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Establishing the psychometric qualities of the Connor–Davidson Resilience Scale (CD-RISC) using exploratory and confirmatory factor analysis in a trauma survivor sample

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ABSTRACT

Resilience is frequently viewed as an indicator of good adjustment following adversity such as traumatic events. Connor and Davidson (2003) developed a brief self-report scale to quantify resilience over 1000 participants. We collected the data from individuals who are exposed to devastating earthquakes that occurred in 1999 in Turkey. A total of 246 earthquake survivors from the disaster area, with the mean age 35.80 (S.D. = 8.6), completed the Turkish version of CD-RISC. The purpose of the study is to validate factor structure of the scale through exploratory and confirmatory factor analysis using a Turkish sample. In this investigation 52% of the total variance was accounted for by three factors and the obtained factor structure was verified through confirmatory factor analyses. The results indicated that there was no statistical gender difference with regard to the Turkish version of CD-RISC scores. The Turkish version of the scale obtained a Cronbach alpha coefficient of 0.92. The results showed that the Turkish version of the CD-RISC is a valid and reliable measure of resilience.

1. Introduction

Focusing on personal strengths rather than weaknesses has become recent trend in social sciences. Positive personality constructs such as resilience, subjective well-being, forgiveness, or hardiness are the popular and promoted research of interests in social sciences shifting from pathology to mental health. Adverse life patterns in our global world from huge natural disasters causing large numbers of death toll, wars even leading to death of babies and children and terrorist attacks forcing people having hostile feelings to other group of people with different race, religion, or language to competitive business life, economical difficulties require human beings be more resilient. Resilience is an indicator of good adjustment following adversity such as traumatic events or poverty. Resilience is a multidimensional construct regulating optimal human functioning and locates itself in a positive psychology (Seligman and Csikszentmihalyi, 2000) that which addresses mental wellness rather than mental illness.

In recent literature there is a shift from "at risk" children to trauma samples in resilience studies. It is ironic that human strengths are embodied in the face of trauma, loss, and adverse life events (Miller and Harvey, 2001). Even though most of the early studies mainly focused on resilience in children and adolescents as long as the ability to adapt is the essence of resilience, individuals at any age with any kind of stressor, either acute or chronic, would be in need of being resilient at any point of life course. Campbell-Sills et al. (2006) emphasized that resilience received little attention from clinical perspectives although it has been widely studied by developmental psychologists. In Bonanno's (2004) work, trauma studies and treatment efforts are criticized for undermining adjustment efforts that characterize the resilient people. Paying greater attention to the human ordinary capacity to thrive has been suggested. In a reply to Bonnano's article, Kelley (2005) came up with another excellent way of describing resilience, *an innate human psychological immune capacity.* He summarized it as "the human capacity for resilience, as highlighted by Bonanno, is natural and normal, part and parcel of the innate health built into all human beings" (pp.265).

Several resilience models in the existing literature address the interaction between life challenges and protective factors to find out how the adversity is managed. Flach (1988, 1997) suggested a model defining a resilience process similar to the relational pattern between equilibrium and disequilibrium in Piagetian Developmental Theory. In this model, "bifurcation points," which characterize the traumatic times or life challenges disrupt the homeostatic state of individuals. This interruption leads to destabilization in cognitive, behavioral, or affective constructs, called chaos. Flach (1988) mentioned that bifurcation points do not necessarily need to be life-challenging traumatic events; they can be daily life stressors. Those bifurcation points may provide grounds for being vulnerable or more effective functioning may be reached due to extreme stress, called reintegration. Reintegration is "the process of

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reforming a worldview" (Richardson et al., 1990, pp.37). Additionally, Miller (2003) stressed the role of resilience in therapy setting and the role of therapist in drawing out client's strengths; he offered some ways for conceptualizing resilience in therapy. Likewise, Davidson et al. (2005) emphasized the need for the enhancement of resilience in therapeutic environment.

Unfortunately, research is limited about resilience mechanisms that protect individuals from chronic stress and facilitate healthy adjustment in adults. An examination of the literature resulted in a paucity of reliable and valid measures of resilience (Connor and Davidson, 2003). This shortage can be explained by the tendency of overly focusing on psychopathology instead of adaptive constructs in personality. Contrastingly, reliable and valid measures are necessary tools to increase the quality of research in social sciences. The need for psychometrically valid and reliable instruments measuring positive constructs protecting mental health is obvious. It is hoped that a well-developed valid measures will contribute to improved counseling efforts to enhance the personal qualities of clients and to increase optimal functioning.

