmak (2010). Their mean CD-RISC 25 score was 70.1 (14.1).

Irmansyah and colleagues used the CD-RISC 2, translated into Bahasa Indonesian, to assess resilience in a group of 1,466 earthquake/tsunami survivors (2010). The mean and SD scores were given for each item as 2.29 (1.22) and 2.38 (1.31), making the grand mean 4.67 in the displaced persons group.

Anderson et al (2012a and b) found that women survivors of intimate partner abuse demonstrated a mean score of 75.0 but that higher scores were associated with lower risk of PTSD, and this applied to four of the five scale factors (i.e., all except for the spirituality factor).

Hammermeister and colleagues (2012) studied 351 Stryker Battalion combat troops, some of whom had PTSD, and noted a mean CD-RISC 10 score of 28.1, which is below the population mean. (Score is corrected here – authors had used a 1-5 range instead of 0-4).

Elbogen et al (2012) reported a mean score of 75.1(18.3) in a national sample of over 1,000 OEF/OIF veterans.

Thus, in summary, scores on the CD-RISC 25 and CD-RISC 10 in this group fall in between those for people with PTSD and those in the general population. The CD-RISC 2 score falls below that of the general population.

Other Populations: Further studies of the CD-RISC have been conducted in a range of populations, some of which have been drawn from psychiatric settings (e.g., VA centers, or from special populations in the community, e.g., ambulance officers, missionaries, etc.). These have been grouped together since they are not defined by psychopathology, trauma type or developmental phase. The mean scores are summarized in [Tables 8a-c](#).

Table 8a. Mean (SD) CD-RISC 25-Item Scores in Other Groups, Those Under Stress and/or Mainly Healthy Subjects

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Wilks (2006)	25	205	73.4 (13.30)	USA	Alzheimer's Caregivers
Laff et al (2008)	25	241	76.0 (11.0)	USA	Medical interns
Schaeffer et al (2009)	25	48 203	76.5 (12.8) 73.0 (11.9)	USA USA	Missionaries Missionaries
Green et al (2010)	25	497	71.2.(17.5)	USA	Veteran population
Sen et al (2010)	25	740	75.3 (11.9)	USA	Medical interns
Gabriel et al (2011)	25	57	66.5 (13.4)	USA	Nurses
Phillips (2011)	25	79	72.4(13.0)	USA	Unemployed men
Coates (2012)	25	110	80.5	USA	Single low income Black fathers
Kjellstrand & Harper (2012)	25	128	76.0(14.8)	USA	Single mothers
Cox (2012)	25	144	76.8 (12.5) 71.7 (11.7) 73.6 (14.3)	USA	Military couples pre, during and post deployment
Calcote et al (2013)	25	176	76.3	USA	Hazardous waste and emergency response workers
Knows-His-Gun et al (2013)	25	161	78.3(15.4) 77.5(10.3)	USA	Native American Caucasian
Rudow et al (2014)	25	151	83(11.6)	USA	Kidney and liver donors
Gonzalez et al (2016)	25	409	78.1 (10.9)	USA	Distance runners
Lutz et al (2016)	25	656	78 (13)	USA	Air Force and Army recruits
Bezdjian et al (2016)	25	53,672	83.6(11.0)	USA	Air Force recruits
McFarland & Roth (2016)	25	56	68.5(9.4)	USA	Resident MDs on oncology rotation
Baron Nelson et al (2018)	25	19	81.6 (13.0) 87.0 (8.3)	USA	Parents of children with brain tumor: non-intervention and intervention gps
Gupta et al (2017)	25	48	78.0(11.7)	USA	Healthy volunteers for MRI study
Gillespie et al (2007)	25	735	75.9 (11.0)	Australia	Operating theatre surgical nurses
Gucciardi and Gordon (2008)	25	433	73.4 (11.0)	Australia	Adult cricketers
Gucciardi et al (2011)	25	321	73.2 (10.7)	Australia	Adult cricketers
Gucciardi et al (2011)	25	199	73.0 (10.9)	Australia	Teenage cricketers
Loh and Klug (2012)	25	108	75.0	Australia	Women immigrants
Deville & Varker (2015)	25	281	77.28(10.4)	Australia	Victorian police officers
Hegney et al (2015)	25	1,743	69.6 – 70.3	Australia	Four groups of nurses, many with mild depression or anxiety
Baek et al (2010)	25	576	61.0 (13.0)	Korea	Students, nurses, firefighters
Lee et al (2014)	25	552	64.5 (17.0)	Korea	Firefighters
Jeon et al (2017)	25	1794	61.2(13.3)	Korea	Hospital employees sleep survey

Jung et al (2017)	25	42 45	54.5(12.8) 54.0(11.5)	Korea	Hospital employees, mainly nurses. Means given here after correcting for use of 1-5 scoring system
Lee and Williams (2013)	25	206	70.6(14.0)	Koreans in the US	Adults whose parents had alcoholism
Kim et al (2016)	25	169	71.6 (15.6)	Korea	Conscripted Marines
Carli et al (2010)	25	1,265	65.3 (14.1)	Italy	Prisoners
Hosseini and Besharat (2010)	25	139	73.8 (16.0)	Iran	Athletes
Azadmarzabadi et al (2018)	25	100 100 100 100	67 (7) 63 (4) 76 (13) 73 (9)	Iran	Acute stress syndrome from daily stress Acute stress reaction from major trauma No symptoms post daily stress No symptoms after major trauma
Stephenson (2012)	25	50	82.0 (11.2)	US Virgin Islands	Graduates of the Temporary Assistance to Needy Families Program
Hemmings et al (2013)	25	150	73(58,84)	South Africa	Non-TB contacts of family members with TB
Van Breda et al (2015)	25	55 32	77.3(1.7SE) 72.6(2.0)	South Africa	Ironman athletes Recreational athletes
Manzano-Garcia & Calvo (2013)	25	783	79.8(9.8)	Spain	Business owners and entrepreneurs
Yu et al (2009)	25	76	65.4(11.9)	China	Healthy parents
Yu et al (2013a)	25	1,205	60.7(15.6)	China	Refugees
Yu et al (2014)	25	183	57.7 – 59.3	China	Refugees to Hong Kong
Chi et al (2015)	25	645	49.9(15.8)	China	Children (mean age 10.8 – range 8-15) of parents with HIV
Tan et al (2016)	25	3960	63.4 (13.1)	China	New factory employees
Zhang et al (2016)	25	222	56.9(16.9)	China	Parents bereaved of their only child
Lu et al (2017)	25	474	57.9(13.2)	China	Older adults
Du et al (2017)	25	518	66.0	China	Children with HIV+ve parents – mean age 12.0(2.5) years
Zhang et al (2016)	25	516	61.6 (13.0) 60.7 (12.8)	China	Older couples – men and women’s scores given
Herbert et al (2013)	25	45	69.4(15.7)	India	Adult offspring of a parent with schizophrenia
Rajan and John (2016)	25	121	65.0(15.9)	India	Parents of children with intellectual disability
Bhat (2017)	25	30 30	60.2 (18.5) 60.4 (16.6)	India	Male and female residents in elderly care homes
Petros et al (2013)	25	196	67.0 (15.8)	England	Healthy adults in a university community
Horvath & Massey (2018)	25	116	75.6 (14.3)	England	Forensic medicine faculty who witnessed trauma to others
Tajanlangit (2014)	25	103	81.8	Philippines	Mental health nurses
Cole (2016)	25	47	84.8	Nine countries	Leaders of faith-based schools
Lim et al (2015)	25	365	84.9(11.2)	Singapore	Older community sample Chinese women, average age 72
Ong et al (2018)	25	285	70.8 (15.1)	Singapore	Caregivers to older adults with mental or physical illness
Sarubin et al (2015a)	25	201	73.9(12.0)	Germany	Healthy older women, non-clinical population

Table 8b. Mean (SD) CD-RISC 10-Item Scores in Other Groups, Those Under Stress and/or Mainly Healthy Subjects

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
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Li et al (2012)	10	113	22.6(7.6)	China	Parents under stress: children receiving surgery for congenital disease
Tian et al (2015)	10	575	26.5(6.1)	China	Telephone operators
Ye et al (2017)	10	500	23.0 (5.7)	China	Parents of children with cancer
Blanco et al (2017)	10	294	26.9(8.3)	Spain	Non-professional caregivers
Paulus et al (2012)	10	10 11	30.6(12.3) 31.4(10.0)	USA	Elite athletes Healthy adult controls
Prabhakaran et al (2012)	10	63,290	31.9	USA	Active duty air force personnel
Rosenberg et al (2013)	10	96	30.0(6.0)	USA	Parents of children with cancer
Warren et al (2013)	10	133	33.4(4.0)	USA	Surgeons
Turner (2015)	10	10	36.7	USA	Nurses in hospital following tornado
Gonzalez et al (2016)	10	409	31.1 (5.0)	USA	Distance runners
Houpy et al (2017)	10	117	28.2 (6.4)	USA	Third and fourth year medical students
Richards et al (2017)	10	419	32.3	USA	Physical educators
Brown et al (2018)	10	521	30.7 (5.0)	USA	Nurses
Lauridsen et al (2017)	10	272	30.3 (5.2)	Denmark	Hospital employees
Gayton and Lovell (2012)	10	146 73	30.1-31.2 27.4	Australia	Experienced paramedics Student paramedics
Slatyer et al (2017)	10	65 26	28.3 (6.0) 27.5 (5.1)	Australia	Nurses enrolled in mindfulness based stress reduction course
Avrech Bar et al (2017)	10	184	29	Israel	Nurses, OT and PT staff
Ang et al (2018)	10	1338	25.9 (6.0)	Singapore	Nurses

Table 8c. Mean (SD) CD-RISC 2-Item Scores in Other Groups, Those Under Stress and/or Mainly Healthy Subjects

Authors	Scale	Number	Mean (SD)	Location	Diagnostic group
Eisenach et al (2014)	2	13	6.9 (1.0)	USA	New anesthesiology residents
Langhinrichsen-Rohling et al (2017)	2	120	4.97(2.59)	USA	Highly stressed, primary care sample referred to behavioral health
Stevens et al (2010)	2	633	6.84 (3.82)	Australia	Ambulance officers
Gianesini (2012)	2	324	6.25 (1.63)	Switzerland	Parents of young schoolchildren

Two hundred and five Alzheimer's disease caregivers were studied by Wilks (2006), and their mean CD-RISC was 73.4 (13.3). A second study of dementia caregivers by Lavretsky et al (2010) gave lower scores ranging between 60 and 66.

In a study of African Americans, Brown (2008) reported a mean score of 78.1 (12.1). Another population of African American diabetics scored a mean of 83.8 (8.5) (Steinhardt et al, 2009). In a third study of African Americans, Coates (2012) reported a mean score of 80.5 and mean (sd) item score of 3.22 (0.56) in 110 single, low-income fathers.

A study of Australian surgical nurses reported the mean CD-RISC to be 75.9 (11.0) (Gillespie et al, 2007). In a large population cohort of Americans over age 60, the mean score was 75.7 (13.0) (Lamond et al, 2008). Two Chinese cohorts of parents of autistic children (PAC, n=76) and of non-autistic children (PNC, n=329) resulted in mean (sd) scores of 65.4 (11.9) and 71.0 (11.3) (Chen Yu, personal communication, 5/26/09). 143 healthy Korean volunteers were studied by Ha et al (2009) and a mean score of 66.8 (12.7) was noted.

US missionaries in Europe (n=48) and Africa (n=203) yielded mean (sd) scores of 76.5 (12.8) and 73.0 (11.9) respectively (Frauke Schaefer, personal communication, 5/22/09).

Gucciardi and colleagues (2008, 2011) examined three populations of adult or teenaged Australian cricketers and reported the mean CD-RISC as 73 in all cases. In one report (Gucciardi et al 2011), mean scores for the CD-RISC 25 were 73.2 (10.7) and 73.0 (10.9) in 321 adult and 199 adolescent Australian cricketers respectively. For the CD-RISC 10, the mean score in adults was 29.51 (4.88). An Iranian study of athletes from different sports (volleyball, basketball and football being most common) showed a similar mean CD-RISC score (73.8 (16.0)) to that of the cricketers (Hosseini and Besharat, 2010).

A study of medical interns at Yale found a mean RISC score of 76.0 (11.0). Although total CD-RISC score and the factor scales failed to predict depression among interns, two items relating to challenge were associated with risk (Laff, 2008). A subsequent study in another group of interns by Sen et al (2010) found a mean CD-RISC score of 75.3 (11.9) in a US cohort of 740 medical interns.

Baek et al (2010) studied the CD-RISC in a non-randomly selected young (average age = 27.4) Korean population of 576 students, nurses and firefighters. The mean score was 61.2 (13.0). A subsequent study of Korean firefighters found a mean score of 64.5 (17.0) (Lee et al, 2014).

In two military samples of active duty Marines and veterans of OIF/OEF, the mean CD-RISC scores were respectively 71.6 (16.2) and 67.0 (17.6) (Johnson et al, 2011). The mean scores in military couples before, during and after deployment were comparable (71.7 to 76.8) (Cox, 2012).

In 57 US nurses, Gabriel et al (2011) reported mean score of 66.5 (13.4). *[Note that in their paper, the authors reported a mean score of 91.5, due to scoring each item on a 1-5 scale, rather than the 0-4 metric].*

A group of 128 upper- or middle-income single mothers was found to score 76.0 (14.8) (Kjellstrand and Harper 2012). The five highest scoring items reflected qualities of personal competence and tenacity.

113 parents whose children were undergoing surgery scored 22.2(7.6) on the CD-RISC 10 in a Chinese sample (Li et al, 2012).

Gayton and Lovell (2012) observed a higher CD-RISC score in paramedics with several years' experience compared to student paramedics.

Lee and Williams (2013) studied 206 Koreans living in the US, most of whom were students; 89% were born in Korea and 11% in the US. Mean CD-RISC score was 70.6 (14.0).

Parents of children with cancer in the USA were found to score close to the population mean, but those with lower scores were more at risk for unfavorable outcomes (Rosenberg et al, 2013).

A group of surgeons was found to score 33.4 (4.0) on the CD-RISC-10, which is no different from the score of post-college educated subjects in a US community sample (Warren et al, 2013). US medical students scored slightly lower on the CD-RISC-10 than national norms, but fourth year students, men and those not burned-out scored higher than their counterparts (Houpy et al, 2017).

Summary: These results lead to the conclusion that psychiatrically healthy subjects score higher on the CD-RISC than do those with a range of psychiatric illnesses, or even than a general sample of primary care patients. In the US, two population surveys of the 25- and/or 10-item scales suggest that the mean item score ranges from 3.17-3.21, which translates into a 25 item score around 79-81, or 31-32 for the CD-RISC 10. Studies of healthy Chinese, Japanese and Korean and other non-US adults showed substantially lower scores, suggesting that ethno-cultural factors need to be taken into account when measuring resiliency. It is also possible that response-set bias may exist, leading some populations to under- or over-report symptoms.

Interpretation of mean population scores is confounded also by such considerations as the age of subjects, and whether or not the sample has been enriched by special features, e.g., medical clinic samples, exposure to severe trauma (Bitsika et al, 2010). In a varied group of adolescents, students and young adults, the CD-RISC 25 scores cluster between the mid-50s to low 70s. Studies in the US have tended to report higher scores than in other countries.

For the CD-RISC 2, two US population studies have yielded mean scores of 6.94 in the general population (Vaishnavi et al, 2007) and 5.6 (2.6) in a non-PTSD sample who had contacted the Anxiety Disorders Association of America (ADAA), a major national anxiety disorders advocacy organization, and a significantly lower score of 4.6 (2.6) in those with PTSD who contacted the ADAA. As a self-selected sample of enquirers to a support organization, it is likely that the level of resilience in this group may have been lower. In a Portuguese general community convenience sample, the mean score was 6.50 (1.23) (Joana Faria, personal communication, 7/22/2010). A representative state sample of Australian ambulance officers resulted in a CD-RISC 2 score of 6.84 (3.82) (Stevens et al, 2010).

The material in Tables 1-8 is presented according to the nature of the sample and sub-grouped for the three versions of the CD-RISC. For those who wish to see the entire scores from all studies with the 10- and 2-item versions of the scale, these follow in [Tables 9](#) and [10](#) respectively.

