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Greek Version of the Connor-Davidson Resilience Scale: Psychometric Properties in a Sample of 546 Subjects

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Abstract. *Background/Aim: To evaluate psychometric properties of the Connor and Davidson Resilience Scale (CD-RISC) in a Greek population. Materials and Methods: Internal consistency and test-retest reliability were measured. Global Assessment of Functioning Scale (GAF), World Health Organization Quality of Life (WHOQOL) questionnaire, Perceived Stress Scale (PSS) and General Health Questionnaire (GHQ) were used as measures for convergent reliability. Factors were extracted by using exploratory factor analysis (EFA). A total of 546 subjects (244 healthy individuals and 302 psychiatric patients) were recruited. Results: The scale showed excellent internal consistency (Cronbach's alpha=0.925), as well as excellent test-retest reliability (intra-class correlation coefficient=0.925). CD-RISC scores were positively correlated to GAF and WHOQOL scores, while being negatively correlated to PSS and GHQ scores, establishing adequate convergent validity. We decided on a model with four factors, in order to form sub-scales that measure different, but related aspects of resilience. Conclusion: CD-RISC is a reliable and valid measure of resilience and can be used for clinical and research aims in the Greek population.*

There are many ways to define resilience, depending on different theoretical frameworks or research methods. The study of resilience has grown in past decades, after the observation that some individuals remain stable and healthy despite exposure to stressors, while others develop psychiatric disorders (1). Some researchers focus on personal determinants (2), while others on physical and social environmental influence (3). Recently, most researchers have agreed on the complex nature of the term and consider resilience to be a dynamic process that leads to health, adaptation and positive functioning (4, 5). Many objections about the validity of or the necessity for the term have been raised (5), however, 'resilience' seems to be a useful term, leading to a better understanding of the mechanisms underpinning health promotion and psychopathology prevention (3).

Several tools have been used in order to assess resilience (6). Connor and Davidson developed a resilience scale (CD-RISC) on the basis of different resources. The scale includes items reflecting control, commitment, self–efficacy, the perception of change as a challenge, safe and secure relationships, the adaptability to change, the development of goals gaining strategies, the strengthening that stress could bring on, the importance of patience and tolerance of negative emotions, as well as the optimism (7). A vague description of the items is shown in Table I. The scale has been translated into many other languages with adequate psychometric properties, such as Korean (8,9), Turkish (10, 11), Spanish (12) and Chinese (13, 14). Short versions of the scale have been proposed, such as CD-RISC10 (15) and CD-RISC2 (16), which include 10 (items: 1,4,6,7,8,11,14,16,17 and 19) and two (items: 1 and 8) of the initial 25 items, respectively. The aim of this study was to evaluate the psychometric properties of CD-RISC25 in a Greek population. Convergent validity for CD-RISC10 and CD-RISC2 were also measured, in the same sample.

Materials and Methods

Greek translation of CD-RISC was performed according to the scientific standards for this procedure, in close collaboration with the creators of the original scale. CD-RISC25 (including the items of CD-RISC10 and CD-RISC2) is a short, self-rated assessment of

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25 items based on the previous month, scoring from 0 to 4 in a Likert scale, with total scale scores from 0 to 100 (7).

The General Health Questionnaire-28 (GHQ) is a self-administered 28-item scale, including four subscales (physical symptoms, stress and insomnia, social dysfunction and depression). It is a widely used measure of current psychiatric, not psychotic disorders (17), and it has been translated and validated in Greek (18).

The World Health Organization (WHO) quality of life instrument (WHOQOL-BREF) is a self-rated 30-item questionnaire, organized into four distinct parts, labeled physical health, psychological health, social relationship and environment (19). It also has been translated and validated in Greek (20).

The Perceived Stress Scale (PSS-14) is a self-reported 14-item scale measuring the perception of stress experience during the previous month (21) and has also been translated and validated in Greek (22).

We also used a Global Assessment of Functioning Scale (GAF) (23) which was the only measure evaluated by the examiner.