Resilience is a stress-resistant construct in human capacity that is difficult to measure and define. Although there are some measures to quantify resilience in children and adolescents, there are only a few measures intended to assess resilience in adults. The *Resilience Scale* (Wagnild and Young, 1993) in nursing literature, the *Resilience Scale* (Jew et al., 1999), the *Clinical Assessment Package for Assessing Client Risks And Strengths* (Gilgun, 1999), and the *Ego Resilience Scale* (Block and Kremen, 1996) are the scales that are most commonly used in investigating adult resilience. Among those instruments, the *Ego Resilience Scale* (Block and Kremen, 1996) is relatively frequently used; the *Resilience Scale* (Wagnild and Young, 1993) was generally used with the elderly. Connor and Davidson (2003) mentioned that a textbook published by American Psychiatric Association does not include a resilience scale and underlined the need for validated and reliable measure of resilience. In order to fill this gap, Connor and Davidson (2003) developed a brief self-report scale to quantify resilience with over 1000 participants from different settings. Therefore, this scale is applicable to different populations since it was not developed for a specific group. Each item is rated on a 5-point scale from not at all true to true nearly all the time (0–4), with higher scores indicating higher resilience. The original factor structure consists of five factors named as *personal competence, high standards, and tenacity; trust in one's instincts, tolerance of negative affect, and strengthening effects of stress*; *positive acceptance of change and secure relationships with others*; *control*; *spiritual influences*. Thus, CD-RISC is a promising tool to explore resilience in adults.

The purpose of the study is to translate a recently developed resilience scale into Turkish language. In line with this, we adapted CD-RISC into Turkish by the permission of original authors. We explored the psychometric properties of the Turkish version of CD-RISC. Through the use of exploratory and confirmatory factor analysis, the factor structure of the scale in Turkish culture was assessed.

2. Method

2.1. Risk factor and sample

In the past century, more than 25 large-impact-scale earthquakes occurred in Turkey. To name a few, Erzincan Earthquake in 1939 with a magnitude of 7.9 resulted in extensive causalities such as larger number of death toll or large-scale economical damage. Between the years of 1966 and 2004, 27,892 people died because of earthquakes in Turkey (Munich Re Group, Major Disasters, Turkey). Turkey failed to effectively manage the consequences of such a large-scale disaster and one of the basic needs of human being, sheltering, could not be met adequately; roughly 20,000 survivors were living in tents (Ertem and Cin, 2001). Since earthquakes have large-scale impacts on Turkish people, better mitigation efforts for different areas such as earthquake-resistant structure construction or disaster preparedness for community should be put into practice in order to alleviate the negative psychological impacts of earthquakes.

Two severe earthquakes occurred in Turkey in 1999. A large industrial and heavily populated area was impacted by these two massive earthquakes. The Marmara earthquake with a magnitude of 7.4 lasted for 45 s. Bolu earthquake with a magnitude of 7.2 hit northwest of Turkey. Kocaeli, Sakarya, Yalova, Bolu, and Duzce were the most heavily destroyed towns where more than 18,000 people died, 49,000 people injured, 380,000 building damaged or destroyed in 1999 (American Red Cross).

Data for this investigation were collected from individuals who were exposed to devastating earthquakes occurred in 1999 in Turkey. A web site that covers all the measures used in the study along with an instruction that explained the purpose of the study was constructed and activated. A standard e-mail explaining the background of the study, the contact info about the researcher, and the web site covering the questionnaire were prepared. The researcher searched for the official web sites of governmental units such as Regional Chief Police Offices, Directorates of the Regional Educational Councils, Directorates of the Regional Health Councils, In addition, private companies, online societies, discussion groups, e-forums, and chambers of industry, Regional Bodies of the Lawyers, Regional Bodies of Medical doctors, local press associations, and radio stations in those towns were searched to increase the number of participants in the study. The standard e-mail was sent to abundant e-mail addresses obtained from the active governmental and non-governmental web sites mentioned above. Since the e-groups were used largely, it was not possible to calculate the return rate. Self-responsibility and mitigation for future earthquakes were mentioned in the standard e-mails as the motivation sources. Web-based survey link was provided in those e-mails. Volunteer participants completed all the measures online and submitted it. The approximate duration for the completion of the instruments was about 20–25 min. Participation in the study was anonymous.

A total of 246 earthquake survivors from the disaster area, with the mean age 35.80 (S.D. = 8.6) completed the Turkish version of CD-RISC. Participants ranged in age from 18 to 58. Since data were collected online, the researcher could not control the age limit. Of the 246 participants in the study, 151 were female (61%) and 95 were male (39%). With regard to education, of the total sample 123 had graduate degrees (50%), 103 had bachelor's degree (42%), 18 had high school degree (7%), and only two did not have high school diploma (1%) at the time of the study.