Summary Scores: CD-RISC-10

Table 9. Mean (SD) CD-RISC 10-Item Summary Scores

Authors	Scale	Number	Mean (SD)	Location	Comments
Davidson (2003)	10	458	32.1 (5.8)	USA	National random digit dial sample
Campbell-Sills et al (2007)	10	131	27.2 (5.8)	USA	College undergraduates
Campbell-Sills et al (2008)	10	764	31.8 (5.4)	USA	Community random digit dial sample in Memphis
Wingo et al (2010)	10	792	34.0 (median) (0-40 range)	USA	Primary care/gynecology groups
Dodd (2010)	10	102	32.4(5.4)	USA	Inpatients in rehabilitation post injury
Grattan et al (2011)	10	71	29.1(6.1)	USA	Deepwater Horizon Oil Spill
	10	23	29.9(5.9)	USA	
	10	47	30.0(6.5)	USA	
	10	47	28.5(5.5)	USA	
Wrenn et al (2011)	10	233	30 (12) median	USA	PTSD primary care patients
		534	35 (8) median		Non-PTSD primary care patients

Christensen (2011)	10	41	31.4(5.8)	USA	Inpatients with traumatic injury
Hartley (2012)	10	605	30.1(5.3)	USA	Normative student sample
Melvin et al (2012)	10	60	31.0 (6.5)	USA	Combat veteran couples
Goins et al (2012)	10	160	33.5 (6.2)	USA	Federally recognized Native American tribe
Hartley (2012)	10	121	19.6(8.2)	USA	Student counseling clinic sample
Mascolini (2012)	10	42 20	27.0 31.0	USA	HIV positive older subjects HIV negative older subjects
Paulus et al (2012)	10	10 11	30.6(12.3) 31.4(10.0)	USA	Elite athletes Healthy adult controls
Hammermeister et al (2012)	10	351	28.1 (0.88)	USA	Stryker Battalion combat troops
Prabhakaran et al (2012)	10	63,290	31.9	USA	Active duty Air Force personnel
Rosenberg et al (2013)	10	96	30.0(6.0)	USA	Parents of children with cancer
Bradley et al (2013)	10	971	31.6(7.7)	USA	African-American OB-GYN outpatients
Warren et al (2013)	10	133	33.4(4.0)	USA	Surgeons
Dale et al (2014a)	10	138	28.8(7.8)	USA	HIV+ve women
Dale et al (2014b)	10	85	29.3(7.8)	USA	HIV +ve women
McCanlies et al (2014)	10	114	29.9 (6.3)	USA	Police officers post Hurricane Katrina
Rainey et al (2014)	10	110	31.3 (not given)	USA	Hospitalized subjects with traumatic injury
Green et al (2014)	10	1,090	30.5 (6.6)	USA	Community sample of military veterans
Lukow et al (2015)	10	96	22.0 (8.8)	USA	Mild to severe TBI
Rosenberg et al (2015)	10	1,782	31.4(6.6)	USA	Hematopoietic cell transplantation patients
Turner (2015)	10	10	36.7	USA	Nurses responding to tornado casualties
Gonzalez et al (2016)	10	409	31.1 (5.0)	USA	Distance runners
Battalio et al (2016)	10	1574	29.0(7.0)	USA	Neurological disability
Terrill et al (2016)	10	1862	28.0(7.1)	USA	Long term physical disabilities
Wingo et al (2017)	10	246	23.6(7.8)	USA	Veterans with PTSD and depression
Carlsen et al (2017)	10	73	30.4(5.5)	USA	Adolescents with IBD
Jones et al (2017)	10	39	33.5(18.4) 24.1 and 26.4	USA	Juvenile male controls Juvenile male sexual offenders
Koelmel et al (2016)	10	163	26,8(6.2)	USA	Multiple sclerosis
Richards et al (2017)	10	419	32.3	USA	Physical educators
Lee et al (2018)	10	110 92	23.4 (8.2) 33.1 (5.7)	USA	Schizophrenia Healthy controls
Brown et al (2018)	10	521	30.7 (5.0)	USA	Nurses
Shlomi (2010)	10	220	28.0 (5.7)	Canada	Psychology students
McGlone (2010)	10	27	29.3 (6.2)	Canada	Epilepsy

Rahimi et al (2014)	10	155	28.8(4.4) Female 31.2(5.2) Male	Canada	Medical students
Poole et al (2017a)	10	3413 277	31.0 22.3(7.6)	Canada	Prim care non-depressed Prim care depressed
Poole et al (2017b)	10	3802	30.3(7.0)	Canada	11 primary care practices Calgary
Levasseur et al (2017)	10	4541	31.0 Women 32.0 Men	Canada	Community sample of elders 60+ years of age
Wang et al (2010)	10	341	24.8(7.4) 20.8(6.3) 26.8(6.3)	China	Earthquake survivors – whole group PTSD group Non-PTSD controls
Wang et al (2010)	10	341	26.8 (6.3)	China	Schoolteachers affected by earthquake
Li et al (2012)	10	113	22.6(7.6)	China	Parents under stress: children receiving surgery for congenital disease
Duan et al (2015)	10	95	25,.5 (4.9)	China	University students with PTSD and PT growth
Tian et al (2015)	10	575	26.5(6.1)	China	Telephone operators
Wu et al (2015)	10	318	24.8(7.5)	China	Earthquake survivors – corrected values given here
Li et al (2016)	10	231	26.9 (6.6)	China	Pregnant women
Ye at al (2017)	10	460	23.2	China	Parents of children with cancer
Kang et al (2018)	10	227	28.9 (6.7)	China	Ambulance personnel: MDs, RNs and EMTs
Skrzypiec et al (2018)	10	2050	29.3 (7.3)	China	Schoolchildren ages 10-15
Chow et al (2018)	10	678	24.0 (5.7)	China/Hong Kong	Student nurses
Matzka et al (2016)	10	343	29.3(7.0)	Austria	Cancer patients
Kilic et al (2013)	10	60	29.5(7.2)	Australia	Spinal cord injury
Gayton and Lovell (2012)	10	146 73	30.1-31.2 27.4	Australia	Experienced paramedics Student paramedics
Black & Dorstyn (2013)	10	196	27.0(7.1)	Australia	Multiple sclerosis
Hayter & Dorstyn (2013)	10	97	25.6(8.0)	Australia	Spina bifida
Lyons et al (2016)	10	357	27.0 (7.7)	Australia	HIV+ve gay men
Chamberlain et al (2016)	10	240	32.0 (5.7)	Australia	Third year nursing students
Slatyer et al (2017)	10	65 26	28.3 (6.0) 27.5 (5.1)	Australia	Nurses in clinical trial
Seib et al (2018)	10	278	30 median	Australia	Women with cancer
Skrzypiec et al (2018)	10	2050	29.3 (7.3)	Australia/China	Chinese schoolchildren ages 10-15
Davidson et al (2008)	10	329	20.1 19.9	International International	PTSD before drug treatment PTSD before receiving placebo
Klasen et al (2010)	10	330	22.7 (8.3)	Uganda	Former child soldiers aged 11-17
Aloba et al (2016)	10	449	26.7	Nigeria	Student nurses
Lopes and Martins (2011)	10	463	29.1 (5.5)	Brazil	Adult sample
Solano et al (2016)	10	575	25.8 (9.1)	Brazil	Medical and psychiatric patients

Lim et al (2011)	10	190	27.88	Singapore	Adolescents mean age 12.8 (range 12-16)
Ang et al (2018)	10	1338	25.9 (6.0)	Singapore	Nurses
Deen et al (2017)	10	5	16.8 and 22.4	Malaysia	Elite squash players tested before and after therapy
Notario-Pacheco et al (2011)	10	681	27.4 (6.4)	Spain	University first year students mean age 20.1 (18-30)
Montero-Marin et al (2014)	10	314	27.8 (6.7)	Spain	Dental students
Notario-Pacheco et al (2014)	10	191	24.7(10.8)	Spain	Fibromyalgia patients
Rodriguez-Rey et al (2015)	10	620	28.4 (6.8)	Spain	Mixed sample of medical patients, parents of children with medical/psych problems and general population
Scali et al (2012)	10	238	27 (22-32 1,3Q)	France	Mammography subjects with and without breast cancer
Glück et al (2013)	10	84	25.9 (6.7) PTSD 31.1 (6.1) Control	Austria	World War II survivors
Markovitz et al (2014)	10	254 101 107	25.7 (6.8) 27.6 (5.9) 27.4 (6.8)	Netherlands Belgium Belgium	Students Breast cancer patients Control women
DiFabio & Saklofske (2014)	10	164	24.8(6.2)	Italy	High school students
Okuyama et al (2014)	10	1,973	20.5(0.2 SE)	Japan	Adolescent survivors of Great East Japan Earthquake
Lee et al (2016)	10	1094	25.8 (8.0)	Korea	College students
Antunez et al (2015)	10	1,922	29.0 (0.1)	Spain	Adults in the community
Blanco et al (2017)	10	294	26.9(8.3)	Spain	Non-professional caregivers
Farkas & Orosz (2015)	10	465	28.0 (0.6)	Hungary	Students
Gabor et al (2018)	10	343	28.2	Hungary	High school and university students
Schäfer et al (2015)	10	191	31.3 (4.8)	Germany	Male soldiers
Mathad et al (2017)	10	194	26.3(6.3)	India	Nursing students
Lauridsen et al (2017)	10	272	30.3 (5.2)	Denmark	Hospital employees
Moffett & Bartram (2017)	10	105	27	England	First year veterinary students
Avrech Bar et al (2017)	10	184	29 [median]	Israel	Nurses, OT and PT staff
Walsh et al (2018)	10	241	29.0 (7.5)	Ireland	Men 1 year post treatment for prostate cancer
Sharma et al (2018)	10	131	27.0 (7.0)	Nepal	Chronic pain

Summary Scores of All Studies: CD-RISC-2

Table 10. Mean (SD) CD-RISC 2-Item Summary Scores

Authors	Scale	Number	Mean (SD)	Location	Comments
Nicholls et al (2006)	2	770	5.6 (2.6)	USA	Trauma survivors who contacted Anxiety Disorders Association of America
Vaishnavi et al (2008)	2	458	6.91(1.5)	USA	National random digit dial sample
Campbell-Sills et al (2008)	2	764	6.82(1.33)	USA	Community sample random digit dial in Memphis
Davidson and Lee (2015)	2	106 134	6.7 (1.3) 6.2 (1.5)	USA	National RDD trauma survivor sample. Those who forgave perpetrators of violent trauma vs those who did not.
Osofsy et al (2011)	2	452	6.87(2.04)	USA	Deepwater Horizon Oil Spill area residents
Eisenach et al (2014)	2	13	6.9 (1.0)	USA	New anesthesiology residents
Langhinrichsen-Rohling et al (2017)	2	120	4.97(2.59)	USA	Primary care sample referred to behavioral health. Highly stressed.
Davidson et al (2008)	2	329	4.53 4.56	International International	PTSD before receiving drug PTSD before receiving placebo
Irmansyah et al (2010)	2	1,466	4.67	Indonesia	Tsunami survivors
Gianesini (2012)	2	324	6.25(1.63)	Switzerland	Parents of schoolchildren aged 3-10
Stevens et al (2010)	2	633	6.84 (3.82)	Australia	Ambulance officers
Draper et al (2014)	2	210	5.9 (2.0)	Australia	Geriatric psychiatry in- and outpatients
D'Emden et al (2017)	2	151	6.1(1.5)	Australia	Type 1 diabetes
Faria et al (2011)	2	421	6.50 (1.23)	Portugal	Community sample Lisbon
Lim et al (2011)	2	190	5.76	Singapore	Adolescents mean age 12.8 (range 12-16)
Vinaccia and Quiceno (2011)	2	40	6.8 (1.8)	Colombia	COPD
Vinaccia et al (2012)	2	40 41	7.5 (1.0) 7.0 (1.4)	Colombia	Chronic renal disease Rheumatoid arthritis
Markovitz et al (2014)	2	254 101 110	5.6 (1.4) 6.2 (1.2) 5.9 (1.5)	Netherlands Belgium Belgium	Dutch students Breast cancer patients Control women
Lu et al (2016)	2	218	6.46(1.72)	Taiwan	Student athletes
Ni et al (2015)	2	10,997	5.03(1.37)	China	Hong Kong general population
Jeong et al (2015)	2	222	6.0 (1.2) 5.1 (1.5) 4.4 (1.5)	Korea	Firefighters and rescue workers Controls PTSD or MDD alone PTSD and MDD
Harrer et al (2018)	2	75 76	4.80 (1.72) 4.79 (1.87)	Germany	Students pre-treatment Student controls
Heo et al (2018)	2	1866	5.6 (1.7)	Korea	School system adolescent sample
Rapacciuolo et al (2016)	2	571	5.87(1.7)	Italy	Older community sample in Naples
Lewis et al (2017)	2	697	5.8 (1.7)	England	Subthreshold depression primary care
Sharma et al (2018)	2	131 140	5.2 (1.7) 5.4 (1.9)	Nepal	Chronic pain i Chronic pain ii

Factor Analysis

Factor analysis Reports will be presented for the RISC-25 and RISC-10 as follows.

CD-RISC-25

In the first report describing the scale in an adult cohort (n =577) representative of the US population, Connor and Davidson (2003) derived five factors, the strongest of which captured aspects of persistence/tenacity and strong sense of self-efficacy. Other factors with lower eigenvalues (ranging from 1.563 to 1.073), corresponded to emotional and cognitive control under pressure (factor 2); adaptability/ability to bounce back (factor 3); control/meaning (factor 4); meaning (factor 5). Factors 4 and 5 are composed of only 3 and 2 items respectively and may be less robust.

Lamond and colleagues (2008) examined a cohort of 1,395 older Americans, and derived four factors from the data: personal control/goal orientation; adaptation and tolerance of negative affect; leadership and trust in instincts; spiritual coping.

In a study of 787 South African adolescents, Jørgensen and Seedat (2008) were unable to confirm the original five-factor solution, and proposed a two- or three-factor solution, wherein tenacity was quite robust. Ethnicity appeared to influence their findings, and it may be of importance that the English language version of the CD-RISC was given to subjects for whom English was often a second language.

A report in 323 Iranian university students who completed the CD-RISC generated four factors, which the author considered to be relatively similar to those derived by Connor and Davidson (2003), termed as achievement motivation, self-confidence, tenacity and adaptability (Khoshouei, 2009).

A Chinese study of the CD-RISC by Yu and Zhang (2007) in 560 residents of Guangdong and Beijing, found three factors to best account for their findings: tenacity, strength and optimism. Of these, tenacity (hardiness) explained the greatest variance, similar to Connor and Davidson's original findings. Yu and Zhang also make some important observations on the different valence that is given to personal competence/control and spirituality in the United States, compared to their lesser salience in Chinese culture, while harmony was seen as being of greater importance. The ability

to get along well with others and to empathize with their needs, feelings etc., may deserve more attention with respect to resilience. In this context, perhaps altruism is an important missing element in current measures of resilience.

Gillespie et al (2007) assessed 735 Australian operating room surgical nurses, and largely replicated the Connor and Davidson 5 factor structure, albeit with differences in item loadings.

Catalano et al (2008) found a five-factor solution to be the most satisfactory interpretation of their results in a Canadian sample of 274 spinal cord injury patients.

A Japanese study extracted five factors by exploratory factor analysis, which differed somewhat from the five factors reported by Connor and Davidson, and then in a confirmatory factor analysis to test a one-dimensional structure, the authors confirmed goodness of fit to the data (Ito et al, 2009). A contrary finding has been reported by Burns and Anstey (2010) in a sample of 1,775 Australian community members. The authors were unable to establish goodness of fit in a confirmatory factor analysis of the original Connor and Davidson model, leading them to conclude that the CD-RISC reflected a multidimensional measure of resilience. They therefore undertook parallel analysis to guide a further exploratory factor analysis, and ultimately retained 22 items that they regarded as a one-dimensional measure. They also found that their derived measure was in some ways superior to the CD-RISC 10, which was also tested. Slightly different findings emerged, however, in a later study by Gucciardi et al (2011).

In veterans of OIF/OEF (n=272), exploratory factor analysis found five factors, which the authors labeled as hardiness, purpose/control, leadership, effort and spiritual (Pietrzak et al, 2009). Higher scores on the purpose/control factor were associated with lower risk of suicidal ideation.

In a study of 40 women with infertility problems, Sexton et al (2009) reported five factors, labeled emotional/interpersonal stability, self-efficacy, adaptability, spirituality and confident decision-making. Her view is that the factor analysis obtained most closely resembled the factor structure reported by Lamond. However, the numbers here are on the small side for a factor analysis.

Garzia-Izquierdo et al (2009) observed that the original CD-RISC factors of personal competence and positive acceptance of change negatively predicted emotional exhaustion in a group of 311 Spanish workers. (The other three factors were not examined).

Varying levels of homogeneity for each factor-generated subscale of the CD-RISC was reported by McTighe (2009), with Cronbach's α ranging from 0.67-0.85.

Singh and Yu (2010) examined 256 Indian students (mean age 22.7, range 17-27), and found a four-factor solution by exploratory factor analysis: hardiness, optimism, resourcefulness and purpose. Scale homogeneity was established with Cronbach's α being 0.89 for the total scale and 0.80, 0.75, 0.74 and 0.69 for factors 1 through 4.

Jowkar et al (2010) compared Iranian versions of the CD-RISC and the Resilience Scale for Adults (RSA) in a student population. A factor analysis upheld the original structure of the RSA, but not of the CD-RISC, for which the authors failed to show a clear pattern. However, the Cronbach α was high for the full CD-RISC and for factor 1, but lower for factors 2-4.

Four factors were obtained by Bitsika et al (2010), which represented challenge-seeking/purpose, decisiveness, spirituality and self-confidence/optimism. Factors 1, 2 and 4 showed inverse relationships with depression and anxiety, with factor 4 (self-confidence) bearing the strongest relationship to both depression and anxiety, and factor 2 (decisiveness/solution-focused) being also relevant to anxiety risk.

A three-factor solution was generated by Karairmak (2010) in her sample of Turkish earthquake survivors, these being labeled as tenacity/personal competence, tolerance of negative affect and spirituality. Cronbach's α was 0.89 for the full scale and 0.93, 0.79 and 0.50 for the three factors, the last factor consisting of only three items.

In their study of adolescents, Yu et al (2011) replicated by confirmatory factor analysis the original five factors of Connor and Davidson (2003), and showed a Cronbach's α coefficient of 0.89 for the full scale, and 0.83, 0.66, 0.66, 0.58 and 0.50 for factors 1 through 5 respectively.

In a Korean population, the authors (Baek et al, 2010) obtained five factors, which differed to some degree from those obtained by Connor and Davidson. These factors were termed hardiness, tolerance of negative affect, optimism, social support and spirituality. As with others (Yu and Zhang, 2007), the authors suggested that the original CD-RISC spirituality factor may be heavily influenced by Western beliefs, and apply less to other belief systems. Baek et al found high Cronbach α 's for the item-subtotal analysis (0.93), but varying levels for each factor (0.87, 0.87, 0.58, 0.59 and 0.25 for factors 1-5). Another study from Korea found a Cronbach's $\alpha = 0.82$ (Jung et al, 2017).

Among 520 Australian cricketers (Gucciardi et al, 2011), confirmatory factor analysis and item level analyses confirmed superiority of the 10-item over the original five factor 25-item CD-RISC. Using measurement invariance analysis, the authors demonstrated configural, metric and partial scalar invariance for the 10-item scale when comparing adolescent (mean age 16.9) and adult (mean age 26.1) cricketers.

In two samples of Spanish business owners, three factors were derived and confirmed, corresponding to hardiness, resourcefulness and optimism (Manzano-Garcia and Calvo, 2012).

Young children between ages 6 and 16 who survived an earthquake in China were assessed with the CD-RISC, for which two factors emerged: rational/positive thinking and self-awareness (Fu et al, 2013).