Participants. Patients were recruited between May 2012 and May 2016 from Attikon University Hospital and the Naval Hospital of Athens and the study protocol was approved by the scientific councils of both hospitals and received ethical approval (approval numbers: 9-29/08/2013 and 4/13-22/04/2013 respectively). Subjects with no ability to understand the Greek language or to self-rate the scale were excluded. The total sample (N=546) consisted of 244 (44.7%) healthy University students (controls) and 302 (55.3%) psychiatric patients. The patient subgroup included inpatients (55.6%), outpatients (27.8%), and patients admitted to general departments and examined by the liaison psychiatric team (16.6%). All participants gave their informed consent. Demographic data (gender, age, years of education, occupation status, previous history, living alone or with others, marital status) were completed by all participants and are shown in Table II.

Statistical analysis. All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) 22 (IBM, Armonk, NY, USA). Non-parametric test (Mann–Whitney) was used for paired comparisons. Pearson's r correlation coefficient was used to determine correlation of continuous variables. Exploratory factor analysis (EFA) was used for factor extraction, in order to form sub-scales.

Results

Mean±SD CD-RISC25 scores for the whole sample, controls and patient subgroup were 60.97±18.59, 70.23±11.43 and 53.48±19.86, respectively; the score for the patient subgroup was statistically significantly lower than that for the controls ($p<0.001$).

CDRISC-25 scores were weakly negatively correlated with age (r=–0.238, $p=0.01$) and weakly positively correlated with years of education (r=0.237, $p=0.01$).

Male participants, participants without past psychiatric diagnosis, those not married and employed participants presented higher score for resilience. Living alone was not found to be statistically significantly associated with CD-RISC25 score (Table III).

Table I. *Vague description of the items of CDRISC-25.*

R1	Able to adapt
R2	Secure attachment
R3	Sometimes fate or God could help
R4	Can deal with adversities
R5	Past success gives confidence for future
R6	Humor
R7	The strengthen that stress could bring on
R8	Recovery from illness or hardship
R9	Things happen for a reason
R10	To give the best effort
R11	Goals achievement
R12	When things look hopeless, I don't give up
R13	Know where to turn for help
R14	How I act under pressure
R15	Prefer to take the lead in problem solving
R16	Not discouraged by failure
R17	Consider of self as strong person
R18	Make difficult decisions
R19	Can handle unpleasant feelings
R20	To act on a hunch
R21	Strong sense of purpose
R22	In control of my life
R23	Challenges
R24	Acting work to attain goals
R25	Pride in achievements

Internal consistency. Cronbach's alpha for the full scale was 0.925, indicating excellent internal consistency, while item-total correlations ranged from 0.326 to 0.750, except for items 3, 9 and 20 (Table IV).

Factor analysis. Kaiser-Meyer-Olkin measure of sampling adequacy was 0.952 and Bartlett's sphericity test rejected the null hypothesis ($p<0.05$), therefore the factor analysis was valid. EFA was conducted on the whole sample, using the Varimax method with rotation. The EFA led to a 4-factor model, explaining 53.65% of the variance (Table IV).

Convergent validity. CD-RISC scores were significantly negatively correlated with PSS, weakly positively correlated with GAF, strongly negatively correlated with the total GHQ score, while correlations with GHQ subscales were moderately to strongly negative. CD-RISC scores were also positively correlated with the general items of WHOQOL, as well as to WHOQOL subscales. All scale and subscale correlations for the whole sample are shown in Table V.

Test-retest reliability. Test-retest reliability was examined in 73 participants of the control subgroup. The scale was administered for a second time after a period of 15-30 days. The intra-class correlation coefficient was calculated to be 0.925, indicating excellent test-retest reliability.

