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Measurement and Predictors of Resilience Among Community-Dwelling Older Women

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Abstract

Background—Resilience, the ability to adapt positively to adversity, may be an important factor in successful aging. However, the assessment and correlates of resilience in elderly individuals have not received adequate attention.

Method—A total of 1,395 community-dwelling women over age 60 who were participants at the San Diego Clinical Center of the Women's Health Initiative completed the Connor-Davidson Resilience Scale (CD-RISC), along with other scales pertinent to successful cognitive aging. Internal consistency and predictors of the CD-RISC were examined, as well as the consistency of its factor structure with published reports.

Results—The mean age of the cohort was 73 (7.2) years and 14% were Hispanic, 76% were non-Hispanic white, and nearly all had completed a high school education (98%). The mean total score on the CD-RISC was 75.7 (SD=13.0). This scale showed high internal consistency (Cronbach's alpha=0.92). Exploratory factor analysis yielded four factors (somewhat different from those previously reported among younger adults) that reflected items involving: 1) personal control and goal orientation, 2) adaptation and tolerance for negative affect, 3) leadership and trust in instincts, and 4) spiritual coping. The strongest predictors of CD-RISC scores in this study were higher emotional well-being, optimism, self-rated successful aging, social engagement, and fewer cognitive complaints.

Conclusions—Our study suggests that the CD-RISC is an internally consistent scale for assessing resilience among older women, and that greater resilience as assessed by the CD-RISC related positively to key components of successful aging.

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Keywords

Resilience; adaptation; elderly; successful aging; cognition; optimism

Introduction

Resilience, or the ability to adapt positively to adversity, is a psychological construct that has been examined in relation to an individual's response to cancer (Aspinwall & MacNamara, 2005), traumatic stress (Charney, 2004), and other challenging life circumstances. Resilience and other similar adaptive processes are posited to be important to successful aging (Baltes, 1997; Hardy, Concato, & Gill, 2002; Hendrie et al., 2006; Schulz & Heckhausen, 1996). Most research on successful aging has focused on physical contributors with relatively little attention to resilience and its assessment.

As with successful aging (Blazer, 2006; Depp, Glatt, & Jeste, 2007; Depp & Jeste, 2006), there is no consensus on the construct definition of resilience. Some view resilience as a response to a specific event, such as a trauma, whereas others treat resilience as a stable coping style (Luthar, Cicchetti, & Becker, 2000). Regardless of the specific definition, resilience may be particularly relevant to successful aging by accounting for some older individuals' propensity to view their lives and health as satisfactory in spite of age-related disease and disability. Specifically, previous reports in samples of older people indicate that a large percentage rate themselves as aging successfully, even though a small proportion of them were free of chronic disease and disability, suggesting that resilience in the face of health limitations may characterize successful aging (Montross et al., 2006; Strawbridge, Wallhagen, & Cohen, 2002). Indeed, several influential psychological models of successful aging involve similar concepts of adaptation to physical and other limitations (Baltes, 1997; Hendrie et al., 2006; Schulz et al., 1996).

There are several self-report measures of resilience, and psychometric properties of these scales have been reviewed elsewhere (Ahern, Kiehl, Lou Sole, & Byers, 2006). A handful of studies have used these instruments to assess resilience in older people (Hardy *et al.*, 2002; Nygren et al., 2005; Wagnild, 2003). Hardy et al. (2004) developed a 6-item scale that assessed resilience in response to a specific life event identified by the respondent. In contrast, Wagnild (2003) evaluated the Resilience Scale, which addressed resilience as a coping style, in a sample of 43 older adults. This scale was further examined in a sample of 125 Swedish persons aged ≥ 85 years (Nygren et al., 2005) that showed correspondence with scales measuring other positive psychological traits (e.g., personal control). Interestingly, Nygren *et al.* (2005) found that the mean resilience scores were higher in their oldest-old sample (over age 85) compared to those found in a comparison sample of younger adults. In these studies, resilience was related to self-rated mental health, physical activity, social support, and health-promoting behaviors (Wagnild, 2003), Hardy et al., 2004), but not to income (Wagnild, 2003). Thus, these instruments appear to be appropriate for use in older people. Yet, it is unclear from these studies whether the factor structure of these instruments remains similar in younger versus older adults (i.e., whether the instruments are measuring similar phenomena in earlier versus later life).

Another resilience scale, the Connor-Davidson Resilience Scale (CD-RISC), has not been specifically evaluated among older people, but appears to have excellent psychometric properties among younger people (Campbell-Sills, Cohan, & Stein, 2006; Connor & Davidson, 2003). In their psychometric study, Connor and Davidson evaluated the instrument in three samples: generally healthy adult community-dwellers, primary care patients, and persons with post-traumatic stress disorder (total $n=550$; mean age=44 years; Connor and Davidson, 2003). The scale demonstrated high internal consistency, test-retest reliability, and convergent

validity with other indicators of positive psychological health. In an exploratory factor analysis, the CD-RISC was multi-dimensional, with five factors. The factor contributing the largest proportion of variance reflected personal competence, high standards, and tenacity. The authors did not examine the differential psychometric properties of this instrument among persons over age 60 (although there was no significant correlation of CD-RISC score with age in that report).

In our published study of elderly community-dwelling people ($n=205$), Montross et al. (2006) found that scores on the CD-RISC correlated significantly with level of self-rated successful aging. In the present report, our study goals were to examine the psychometric properties of the CD-RISC, including its factor structure, in a different and larger sample of women over age 60, living in the community, and to examine the relationship of resilience to factors postulated to be related to successful aging. We hypothesized that, given adequate internal consistency ($\alpha > 0.80$), the CD-RISC scores would correlate significantly with several components of successful aging (e.g., low levels of disability, high levels of cognitive functioning, social engagement, optimism, and emotional well-being (Phelan, Anderson, LaCroix, & Larson, 2004); Depp and Jeste, 2006:). We also explored the consistency of the factor structure of the CD-RISC with that reported among younger adults, by comparing factors derived from our sample with those in the study by Connor and Davison (2003).