Among Canadian subjects with spinal cord injury (SCI), the original 5-factors were tested and found to fit the data reasonably well, with good reliability of the five scales. The authors concluded that the 5-factor structure observed in the general population was replicated in the SCI sample (Fujikawa et al, 2013).

A study of 1,981 veterans of OIF and OEF in Iraq and Afghanistan was studied by Green et al (2014), who found that a two-factor model provided best fit to the data, these factors being labeled adaptability and self-efficacy. The adaptability factor emerged as the factor which most closely corresponded to the usual notion of resilience, being associated with protection against psychopathology following exposure to trauma, unlike the other factor. The authors noted that 6 of the 8 adaptability items appear in the CD-RISC-10, and the two items in the CD-RISC-2 also contain items

from this factor. A later report (Mehta et al, 2018) in Australian and US subjects with PTSD found a two-factor solution of self-efficacy and adaptability, similar to the Green et al report above.

When the original five-factors were applied as predictors of suicidal tendencies, Youssef et al (2013b) found that factor 3 (close relations and positive acceptance of change) was the strongest predictor.

Confirmatory factor analysis was used to assess three competing models in a sample of Mexican-American adolescents with substance use disorders. A single 7-item factor emerged, comprising items which were indicative of how one copes with difficult circumstances (Burrow-Sanchez et al, 2014).

Sarubin et al (2015b) has found that a single factor component accounted for the scale structure, using exploratory principal axis analysis.

Factor analysis of the CD-RISC in 120 patients awaiting liver transplant showed a single factor solution after removing five poorly loading items, which related mainly to meaning/purpose and coping (Fernandez et al, 2015).

A study conducted in 2357 Chinese military personnel found three factors which the authors named competency, toughness and adaptability (Xie et al. 2016). Four items (3, 15, 18 and 20) did not load on these factors. The authors made the interesting comment that “all religious beliefs and activities are banned by the Chinese military”, which would essentially invalidate the items that tap into that construct, or at least be confusing to respondents. Although Xie et al obtained three factors, these were quite different from the three factors obtained by Yu and Zhang (2007) in their study of Chinese subjects.

A study of the CD-RISC in Spanish university students applied Rasch analysis to examine the structure and psychometrics of the CD-RISC (Gonzalez et al, 2015). Unlike most studies of scale structure and dimensionality, which rely on classical test theory and measures such as Cronbach's alpha, the Rasch analysis is based on item response theory, which has some advantages. The authors obtained unidimensionality for 22 items, after removing items 3, 9, and 20. They concluded that overall the instrument has good psychometric properties and serves as a satisfactory measure of overall resilience. Their study did find that the items are

appropriate for detecting different levels of impaired resilience, e.g., in clinical samples, but that a ceiling effect at the high end might mean the scale would not be optimal in situations where the task was to differentiate between groups who had strong resilience to start with.

Perera and Ganguly (2016) used confirmatory factor analysis (CFA) and exploratory structural equation modeling (ESEM) in a sample of 274 university students with disability. They identified general (G) and specific (S) factors of competence, control and spirituality and recommended ESEM as an approach that successfully accounts for the multidimensional structure of the CD-RISC due to (i) coexistence of general and specific constructs and (ii) fallibility of items as purely unidimensional indicators of the constructs they are designed to measure. The G and S factors were then found to relate to career optimism and wellbeing.

Exploratory factor analysis with oblique rotation resulted in the emergence of four factors in a sample of 575 Brazilian psychiatric and medical outpatients (Solano et al, 2016b), named tenacity (40% of the total variance), adaptability, social support and intuition. The internal coherence was high with a Cronbach alpha = 0.93.

Wu et al (2017) found four factors, labeled stress tolerance; tenacity/goal direction; adaptability/acceptance; optimism in a large community sample of new employees in Chinese cities.

The original five-factor structure was replicated by Sharma and Sharma (2016) in 160 employees of Indian IT companies. Another study in India found a four-factor solution, using exploratory factor analysis – hardiness, optimism, resourcefulness and purpose in adolescent low-income girls (Sidheek et al 2017).

A report by Laird et al (2018) found four factors in a sample of US adults over age 60 with depression, these factors being labelled as grit, active coping self-efficacy, accommodative coping self-efficacy and spirituality.

Chen reported a Cronbach alpha = 0.92 in a sample of Chinese students (2018).

CD-RISC 10 and Factor Structure:

Campbell-Sills et al (2007) assessed a group of 1,743 undergraduates, 75% of whom were women, finding that the CD-RISC possessed an unstable four-factor structure in two identical cohorts. The authors removed those items that had inconsistent or non-salient loadings and those that corresponded to poorly defined factors. A 10-item scale emerged, and performed well in exploratory and confirmatory factor analyses: the items in this derivative scale came from the hardiness (items 1, 4, 6, 7, 8, 11, 14, 16, 17, 19) and persistence (item 11) factors of their previous analyses. The CD-RISC 10, according to the authors, is best seen as reflecting one latent factor of 'resilience.' The one-factor structure of the CD-RISC 10 has since been replicated in Chinese teachers (Wang et al, 2010), Chinese parents of children with cancer (Ye et al, 2017), Spanish students and Spanish patients with fibromyalgia (Notario-Pacheco et al, 2011; 2014), Spanish caregivers (Blanco et al, 2017), Brazilian adults (Lopes and Martins, 2011), low-income African-American men (Coates et al, 2013) a German community (Sarubin et al, 2015b), US competitive athletes (Gonzalez et al, 2016) and Danish hospital employees (Lauridsen et al, 2017). In the Danish study, the authors reported a Cronbach's alpha of 0.87. One exploratory factor analysis in Nigerian student nurses demonstrated two factors, named toughness and motivation (Aloba et al, 2016). In that same study, the scale showed strong internal consistency with a Cronbach's alpha = 0.81. A study of the Khmer translation of the CD-RISC-10 for adolescents found a single factor, and a Cronbach's alpha of 0.82 (Duong & Hurst, 2016). A unifactorial structure was obtained using CFA and allowing for correlation of residues in a sample of 1862 patients with long-term physical disabilities (Terrill et al, 2016). A unifactorial structure was also obtained by Madewell and Ponce-Garcia (2016) in over 400 US college students. Munevar et al (2016) found a one-factor solution in 52 Colombian patients with chronic illness, and regarded the scale as being suitable for the Colombian culture. In this sample, the Cronbach alpha was 0.81. Cronbach's alpha was 0.92 in a Chinese sample of ambulance and medical personnel (n = 227, Kang et al, 2018)

CD-RISC-2 and Factor Structure

With only two items, it makes little sense to perform factor analysis, but one report found a Cronbach's $\alpha = 0.84$ in 120 primary care patients (Langhinrichsen-Rohling et al, 2017).

Summary: In over 10,000 subjects, covering many different populations, studies have variously found 1, 2, 3, 4, and 5 factor solutions to best explain the structure of the 25-item scale. The observed differences across the studies are hardly surprising, and may reflect variations in methodology and sample, as well as underlying assumptions (e.g., pre-determining the number of factors, or items in a factor). For the 10-item scale, almost all studies have replicated its unifactorial structure, in keeping with the original purpose behind the development of this shorter scale.

Culture, Nationality and Ethnicity: Studies with the CD-RISC

Yu and Zhang (2007) noted the CD-RISC to show strong psychometric properties in a Chinese adult population, almost 75% of whom were between ages 20-49. Good internal consistency was obtained (Cronbach α coefficient = 0.91), and significant correlations were obtained between the CD-RISC and the Rosenberg Self-Esteem Scale, Life Satisfaction Index and the five scales of the NEO Inventory. As noted, a factor analysis produced somewhat different, yet still overlapping findings.

A second study in China examined the characteristics of parents of autistic children (PAC), as compared to parents of normal children (PNC). The PAC group showed lower levels of resilience on the CD-RISC, and this measure was inversely associated with levels of somatization, interpersonal sensitivity and phobic anxiety (Chen Yu, personal communication 2/29/2008).

In one South African study, the CD-RISC demonstrated validity in adolescents and the authors considered the scale to be a useful measure in their population, although in need of further validation. As in some other studies, Jørgensen and Seedat found that increasing age was associated with lower resilience (i.e., younger adolescents were more resilient than older ones), and that Black ethnicity was associated with lower scores.

An Iranian study (Khoshouei, 2009) showed good internal consistency for the CD-RISC (alpha coefficients ranging from 0.78-0.91), and good test-retest reliability ($r=0.78-0.88$).

Brown (2008) evaluated the CD-RISC in 153 African Americans. The scale correlated significantly with racial socialization messages as measured by the Teenage Experience of Racial Socialization Scale (TERS), Cultural Pride Reinforcement Scale (CPR) and the Multidimensional Scale of Perceived Social Support (MSPSS), particularly the special person and family support subscales of the MSPSS. A hierarchical regression analysis showed that, of all the variables studied, CPR and MSPSS-Special Person were the significant predictors of resilience, supporting Brown's main hypothesis that social support and racial socialization would predict resiliency in young African American adults. In a later report, Brown and Tylka (2011) found that the CD-RISC was related to racial socialization and related messages, but not to racial discrimination.

An Italian study assessed the relation between resilience and aggression in 903 prisoners with or without substance abuse. Inmates with substance abuse scored lower on the CD-RISC than did the controls (Cuomo et al, 2008).

In a South African sample of 502 young people, Bruwer et al (2008) demonstrated convergent validity between the MSPSS and the CD-RISC, similar to the Brown study.

A study in Japanese students by Ito et al (2009) found good internal consistency (Cronbach's $\alpha = 0.94$ and 0.90 for two samples), and good test-retest reliability of 0.94 and 0.83 .

Acceptable psychometric properties of the CD-RISC were obtained in a Turkish sample (Karairmak, 2010).

In Korean adults, the scale showed good internal homogeneity (0.93 for two samples) and acceptable test-retest reliability ($r=0.70$) (Baek et al, 2011). In depressed or anxious Korean outpatients, resilience was predicted by use of positive reappraisal, focus on planning and less use of rumination, according to the Cognitive Emotion Regulation Questionnaire (CERQ) (Min et al, 2013).

A community sample of older Native Americans from the southeastern US, part of the Native Elder Study, was studied and found to show resilience scores comparable to other US community samples (mean 83.0 (13.4) for the 25-item scale and 33.5 (6.2) for the 10-item scale) (Goins et al, 2012). Convergent validity was shown relative to measures of depression ($r=0.51$

both scales), self-efficacy ($r=0.47$ and 0.45 for the 25 and 10 item scales), self-mastery ($r=0.29$ and $r=0.31$) and social support ($r=0.27$ and $r=0.21$). Divergent validity was shown relative to handgrip strength and body mass index (non-significant or weakly significant correlations). A study of Native-Americans found a similar score on the CD-RISC-25 to a comparative group of Caucasians (78.3 vs 77.5)(Knows-His-Gun et al, 2013).

Iranian athletes were studied by Nezhad and Besharat (2010), who found that the RISC predicted athletic achievement, correlated positively with psychological wellbeing, and negatively with psychological distress.

A cultural form of validity was shown by Wu et al (2011) who found that in a culture that emphasized collective values more than individual ones, the RISC score was predicted by level of collectivist well-being, but not by individualistic well-being, in Chinese earthquake survivors. A similar finding has been reported by Yu and colleagues (2013a), who noted that family resilience (measured by the Zubrick scale) served as an additional predictor of depression beyond individual resilience, which was measured by the CD-RISC, in mainland Chinese refugees in Hong Kong.

In a community sample of 365 older Chinese women, Lim et al (2015) observed that stressful life events (SLE) and resilience moderated the impact of SLE in producing depression, and that optimism and sense of competence were two major aspects of resilience in this regard. In another study from China, Zhong et al (2016) found that in elderly patients, an authoritative parenting style was associated with higher resilience, compared to an authoritarian style.

Loh and Klug (2012) studied 108 Australian women who had immigrated after the age of 15, and found that the RISC was sole predictor of psychological distress (as measured by the General Health Questionnaire) in a multiple regression analysis, as well as correlating significantly with measures of acculturation (+ve), length of residence (+ve) and distress (-ve). Resilience was an important mediator of the acculturation process and helped to minimize distress.

Suarez (2012) studied 75 Quechua women in Peru, who had survived extreme violence (torture, sexual violence, combat, death of family members and forced displacement). While CD-RISC score did not contribute to variance in PTSD symptoms, it did contribute to post-traumatic distress

when this was measured by local (idiomatic) symptoms. This interesting study speaks to the benefit of measuring distress according to common symptoms in a culture.

Resilience was found to increase in Australian teenage refugees the longer they had been in the country, which speaks to the possibility that as people successfully adapt to new environments, their resilience increases (Ziaian et al, 2012).

Coates et al (2013) have reported a unifactorial structure of the CD-RISC-10 in low income African-American males, as well as correlations with spirituality and well-being.

Burrow-Sanchez et al (2014) studied Mexican-American adolescents with substance use disorders, and noted that a single factor of hardiness taken from the scale held a direct relationship with ethnic identity as measured by the Multigroup Ethnic Identity Measure (MEIM) ($r = 0.285, p < 0.01$), and that ethnic identity mediated the indirect relation between hardiness and depressive symptoms.

In survivors of a Haitian earthquake, spiritual belief and religious practice related to level of resilience. Those who believed that God was responsible for the event had higher CD-RISC score (77.3) than did those without such belief (65.3), and those who practiced the Voodoo religion also had higher scores (72.5) compared to non-practitioners (64.6) (Blanc et al, 2016).

A study of young adults in Afghanistan revealed no correlation between the CD-RISC and a measure of hope and optimism, or with mental and physical distress. The authors opined that in collectivist cultures the RISC score might be lower and also not as sensitive as local culturally relevant measures such as the one-item scale they used to assess hope and optimism (Alemi et al, 2018). The authors make the interesting suggestion that there is perhaps need to shift thinking away from “I” and “self-image” to “Us” when conceptualizing resilience in “non-western” societies.

Validity

The CD-RISC has been compared to numerous other measures that in one way or another are related to aspects of resilience, such as hardiness, social

support, stress-coping ability, self-esteem, life satisfaction, successful aging, positive and negative affect. The results of many investigations assessing the scale's validity will be described.

Construct: The construct of resilience would postulate that those who suffer from depression, PTSD, substance abuse, psychosocial problems and suicidal behavior would be less resilient than their counterparts, and this is indeed the case, as noted above in the presentation of mean scores across different populations (Tables 1-8). Moderating or mediating effects of resilience have been predicted and demonstrated with respect to associations between early adversity and outcomes like depression and suicide attempt, both with the CD-RISC 10 (Wingo et al, 2010; Campbell-Sills et al, 2007) and the CD-RISC 25 (Campbell-Sills et al, 2007). Wingo et al concluded that, using the CD-RISC 10, resilience moderated depression in those who had been exposed to childhood trauma both as a main effect and an interaction with trauma exposure. An increase of 5 points on the CD-RISC 10 was associated with a decrease of 2.5 points on the Beck Depression Inventory (BDI). The nature of the CD-RISC x trauma interaction was such that, for a given level of trauma, the high CD-RISC group (>75th percentile) had lower BDI scores than the less resilient groups.

Construct validity comes from a study by Roberts et al (2007), which showed that among 252 veterans of Iraq or Afghanistan, those with higher resilience were less likely to develop PTSD (OR = 0.11, 95% CI = 0.06-0.21), and of those who did have PTSD, resiliency was uniquely associated with decreased PTSD severity after accounting for demographic variables and combat severity ($\beta = -.037$, $p < 0.001$). Roy et al (2007) showed that the CD-RISC score was lower in substance abusers with a history of attempted suicide than in those with no such history, and that in a logistic regression, the risk of suicide attempt was predicted by the CD-RISC but not the Childhood Trauma Questionnaire (CTQ) score for either emotional or physical abuse. In a second report by the same group, the authors found that CD-RISC score, but not Beck Depression Inventory, predicted suicide attempt (Roy et al, 2007). Likewise, Nruham et al (2010) reported that resilience moderated the association between a lifetime history of violence and attempted suicide even in the presence of antecedent depression. A later report by Roy et al (2011) found a protective effect for resilience against suicide in those who had experienced childhood trauma in two separate samples: prisoners ($n=332$) and substance abuse patients ($n=40$). Similar results were found by Youssef et al (2013a, 2013b) in two samples of

OIF/OEF veterans. Baseline CD-RISC score predicted suicidality at three-year follow-up to a greater extent than did PTSD or alcohol use, and opined that the assessment of resilience and childhood trauma can contribute to their clinical status regarding depression and suicidal ideation..

Breno and Paz Galupo (2007) assessed 82 adult women who had been on the Child Welfare rolls as teenagers, and found that trauma-related beliefs of powerlessness and self-blame correlated negatively ($r=-0.54$, $p<0.01$) with resilience.

One study assessed the relationship between resiliency and scores on an anatomy test in 79 Mexican medical students (Elizondo-Omaña et al, 2007). A significant correlation was obtained between grade and CD-RISC ($r=0.55$, $p<0.05$).

In South African adolescents, Fyncham et al (2009) showed that resilience moderated the relationship between childhood abuse and PTSD symptoms, reducing its impact on PTSD in the presence of high resilience.

Simon et al (2009) showed that childhood abuse, particularly of the emotional neglect type, was associated with lower levels of resilience in generalized social anxiety disorder.

McTighe (2009) failed to demonstrate any relationship between meaning-making and resilience score in social workers who had experienced the attacks on 9/11, although some relationships emerged between certain CD-RISC factors (spirituality and stress) and personal witnessing of 9/11, experience of major loss and length in practice.

Burns et al (2010) evaluated a large Australian general population cohort ($n=3,989$) and demonstrated that the effects of resiliency upon depression and anxiety were fully moderated by positive and/or negative affect.

In a study of college students, Otto et al (2010) reported that a small group of “flourishers” (14% of their sample) showed greater resilience than did “non-flourishers” (mean scores circa 83 and 72 respectively).

In a post-earthquake population, the CD-RISC was the only psychological variable to predict (lower) symptoms on measures of PTSD and depression (Ahmad et al, 2010).

Following the 2004 earthquake and tsunami in Aceh and Nias, Irmansyah (2010) observed that resilience as measured by the CD-RISC 2 served as an independent predictor of outcome, according to the Self Report Questionnaire (SRQ-20).