Table II. *Demographic characteristics of the study participants.*

Variable	Total sample (n=546)	Controls (n=244)	Patients (n=302)
Age, years			
Mean±SD	36.29 (13.9)	27.13 (7.97)	43.28 (13.40)
Years of education			
Mean±SD	14.4 (3)	15.74 (2.2)	13.12 (3.45)
Gender, n (%)			
Male	257 (47.0%)	141 (57.8%)	116 (38.4%)
female	289 (53.0%)	103 (42.2%)	186 (61.6%)
Living arrangement, n (%)			
Alone	112 (20.5%)	40 (16.4%)	71 (23.4%)
With others	434 (79.5%)	204 (83.6%)	231 (76.6%)
History, n			
Negative	257 (47.0%)	0 (0%)	257 (85.2%)
Positive	289 (53.0%)	244 (100%)	45 (14.8%)
Marital status, n (%)			
Married	142 (26%)	33 (13.4%)	109 (35.1%)
Not married	404 (74%)	211 (86.6%)	193 (64.9%)
Employment status, n (%)			
Employed	341 (62.4%)	219 (89.3%)	122 (37.7%)
Unemployed	205 (37.6%)	25 (10.7%)	180 (62.3%)

SD: Standard deviation.

Discussion

In their original article, Connor and Davidson reported a mean (±SD) CD-RISC25 score of 80.4±12.8 in a community sample (people not seeking help) (7), while our control subgroup value was lower (70.23±11.43). Non random selection of participants might explain this difference. Cultural influences might also explain this finding, considering that also in samples derived from other countries the mean scores were below those found in the Connor and Davidson study (8, 14).

In our study, males, younger, single participants, participants of higher education, and employed participants had higher levels of resilience. A greater proportion of females in our patient subgroup might explain gender differences. Males have been found to be more resilient in previous studies (14, 24); however, no gender differences were reported by others (7, 11). Although Connor and Davidson (7) did not find any influence of age, negative correlation between resilience and age was reported by Yu *et al*. (14), while Campbell-Sills *et al*. found a positive correlation (24). Education level was positively correlated with resilience by Campbel-Sills *et al*. (24). Marital status had no influence according to Connor and Davidson (7) but Campbel-Sills *et al*. found that being widowed was associated with lower scores of resilience (24).

Participants with a previous history of psychiatric disorder presented less resilient than those without past psychiatric diagnosis. This finding reflects the core concept of resilience as the 'capacity to bounce back' (16, 25). The CD-RISC scores were negatively correlated with PSS and GHQ scores (especially depression subscale), while being positively correlated with WHOQOL (especially psychological health subscale) and GAF, as expected. These correlations indicate adequate convergent validity, according to the core concept of resilience as an agent protective against illness, especially against depressive symptoms, promoting psychological health, good functionality and improved quality of life (26) and as an effective factor coping with stressors (27).

Table III. *Pair comparisons among subgroups by demographic characteristics.*

Comparison	CD-RISC25 score Mean±SD	Mann–Whitney *U*-test	*p*-Value
Living alone	58.06±19.83	17316.000	0.421
Living with others	60.58±18.57		
Male	70.23±11.43	27588.000	<0.001
Female	57.60±19.40		
Positive psychiatric history	53.38±19.44	15234.500	<0.001
Negative psychiatric history	68.78±14.05		
Married	56.11±20.11	18436.000	<0.01
Not married	61.36±18.30		
Employed	65.74±15.54	19442.000	<0.001
Unemployed	43.65±20.56		

SD: Standard deviation.

Table IV. *Item-total correlations and rotated factor pattern.*

CDRISC-25 Item	Item-total correlation	Cronbach's α if item deleted	Factor (eigen-value)			
			1 (9.724)	2 (1.491)	3 (1.182)	4 (1.017)
R1	0.665	0.920	0.688			
R2	0.326	0.926				0.736
R3	0.096	0.930			0.724	
R4	0.573	0.920	0.680			
R5	0.649	0.920	0.694			
R6	0.490	0.923	0.698			
R7	0.563	0.921	0.622			
R8	0.560	0.921	0.505			
R9	0.240	0.927			0.796	
R10	0.542	0.922		0.669		
R11	0.750	0.919	0.611			
R12	0.668	0.920	0.510			
R13	0.376	0.924		0.658		
R14	0.651	0.920	0.601			
R15	0.551	0.922	0.459			
R16	0.623	0.920	0.521			
R17	0.747	0.918	0.660			
R18	0.482	0.923	0.577			
R19	0.628	0.920	0.688			
R20	0.275	0.926			0.502	
R21	0.665	0.920	0.487			
R22	0.692	0.919	0.552			
R23	0.639	0.920	0.686			
R24	0.747	0.918	0.654			
R25	0.614	0.921	0.522			
			α=0.937	α=0.499	α=0.480	

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser normalization. Rotation converged in seven iterations.