2.2. Instruments

2.2.1. Resilience

2.2.1.1. Connor–Davidson Resilience Scale. The Turkish adaptation of CD-RISC was filled out by the participants. The scale consisted of 25 items included in the original form. Items are rated on a 5-point scale from *not all true* (0) to *true nearly all the time* (4) and higher score shows greater resilience. In an attempt to assess the characteristics of resilient individuals, the items were drawn from three different studies, Kobasa (1979), Rutter (1985), and Lyons (1991). Finally, items measuring optimism and faith were included in the scale. The original scale was administered to six different groups of subjects: normal sample, primary care outpatients, general psychiatric outpatients, clinical trial of generalized anxiety disorders, and two clinical trials of PTSD. The scale has good reliability evidence. The Cronbach alpha was calculated as 0.89 for the general population and concerning test–retest reliability the correlation coefficient between time1 ($M = 52.7$) and time2 ($M = 52.8$) was 0.87 for the group with generalized anxiety disorders and PTSD ($N = 24$).

2.2.1.2. The Ego-Resiliency. The 14-item scale was developed by Block and Kremen (1996). It is Likert type scale with 4-point ranging from 1 (does not apply at all) to 4 (applies very strongly). The cross-time correlations (5 years) were 0.51 for the female sample and 0.39 for the male sample but when adjusted for the attenuation effect, they changed to 0.67 and 0.51 for the female and male samples, respectively. There was no suggested factor structure in the original study.

A value of 0.80 was reported for internal consistency of the total scale.

2.2.2. Global self-worth

Self-esteem is conceptualized as subjective appraisals about general sense of self-worth, which has been shown to be one of the main constructs determining psychological and social adjustment and well-being. Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965, 1989), which measures the general evaluation of one's worthiness as a human being was used. The scale is composed of 10 items. Higher scores on the scale indicate greater positive self-worth. The Cronbach alpha value (0.85) showed good internal consistency for the RSES in the present study.

2.2.3. Dispositional hope

Promotion of resilient personality, the ability to bounce back from adversity requires being hopeful (Werner and Smith, 1992). Hope was assessed using Dispositional Hope Scale (DHS, Snyder et al., 1991). It is a 12-item scale with four filler items. The internal consistency of the scale was reliable ($\alpha = 0.82$).

2.2.4. Optimism

Optimism is defined as the cognitive disposition leading to favorable outcomes in one's life (Scheier and Carver, 1985). Life Orientation Test (LOT; Scheier and Carver, 1985), which has been the most widely used instruments to measure optimism in psychological research was used in the current study. It is an eight-item self-report

measure (along with four filler items) assessing generalized expectancies for positive versus negative outcomes.

The respondents are expected to rate the items on a 5-point Likert scale ranging from 0 (strongly agree) to 4 (strongly disagree). Higher scores on the LOT displays greater disposition for positive outlook. Cronbach's alpha for the scale was 0.76 and test–retest reliability was 0.79 for the original study. In the present study, Cronbach's alpha coefficient was calculated for internal consistency ($\alpha = 0.76$).

2.2.5. Positive and Negative Affect

The Positive and Negative Affect Schedule (PANAS, Watson et al., 1988) is a 20-item scale with two independent sub-scales: Positive Affect (PA) and Negative Affect (NA). Positive Affect reflects the level of emotional well-being whereas Negative Affect makes reference to emotional distress. Each subscale has 10 affective descriptors. Ratings are made on 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Total scores for the PA and NA subscales are calculated by summing the relevant items. Negative affect (NA) includes such aversive emotions as guilt, fear, anger, disgust, and anxiety whereas positive affect (PA) involves such positive states as joy, interest, enthusiasm, inspiration, and the like. Satisfactory reliability and validity evidence for PANAS is documented in the original study (Watson et al., 1988). The reported internal reliability values for the average time reference were 0.88 (PA) and 0.87 (NA).

All the measures have been proved to be culturally valid and reliable.

2.3. Procedure

The scale was translated into Turkish by three experts. One of the experts was a counselor who held a PhD. degree in counseling from an English-medium university in Turkey. The other expert was a faculty member in a Northern Cyprus university with a master's degree in English literature and PhD. in education from an English-medium university. The last expert was an English teacher working in academic writing unit and also pursuing her doctoral degree in an English-medium university. To ensure a correct translation CD-RISC into Turkish, the best combination was selected among three translations. Subsequently, it was back-translated by the researcher who is a Turkish–English bilingual person. In order to detect any language differences the back-translation form was sent to the original authors. CD-RISC items in Turkish were revised once more according to the suggestions from the original authors.