Huang (2010) found that social support and better coping strategies were associated with greater resilience in diabetics, and that resilience was significantly and positively associated with health-related quality of life and diabetic self-care (e.g., diet and exercise).

Pietrzak et al (2010) noted that veterans with suicidal ideation had significantly lower scores on the CD-RISC, and that CD-RISC score were negatively related to suicidal ideation.

A relationship was found between insomnia and suicidality in 1,420 male Italian prisoners, with resilience emerging as one of the variables that independently predicted insomnia (Carli et al, 2011). In another report by the same group, the CD-RISC score was lower among the low-impulsive group than in the high-impulsive group, and CD-RISC was one of a number of independent predictors of suicidality, in that greater resilience was associated with lower risk of suicidality (Carli et al, 2010). A third report by Carli et al (2013) found that CD-RISC score predicted impulsivity on the Barrett Impulsivity Scale but not aggressiveness as measured by the Brown-Goodwin scale. The authors concluded that impulsivity and aggression were two different personality traits.

Response readiness to chemical and other threats was studied in a representative sample of paramedics in New South Wales, Australia. Using the CD-RISC 2, the authors found that personal resilience emerged as one of the strongest predictors of response readiness (Stevens et al, 2010).

A study of medical interns failed to demonstrate an association between resilience, as measured by the CD-RISC, and depression during internship (Sen et al, 2010).

In 120 Iranian university students, the CD-RISC score was a negative predictor of risk for developing substance abuse (Fadardi et al, 2010). A later study in 260 Iranian university students showed a negative correlation

between CD-RISC-25 and severity of obsessive-compulsive personality disorder (Zakiei et al, 2017).

CD-RISC scores were lower in those with PTSD compared to those without (62.9 vs. 77.6, $p < 0.001$) (Green et al, 2010) and, in the same sample, lack of resilience uniquely predicted risk for PTSD, suicidality, alcohol problems, depression and poor health. The authors concluded that resilience may be a construct that plays a unique role in the occurrence of PTSD and severity of other correlates among deployed veterans.

Higher couple functioning was associated with greater resilience, regardless of level of PTSD, in couples where either one or both members had experienced combat (Melvin et al, 2012).

Repressor type coping and trait anxiety, but not resilience, were predictive of post-deployment PTSD in a sample of US Air Force medical personnel (McNally et al, 2011).

Gabriel et al (2011) found that high resilience (HR) was associated with positive affect regardless of task accomplishment in nurses, i.e., they concluded that HR subjects were able to sustain positive affect under any circumstance, but for those with LR, positive affect was dependent on task accomplishment. No such interactive effect was found for negative affect, suggesting that resilience may be more crucial for maintaining positive emotion at times of daily stress rather than preventing negative affect.

Phillips (2011) found that unemployed men with the highest cognitive flexibility as measured by the Short Category Test were those with the highest score on the CD-RISC.

Pietrzak et al (2011) used cluster analysis to derive three groups of OIF/OEF veterans: low combat/low PTSD ($n=134$), high combat/high PTSD ($n=72$), and high combat/low PTSD ($n=61$). CD-RISC scores in the groups were 76.0 (1.9), 66.3 (2.6) and 80.1 (2.2). The authors reported that membership in the highly resilient group was characterized by the following: being in a relationship, having few psychosocial difficulties, reporting greater sense of purpose and control, and the presence of family support. They made suggestions as to the implications of these findings for the development of therapeutic interventions. In a later study of a large national cohort of older veterans, these authors found that resilience (CD-RISC-10) was a predictor

for successful aging, along with gratitude and purpose in life (Pietrzak et al, 2014).

A weak but significantly negative correlation ($r=-0.19$, $p<0.05$) was found between extent of alcohol intake and resilience in 88 college students at the University of Nebraska (Johnson et al, 2011).

In spinal cord injury (SCI) patients, resilience buffered the effects of SCI-related stressors on depression, and that the resilience model may be useful in guiding interventions designed to improve mental health in SCI patients (Catalano et al, 2011).

Dodd (2010) found that greater resilience was associated with secure attachment over fear-based attachment, as well as with social support in disabled in-patients undergoing post-injury rehabilitation.

In a national survey of 744 nurses, Mealer et al (2011) found that higher resilience was associated with lower rates of PTSD and burnout. A later qualitative study by this group showed that highly resilient nurses ($n=13$) differed from nurses with PTSD ($n=27$) in having greater spirituality, supportive social network, optimism and a resilient role model in coping with adversity. Differences were found in worldview, cognitive flexibility, social network and self-care (Mealer et al, 2012).

In depression and anxiety, those with lowest CD-RISC scores were found to be less spiritual in their orientation, to have less purpose in life and to take less exercise; they also showed more trait anxiety (Min et al, 2012).

In a sample of female outpatients who had received mammography, lower resilience levels were associated with current anxiety (but not depression) and previous trauma (Scali et al, 2012).

Posttraumatic growth mediated posttraumatic growth in parents of children undergoing surgery to correct congenital disease, and as positively associated with CD-RISC score ($r=0.432$, $p<0.01$) (Li et al, 2012).

Volunteering in the community and number of chronic health problems were associated (positively and negatively respectively) with resilience, while the two variables also interacted in predicting resilience, such that greatest RISC score was found in volunteers who had the highest number of chronic health

problems. A limitation of this study was the authors' use of an unvalidated six-item variant of the RISC, the structure of which differed substantially from the validated forms of the CD-RISC (Okun et al, 2011).

Among a national sample of 1,100 war veterans, resilience was found to be lower in those who had demonstrated severe violence or other aggression, and the CD-RISC score emerged as an independent predictor of other physical aggression, but not of severe violence, in the sample (Elbogen et al, 2012).

In 351 combat-exposed Stryker Brigade troops, resilience fully mediated the relationship between psychological skills (goal setting, stress management, cognitive skills) and PTSD (Hammermeister et al, 2012).

A large cohort of over 63,000 Air Force personnel was studied by Prabahakaran et al (2012), who showed that CD-RISC-10 score was related to all four pillars of fitness (i.e., physical, emotional, social and spiritual) in the Air Force Comprehensive Fitness program, with the key drivers of resilience being personal coping and symptoms of depression.

Hourani et al (2012) studied 475 active duty marines who were transitioning into civilian life. They found that pre-separation CD-RISC score predicted risk (i.e., higher scores protected against) of mental health problems and functional impairment on follow-up, with strongest influence being noted on the latter.

Kramer (2012) observed that resilient individuals were more likely to use accommodative coping to maintain their assumptions following stress, and that being resilient was predictive of using accommodative focused coping and of positive growth after a stressful event.

Following mild traumatic brain injury (mTBI), resilience (along with depression) was found to predict post-injury anxiety and post-concussion symptoms after accounting for other factors (McCauley et al, 2013). In another study of TBI, the CD-RISC-10 was lower in those with cases as defined on the Brief Symptom Inventory (BSI) compared to non-cases (18.7 vs 26.4), and the score correlated significantly with degree of adaptation to brain injury, and to BSI depression (Lukow et al, 2015).

The ability to switch flexibly back and forth between processing affective and non-affective stimuli has been regarded as central to trait resilience. Genet and Siemer (2013) showed that resilience, as measured by a combined score of the CD-RISC and Block's Ego Resiliency Scale, was predicted by greater flexibility on an affective task-switching test.

Successful aging was predicted by resilience to the same extent as it was predicted by physical health and depression in a large cohort of older community members (Jeste et al, 2013).

In a sample of Korean psychiatric outpatients, the RISC was positively correlated with CERQ measures of positive refocusing and reappraisal, focus on planning and putting things into perspective, while CD-RISC scores were negatively correlated with Beck depression score, State-Trait anxiety, self-blame, catastrophizing and rumination (CERQ) (Min et al, 2013).

CD-RISC was the only variable to predict level of PTSD symptoms in a group of 38 Italian industrial accident survivors (Ghisi et al, 2013), and scores were lower (61.3) in the trauma group than in the controls (74.2).

Resilience mediated the effect of dispositional optimism on subjective well-being in a group of burn-injury patients, as well as having an independent effect on well-being (He et al, 2013).

Resilience predicted risk of psychological vulnerability to a greater extent than did positive affect in Iran men attending a fertility clinic (Abolghasemi et al, 2013).

Senders and colleagues (2014) observed a strongly positive correlation between CD-RISC score and a measure of trait mindfulness, the Five Facet Mindfulness Questionnaire (FFMQ) ($r=0.67$), and noted that mindfulness accounted for 44% of the variation in CD-RISC score in a group of patients with multiple sclerosis.

In their community study of the CD-RISC 10 in Memphis, Campbell-Sills et al (2009) demonstrated that the CTQ measure of early sexual abuse predicted CD-RISC in a multiple regression model ($\beta=-0.10$, $p<0.05$), but no such relationships were observed for the emotional and physical neglect measures.

Wingo and colleagues (2014) found that higher CD-RISC-10 scores mitigated against the risk of harmful alcohol and illicit drug use in a large cohort (n=2024, mean CD-RISC-10 score = 31.8) of inner city residents, most of whom were African-American, all recruited from hospital clinics. Resilience had a buffering interaction effect in those who had experienced childhood abuse, affording greater protection against harmful drug and alcohol use. A later report by the same group obtained a significant correlation between the RISC-10 and social function (beta = 1.11, $p < 0.0001$) in veterans with PTSD and depression (Wingo et al, 2017).

Adolescent survivors of the Wenchuan earthquake were less likely to develop depression and PTSD if they showed greater resilience (Ying et al, 2014).

Paramedic students in South Africa who had PTSD showed lower resilience scores than those without (Fjeldheim et al, 2014), and the CD-RISC served as a predictor of PTSD status in a multivariate logistic regression.

CD-RISC score moderated the relationship between traumatic experience and PTSD symptoms in Korean firefighters, and for equal exposure to trauma, it was found that those with CD-RISC scores in the upper 25th percentile were protected from the direct and indirect effects of trauma relative to those in the lower percentiles (Lee et al, 2014).

In postpartum women who had been exposed to childhood trauma, the RISC score predicted postpartum depression and PTSD, and sense of competence and overall functioning. The CD-RISC moderated the effect of high degree early trauma on outcome; in those with scores above 53, the rate of postpartum PTSD was 8%, while in those with scores below 29, the rate was 58% (Sexton et al, 2015).

In sixty-eight Swiss cancer patients, low resilience was associated with greater unmet psychological needs concerning their cancer. Age, metastasis, living alone and recurrence were predictive factors of resilience (Dubey et al, 2015).

The CD-RISC-10 score was negatively correlated with the Silencing of the Self Scale (STSS) score in a sample of US women who were HIV +ve (Dale

et al, 2014b). STSS contributed to resilience over and above the contribution of other variables.

Daily alcohol consumption correlated negatively with CD-RISC-10 score in police officers exposed to trauma. The mean score was 31.5 in those consuming 2 daily drinks or less, versus 25.3 in those who had 7 or more daily drinks (McCanlies et al, 2014).

The severity of traumatic injury as measured on the Glasgow Coma Scale (GCS) correlated significantly with the CD-RISC-10 score at baseline ($r = 0.257$) and 12 months ($r = 0.338$) in 110 traumatically injured inpatients (Rainey et al, 2014).

Nicotine withdrawal symptoms are associated with more severe PTSD. Resilience protected patients against severe PTSD when nicotine withdrawal was mild, but not when severe, suggesting a protective function for resilience against PTSD in those with mild (but not severe) nicotine withdrawal (Asnaani et al, 2015).

The CD-RISC-2 score was lowest in those with PTSD and depression, compared to those with PTSD or depression alone, and controls, in a sample of Korean firefighters (Jeong et al, 2015).

A large community study of the Hong Kong general population demonstrated significant correlation between the CD-RISC-25 and CD-RISC-2 with depression (negative), family harmony and functioning (positive) and no significant relation to alcohol intake (Ni et al, 2015).

A study of 161 Native American Indians and Caucasians at the St. Labre Community showed positive relationship between resilience and length of time employed and between resilience and existential wellbeing, and a negative relationship with years of unemployment (Knows-His-Gun et al, 2013).

The CD-RISC-10 correlated negatively with Maslach's Burnout scale (emotional exhaustion, cynicism and reduced personal accomplishment) and positively with a measure of psychological empowerment in a group of Chinese telephone operators (Tian et al, 2015).

Ultra-endurance Ironman athletes scored significantly higher than recreational athletes on the CD-RISC-25, and also the resilience scores of the combined group correlated negatively with the personality dimension of harm avoidance; there was no correlation versus reward dependency or novelty seeking (Van Breda et al, 2015).

Two studies showed that the CD-RISC correlated with or predicted psychological wellbeing in Australian university students (Pidgeon and Keye, 2014) and Indian geriatric subjects with depression, rheumatoid arthritis or accompanying persons of these patients (Singh et al, 2014).

Functional status was the sole variable to predict resilience in a group of Iranian stroke survivors (Derakhshanrad et al, 2014). A later study by this group obtained positive correlations between the CD-RISC-25 and measures of motivation (the AAMQ), occupational performance and satisfaction on the Canadian Occupational Performance Measure ($r = 0.67, 0.45$ and 0.48 respectively) (Derakhshanrad & Piven, 2017).

The CD-RISC correlated with measures of self-concept and social support in 1,250 Spanish adolescents (Rodriguez-Fernandez et al, 2015). Among parents of children with intellectual disability, the CD-RISC correlated negatively (-0.224) with a measure of impact of disability, while a positive (0.479) correlation was obtained relative to positive impact of disability on the parent in an Indian sample (Rajan and John, 2016).

In 115 Chinese patients, cut off scores of 45.5 and 19.5 were found to distinguish best between those with and without PTSD for the CD-RISC-25 and CD-RISC-10 respectively (Peng et al, 2016).

In a large study of over 50,000 Air Force recruits, CD-RISC score was lower (76.9) in those who were eventually separated from service as being unsuitable, compared to the remainder (84.0), and similarly for those who developed mental illness (76.1) compared to those without (83.9) (Bezdjian et al, 2016). AUC cutoff scores to discriminate between groups showed moderate sensitivity (64-65%).

Healthy eating index (HEI) scores according to US dietary guidelines were associated with higher CD-RISC scores and for every 10-point increase in the HEI, the likelihood of being in the high resilience group increased by 22% (Lutz et al, 2016).

In older members of the Naples, Italy, metropolitan area, correlation was observed between CD-RISC-2 score and Psychological General Wellbeing Short Scale ($r=0.22$, $p<0.0001$) (Rapacciuolo et al, 2016).

A US study of subjects with physical disability found that CD-RISC-10 was correlated with social role satisfaction ($\beta = 0.17$, $p<0.001$) and Older Person Quality of Life (OPQOL) scale ($\beta = 0.39$, $p<0.001$). but bot with physical role (Battalio et al, 2016).

Among 377 Chinese nurses, the CD-RISC-10 correlated ($r=0.40 - r=0.46$, $p<0.01$) with measures of achieving rapport, listening receptively and communicating effectively, and the scale moderated the effect of emotional intelligence on clinical communicative ability (Kong et al, 2016).

Dispositional mindfulness and optimistic expectations of achieving success predicted resilience on the CD-RISC-10 in Australian student nurses (Chamberlain et al, 2016).

The presence of personality disorder traits was associated with CD-RISC-25 score in almost 4000 Chinese factory employees, with lower RISC scores associated with greater chance of personality pathology (Tan et al, 2016). Another study of the relationship between resilience and personality in US war veterans showed that those with over-controlled and under-controlled personalities were less resilient than those categorized as having resilient personalities (Elliott et al, 2016).

Resilience correlated positively with physical self-concept in 148 Chilean judo practitioners (Zurita-Ortega et al, 2016).

In 430 Spanish adults, the CD-RISC-25 correlated negatively with two dimensions of coping on the SCQA (Alonso-Tapia et al, 2016): rumination, emotional expression, and positively with three: help seeking, positive thinking and problem solving.

CD-RISC scores were lower in bipolar disorder and also correlated with quality of life in a group of 136 Chinese subjects with bipolar disorder and in healthy controls (Lee et al, 2016).

The CD-RISC-10 correlated positively with empathy ($r=0.23$) and mindfulness ($r=0.47$), and negatively with perseverative thinking ($r=-0.23$) in Indian nursing students (Mathad et al, 2017).

You and Park (2017) found that higher score on the CD-RISC-25 protected men, but not women, against suicidal behavior in a large community sample of Korean elders.

Poole et al (2017a) noted that resilience moderated the relationship between adverse childhood experiences and depression, as well as independently predicting depression in primary care patients. She also observed a correlation between the RISC-10 and anxiety on the GAD-7 ($r=-0.48$), Adverse Childhood Experiences ($r=-0.19$) and emotional dysregulation on the DERS ($r=-.062$, all $p<0.001$). Resilience moderated the effect of ACEs on emotional dysregulation, with ACEs having stronger influence on dysregulation in those with low resilience than in those with high resilience (Poole et al, 2017b).

In a sample of Swiss parents, the CD-RISC-2 was found to correlate positively ($r = 0.17$) with an emotional coach type of parenting, and negatively with dismissing and disapproving styles of parenting ($r = -0.12$ and -0.14) (Gianesini, 2012).

Older Chinese married couples were studied as to the relationship between sense of community and life satisfaction, and the moderating influence of personal and partner resilience. Both of the latter, along with sense of community predicted life satisfaction, and in cases where resilience was low, the effect of sense of community on life satisfaction was weaker (Zhang et al, 2017).

Resilience was related to perceptions of mattering, isolation and marginalization in physical educators (Richards et al, 2017).

The control factor of the CD-RISC was associated with psychological wellbeing and the personal competence subscale factor with physical wellbeing in 986 community and university subjects: each of these β values was greater than the values for other resilience measures in a regression analysis (Maltby et al, 2017).

Resilience correlated positively with satisfaction with life ($r = 0.43$), gratitude ($r = 0.35$), social support ($r = 0.42$) and negatively with PTSD symptoms ($r = -0.39$) in a sample of 113 New Orleans police officers dealing with the aftermath of Hurricane Katrina (McCanlies et al, 2017).