High internal consistency was found. Items 3 (sometimes fate or God could help), 9 (things happen for a reason) and 20 (to act on a hunch) showed item-total correlation under 0.3 and according to some investigators, they can be excluded as being irrelevant to the main structure (12, 28). The reliability of the scale seemed to increase when each of those items is excluded (Table IV); however, the increase was not significant.

Factor analysis of the initial scale yielded five factors, after conducting an EFA, in order to form sub-scales that measure different but related aspects of resilience (7). We decided on a four-factor model. Factor 1 seemed to be the most stable and gathered important aspects of the concept of resilience, such as personal competence, high standards, strengthening effects of stress, control, coping with stress, positive acceptance of change and tolerance of negative affect. It includes the main core of factors 1, 2, 3, and 4 of the initial scale, plus 2 items of factor 4 and can be labeled as acting coping with stress (individual resources). Factor 2, including two items, represents the concepts of tenacity and support. Factor 3 reflects spiritual influences and trust in one's instinct and included items 3, 9 and 20 which are presented with the lowest item-total correlation and were clustered together as a separate factor. Factor 4 includes only one item, corresponding to secure relationships. Although we are aware of the limitation that only one item loaded into this factor, perceived stress support is considered as a crucial resilient factor (29). The unstable nature of the scale did not allow us the opportunity to conduct confirmatory factor analysis.

Previous factor analysis was unable to establish stable factors amongst different populations and in most cases failed to replicate the findings of Connor and Davidson. The initial scale factor component has been criticized as unstable and unclear, while methodological issues have also been discussed (14, 15 and 28) and evidence supporting that the scale acts in a one-dimensional way has also been provided (28, 30). Arias González *et al*. proposed the deletion of items 3, 9 and 20 (28).

We considered it would be better to retain items 3, 9 and 20, as a separate spirituality factor, rather than rejecting them. Good psychometric properties of the scale as a whole allowed us to include all items and the scale's internal consistency would not have benefited from the deletion of

Table V. *Convergent validity of CDRISC-25 and its abbreviated versions.*

	CDRISC-25	CDRISC-10	CDRISC-2
PSS	–0.667	–0.700	–0.603
GAF	0.381	0.388	0.288
GHQ	–0.670	–0.675	–0.559
Body symptoms	–0.529	–0.542	–0.495
Stress and insomnia	–0.529	–0.575	–0.492
Social dysfunction	–0.597	–0.580	–0.468
Depressive emotion	–0.627	–0.610	–0.472
WHOQOL	0.580	0.572	0.531
Physical health	0.612	0.618	0.539
Psychological health	0.769	0.764	0.650
Social relationship	0.547	0.551	0.497
Environment	0.436	0.455	0.388

All Correlations are Significant at the 0.01 level. PSS: Perceived stress scale, GAF: global assessment of functioning scale, GHQ: general health questionnaire, WHOQOL: World Health Organization (WHO) quality of life.

these three items. Even if spirituality does not seem to be the major component of resilience (8), the concept of resilience incorporates spirituality in many cases. Spirituality has been considered as a characteristic of resilient people (31), since adults use their spirituality as a way to enhance and experience resilience in later life (32). Spirituality and purpose in life are considered causally related to adolescent development outcomes, leading to reduced incidence in developing psychopathology (33). Retaining all items allowed us to be in accordance not only with statistical but also with theoretical standards.

Conclusion

CDRISC25 is a reliable and valid scale measuring resilience. According to our findings, CDRISC25 acts as a four-dimension scale. Items 3, 9 and 20 have an unstable relation to the scale but they add information, without influencing the psychometric properties of the scale. To our knowledge, this is the first resilience scale that has been validated in a Greek population.

Limitations

The use of non-randomly chosen participants did not allow the opportunity for normative data.

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