Data were collected through the Internet because the population of the study was geographically dispersed. Participants from disaster area were e-mailed and informed about the purpose of the research through e-mail and they were also assured of confidentiality and participation was voluntary. The scales were accessible online. The instructions for completing the scale were literally written for the participants. Participants completed the scales by using computer only if they were willing to do it. Although some researchers (Carbonaro and Bainbridge, 2000; Dillman, 2000; Ahern, 2005) strongly advocates using technological advancements in data collection, since online data collection requires basic computer skills and easy access for all participants obtaining a representative sample online is a challenge for researchers. Apparently, the method of collecting data in the present study put a limitation in the generalization of the results. However, since the survivors are spread out in a large region, reaching them online was an efficient way. Some researchers (Cobanoglu et al., 2001; Ilieva et al., 2002; Ilieva et al., 2002) compared main and online method of data collection and indicated that online methods are better in several ways such as less involvement of the researcher. Contact e-mail address was provided for any questions that might emerge during the completion of the questionnaires.

2.4. Data analyses

The scores obtained from the Turkish version of CD-RISC were initially analyzed descriptively. Subsequently, in an attempt to explore the validity of the scale, research has been focused on construct validity using factor analyses. Pearson's correlation coefficients were calculated between the scores of the Turkish version of CD-RISC and other related constructs for the evidence of divergent and convergent validity. Third, inter-item correlations and internal reliability were examined. Finally, a confirmatory factor analyses with LISREL (Linear Structural Relations Statistics Package Program) 8.3 for Windows (Jöreskog and Sörbom, 2001) using maximum likelihood to examine how well three factor models fit the data was computed using CD-RISC scores.

3. Results

3.1. Descriptive statistics

Mean, standard deviations, and median scores were calculated for total, male and female samples. Table 1 presents the descriptive results regarding CD-RISC scores in Turkish sample and original sample. There was a statistical difference between the average CD-RISC score of general population in the original study and the average score in the present study [$t = -11.50$, $df = 245$, $P < 0.000$]. ANOVA was also run to examine any gender differences with regard to CD-RISC scores.

Table 1
The descriptive data regarding the Turkish version CD-RISC.

Samples	*N*	Mean	S.D.	Median (1st, 4th Q)
Male	95	69.71	13.71	68 (61, 79)
Female	151	70.27	14.37	72 (61, 80)
Total	246	70,06	14.10	71 (61,79)
Original sample	577	80.40	12.80	82 (73, 90)

N: sample size; S.D.: standard deviation.

The results indicated that there was no statistical gender difference [$F(1, 244) = 0.092$ $P = 0.761$].

3.2. Construct validity

Exploratory factor analysis (EFA) was employed to CD-RISC without any extraction. Just like in the original study, the principal component analysis factor analysis with Varimax rotation and Kaiser normalization yielded five factors whose eigenvalues were correspondingly 9912, 1664, 1467, 1239, and 1057. Total amount of explained variance for those factors was 61%. Although the factor analysis yielded five factors that might seem to be comparable with the original factors, factor loadings of items were dissimilar. Since there are only three items in the last two factors, factor analysis was extracted a second time with three factors. A total of 52% the total variance were accounted for by three factors. The factor loadings of the items exceeded 0.30 except for item 2. Therefore, item 2 was not included in further analysis. The items were *tenacity and personal competence*, *tolerance of negative affect, tendency toward spirituality* (Table 2).

Table 2
Rotated factor pattern for the Turkish version of CD-RISC with three factors.

Item numbers	Factors		
	I (39%)	II (7 %)	III (6%)
Eigen values	9.912	1.664	1.467
24. One works to attain one's goals	0.833	0.200	0.059
16. Not easily discouraged by failure	0.809	0.318	0.112
11. One can achieve one's goals	0.743	0.184	0.266
21. Strong sense of purpose	0.732	0.206	0.159
17. Think of self as strong person	0.716	0.393	0.139
22. In control of my life	0.707	0.290	−0.075
23. I like challenge	0.663	0.287	−0.038
12. When things look hopeless, I don't give up	0.662	0.244	0.279
15. Prefer to take the lead in problem solving	0.654	0.113	−0.024
18. Make unpopular or difficult decisions	0.627	0.409	0.013
5. Past success gives confidence for new challenge	0.580	0.377	0.130
25. Pride in your achievements	0.549	−0.104	0.191
19. Can handle unpleasant feelings	0.528	0.518	0.125
10. Best effort no matter what	0.486	0.121	0.482
1. Able to adapt to change	0.407	0.332	0.145
7. Coping with stress strengthens	0.121	0.722	0.118
6. See the humorous side of things	−0.019	0.699	0.027
8. Tend to bounce back after illness or hardship	0.207	0.653	0.109
14. Under pressure, focus and think clearly	0.385	0.614	−0.016
4. Can deal with whatever comes	0.517	0.527	0.142
13. Know where to get help	0.399	0.526	0.278
2. Close and secure relationships	0.177	0.290	0.070
3. Sometimes fate and God can help	−0.060	−0.020	0.796
9. Things happen for a reason	0.127	0.241	0.741
20. Have to act on a hunch	0.185	0.278	0.308

Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.
Factor 1: Tenacity and personal competence.
Factor 2: Tolerance of negative affect.
Factor 3: Tendency toward spirituality.