The CD-RISC was associated with capacity to learn from one's mistakes ("self-regulation"). Unfortunately, the authors extracted an unofficial 15-item scale to demonstrate this interesting finding, making it impossible to interpret and of uncertain relevance to the available and validated forms of the CD-RISC (Artuch-Garde et al, 2017).

McKillop et al (2017) found the CD-RISC to correlate negatively ($r = -0.28$, $p < 0.05$) with scores on the Pain Disability Index (PDI) in 70 Canadian patients with chronic back pain. Other correlations between the CD-RISC-10 and CD-RISC-2 and measures of pain were reported by Sharma et al (2018). In their study of Nepali patients with chronic pain, the RISC-10 correlated at $r = -0.35$ for pain catastrophizing (PCS) and $r = -0.27$ for pain intensity (PROMIS). Correlations for the CD-RISC-2 were -0.30 and -0.27 .

A new scale to measure wisdom was developed by Jeste's group (Thomas et al, 2017). This scale, the SD-WISE, shares a number of features in common with resilience and the CD-RISC-10 was used to demonstrate construct validity. Of nine measures of mental health and wellbeing, the correlation of the SD-WISE to the CD-RISC-10 ($r = 0.33$) was highest of all scales.

In 606 Indian adolescent girls, the Kannada version of the CD-RISC correlated negatively ($p < 0.001$) with psychological distress on the Kessler-10 scale, and scores were lower (58.2) in those below the K-10 cutoff of 20 (Sidheek et al, 2017).

The percentage of subjects with CD-RISC scores below the median was higher in US veterans with suicidal ideation (76%), and violent impulses (82%) than in those with neither (49%) (Elbogen et al, 2017).

Chen, Chen and Bonanno (2018) reported that enhancement and suppression ability, as measures of flexibility in emotional regulation, correlated significantly with the CD-RISC score ($r = 0.26$ and 0.33) in 310 Chinese college subjects.

Brown et al (2018) reported a positive correlation ($p < 0.001$) between CD-RISC-10 score and job satisfaction among US nurses.

Crosta et al (2018) reported a negative correlation between the CD-RISC-25 and Childhood Trauma Questionnaire (CTQ) score an Italian sample ($r = -0.42$, $p < 0.01$).

In 343 Hungarian subjects, the CD-RISC-10 correlated significantly with measures of competitive qualities: lack of competitive interest, anxiety-driven avoidance of competition and competitive orientation ($r = 0.12$, $r = 0.23$ and $r = 0.24$) (Gabor et al, 2018).

Convergent Validity:

CD-RISC-25:

Concurrent (convergent) validity is demonstrated by showing that the scale correlates with like measures, either of resilience itself or related measures such as stress coping, self-esteem, optimism, symptoms of depression or anxiety, etc. Three Chinese studies have assessed the convergent validity of the CD-RISC. In one (Yu and Zhang, 2007a), the CD-RISC correlated with the Rosenberg Self-Esteem Scale ($r=0.49$, $p<0.01$), the Life Satisfaction Index A ($r=0.48$, $p<0.01$), and all five factors of the NEO-FFI (i.e., neuroticism, $r=-0.47$; extraversion, $r=0.43$; openness, $r=0.27$; agreeableness, $r=0.36$; conscientiousness, $r=0.64$ – all $p<0.01$). In another study (Yu and Zhang, 2007b), the CD-RISC and Ego Resiliency Scale (ERS) were evaluated and the CD-RISC proved superior in comparison to the ERS in respect of correlations against the NEO, self-esteem and life satisfaction scales, 6 out of 7 of which were significant for the CD-RISC (ranges $r=-0.39$ to 0.54), and only one of which was significant for the ERS (ranges $r=-0.13$ to 0.19). In a third report of adolescents, the CD-RISC and nearly all of its five factors correlated significantly in expected directions with the Children's Depression Inventory, the Screen for Child Anxiety Related Emotional Disorders and the Multidimensional Scale of Perceived Social Support. Only in factor 5, which contains 2 items, were correlations non-significant for depression and anxiety (Yu et al, 2011).

Positive correlations have been shown against the Kobasa Hardiness scale ($r=0.83$, $p<0.001$), the Sheehan Social Support Scale ($r=0.36$, $p<0.0001$). Negative correlations were found for the Perceived Stress Scale ($r=-0.76$,

$p < 0.001$), the Sheehan Stress Vulnerability Scale ($r = -0.32$, $p < 0.0001$), and the Sheehan Disability Scale ($r = -0.62$, $p < 0.0001$) (Connor and Davidson, 2003).

Maguen and colleagues (2008) found that in 328 military medical personnel preparing for deployment, the CD-RISC score correlated with the PTSD Checklist-Military (PCL-M) measure of PTSD ($r = -0.22$, $p < 0.01$), negative ($r = -0.32$, $p < 0.01$) and positive ($r = 0.62$, $p < 0.01$) effect on the Positive and Negative Affectivity Schedule (PANAS). In subsequent hierarchical linear regression analyses of predictors for positive and negative affect, the CD-RISC remained as a significant predictor, but not in the model to predict PTSD symptoms. The authors stressed the important association between resilience and positive affect.

In a study of the Brief Resilience Scale (BRS), Smith and colleagues found that the BRS correlated with the CD-RISC ($r = 0.59$, $p < 0.01$) (Smith et al, 2008). Significant correlations were also found between the CD-RISC and the PSS ($r = -0.53$, $p < 0.01$), positive and negative affect on the PANAS ($r = 0.68$ and $r = -0.25$, $p < 0.01$), as well as anxiety and depression on the Hospital Anxiety and Depression Scale (HADS) ($r = -0.40$ and $r = -0.35$, $p < 0.01$). Two of these correlations held up when partialling out for the effect of other measures in the model.

In an epidemiological survey of older community members in California, Lamond et al (2008) observed a significant predictive relationship between the following variables and CD-RISC score: emotional wellbeing ($r^2 = 0.237$, $p < 0.001$), cognitive functioning ($r^2 = 0.303$, $p < 0.001$), self-reported successful aging ($r^2 = 0.353$, $p < 0.001$), optimism ($r^2 = 0.386$, $p < 0.001$) and days spent with family and friends ($r^2 = 0.386$, $p < 0.001$).

Campbell-Sills et al (2006) demonstrated a number of convergent relationships between the CD-RISC and other measures, in keeping with their hypotheses. In 132 undergraduates, the investigators assessed the degree to which the CD-RISC served as a satisfactory measure of adult resilience. They predicted that coping style would relate to resilience and that, secondly, the CD-RISC would show convergent validity with related measures, and divergent validity against less closely related ones. Lastly, they assessed the degree to which the scale served as measure of buffering (i.e., showed a 'moderator' effect) on the relationship between recalled childhood abuse and current psychiatric symptoms as measured by the Brief

Symptom Inventory (BSI). Their findings showed that strong correlations existed with three of the five NEO dimensions (neuroticism, $r=-0.65$; extraversion, $r=0.61$ and conscientiousness, $r=0.46$). Lesser but still significant correlations were found relative to the openness ($r=0.20$) and agreeableness ($r=0.15$) scales. Except for one comparison, gender and ethnicity did not influence these findings. As to coping, in a regression model, task-oriented coping ('active' coping) and emotion-oriented coping showed positive and negative relationships with CD-RISC respectively ($\beta=0.39$, $t=6.06$, $p<0.001$ and $\beta=-0.18$, $t=-2.39$, $p<0.05$). With regard to their last hypothesis that resilience would moderate the relationship between early trauma and current symptom state, the authors found this to be the case, in that those with high resilience and severe early trauma failed to exhibit significant symptoms, while the low resilience/high trauma group reported more severe symptoms. The low trauma group showed intermediate symptoms regardless of resilience level.

Schaefer et al (2007) studied 256 US missionaries in Europe and Africa, and found that the CD-RISC was one predictor of the Davidson Trauma Scale (DTS) score, a measure of PTSD severity ($\beta=-0.20$, $p<0.01$).

Benetti and Kambouropolous (2006) studied a group of 240 young Australian adults and college students, examining whether trait anxiety and resilience influenced self-esteem, as measured by the Rosenberg Self Esteem Scale, and if these effects were mediated by negative and positive affects respectively, as measured by the PANAS. Their results found this to be the case and the authors concluded that the impact of resilience on self-esteem is due to its effect on regulating affective experience.

A cohort of 136 information technology students was studied by Lewis et al (2008). A relation was shown between CD-RISC and the Schutte Emotional Intelligence (EI) Scale ($r=0.31$, $p<0.01$) and INTENT, a scale measuring intent to stay in the course ($r=0.28$, $p<0.01$). In linear regressions, the CD-RISC remained a significant predictor of EI, but not of INTENT, after controlling for other variables.

In Bruwer et al (2008), Cohen's Perceived Stress Scale (PSS) also correlated significantly with the CD-RISC ($r=-0.28$; $p<0.01$) as did the Beck Depression Score ($r=-0.43$, $p<0.01$).

Ito et al (2009) noted negative correlations relative to perceived stress ($r=-0.58$, $p<0.01$) and psychiatric symptoms on the K-6 scale in Japanese students ($r=-0.44$, $p<0.01$). Positive relationships ($p<0.01$) were observed with regard to Kobasa's Hardiness ($r=0.68$) and Antonovsky's Sense of Coherence ($r=0.50$) scales.

In veterans of OIF and OEF, Pietrzak et al (J Aff Dis, 2009) reported negative correlations between the CD-RISC and PTSD symptoms ($r=-0.53$, $p<0.001$), and depression ($r=-0.57$, $p<0.001$). In a second publication (Pietrzak et al, Depression and Anxiety, 2009), the same group noted that two of the original CD-RISC factors, personal control and positive acceptance of change, were negatively associated with depression and PTSD. In the same series of studies, the authors did not find that resilience was a predictor of perceived stigma or barrier to mental health care (Pietrzak et al, Psychiatric Services, 2009).

Giesbrecht et al (2009) found that cognitive reactivity was predictive of lower resilience four months later.

Yu et al (2009) reported that in 271 Chinese subjects who were HIV +ve, the CD-RISC was a protective factor against depression, anxiety and stress. Among cricketers, all four subscales of the Cricket Mental Toughness Inventory (CMTI) - desire to achieve, $r=0.23$; resilience, $r=0.73$; attentional control, $r=0.84$; self-belief, $r=0.52$ - showed positive correlations with the CD-RISC (Gucciardi and Gordon, 2009).

Otto et al (2010) noted positive correlations between the CD-RISC and the Marlowe-Crowne Social Desirability, Positive Affect, Global Physical health scales, while a negative correlation was obtained against the Negative Affect Scale. Resilience accounted independently of other variables for some (2.3%) of the variance in global wellbeing.

Karairmak (2010) demonstrated significant correlations for the CD-RISC versus the Ego Resiliency Scale ($r=0.68$), Positive Affect Scale ($r=0.69$), Rosenberg Self Esteem Scale ($r=0.53$), and measures of optimism (Life Orientation Scale, $r=0.55$) and hope (Dispositional Hope Scale, $r=0.68$). A negative correlation was obtained relative to the Negative Affect Scale ($r = -0.44$).

Park et al (2010) observed a correlation between resilience and posttraumatic stress symptoms in Korean firefighters, although it did not mediate the relation between trauma exposure and PTSD, as did self-esteem.

Spinal cord injury patients demonstrated significant positive correlations between the CD-RISC and Satisfaction with Life (SWLS) ($r=0.54$), Inventory of Spiritual Beliefs (ISS) ($r=0.35$) and a negative correlation with depression (PHQ-9) ($r=-0.35$), and no association with Functional Independence (FIM) (White et al, 2010).

Relative to another resilience scale, the RSA of Friborg and Hjemdal, the CD-RISC correlated significantly ($r=0.41$) in 373 Iranian adults (Jowkar et al, 2010).

The Responses to Stressful Experiences Scale (RSES), developed by Johnson et al (2011) to assess response patterns to more severe stress, correlated significantly with the CD-RISC in two samples of 224 active duty Marines and 103 veterans of OIF and OEF ($r=0.61$ and 0.81).

A study in Korean subjects found that the CD-RISC correlated positively with the Rosenberg Self Esteem Scale ($r=0.558$) and negatively with the Beck Depression Inventory ($r=-0.457$), Perceived Stress Scale ($r=-0.319$) and the Impact of Events Scale-Revised ($r=-0.257$) (Baek et al, 2011).

Gucciardi et al (2011) conducted a second study in 520 Australian cricketers, noting significant positive correlations for the 25- and 10-item versions of the CD-RISC against hardiness and athletic burnout. Against global hardiness, which was measured by the Personal Views Survey III-R, there were positive correlations of 0.62 and 0.56 respectively ($p<0.01$). Against the three components of the Athletic Burnout Questionnaire, correlations with the CD-RISC 25 and CD-RISC10 ranged from -0.32 to -0.46, and -0.38 to -0.40 respectively ($p<0.01$).

In a paper that described the development of a new scale for adolescents, the Singapore Youth Resilience Scale (SYRESS) correlated at $r=0.88$, $p<0.01$ with the CD-RISC (Lim et al, 2011).

In a large community sample, the CD-RISC correlated with positive attitude towards aging as measured by the Philadelphia Geriatric Morale Scale (PGMS) ($r=0.38$, $p<0.001$) (Kavirajan et al, 2011).

CD-RISC scores correlated negatively with measures of neuroticism and negative life events, but positively with social support and extraversion in medical students (Peng et al, 2012).

The CD-RISC was used to demonstrate convergent validity with a new measure of pain ($r=0.42$, $p<0.005$) (West et al, 2012).

In a Norwegian schizophrenia sample, the CD-RISC correlated significantly with subjective wellbeing ($r=0.80$, $p<0.01$), Global Assessment of Function (GAF) ($r=0.87$ for the full recovery group and $r=0.97$ for the remission group, $p<0.01$) and the Global Assessment of Relational Functioning (GARF) ($r=0.61$, $p<0.01$ for all subjects) (Torgalsbøen, 2012). Regression analysis showed that the CD-RISC and GAF explained 67% of the variance in accounting for subjective wellbeing, with CD-RISC remaining a significant predictor when controlling for function.

Mansfield and colleagues (2011) studied 3,069 male Navy and Marine personnel. They found negative correlations between resilience and measures of suicidal ideation, PTSD, depression and substance use, but not with combat exposure. Resilience had a significant protective effect against PTSD and depression in both services and against suicidal ideation in Marines only.

In single African American, low income, fathers, Coates (2012) observed positive and statistically significant correlations between the CD-RISC and measures of spirituality ($r=0.56$), co-parenting relationship quality ($r=0.33$) and motivation ($r=0.33$), but no relationship with measures of social support, conviction history and psychological wellbeing. In a later report (Coates et al, 2013), the same group found that the CD-RISC-10 correlated negatively with the General Health Questionnaire-12 (GHQ-12), a measure of general mental health distress.

Bensimon (2012) demonstrated that resilience was positively associated with posttraumatic growth (PTG) ($r=0.14$) and negatively with PTSD ($r=-0.13$) in 500 Israeli students who had been exposed to trauma. Greater resilience was associated with a broader range of coping behaviors in anticipation of terrorism in the Australian population (Stevens et al, 2012).

Young adults in Canada who were transitioning out of child welfare were found to show less depression and less smoking if they had higher CD-RISC scores, and also greater religious and community involvement. Resilience was independently associated with depression over and above the impact of childhood trauma (Goldstein et al, 2013).

Lee and Williams (2013) showed a significant positive correlation between the CD-RISC and measures of social support and family cohesion in 206 Korean offspring of alcoholic parents. The RISC mediated outcome (depressive symptoms), serving as the main protective factor after sense of belonging.

Among Korean patients with metastatic cancer, those with more depression or anxiety scored lower on the CD-RISC (Min et al, 2012).

Parents of children with cancer, who had lower resilience, were more likely to have sleep difficulty (OR= 5.19), to be unable to express worries (OR= 4.00), to have lower health satisfaction (OR=5.71), greater distress on the K-6 (Kessler-6) scale, as well as lower social support and more likelihood of driving under the influence of alcohol (Rosenberg et al, 2013).

In a study of 20 amputees conducted in the Netherlands, the CD-RISC correlated positively with all four scales in the WHO-QoL, and negatively with all scales in the SCL-90R (Bodde et al, 2013).

Adult offspring of a parent with schizophrenia were found to be unsatisfied with the quality of parenting by the affected parent, but the most resilient in the sample were those who endorsed greater support from other relatives, and greater social support in coping with difficulties (Herbert et al, 2013).

Petros et al (2013) studied a sample of 196 healthy English adults and found strong positive correlations between the CD-RISC and the Schwarzer & Jerusalem Generalised Self-Efficacy Scale, as well as significant positive correlations versus the LOT-R Dispositional Optimism Scale, the Berlin Social Support Scale, and WHO-5 Wellbeing Scale. Negative correlations were found vs the CES-D-10 Depression Scale and Spielberger Trait Anxiety Scale, and number of adolescent life stresses as measured by the Early Life Stress Inventory.

Senders et al (2014) reported significant correlations between CD-RISC score and mental health quality of life ($r=0.58$), adaptive coping ($r=0.47$), maladaptive coping ($r=-0.58$), perceived stress ($r=-0.55$), using the Brief Coping Inventory for Problem Experiences (B-COPE), Perceived Stress Scale (PSS) and Medical Outcome Study Short Form-36 (SF-36). No significant association was found between CD-RISC and SF-36 physical health quality of life.

Spies and Seedat (2014) studied South African women infected with HIV, and found a negative correlation between CD-RISC and depression as measured by the CES-D ($r=-0.28$), PTSD measured by the Davidson Trauma Scale (DTS) ($r=-0.23$) and childhood trauma (CTQ) ($r=-0.22$).

In a group of organ donors, Rudow et al (2014) observed significant correlations between the CD-RISC-25 and measures of purpose in life (PIL), post-traumatic growth (PTG), extraversion, agreeableness and conscientiousness, but not openness (NEO).

Significant correlation was found between the CD-RISC and Wagnild and Young's Resilience Scale in a German population (Sarubin et al, 2015b).