3.3. Discriminant and convergent validity evidence

CD-RISC scores were positively correlated with Ego-Resiliency Scale (Block and Kremen, 1996), which is another measure used in some studies (Fredrickson et al., 2003; Tugade and Frederickson, 2004) to quantify resilience ($N=246$. Pearson $r=0.68$, $P<0.001$). In the current study, the correlation coefficient value between two resilience scale is slightly higher than the value ($r=0.61$) reported in Yu and Zhang (2007a). Positive and Negative Affect Schedule (PANAS, Watson et al., 1988) was used to investigate the correlations between resilience and positive and negative emotions. CD-RISC scores were positively correlated with positive affect scores ($N=246$. Pearson $r=0.69$, $P<0.001$), on the other hand, negatively correlated with negative affect scores ($N=246$. Pearson $r=0.44$, $P<0.001$).

In addition, resilience seems to be highly correlated with self-esteem (Benetti and Kambouropoulos, 2006). Self-esteem is typically viewed as an indicator of better psychological health (Sedikides et al., 2004). Self-Esteem Scale (Rosenberg, 1965, 1989) was used to examine the correlation between resilience and self-esteem in the present study. The Pearson's correlation coefficient was 0.53 ($N=246$, $P<0.001$). Moreover, since the nature of resilience is generally associated with optimism (e.g., Floyd, 1996; Major et al., 1998; Wanberg and Banas, 2000; Judge and Bono, 2001) and hope (e.g., Rew et al., 2001), the correlation coefficients between resilience and these two constructs were calculated. The Life Orientation Scale (Scheier and Carver, 1985) and Dispositional Hope Scale (Snyder et al., 1991) were used to assess optimism and hope. Both optimism ($N=246$. Pearson $r=0.55$, $P<0.001$) and hope ($N=246$. Pearson $r=0.68$, $P<0.001$) were positively correlated with resilience as expected (Table 3).

3.4. Reliability evidence

The Turkish version of the CD-RISC obtained a Cronbach alpha coefficient of 0.92 and the three factors namely *tenacity and personal competence, tolerance of negative affect* and *tendency toward spirituality* of the scale obtained 0.93 (15 items), 0.79 (6 items), and 0.50 (3 items), respectively. It was 0.89 for normal populations in the original study. The reliability coefficient of Factor 3 was high enough since the number of items in Factor 3 was only three. The correlation coefficients between the total score of CD-RISC and the factors, *tenacity and personal competence, tolerance of negative affect*, and *tendency toward spirituality*, were: 0.95, 0.83, 0.49, respectively. All the correlations were significant at the 0.01 level (two-tailed). Table 4 shows the correlations among the total score of resilience and factor scores. The mean of inter-item correlations was 0.342 ranging from −0.068 to 0.78. Statistics regarding items can be followed through Table 5.

Table 3
The evidence for divergent and concurrent validity evidence for the Turkish version of CD-RISC.

	OPT	ER	PA	NA	Hope	SE	CD-RISC
OPT	1	0.516[a]	0.445[a]	−0.548[a]	0.508[a]	0.376[a]	0.546[a]
ER		1	0.696[a]	−0.387[a]	0.593[a]	0.449[a]	0.681[a]
PA			1	−0.388[a]	0.607[a]	0.560[a]	0.692[a]
NA				1	−0.430[a]	−0.446[a]	−0.445[a]
Hope					1	0.621[a]	0.675[a]
SE						1	0.532[a]
CD-RISC							1

[a] Correlation is significant at the 0.01 level (2-tailed). Opt = Life Orientation Test; ER = Ego-Resilience Scale; PA and NAS = Positive and Negative Affect Scale; Hope = -Dispositional Hope Scale; SE = Rosenberg Self-Esteem; CD-RISC = Connor–Davidson Resilience Scale.

Table 4
The correlations among the Turkish version of CD-RISC scores and factor scores.

	CD-RISC	Factor 1	Factor 2	Factor 3
CD-RISC	1	0.949*	0.833*	0.491*
Factor 1		1	0.674*	0.321*
Factor 2			1	0.328*
Factor 3				1

Correlation is significant at the 0.01 level (two-tailed.).
Factor 1: Tenacity and personal competence.
Factor 2: Tolerance of negative affect.
Factor 3: Tendency toward spirituality.

3.5. Confirmatory factor analysis

Our findings indicated that the measurement model demonstrated acceptable fit to the data for the current sample. The chi square of the measurement model was significant. $\chi^2(223)=450.87$. $P<0.001$. The *root mean square error of approximation* (RMESA) assessing the amount of model misfit (Steiger, 1990) was 0.065. The *Standardized root mean square residual* (SRMR), which is the average discrepancy between the hypothesized and observed variances and covariances in the model was 0.052. SRMR values of 0.08 or less indicates a good fitting model (Hu and Bentler, 1999). The comparative fit index (CFI, Bentler, 1990) compares the hypothesized model against an independence model and is ranged between 0 and 1. Values above 0.90 are generally indicators of good fitting models. The CFI of .92 was satisfactory. Additionally, the ratio between χ^2/df should be 1 and 3 or less than 3 for a good fitting model (Kline, 1998). The ratio between chi square and degree of freedom was 2.05 in the present study Table 6 tabulates the goodness-of-fit statistics for the two-factor model. The results supported the measurement model of the Turkish version of CD-RISC with three factors. Although the results showed good fit to the data and all the path coefficients were significant; R^2 of the *item 3* was low (0.022). Table 6 presents the goodness of-fit-statistics for the tested measurement model.

Table 5
Statistics with regard to the items in the Turkish version of CD-RISC.

Item	Mean	S.D.	Scale mean if item deleted	Item-total correlation
1	2.94	0.83	67.13	0.49
3	2.60	1.30	67.46	0.13
4	2.60	0.84	67.46	0.70
5	3.05	0.82	67.01	0.66
6	2.12	1.11	67.94	0.35
7	2.21	1.10	67.85	0.49
8	2.67	0.95	67.39	0.50
9	3.00	0.99	67.06	0.39
10	3.49	0.69	66.57	0.53
11	3.09	0.79	66.98	0.71
12	2.87	0.94	67.20	0.68
13	2.83	0.95	67.23	0.65
14	2.29	1.07	67.77	0.58
15	3.07	0.88	66.99	0.52
16	3.08	0.82	66.98	0.80
17	3.04	0.86	67.02	0.78
18	2.8	0.99	67.21	0.67
19	2.77	0.95	67.29	0.69
20	2.15	1.06	67.91	0.36
21	2.93	0.92	67.13	0.69
22	2.73	0.99	67.33	0.64
23	2.72	1.00	67.35	0.62
24	2.98	0.87	67.09	0.74
25	3.04	0.98	67.02	0.39

Table 6
Summary of fit indices from measurement model of the Turkish version of CD-RISC.

	χ^2	*df*	χ^2/df	RMSEA	SRMR	CFI	NNFI	GFI
CFA	450.87	223	2.02	0.065	0.051	0.92	0.91	0.86
Confidence interval (0.056; 0.073)								

4. Conclusion

The initial attempt to show that CD-RISC is a valid and reliable scale to quantify resilience in Turkish culture was successful. The multi-dimensional nature of the resilience concept was stated by the original authors (Block and Kremen, 1996). However, exploratory factor analysis yielded a three-factor solution for Turkish disaster survivors. The factors were labeled as *tenacity and personal competence, tolerance of negative affect* and *tendency toward spirituality*. Consistent with the original study (Connor and Davidson, 2003), there was no gender difference with regard to the Turkish version of CD-RISC scores. The resulting psychometric qualities of the Turkish version suggest that the scale could be used in both clinical settings and research.

The factor structure of the scale obtained through exploratory factor analyses provides strong evidence for construct validity. As mentioned by Sexton et al. (2010) the original factor structure (Connor and Davidson, 2003) has not been obtained in the following studies (e.g., Campbell-Sills et al., 2006; Yu and Zhang, 2007b; Jorgensen and Seedat, 2008; Khoshouei, 2009). Similarly, the three-factor structure gathered in our study has not verified the original five-factor structure although the Turkish version psychometrically sounded reliable and valid. To some extent, a three-factor structure of resilience (*tenacity, strength, and optimism*) in Chinese population was reported by Yu and Zhang (2007b) was similar to the three-factor solution obtained in our study despite the different factor loadings of the items. Explained variance was higher (52%) than the Chinese version (45%). In addition, a significant correlation was found between CD-RISC scores and self-esteem in both Turkish version and Chinese version. The indicator of internal consistency of the Turkish version was as satisfying as the Chinese version and slightly better than the original study.