Wu et al (2015) found that resilience correlated significantly with posttraumatic growth in Chinese earthquake survivors.

Sanchez-Teruel and Robles-Bello (2015) observed a significant correlation between the CD-RISC and RS-14 of Wagnild ($r = 0.87$) in 323 Spanish college students.

Xie et al (2016) reported significant correlations between the CD-RISC and the Rosenberg Self-esteem scale ($r=0.27$), and positive affect ($r=0.52$) and negative affect ($r=-0.26$) on the PANAS, in a large sample of over 2300 Chinese military personnel. Shi et al (2016) noted a significant negative correlation ($r=-0,488$) between the CD-RISC-25 and SCL-90-R.

DeSimone et al (2016) reported significant correlations between a new measure of resilience, the 5x5 RS, and the total ($r=0.79$) and factor scores ($r=0.23 - 0.77$) of the CD-RISC.

The Impact of Events Scale-Revised (IES-R), which measures PTSD symptoms, correlated negatively with the CD-RISC ($r = -0.30$, $p = 0.02$) in 56 resident physicians (McFarland and Roth, 2016).

The CD-RISC-25 correlated with the Resilience Scales of Wagnild (25 and 14 item versions): $r=0.72$ and $r=0.72$) in 421 US college students (Madewell and Ponce-Garcia, 2016).

A negative correlation ($r = -0.78$) was observed between the CD-RISC-25 and the Beck Depression Inventory-II (Arbour et al, 2017) in a Canadian sample with moderate to severe TBI.

CD-RISC factors of ego-resiliency, tenacity, strength and optimism correlated significantly ($r = 0.45$ to $r = 0.65$) with the perseverance and optimism factors of the Resilience Style Questionnaire (RSQ) in a Hong Kong sample (Mak et al, 2017).

CD-RISC-10:

McGlone and colleagues (2009) studied the CD-RISC-10 in 27 patients with epilepsy, using the scale in the context of validating measures of stigma. They found the CD-RISC to correlate strongly with measures of the positive aspects of stigma and with resistance to stigma. In other words, more resilient epileptic subjects either gained more from the challenges posed by the disease, or showed greater resistance to the problems of stigmatization.

Wang showed a negative correlation between the CD-RISC 10 and the Los Angeles PTSD Symptom Checklist (LASC) four months after a severe earthquake, both with respect to total score and the three PTSD subscales. Mean CD-RISC 10 scores were significantly lower in the PTSD group (20.8(7.9)) as compared to those without (26.8(6.3)) (Wang et al, 2010).

Shlomi (2010) showed positive correlations between the CD-RISC 10 and Sense of Belonging and Peer Emotional Support, and a negative correlation against the CES-D measure of depression.

In 465 Hungarian students, the CD-RISC-10 correlated significantly with the Ego Resiliency Scales (ER89 and ER11) of Block and Kremen, and the CD-RISC showed stronger correlation with aspects of resiliency reflective of stability (conscientiousness, agreeableness and emotional stability) than to

flexibility (extraversion and openness), whereas for the ER scale, it was vice-versa. However, for both dimensions, the CD-RISC-10 was significantly correlated (Farkas and Orosz, 2015). CD-RISC-10 score correlated negatively with PTSD score on the PCL-C (McCanlies et al, (2014) in police officers exposed to trauma.

In 314 Spanish dental students, the CD-RISC-10 correlated positively with a measure of efficacy, and negatively with measures of depression, perceived stress, tenseness, anxiety exhaustion and cynicism (Montero-Marin et al, 2014).

Depression on the PHQ-8 correlated negatively ($r = -.033$ and $r = -.048$) with the CD-RISC-10 in a sample of injured inpatients (Rainey et al, 2014).

The CD-RISC-10 correlated significantly with PTG in Chinese university students with PTSD ($r=0.53$), as well as with measures of conscientiousness ($r=0.41$) and vitality ($r=0.40$) (Duan et al, 2015). A later study found similar associations between RISC-10 and Vicarious Post Traumatic Growth (VPTG) scores in ambulance and medical personnel confronted with major trauma in their work ($r = 0.67$, Kang et al, 2018).

A positive correlation was found for the CD-RISC-10 relative to the Rosenberg Self-esteem Scale ($r=0.336$), and negative correlations versus the PHQ-9 ($r=-0.316$) and the GHQ-12 ($r=-.0242$) in Nigerian nurses (Aloba et al, 2016).

In US athletes, the CD-RISC-10 was negatively related to somatic and cognitive anxiety, and disrupted concentration (Gonzalez et al, 2016).

The Spanish version of the CD-RISC-10 correlated significantly with the Spanish Brief Resilience Scale ($r = 0.56$) (Rodriguez-Rey et al, 2015).

A significant correlation ($r=0.68$ and $r=0.66$, $p<0.001$) was observed relative to the RS-25 and RS-14 of Wagnild in 412 US college students (Madewell and Ponce-Garcia, 2016).

A negative correlation of $r = -.063$ was found between the CD-RISC-10 and PSS-10 in Danish hospital workers (Lauridsen et al, 2017).

CD-RISC-2:

Area residents were studied after the Deepwater Horizon oil spill, and the CD-RISC 2 was related to levels of depression and anxiety, serving as an independent predictor of post-disaster symptoms (Osofsky et al, 2011). In Korean firefighters and rescue workers, the CD-RISC-2 correlated positively with SF-36 mental and physical health and Global Assessment of Function (GAF), while a negative correlation was obtained against the Beck and Hamilton Depression and Anxiety Scales, the Montgomery-Asberg Depression Scale, the Clinician Administered PTSD Scale (CAPS), and two self-ratings of PTSD, the IES-R and the PDS (Jeong et al, 2015). Among 40 patients with chronic obstructive pulmonary disease who were studied in Colombia, the CD-RISC 2 correlated with the Wagnild and Young Resilience Scale (RS) ($r=0.750$, $p<0.01$), and a measure of mental health ($r=0.320$, $p<0.05$) (Vinaccia and Quiceno, 2011).

A highly stressed sample of primary care patients referred to behavioral counselling was studied by Langhinrichsen-Rohling et al (2017). The CD-RISC-2 correlated with PTSD ($r=-0.40$, $p<0.001$), stress ($r=-0.21$, $p<0.05$), depression ($r=-0.52$, $p<0.001$), suicidality ($r=-0.38$, $p<0.01$) and anxiety ($r=-0.40$, $p<0.001$).

Spirituality: Some have argued that a relationship exists between resilience and spiritual beliefs. Wilks (2006) hypothesized that the greater the degree of intrinsic spirituality, the greater would be resilience. His results in a group of 298 Alzheimer's disease caregivers showed a correlation between Hodge's Intrinsic Spirituality Scale (ISS) and the CD-RISC ($r=0.53$, $p<0.001$). Later, Wilks and Vonk (2008) reported that private prayer mediated (enhanced) resilience, while caregiver burden reduced resilience, in the same sample.

Bitsika et al (2010) failed to show a relationship between the spirituality factor and measures of depression and anxiety.

Karairmak (2010) demonstrated that a factor-defined spirituality scale correlated significantly with two other CD-RISC factors ($r=0.32$ and 0.33).

White et al (2010) demonstrated a correlation ($r = 0.35$) between the CD-RISC and score on the Inventory of Spiritual Beliefs.

In a National Spiritual Beliefs Survey using the East-West Spiritual Beliefs Scale (EWSBS), Davidson and colleagues failed to demonstrate a relationship between CD-RISC score and those who subscribe to beliefs in karma and reincarnation, using an early 11-item subscale, which has not subsequently been developed further (Davidson et al, 2005). In line with Wilks (2006), Lee et al (2008) demonstrated that CD-RISC score was a significant predictor of agreement with traditionally Western spirituality ($\beta=0.08$, $p<0.0001$), but not with spiritual beliefs of Eastern heritage, suggesting the relationship between resilience and spirituality may be complex. In a third report of their US National Survey, Connor et al (2003) showed that in the 605 survivors of violent trauma, CD-RISC, along with persistent anger and spiritual beliefs, predicted mental and physical health status ($OR=0.91$, 95% $CI = 0.88,0.94$ and $OR=0.80$, 95% $CI =0.76,0.84$). When looking at predictors of PTSD severity on the DTS, the CD-RISC score ($\beta=-0.33$, $p<0.001$), with anger and spiritual belief, predicted symptom severity, such that for every 10-point increase on the CD-RISC, there was a 6 point drop (reduction of severity) on the DTS.

The notion that spiritual or religious beliefs are an essential component of resilience has been questioned, and some studies of the CD-RISC have failed to replicate such a factor. In part this may be due to the limited number of relevant questions in the scale, and also it may be affected by cultural factors. Thus for example, in one Chinese study (Yu et al, 2007), no such factor emerged in the CD-RISC, while in another, some elements emerged as one of two factors in children who survived an earthquake (Fu et al, 2013), and a study in Singapore derived a spirituality factor on the SYRESS (Lim et al, 2011). A study from Korea found that lower spirituality was the leading predictor of poor resilience and depressed and anxious outpatients (Min et al, 2012).

A study of Iranian university undergraduates showed that resiliency and spiritual intelligence, as measured by the Abdollah-Zadeh Spiritual Intelligence Scale, were positively correlated, and that the latter independently of mental health predicted RISC score ($R^2=0.18$, $p<0.01$) (Ebrahimi et al, 2012). The same measure of spirituality was found to correlate positively with the CD-RISC-25 score a group of 13 Iranian national hockey players (Dodman and Moradi kor, 2015)

Refugees from the Chinese mainland to Hong Kong showed a significant correlation between their scores on the Zubrick Family Resilience Scale and the CD-RISC ($r=0.35$, $p<0.001$) (Yu et al, 2013a).

Coates et al (2013) studied 127 low income African-American men and found the CD-RISC-10 to correlate positively with the Religious Wellbeing scale.

Davidson and Lee studied the relationship between resilience and forgiveness in a national survey of the US population (unpublished data, 2015). Using the CD-RISC-2, they found that those who had experienced personal violence ($n=239$), and who had forgiven the perpetrator scored higher (6.7 (1.3)) than did those who had not forgiven the person responsible (6.2(1.5)), $p=0.007$.

In survivors of a Haitian earthquake, spiritual belief and religious practice related to level of resilience. Those who believed that God was responsible for the event had higher CD-RISC score (77.3) than did those without such belief (65.3), and those who practiced the Voodoo religion also had higher scores (72.5) compared to non-practitioners (64.6) (Blanc et al, 2016).

Aloba et al (2016) noted a significant negative correlation between the CD-RISC-10 and the Religiosity Orientation Test ($r = -0.184$) in Nigerian student nurses. The authors interpreted this finding as indicating a relationship between greater resilience and greater religious belief or practice, and considered it to be a form of construct validity for the CD-RISC.

Cahyani and Akmal (2017) found that spirituality (i.e. purpose, connectedness and sense of a transcendental power) was associated with greater resilience and better handling of difficulties among students preparing their final papers.

Lower scores in the spirituality subscale was found in US veterans with suicidal ideation (Elbogen et al, 2017).

Chinese medical and ambulance personnel with higher RISC-10 scores were found to exhibit higher scores on the spirituality subscale of the Vicarious Posttraumatic Growth Inventory (VPTGI) ($r = 0.63$) (Kang et al, 2018).

Support and Social Relationships: Perceived social support was found to correlate significantly with the CD-RISC in studies of the Multidimensional Scale of Perceived Social Support Scale (MSPSS) by Bruwer (2008) ($r=0.36$ to 0.42 for the four subscales) and in the study by Brown (2008) ($r=0.11$ to 0.22). In Brown's study, a hierarchical multiple regression analysis to predict resilience showed that, of all 11 variables in the model, only cultural pride reinforcement and support from a special person predicted CD-RISC score. A study of unemployed men by Phillips (2011) demonstrated a significant correlation ($r=0.57$, $p<0.01$) between the CD-RISC and the MSPSS.

Clauss-Ehlers and Wibrowski (2007) found the CD-RISC to correlate significantly with Confidant Availability ($r=0.24$, $p<0.05$) and Peer Availability ($r=0.36$, $p<0.01$), but not with measures of Supervisor Availability or Adequacy, or Peer Adequacy. Ito et al (2009) found positive correlations between the CD-RISC and Furukawa's social support scales ($r=0.23$ and 0.24 , $p<0.01$).

In veterans of OIF and OEF, Pietrzak et al (J Affective Disorders, 2009) reported positive correlations between CD-RISC score and unit support ($r=0.40$, $p<0.001$), post-deployment social support ($r=0.51$, $p<0.001$), and negative correlations versus psychosocial difficulties ($r=-0.40$, $p<0.001$). Path analysis suggested that resilience fully mediated the association between unit support and depression and PTSD.

In 495 earthquake survivors followed up for five years, Ni et al (2015) observed that different aspects of social support, as measured by the Social Support Rating Scale, predicted resilience in men and women – in the former, support-seeking behaviors were predictive, while in the latter, it was subjective social support.

The CD-RISC-25 correlated significantly with social support ($r=0.47$) and social skills ($r=0.44$) in 412 US college students, while the CD-RISC-10 correlated at levels of $r=0.39$ and 0.34 respectively (Madewell and Ponce-Garcia, 2016), using Ponce-Garcia's Scale of Protective Factors to measure social support and skills.

Gaddy and associates (2016) observed that, in 132 US military personnel, there was a significant correlation ($r = 0.41$) between CD-RISC score in

subordinates and their perception of authentic leadership on the part of their supervisors, as defined by self-awareness, moral compass, enhanced information processing and relational transparency leading to self-development.

In a sample of 294 subjects who were exposed to Hurricane Katrina and the Deepwater Gulf Oil Spill, RISC-10 scores correlated significantly with scores on a community support scale assessing caring/connection, provision of resources, transformative potential and information/communication (Lee et al, 2017).

A Spanish sample of 294 caregivers demonstrated a significant correlation ($r = 0.228$) between the CD-RISC-10 and the Duke-UNC Functional Support Scale (Blanco et al, 2017).

Divergent Validity: A report by Connor and Davidson (2003) noted the absence of a significant correlation between the CD-RISC and a measure of sexual function in two analyses ($r=-0.34$ and $r=-0.30$), in keeping with prediction. Pietrzak et al found no relationship between CD-RISC and exposure to combat in their National Guard cohort ($r=0.04$, ns), which is as would be expected: exposure to combat in the military is unlikely to be substantially determined by resiliency. Shlomi (2010) showed no relationship between the CD-RISC 10 and Childhood Socioeconomic Position as assessed by the FAS. In school leavers, Stephenson (2012) found no association between resilience and economic self-sufficiency. Kilic found no relationship between CD-RISC 10 score and the extent of spinal cord damage or diagnosis in a cohort of 60 spinal cord injured patients (Kilic et al, 2013). No association was found between resilience and fetoplacental blood flow in a cohort of South Africa women attending an obstetrics clinic (Roos et al, 2014). Although a relationship was expected, and found for, antenatal anxiety and blood flow, the case for expecting such a finding for resilience was weaker according to the authors.

A study of the CD-RISC-2 found no relationship (in accordance with prediction) between the scale and a measure of alcohol consumption, the AUDIT (Jeong et al, 2015).

Among Chinese women with breast cancer, no relationships were found between CD-RISC score and a family history of breast cancer, religion, stage of cancer or time since diagnosis (Wu et al, 2016).

Decroos et al (2017) developed a measure of team/collective resilience (CREST), and found divergent validity for the CREST relative the concept of individual resilience in the CD-RISC-10 in two samples of British and Belgian athletes (n=345 and n=75).

Lee et al (2017) showed no correlation between the CD-RISC-10 and cumulative exposure to disaster.

CD-RISC: Predictive Validity, Treatment and Change over Time

Predictive Validity & Sensitivity to Change: Numerous studies have used the CD-RISC to assess change during treatment with medication, psychotherapy, or from some other form of intervention, such as instruction in stress-management or resilience-building, which are summarized in chronological order in [Tables 11a](#) and [11b](#). Some studies have also examined whether the baseline CD-RISC predicts treatment outcome or health status. One study evaluated a cut point to distinguish between depressed and non-depressed subjects.