The first factor in the present study included all the items in the factor named *personal competence, high standards, and tenacity* in the original study (Connor and Davidson, 2003). The first factor also extracted seven items from other factors named *trust in one's instincts, tolerance of negative affect, and strengthening effects of stress*; *positive acceptance of change and secure relationships with others*; *control* in the original study. Compared to the original study, the structure of first factor composed of large number of items and accounted for a substantive proportion of the explained variance. The first factor in the present study seems to be well-mixed combination of first (*personal competence, high standards, and tenacity*), second (*trust in one's instincts, tolerance of negative affect, and strengthening effects of stress*), third (*positive acceptance of change), and* fourth factors (*control*) in the original study. This finding implies that the structure of resilience in Turkish trauma exposed population was interpreted differently from American (Connor and Davidson, 2003); Australian (Gillespie et al., 2007) population. It is perceived as less differentiated and more integrative in Turkish population. According to the exploratory factor analysis results, resilience was definitely related to personal competence and tenacity; however, the data did not differentiate a separate factor for being able to change, having sense of control and coping with stress like in the original study. On the contrary, the content of the items in the second factor indicates that resilience is seen as a concept operationalized in crisis situations, which is consistent with the general definition of the resilience. The clustering of items in the second factor presents a unique structure and the items about stressful and crisis situations seems to be combined in the second factor. A similar factor structure to the second factor has not been reported previously. The items in the second factor have been reported in separate factors in other studies. (e.g., Yu and Zhang, 2007b; Gillespie et al., 2007; Khoshouei, 2009). The structure of the second factor appears to be culture specific. Turkish trauma exposed group of participants conveyed that resilience is activated in the face of adversity. It makes sense when one thinks of the nature of the participants who were survivors of a hazardous natural disaster.

Lastly, the third factor (*tendency toward spirituality*) related to spirituality has emerged independently in Turkish culture. In the original study, there were only two items in the related factor named *Spiritual influences*. Different from the original study, item 20 (acting on a hunch, without knowing why) was included in the third factor. "Without knowing why" culturally might be associated with the God. Since culturally if something is not clearly understandable, it probably comes from the God. In Turkish culture, there is religious idiom saying "God does this because he knows something that we do not know yet." This might be the cultural explanation of why item 20 was placed in the spirituality factor.

Moreover, the confirmatory solution with three-factor model yielded a good fit to the data. Even though the goodness-of-fit indicators is in acceptable range item 3 (*tendency toward spirituality*) in the third factor was not explained well in the tested model of the scale. The original item reads "when there are no clear solutions to my problems, sometimes fate or God can help." The Turkish translation of the item gives almost the same meaning. However, religion is a taboo in Turkish culture and discussing religious beliefs is not culturally suitable. When answering the questionnaire the participants might have felt that they revealed their religious views, which was not culturally acceptable. Hence, this finding might be resulted from cultural difference.

The results of reliability efforts also showed satisfactory internal consistency and stability for the scale. However, the Cronbach alpha was relatively lower for the factor, *tendency toward spirituality*. As mentioned above, since this factor includes religious items the reliability evidence is less for the factor. There is no widely used and generally accepted spirituality scale in Turkish and this may suggest that the spirituality construct is not yet fully developed. It proves that spirituality construct is not culturally developed yet. Nobody can say that religion and spirituality is not well differentiated in Turkish culture. Mostly, religion is a powerful and institutionalized social structure, which solidly defines the ways of religious practices and beliefs in Turkish culture. It makes sense that spirituality dimension of resilience is not fully explained in the current study. In a similar vein, a culture-specific argument was endorsed for not emerging spirituality dimension in Chinese version of the CD-RISC (Yu and Zhang, 2007b). The authors suggested that the spirituality did not function independently in their study because Chinese people are not very religious. The additional reliability and validity studies are needed to replicate the findings with different samples. The scale can be used in Turkish samples but the factor structure of the scale in that specific sample should be carefully analyzed.

The mean score of CD-RISC for general population was significantly higher in the original study than the mean score of trauma exposed group of individuals in the current study. The varying mean scores for different populations were reported in the literature. The mean score was 68.1 (S.D. = 14.3) for fertility patients (Sexton et al., 2010); 73.8 (S.D. = 16.1) for veterans (Pietrzak et al., 2010); 68.34 (S.D. = 17.54) for Iranian university students (Khoshouei, 2009); 60.82 (13.80) for Italian male prisoners with substance abuse (Cuomo et al., 2008); 39 (12.2) for depressed individuals (Dodding et al., 2008); 39.77 (S.D. = 3.68) and 62.93 (S.D. = 2.41) for suicide attempters and nonattempters (Roy et al., 2007) ; 75.7 (S.D. = 13.0) for community-dwelling women over age 60 (Lamond et al., 2009); 75.9 (S.D. = 11.0) for the Australian nurses (Gillespie et al., 2007). The noticeable mean

difference between trauma-exposed Turkish group and general population in the original study seems to be a cultural difference. Geographical closeness and cultural commonalities between Turkey and Iran might explain why Iranian university students (Khoshouei, 2009) and our sample have similar mean values. Since the resilience studies still have been growing in adult population, more research results including cultural differences are needed to reach consistent generalizations. The study extends the resilience research by providing a reliable and valid instrument that can be used for cultural comparisons.