Table 11a. Changes in CD-RISC 25 Associated with Intervention or Treatment

First author	N	Interventions	Pre and post scores	% change	ES *or p value	Sample	Country
Davidson (2005)	92	Antidepressants, CBT	56.0 67.6	21	ES = 0.72	PTSD	USA
Davidson (2006)	224	Venlafaxine Placebo	55.2 69.0 53.4 63.2	25 17	ES = 0.35 Ven vs. Pbo	PTSD	USA
Clauss-Ehlers (2007)	95	Stress management	73.1 76.2	4	ES = 0.21	College freshmen	USA
Dodding (2008)	20	Group treatment Control	39.0 53.9 62.8 64.8	38 3	P<0.005	Depressed and healthy control groups	USA
Steinhardt (2008)	64	Stress management	67.7 75.3 70.6 70.6	11	P<0.01	College students	USA
Steinhardt (2009)	16	Diabetic management counseling	83.2 84.1	1	ES = 0.10	Diabetics	USA
Lavretsky (2010)	40	Escitalopram Placebo	60.2 76.2 66.6 68.4	27 3	ES = 0.47 Esc vs. Pbo	Depression	USA
Vetter (2010)	94	Post-trauma counseling	70.1 73.9	5	ES = 0.29	Children who survived Beslan terrorist attack	Russia
White et al (2010)	42	Spinal cord injury rehabilitation	82.2 81.9 82.6	None	NS	Treatment not specific to resilience	USA
Jafari (2010)	25	Lifestyle training vs. Waitlist control	56.3 69.1 52.9 53.8	23 2	P<0.001	Males with alcohol and drug misuse	Iran
Lavretsky (2010 and 2011)	37	Tai Chi Control	60.5 71.5 56.9 65.5	18 15	P<0.05	Late life depression	USA
Sood (2011)	40	Stress management Waitlist	69.6 79.4 68.0 67.2	14 0	ES = 1.16	MD employees	USA
Thabet (2011)	99	Community treatment	81.9 84.4	3	NS	Women abuse survivors	Gaza
Loprinzi (2011)	20	Stress management Waitlist	73.6 81.1 78.2 82.1	10 5	P<0.05	Breast cancer survivors	USA
Stephens (2012)	61	Resilience training vs. Control	75.2 78.0 74.5 75.7	4 2	P<0.05	Nursing students	Australia
Sharma (2012)	33	Stress management	73.4 81.8	11	P<0.001	Medical center employees	USA
Rogchanchi (2012)	24	Rational emotive therapy vs. Waitlist	56.6 72.7 57.2 59.1	28 4	P<0.001	Student counseling sample	Iran

Naylor (2012)	12	Paroxetine Placebo	73.8 80.1	74.6 79.2	1 0	NS	OEF/OIF veterans with sub-threshold PTSD	USA
Yu (2013b)	54	Resilience counseling	50.7	59.4	17	ES = 0.51	Village residents HIV + and HIV -	China
Chen et al (2014)	32	CBT Support No treatment control	51.5 49.3 52.7	70.8 70.1 53.1	36 43 1	Not given	Adolescent Sichuan earthquake survivors who lost a parent	China
Peng et al (2014)	30 30	Penn Resil Pgm Control Penn Resil Pgm Control	58.5 59.0	69.3 58.3	18 0	P<0.01 NS	Medical students low resil	China
Krystal et al (2014)	20	Tiagabine	62.0	70.4	14	ES = 0.40	PTSD with sleep problems	USA
Sood et al (2014)	26	Stress mgt and resil training (SMART)	70.0	73.0	4	P<0.05 within group	MD radiologists	USA
Gowenlock (2014)	24	Meditation	75.8 84.4	80.8	11	P<0.001 within group	Military personnel at combat support hospital	USA
Yu et al (2014)	183	Resilience counseling Information Control	58.2 57.7 59.3	62.6 56.3 59.1	7 0 0	ES=0.17	Refugees with adjustment difficulties	China
Hoseiny et al (2015)	60	Methadone maintenance(MM) MM with CBT	38.1 37.0	40.1 64.4	5 73	P<0.05	Opiate dependent subjects	Iran
Guest et al (2015)	88	CBT Control	74.1 77.5	71.2 75.4	Reduction in score		Spinal cord injury	Australia
Rogers (2016)	43	Single 90 minute educational intervention workshop	77.3	74.1	Decrease in score	P = ns ES= - 0.33	Healthcare professional students	South Africa
Bird et al (2017)	64	Skill building workshops	72.5	68.6	Decrease in score	P = 0.03	Internal medicine interns	USA
Jeon et al (2017)	10	EMDR 8 sessions	50.0	57.6	15.2	P < 0.01 ES = 0.30	Survivors of ferry boat sinking	Korea
Jung et al (2017)	42 45	On-line mind-body training program vs wait list control	54.5 54.0	59.2 51.7	9% ↑ 4% ↓	P<0.000	Hospital employees	Korea
Ameen (2018)	143	20 sessions of community-oriented psychosocial support	54.7	70.2	30% ↑	Not given	Traumatized Iraqi adolescents aged 12-17	Iraq

Camardese et al (2018)	32	Two kinds of psychosocial Rx	RISC-25 Scores not given	Increased score pre to post	P<0.05	Bipolar disorder	Italy
Eicher et al (2018)	41 45	Low intensity Rx High intensity Rx	11 of 41 17 of 43	Increase of 5 or greater	NS	Cancer patients	Switzerland

- ES= Effect Size
- NS= Not Significant
- P= Probability

Table 11b. Changes in CD-RISC 10 and CD-RISC 2 Associated with an Intervention

First author	N	Interventions	Pre and post	% change	ES or p value	Sample	Country
Davidson (2008)	224	Venlafaxine vs. placebo	20.5 27.0 19.9 24.2	32	ES = 0.34	PTSD	USA
Davidson (2008)	224	Venlafaxine vs. placebo	4.61 5.68 4.52 5.15	23	ES = 0.32	PTSD	USA
Vaishnavi (2007)	20	Mirtazapine vs. placebo	Not given	Not given	ES = 0.46	PTSD	USA
Christensen (2011)	41	Rehabilitation	31.4 32.8	4	Zero	Traumatic injury	USA
Leventhal et al (2015)	2,308	School-based resilience course	20.8 25.7 22.2 23.5	24 6	P<0.001	Rural schoolgirls	India
Tan et al (2015)	64	Resource Enhancement and Activation Program vs Control	26.3 28.1 26.1 25.5	7 0	P=0.07	Older community residents	Singapore
Notario-Pacheco (2014)	208	Treatment as usual	Results divided into non responder (NR) and responder (R) groups	11%↓ 10%↑	ES = 0.00 NR ES = 0.36 R	Fibromyalgia	Spain
DeManincor et al (2016)	47 54	Yoga Waitlist	5.13 5.74 5.11 5.07	12%	ES = 0.49 p<0.01	Anxiety and depressive symptoms	Australia
Moffett & Bartram (2017)	105	Teaching module	27 (IQ 25-30) pre 29 (IQ 26-32) post	7%	ES = 0.28 P<0.001	First year veterinary students	England
Lewis et al (2017)	339 358	Collab care Usual care	5.8 6.2 5.8 5.7	7%	P<0.05	Subthreshold depression in primary care practice	England
Curtis et al (2017)	17	Iyengar yoga	30.7 32.6	6%	NS	Spinal cord injury	USA
Deen et al (2017)	5	Rational Emotive Therapy	16.8 22.4	32%	Not tested	Elite squash playing athletes	Malaysia
Slatyer et al (2017)	65 26	Mindfulness self care (MSCR) Wait list (WL)	28.3 29.5 27.5 27.3	4% 0	NS	Nurses	Australia

Harrer et al (2018)	75 76	Internet/App Rx Wait list control	4.80 4.79	5.56 5.17	16% 8%	P = 0.08	Stressed university students	Germany
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In their original report describing the CD-RISC, Connor and Davidson (2003) showed a significant relationship between CD-RISC and degree of improvement on the Clinical Global Improvement (CGI) scale, whereby greater improvement was associated with greater change on the CD-RISC ($F=3.42$, $df 2$, $p<0.05$).

A subsequent series of uncontrolled studies of antidepressants and cognitive behavioral therapy have also shown that CD-RISC scores increase over time in patients with PTSD (Davidson et al, 2005). In this analysis, the CD-RISC item that assessed the capacity of having a sense of humor under stress was a strong predictor of remission, and optimism/tenacity also predicted good response.

A double-blind, placebo-controlled trial of venlafaxine-XR in posttraumatic stress disorder has shown that the drug produces significantly greater improvement on the CD-RISC than does a placebo (Davidson et al, 2006a), with an effect size (ES) of 0.35, which was greater than the ES of all other measures (e.g., PTSD, depression, quality of life) that were used in the trial. A second double-blind trial of venlafaxine-XR, sertraline and placebo, which overall produced weaker treatment effects than the first study, failed to show significant improvement on the CD-RISC for drug vs. placebo (Davidson et al, 2006b). A more detailed analysis of the first trial (Davidson et al, 2006a) showed that the drug produced improvement on many individual items in the scale (Davidson et al, 2008), including those which reflect a sense of meaning/purpose, tenacity, hardiness, active coping and adaptability. The effect size statistic for these items ranged from 0.41 to 0.35, which are of meaningful size for individual item change.

Predictive validity for the CD-RISC has been further demonstrated in PTSD and depression. In 687 patients with PTSD, the total CD-RISC score at baseline (pre-treatment) was an independent predictor of remission, after controlling for the effect of other predictors such as PTSD severity (Davidson et al, 2006c; Davidson et al, 2012): for every 1-point increase in CD-RISC score at baseline, the odds of achieving remission increased by 2.7%. The CD-RISC also was found to be related to deep learning and

problem-centered coping strategies in Spanish undergraduates, and the three variables all predicted academic achievement (de la Fuente, 2017).

The shorter forms of the CD-RISC also predict response to treatment and reflect differences in treatment, as well as demonstrate a treatment's ability to improve resilience in short-term therapy (Davidson et al, 2008). The 10-item scale served as a significant predictor of remission and improvement in PTSD over 12 weeks of treatment with either venlafaxine-XR or placebo (Davidson et al, 2012). The 2-item scale also predicted outcome in the same series, as well as detecting greater change after treatment with mirtazapine than placebo, at a moderate effect size of 0.46 (Vaishnavi et al, 2007).

Studies by other groups have also demonstrated that treatments can improve resiliency, as measured by the CD-RISC, and/or that baseline CD-RISC serves as a predictor of outcome. In 102 patients with depression, Camardese and colleagues (2007) demonstrated that baseline CD-RISC mean (sd) scores were significantly higher in eventual remitters to treatment than in those who failed to remit: 53.3 (15.2) vs. 41.2 (19.6).

Clauss-Ehlers and Wibrowski (2007) studied a group of high school graduates transitioning to college, and reported mean (sd) CD-RISC scores of 73.1 (14.1) before a preparation course, and as they predicted, an increase to 76.2 (15.3) afterwards.

In a German study of a small cohort (n=17) of acutely traumatized subjects, the 1-month post-trauma CD-RISC predicted the likelihood of developing PTSD at 6 months and was considered to serve as a potentially useful discriminator (Krähenmann, 2008). In a later German study, lower resilience was found to predict stress from stigma related to mental illness and to avoidant coping in this regard (Schibalski et al, 2017).

Steinhardt et al (2008) assigned 30 college students to a four week resiliency training course, and compared them to matched controls. Between pre- and post-treatment, CD-RISC scores increased from a mean of 67.7 (10.0) to 75.3 (8.4) in the treated group, while the controls showed no change (70.6 (12.3) to 70.6 (11.7)). In a later study, the same group demonstrated a change in resilience which correlated with change in growth ($r=0.67$, $p<0.001$) after psychoeducation was given to 31 undergraduates (Dolbier et al, 2009).

In Dodding's study of group therapy for couples (2008), depressed/anxious patients showed a 38% increase in score after group therapy, changing from 39.0 to 53.9 ($p < 0.005$). Their asymptomatic partners failed to show any change (62.8 to 64.8, ns).

A study of 16 African American diabetics found no increase in CD-RISC score after a counseling program, with the pre and post-treatment means being 83.2(8.5) and 84.1(8.4) (Steinhardt et al, 2009). However, the baseline scores were already in line with normative US population scores.

Ninety psychology students enrolled in a positive psychology course at the Indian Institute of Technology, and after completing the program, there was a significant increase in score on the CD-RISC 10, from 36.5 (4.7) to 38.1 (4.9) (Singh and Choubisa, 2009). It is noted that these scores are several points higher than those found in other publications, and the explanation is not clear.

Lavretsky et al (2010) conducted a double-blind trial of escitalopram, which is an antidepressant of the SSRI class, in 40 depressed subjects who were caregivers to family members with Alzheimer's disorder. They found that the drug ($n=20$) produced markedly greater improvement on resilience than did placebo ($n=20$), with an effect size (ES) of 0.47. Baseline CD-RISC scores for the drug and placebo groups were 60.2 (16.7) and 66.6 (17.0), and at post-treatment the extent of change was +16.2 (17.3) and +1.8 (6.9). Thus with escitalopram, CD-RISC score increased over baseline by 27%.

Vetter et al (2010) provided a resilience-enhancement intervention to Russian schoolchildren following a terrorist attack on the Beslan School that left many dead and injured. The mean score increased from 70.1 (14.8) at baseline to 73.9 (11.5) at follow-up, with an effect size of 0.29. The subgroup of children who had been held hostage ($n=46$) showed a greater increase, from 65.6 (16.0) to 72.3 (13.5), with an effect size of 0.45. The non-hostage group ($n=48$) showed no change (74.5 at baseline, 75.3 at follow-up). The groups who sustained greatest loss and/or physical injury showed large improvements in resilience (effect sizes of 0.65 and 0.54 respectively).

Instruction in coping skills was associated with significantly increased CD-RISC at the end of treatment of 13 Iranian males with substance dependence, as compared to a wait-list control group of 12 subjects. Pre and post scores

in the two groups were, respectively, 53 and 70, vs. 52 and 53 (Jafari et al, 2010).

Spinal cord injury patients who were undergoing rehabilitation showed no change in CD-RISC scores at times 2 and 3, despite improvement in other measures, e.g., depression (White et al, 2010). Another sample of traumatic injury survivors failed to show increase in resilience (and self-efficacy), although depression did improve over a 12 week period of rehabilitation (Christensen, 2011).

Tai chi treatment was found to produce enhanced resilience when added to escitalopram in older depressed subjects (n=36), which was significantly greater than the effect of a control treatment, health education (n=37). Final scores on the CD-RISC were 71.5 (9.5) and 65.5 (14.3) ($p<0.05$) (Lavretsky and Irwin, 2010; Lavretsky et al, 2011).

Sood et al (2011) randomized a group of 40 medical doctors with job-related stress to either a course of stress management and resilience training, referred to as SMART (n=20), or to a waiting list control (n=20). At baseline, CD-RISC scores were 69.6 and 68.0 respectively. At the end of the study, they were 79.4 and 67.2, with an ES of 1.16 in favor of SMART. Of the five measures used, the ES for resilience enhancing effects of SMART was the second highest, thereby speaking to a substantial treatment effect as detected by the CD-RISC. The authors also pointed out the final post treatment score of 79.4 brought their sample into line with the general population norms as reported by Connor and Davidson (2003).

Thabet and colleagues (2011) found a modest, but statistically non-significant increase in CD-RISC in 99 Gazan women who had been exposed to domestic violence and took part in a counseling program. It was noted that, despite surviving marked trauma, their baseline scores on the CD-RISC were similar to the mean general population score in the US, suggesting that they already demonstrated a high level of resilience.

Loprinzi and colleagues (2011) administered SMART to survivors of breast cancer, in a single-blind randomized trial. Relative to the wait-list control, SMART resulted in an increase of CD-RISC score from 73.6 to 81.1 vs. 78.2 to 82.1 ($p<0.05$).

A Korean study of 178 depressed patients found that the CD-RISC predicted likelihood of response to antidepressant drugs (Min et al, 2012). The baseline scores in non-responders (NR) was 46.2 (20.8), while in responders (R) it was 52.7 (20.1) ($p=0.04$). ROC analysis yielded an AUC of 0.607, which while low, is statistically significant and provided a cut off score of 49.5 to detect R vs. NR group assignment. Sensitivity was 57% and specificity 65%, both of which would be considered low. In those with low trait anxiety and high resilience, response was more likely (65%) than in the low anxiety/low resilience group (25%). In those with high trait anxiety, response rates were low in both resilience groups (30% and 29%).

Stephens (2012) found that CD-RISC scores increased significantly in a group of adolescent nursing students who received a Twitter-based educational package to promote resilience and sense of support and to decrease perceived stress. The intervention group showed greater resilience post-treatment, but there was no benefit on perceived stress of support. RISC scores increased from 75.2 to 78.0, while the controls changed from 74.5 to 75.7. At longer term follow up, the gains were lost.

Yu and colleagues (2012) demonstrated that a resilience focused intervention among rural Chinese HIV +ve subjects led to an increase in the CD-RISC score after treatment.

Sharma et al (2012) administered the CD-RISC pre- and post-stress management training in 33 medical center employees. The mean score increased over 12 weeks from 73.4 (10.8) to 81.8 (13.8).

Rational emotive therapy (RET) with art therapy ($n=12$) showed greater increase in CD-RISC over time than did a wait-list control ($n=12$) in a group of 24 Iranian subjects. The treatment group pre and post scores were 56.6 and 72.7, compared to 57.1 and 59.2 for the controls (Rogchanchi et al, 2012). Another study of RET in five athletes showed a 32% increase in CD-RISC-10 score from pre- to post-treatment (Deen et al, 2017).

A small double-blind placebo-controlled trial of paroxetine in sub-threshold PTSD failed to demonstrate benefit on any measure, including the CD-RISC (pre and post scores: 73.8 and 74.6 for drug vs. 80.6 and 79.2 for placebo) (Naylor et al, 2012).

Hazardous waste operations and emergency response workers who had undergone training were found to show significantly lower resilience (75.0) than a group who had not been trained (78.5); they also showed more severe PTSD symptoms (Calcote et al 2013). The authors were surprised to find this difference and offered some possible reasons, including the possibility that training was not well conducted. Importantly, no data were presented on the pre-treatment scores to observe change from the resilience training.

CBT given to bereaved adolescents following an earthquake was associated with significantly greater increase in resilience than was a no treatment control (Chen et al, 2014). Peng and colleagues (2014) found that the Penn Resiliency Program increased resilience more than in a control group in Chinese medical students who entered the study with low RISC scores (mean 58-59), whereas in those with high baseline resilience (86), there was no improvement in either treatment group.

An open-label study of tiagabine in PTSD by Krystal et al (2014) revealed an increase of 14 points from pre- to post-treatment, with an effect size of 0.40.

Meditation practiced twice daily for eight weeks lead to improved resilience (8 point increase), depression, anxiety and perceived stress in 21 military medical personnel (Gowenlock, 2014).

Notario-Pacheco et al (2014) observed an effect size of 0.36 on the CD-RISC-10 for fibromyalgia subjects who had responded to treatment according to the FIQ, while in non-responders, the ES was 0.00.

A small community study in Singapore showed changes associated with a resource enhancement program that was greater than in a control group, to a level that just failed to meet statistical significance, using the CD-RISC-10 (Tan et al, 2015).

A study of CBT add-on treatment for subjects with spinal cord injury failed to find any benefit on the CD-RISC, or any other measure of outcome (Guest et al, 2015).

A school-based resilience curriculum resulted in a 24% increased score on the CD-RISC, compared to 4% in controls. The sample of over 2000 rural Indian adolescents was large (Leventhal et al, 2016).

Rogers (2016) did not find any increase in resilience among South African clinical associate students after a single workshop.

On-line mind-body training proved more effective than wait list control in 87 Korean hospital employees (Jung et al, 2017).

A sample of displaced Iraqi adolescents showed a 30% increase in RISC-25 score after 20 sessions of community-oriented psychosocial treatment (Ameen, 2018).