Many clients seeking psychological help are most likely to feel weak and unable to find anything positive in life (Rathunde, 2001). In such cases, promoting resilience in therapy settings helps individuals to be aware of their strengths. In a recent study, a 6-week group intervention for people experiencing anxiety and/or depression significantly increased resilience scores (Dodding et al., 2008). Psychoeducation, cognitive behavioral therapy (CBT), assertive communication, relaxation training, and narrative therapy were basically covered in the group procedure. In addition, Steinhardt and Dolbier (2008) tested the effectiveness of a 4-week resilience intervention to enhance resilience in face of the academic stress and their result indicated that experimental group showed significant improvements in resilience and protective factors such as self-esteem and positive. Effect of venlafaxine extended release on the CD-RISC scores in individuals suffering from post-traumatic stress disorder (PTSD) was examined and venlafaxine ER increased resilience patients with PTSD (Davidson et al., 2008) as well. In addition, medical treatments including tiagabine, fluoxetine, sertraline and sertraline with cognitive behavioural therapy increased resilience scores in patients with PTSD (Davidson et al., 2008) Thus, in the long run, people may come to counseling and psychotherapy sessions to discover their potentials and discuss about their strengths instead of their weaknesses. In this respect, it seems to be useful to have a valid and reliable measure of resilience. Psychometrically well-developed measures lead to reach more reliable and consistent research findings, in turn, which helps generating widely accepted theories.

In the future, just like well-being therapy (Fava, 1999) a specific psychotherapeutic procedure may be developed for promoting resilience. Fava et al. (2005) showed that the combination of well-being therapy and cognitive behavioral therapy was superior to CBT and the improvement in well-being and reduced symptoms was maintained at follow-up measure. Well-being therapy, which is based on Ryff's model (1989), has six dimensions in line with the general assumptions of positive psychology: autonomy, environmental mastery, purpose in life, positive relations, and self-acceptance. Similarly, the elements of resilience such as personality characteristics and risk factors might be based on a resilience model and scientifically tested.

There are several limitations to the present study. First, self-report measure itself limits the generalizations of the findings. Second, the present study makes contributions to psychological resilience. However, resilience is a multidimensional concept and might be affected by other factors such as biological or demographic factors. Future research can search for biological markers (i.e., health outcomes) that can increase or decrease resilience. Demographic factors might also be determinants of resilience. Additional research with larger sample size focusing on demographic characteristics (i.e., marital status) could be worth noting. Third, online data collection method required basic computer skills and easy access in the present study. The participants were limited to individuals whom could have been reached online.

Despite these limitations, the present study provides preliminary information on the Turkish version of CD-RISC.

To conclude, The Turkish version of the CD-RISC demonstrated concurrent validity and the findings of this study also demonstrated strong correlations between resilience and its correlates. The correlations provided support for the internal qualities, which may make individuals more resilient. For instance, the association between self-esteem, a pervasive force in human motivation (Pyszczynski et al., 2004) and resilience was strongly supported. Consistent with previous studies (Fredrickson et al., 2003; Tugade and Frederickson, 2004), the strong correlation between resilience and positive affect was found. Additionally, hope as a potential resiliency factor (Kashdan et al., 2002) and optimism as a factor contributing to resilience (Gordon and Song, 1994) were associated with resilience. Another study revealed that self-esteem and optimism as correlates of resilience was carried out by Judge and Bono (2001). Therefore, the correlates of resilience reported in the present study were consistent with previous findings and theoretically in expected direction. This conclusion indicates that although the factor structure of CD-RISC show cultural variations resilience has universal elements as well.

This study was also an initial attempt to quantify resilience with a widely used measure in Turkish culture. Since the results of the study psychometrically supported the Turkish version of CD-RISC cross-cultural studies examining cultural differences could be carried out. For instance, the average scale CD-RISC scores reported in the original study for general population was markedly higher than the sample of the trauma exposed group of Turkish individuals. On the other hand, the average-scale CD-RISC scores reported for Iranian university students (Khoshouei, 2009) was very similar to the average score in the present study. For future studies, it is recommended that the comparative studies may provide better understanding of resilience.

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