Predictor of Health Status

In a group of women who were HIV+ve and who had been exposed to sexual abuse or multiple abuses, Dale et al (2014) found that for each increase in score of one point on the CD-RISC-10, there was a significant increase in the odds ratio (OR=1.08) of having at least 95% adherence to highly active antiretroviral therapy (HAART) and a decrease in the odds (OR=0.94) of having a detectable viral load (less than 20 copies/mL). The authors recommended the use of coping strategies that promote resilience among this group in order to promote higher adherence and viral suppression.

Schure et al studied 151 older (above age 55) American Indians, and found that lower resilience was associated with poorer physical and mental health, and greater chronic pain.

Among OEF/OIF war veterans, the resilient cluster of people showed better adjustment than did those whose personality/coping profile indicated either overcontrol or undercontrol, and the authors suggested that this relationship was mediated via greater social support, active coping and flexibility (Elliott et al, 2015).

Liu et al (2015) observed a buffering effect of resilience on the negative impact of stress on sleep disturbance in 1,471 Chinese community dwelling adults.

Low baseline CD-RISC-10 predicted higher risk of alcohol misuse after one year in a national sample of military veterans, and greater increase in RISC over time predicted lower risk of alcohol misuse (Green et al, 2014).

In Air Force recruits, less resilient personnel were more likely to be separated from service due to unsuitability or mental illness. Using ROC, the Area under Curve (AUC) was 64-65%, indicating moderate accuracy in predicting outcome (Bezdjian et al, 2016).

The CD-RISC-10 was found to distinguish between Spanish caregivers with and without depression at a cut off score of ≤ 23 . However the AUC was only 0.73, which indicates a relatively non-precise classification (Blanco et al, 2017).

Test Retest Reliability

Connor and Davidson showed acceptable test-retest reliability for the full CD-RISC ($r=0.87$). Khoshouei showed test-retest good reliability for the four factors in a factor analysis ($r=0.78$ to $r=0.88$) (Khoshouei, 2009). As noted, Ito et al (2009) showed good test-retest reliability in Japanese students. Test-retest reliability was reported by Giesbrecht et al (2009), who noted mean scores of 66.4 (10.8) at time 1, and 66.3 (9.8) at time 2, four months later. In Steinhardt's study (2008), the wait-list control group showed no change in the CD-RISC over 4 weeks (70.5(12.3) and 70.6 (11.7)). Baek et al (2010) reported a test-retest reliability coefficient of $r=0.70$ in Korean subjects. A correlation of $r=0.732$ was obtained for test-retest reliability on the CD-RISC 10 in Spanish undergraduates (Notario-Pacheco et al, 2011). Patients undergoing rehabilitation after spinal cord injury showed consistent scores in the CD-RISC (82.2, 81.9 and 82.6) across a 2-3 month period (White et al, 2010).

A test-retest reliability correlation coefficient of 0.90 was obtained for the CD-RISC 10 in a Chinese sample (Wang et al, 2010), and in another Chinese sample, of 0.78 (Ye et al, 2017).

In a sample of Spanish patients with fibromyalgia, the CD-RISC-10 was repeated at six weeks, to yield a test-retest reliability of 0.89, and a Cronbach's alpha = 0.88 (Notario-Pacheco et al, 2014).

In a group of traumatically injured subjects, the CD-RISC score did not change across a 12-month follow up period from hospitalization ($t = -60.50$, $p = .840$, Wilcoxon signed rank test) (Rainey et al, 2014). A similar finding

was reported in 201 older healthy German women at intervals of six months by Sarubin et al (2015b) for the CD-RISC-10 ($r = 0.81$ test-re-test) and CD-RISC-25.

In the absence of any intervention, CD-RISC-10 score remained the same over one year in a large nationwide sample of military veterans, changing only by a score of 0.33 (Green et al, 2014).

Solano et al (2016b) reported an intraclass correlation of 0.84 in 121 psychiatric outpatients who were tested twice.

A form of split-sample reliability has also been demonstrated in the breaking of cohorts of PTSD patients by randomization before treatment (Davidson et al 2006), and (by non-randomization) of two missionary groups (Schaefer et al, 2006). In this process, the resulting CD-RISC scores for the PTSD pairs were similar. The same was found in the missionary groups.

The CD-RISC-2 was administered at three time intervals in 13 anesthesiology residents, with scores of 6.9, 6.6 and 6.5 reflecting little change as they adapted to acute occupational stress (Eisenach et al, 2014).

Sharma et al (2018) reported correlations of $r = 0.71$ between time 1 and time 2 for the CD-RISC-2 and $r = 0.89$ for the CD-RISC-10 in Nepali patients with chronic pain

Biological and Other Mechanistic Studies of the CD-RISC

Further test of the scale's construct validity comes from biological studies as described in the following paragraphs. These studies show that the CD-RISC may serve as a valid marker of resilience as efforts are made to understand the putative neurobiology of resilience.

In a study of depression, Davidson and colleagues (2005) noted that improvement in resiliency correlated significantly with the extent of norepinephrine (NE) transporter occupancy in patients who were treated with venlafaxine-XR, a drug with substantial NE transporter (NET) inhibiting effects. We considered this finding to suggest that NE pathways are integrally involved in mediating resilience, and can perhaps be one point

of entry for treatments which might enhance resiliency, i.e., drugs which inhibit the reuptake of NE. Indeed, this has been found to occur as noted above. This clinical finding resonates with an animal study which showed the importance of NET activity in regulating resilience.

Camardese et al (2007) examined a possible relationship between the CD-RISC and cortisol in depression, without finding any significant association. Another study looked at the relation between CD-RISC and cortisol also found no significant association (Phillips, 2011); in her study of unemployed men, Phillips found that cortisol failed to correlate with any variable.

The serotonin transporter (5HTT) is regarded as playing an important part in the regulation of anxiety-proneness, resistance to the effects of stress and resilience. The 5HTT promoter polymorphism (5HTTLPR) is under the influence of genetic control and those with the short allele have, in many studies, been found to show greater fear or amygdala arousal in response to neutral or fearful stimuli, as well as, in some instances, poorer response to certain treatments. A study by Stein et al (2009) showed that the CD-RISC 10 score was reduced in those with the short allele. For each copy of the short allele (i.e., heterozygous and homozygous), there was a 1.53 increased odds of falling in the low resilient category of > 1 SD below the mean. A study by Carli et al (2011) explored the roles of 5HTTLPR status and childhood trauma on resilience and depression in male prisoners (n=763). Genotype did not influence resilience or depression, but an interaction between genotype and childhood trauma was found for both resilience and depression. The long-allele polymorphism was associated with lower resilience scores and may confer greater vulnerability in those exposed to previous severe stress. In a study of older adults, O'Hara et al (2012) failed to show a relationship between the 5HTTLPR short allele and resilience, although short allele status was associated with less successful aging. Graham et al (2013) studied 41 veterans with traumatic brain injury (TBI) and 26 controls without. They found evidence that the S'S' genotype of the 5-HTTLPR and TBI status were independently associated with resilience, but in opposite directions. Veterans with an S'S' genotype (with or without TBI) were the most resilient (83.2 and 83.3); those with an L' genotype but no TBI were intermediate (75.0), and those with an L' genotype and TBI were the least resilient (56.7), all groups differing from the L-genotype with TBI. An Iranian study (Azadmarzabadi et al, 2018) found that low RISC scores correlated with under-expression of the 5HTT gene, as well as genes

for MAO-A and COMT, in 200 subjects who has responded to stressful events with an exaggerated acute stress reaction.

Arce and colleagues (2009) conducted a forced emotional choice task when presented with pictures of neutral faces and faces morphed to show sadness, fear and happiness. Among the findings was an association between high resilience on the CD-RISC 10 and a bias towards judging neutral faces as being happy. The assumed tendency of this group to engage in positive emotions may come to the rescue during times of hardship, unlike those with low resilience who cope less well in the face of stress.

In an fMRI study of working memory and emotional processing in PTSD patients and trauma controls, Morey et al (2008) failed to show a significant relationship between baseline CD-RISC score and neural activity in response to task-irrelevant visual distractors. Although the extent of these changes was related significantly to the DTS score, no such relationships were found with the CD-RISC.

Ha et al (2009) examined responses to different facial expressions in 143 Korean volunteers. They found that tendencies to recognize contemptuous faces were negatively related to CD-RISC score.

Paulus et al (2010) applied fMRI in response to target face assessment tasks in 26 university undergraduates. The major result showed that limbic and paralimbic region activation during face emotion processing is modulated by level of resilience. Greater resilience is associated with less activation in the ventromedial prefrontal cortex but more activation in the right anterior insular cortex. Higher resilience was also associated with less amygdalar activation.

Das and colleagues (2011) studied the dopamine receptor D4 (DRD4) exon III variable number tandem repeat (VNTR) polymorphism in 1,148 Australian adults between ages 30-34 years. They found that the 7-repeat allele protected against adverse effects of childhood abuse (CA) on resilience. Moreover, they found a relationship between CD-RISC score and approach/avoidance personality measures, and proposed that when stressors are present, the 7-repeat allele influences the development of personality in a way that protects against adverse outcomes. Azadmarabadi et al (2018) found that overexpression of dopamine signaling genes DRD4, DBH, DAT (and BDNF) was associated with lower RISC-25 scores in 200 Iranian

subjects with acute stress syndromes following exposure to either everyday stress or major trauma.

In a study of rape trauma survivors, Malan (2011) examined telomere length and found no relationship between this measure and CD-RISC score. (No relationship was found between telomere length and depression, and only a marginal relationship was found for telomere length and PTSD).

Daniels et al (2012) studied 70 acute trauma survivors, a minority of whom had PTSD and assessed a subgroup of 12 subjects with fMRI in the context of provoking memories of the trauma. In the larger sample, CD-RISC predicted PTSD status at three months better than did CA, and fully mediated the relationship between CA and PTSD. In the fMRI group, CD-RISC score was positively correlated with BOLD signal strength in the right thalamus and middle frontal area gyri (Brodmann area 47), areas relevant to the regulation of emotion.

A Korean study (Kang et al, 2013), observed in males (but not females) that low resilience was associated with a particular COMT genotype, the Val/Val carrier, in whom the mean CD-RISC was 67.5, compared to the Val/Met and Met/Met carriers, who scored 70.9, a statistically significant difference. They also noted that in the low COMT Val/Val group, those with a BDNF Val/Val genotype scored lowest (64.7). A finding with respect to a COMT gene has been described above in a sample of 200 Iranian subjects who were exposed to stress (Azadmarzabadi et al, 2018). A study which examined polymorphisms of the COMT gene in athletes found no difference in CD-RISC-25 scores for those typed as having the Val¹⁵⁸Met allele compared to the Met¹⁵⁸Met allele (Van Breda et al, 2015).

Bradley et al (2013) examined the relationship between childhood environment, the oxytocin OXTR rs53576 genotype and adult resilient coping as measured by the CD-RISC-10, in 971 African-American adults. Although RISC score was positively related to positive early childhood and family environment (and negatively correlated with PTSD, childhood abuse and lifetime trauma), it was unrelated to the oxytocin genotype.

Dehydroepiandrosterone sulphate (DHEA-S) but not cortisol was found to correlate with the CD-RISC score in a sample of 32 healthy English adults, obtained as an opportunistic sample from a university community (Petros et al, 2013). This relationship remained after controlling for other variables.

Circadian typology was found to relate to CD-RISC-10 in a community sample of 1922 Spanish workers and students, where morning-preferrers on the Morningness-Eveningness Questionnaire scored higher (30.9 (0.3)) than did evening-type subjects (26.8 (0.3)) (Antunez et al, 2015).

A German study evaluated the relationship between CD-RISC-10 and attentional bias and control. Results showed that attentional control was positively related to CD-RISC score. Attentional bias to threat was negatively related to resilience when attentional control was low, and positively when control was high. The authors concluded that attentional processing may promote resilience (Schäfer et al, 2015).

In an fMRI study of 46 right handed volunteers, level of resilience as measured by the CD-RISC-10 was related to attention to bodily signals (interceptive awareness) and activation of the insular and thalamus. Those with the lowest resilience paid less attention yet showed greatest activation (i.e., neural processing) to aversive bodily perturbations, and the authors concluded that low resilience was associated with a mismatch between attention to, and processing of, interoceptive afferents which could result in poor adaptation to stressful situations (Haase et al, 2016).

Chronobiology was studied in relation to the resilience of Korean college students. Using the CD-RISC-10, Lee et al (2016) found that morning types were more resilient than evening or intermediate types. Morningness, better sleep quality and greater daylight sunshine exposure all predicted resilience.

Physiological (autonomic) reactivity was compared in high and low resilient subjects based on CD-RISC-10 scores (Lu et al, 2016). Highly resilient individuals showed better recovery of systolic and diastolic BP and pulse, and of respiratory sinus arrhythmia when anticipating a stressful public speaking challenge at two times, as well as greater habituation of BP at time 2.

Among pregnant Chinese women seen at a prenatal visit, resilience was associated with better sleep, and it also mediated the relationship in a protective manner between pregnancy-related stress and poor sleep (Li et al, 2016).

Resilience was related to autonomic reactivity in a stress paradigm of public speaking among Chinese students (Lü et al, 2016). Those with higher CD-RISC scores showed greater habituation to repeated stress as measured by respiratory sinus arrhythmia (RSA) and blood pressure and pulse and more complete recovery on these measures, compared to the low resilience group.

An Italian MEG study of 38 trauma-exposed subjects with PTSD or no PTSD demonstrated a significant inverse correlation ($r = -0.45$) between RISC score and connectivity between the Default Mode Networks (DMN) and Salience Networks (SN) in various regions of the cortex. This relationship was accounted for by those with PTSD, leading the authors to conclude that disruption of dialogue between the two network systems impaired recovery from trauma and was associated with lower resilience (Brunetti et al, 2017).

Forty-eight healthy US volunteers underwent structural MRI scans, with segmentation and regional parcellation of images to yield 165 regions. Significant correlations were found between CD-RISC-25 score and gray matter (GM) change in hypothesized brain regions: subparietal and intraparietal sulci, amygdala, anterior and subgenual cingulate cortices. Resilience was associated with brain morphology of regions involved in cognitive (executive control) and affective (emotional arousal) processes related to cortico-limbic inhibition (Gupta et al, 2017). Positive correlations were also found for resilience and positive affect ($r=0.62$) on the PANAS.

The CD-RISC-25 was associated with HPA axis function in young children living with the stigma of parental HIV, specifically higher levels of awakening salivary cortisol and steeper cortisol slopes in the more resilient children (Chi et al, 2015). More resilient children felt less stigma and in turn showed a “healthier” diurnal cortisol rhythm.

Subjects with irritable bowel syndrome (IBS) did not show an interaction between resilience and IBS severity for ACTH-stimulated cortisol response using the CD-RISC-25, but such an interaction was observed with the Brief Resilience Scale (BRS), possibly reflecting the different item contents (Park et al, 2017).

Highly resilient Chinese medical students differed from low-resilient counterparts in showing greater bias towards positive than negative

emotional information on a facial emotion recognition test (Peng et al, 2017).

Psychogenic nonepileptic seizures (PNES) with altered responsiveness are associated with lower resilience than PNES with intact responsiveness (scores 55.9 vs 67.8, $p < 0.03$) (Baslet et al, 2017).

In Australian veterans and US civilians with PTSD, CD-RISC correlated positively with DNA methylation-predicted age (DNAm age), ($r = 0.32$, and $r = 0.23$, $p < 0.025$), i.e. as those with PTSD responded with greater stress burden (allostatic load), their higher resilience came at a price to health. The self-efficacy factor items accounted for this relationship. In those who did not develop PTSD after stress, the relationship between RISC and DNAm was inverse, i.e. a negative correlation (Mehta et al, 2018).

In a twin study paradigm, Wolf et al (2018) showed a heritability of 49% for PTSD and 25% for resilience, with the two measures correlating at $r = -0.59$. 59% of this correlation was attributable to a single genetic factor, while the remainder was due to a single non-shared environmental factor. Further, resilience was also influenced by common and unique factors that were separate from PTSD, and that there was no genetic factor specific to resilience. The authors proposed a single spectrum of vulnerability, with high PTSD symptoms at one end and a resilient low-symptom expression at the other end.

In samples of healthy controls and schizophrenia, Lee found that the CD-RISC-10 contributed significantly to outcomes of physical health, mental health, glycosylated hemoglobin (HbA1c) and HOMA-IR, an integrated measure of insulin resistance, but not to BMI, in a series of GLMs examining the relationships between trauma severity, resilience and subject group. Cohen Effect Sizes were generally higher than for other predictor variables (0.39-0.55).

Translations of the CD-RISC

Approved translations of the CD-RISC currently exist in the following seventy-seven languages:

Afrikaans, Albanian, Amharic, Arabic, Assamese, Azeri, Bahasa Indonesia, Bahasa Malaysia, Bemba, Bangla (Bengali), Bosnian, Cebuano, Chinese (Taiwan and Peoples Republic), Burmese (CD-RISC-2), Croatian, Creole, Czech, Danish, Dari, Dutch, Farsi, Finnish, French (France, Belgium, Canada), German, Greek, Hakha Chin (CD-RISC-2), Hebrew, Hindi, Hungarian, Icelandic, isiXhosa, isiZulu, Italian, Japanese, Kannada, Kinyarwanda, Kiswahili, Khmer (CD-RISC-10), Korean, Kurdish, Liberian, Lithuanian, Macedonian, Malagasy, Malayalam, Marathi, Mongolian, Nepali, Norwegian, Pashto (CD-RISC-2 and CD-RISC-10), Polish, Portuguese (Europe, Brazil), Quechua, Romanian, Russian, Serbian, Slovenian, Somali (CD-RISC-2), Spanish (Europe, Caribbean, South America, Central America), Swedish, Tagalog, Tamil, Telugu, Thai, Tigrinya (CD-RISC-2), Turkish, Ukrainian, Urdu, Vietnamese, Welsh.

We are aware of some unauthorized translations of the CD-RISC. To minimize further use of these, any person who is considering either the use of a translation or the creation of a new translation is requested to contact either Dr. Connor or Dr. Davidson. We cannot vouch to the accuracy, validity or reliability of these unauthorized translations, some of which have been taken directly from the publication by Davidson and Connor (2003), which does not provide the complete scale.

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