Method

Participants and Procedures

Participants for the current study were derived from the San Diego clinical center of the Women's Health Initiative (WHI), a large NIH-funded multi-center study of the predictors of morbidity and mortality among post-menopausal women (Langer et al., 2003) who were followed for an average of 7 years. A complete description of the methodology and findings from the WHI study are available elsewhere (Women's Health Initiative Study Group 1998). At the time of enrollment in the WHI study, potential subjects were excluded if they did not plan to reside in the area for at least 3 years, had medical conditions predictive of survival less than 3 years, or had complicating conditions such as alcoholism or drug dependency.

Approximately 5,608 women were enrolled in the San Diego site of the WHI. At the end of study visit, participants from the San Diego cohort were invited to participate in a study of successful aging. To enroll, women were either consented at their final clinic visit (for clinical trial participants) or mailed the questionnaire and consent form (for observational study participants). Approximately 2017 surveys were returned and the following analysis is based on a sample of 1,741 English Speaking women who returned a signed consent form and were older than age 60. Some of the data from other measures (i.e., measures about self-rated successful aging, and cognitive functioning) have been published previously, but not the data from the resilience scale except correlations with the total CD-RISC score (Moore et al., 2007, Montross et al. 2006). This study was approved by the Institutional Review Board of the University of California, San Diego. All study participants provided written informed consent.

Description of Variables

In addition to information regarding individual demographic characteristics and a measure of resilience, seven additional variables were also selected that have been previously described as components of successful aging (see reviews by Depp and Jeste, 2006 and (Phelan et al., 2004).

Demographics—Demographic information including, marital status, educational attainment and ethnicity was obtained from the baseline (enrollment) visit of the WHI (approximately 1998). Current age was obtained from the end of study survey questionnaire.

Resilience—Participants' level of resilience was assessed using the CD-RISC (Connor and Davidson, 2003). This is a 25-item questionnaire which includes statements such as “I am in control of my life”, “I tend to bounce back after illness or hardship”, and “I am able to adapt to change”. Responses are rated on a 5-item Likert scale (Not true at all; Rarely true; Sometimes true; often true; True nearly all of the time), and total scores range from 0 to 100, with higher scores reflecting greater resilience.

Self-Rated Successful Aging—Participants were asked to rate their own degree of successful aging on a scale from 1 to 10 (1=least successful, 10=most successful). The mean score on this scale ranged from 8.1 to 8.5 in other samples gathered through our research center (Montross et al., 2006; Moore et al., 2007).

Social Engagement—An operational definition of social engagement that has been employed previously (Strawbridge et al., 2002) was used, in which the number of days per week in which subjects reported that they visited with family and friends was summed.

Physical Functioning—This construct was assessed by the Medical Outcomes Study 36-item Short-Form Health Survey or MOS-SF 36 (Ware, Kosinski, & Keller, 1994) Physical Functioning Subscale. This subscale contains 10 items concerning disability (limitations in walking, climbing stairs, bending) and limitations in participating in exercise.

Emotional Health/Well-Being—Also from the SF-36, emotional well-being was examined by the Emotional Health/Well-Being Subscale, which includes five items regarding the degree to which participants were experiencing a sad mood, happiness, peacefulness, nervousness, and feeling down in the dumps.

Cognitive Functioning—Cognitive functioning was measured with two instruments: the Cognitive Failures Questionnaire (CFQ), (CFQ; Broadbent et al., 1982) and the Cognitive Abilities Screening Test - Revised (CAST-R). The 25-item CFQ uses a 5-point Likert-type scale (1=Never, 5=Very often) to evaluate self-reported cognitive problems (e.g. “Do you need to re-read instructions several times?”). The CAST-R mimics a typical mental status examination, with questions involving orientation, construction, clock drawing, and calculation; scores range from 0 to 40. This measure has been previously shown to correspond satisfactorily with rater-administered cognitive testing (Drachman et al., 1996; Swearer et al., 2002) as well as other indicators of successful aging (Moore et al., 2007).

Optimism—The Life Orientation Test (Scheier & Carver, 1985) is a five-item measure of trait optimism in which statements (e.g., “In uncertain times I usually expect the best”) are responded to on a 4-point Likert scale. This instrument has been evaluated in numerous studies, including some that had elderly subjects (Andersson, 1996).

Statistical Analyses

Data were examined for missing values, normality of distribution, and homogeneity of variance. We then calculated the Pearson correlation coefficients between individual items and the total score on the CD-RISC, as well as the internal consistency of the instrument (Cronbach's alpha). To replicate the exploratory factor analysis conducted in the CD-RISC development study (Connor and Davison, 2003), we performed an exploratory principal components analysis with varimax rotation. Finally, we conducted a series of Pearson correlations between the CD-RISC Total Score and the seven variables related to successful aging. To reduce the potential for Type 1 error, we set the alpha level for these correlations at 0.01. To determine the relative strength of the relationships of these multiple predictors, we

conducted a stepwise regression analysis using variables that showed a significant bivariate ($p<0.01$) correlation with the CD-RISC total score.

Results

Sample Characteristics

Of the 1,741 women who completed the successful aging survey, we excluded 346 who had missing data from at least one item on the CD-RISC yielding a final sample of 1,395. The mean age of these participants was 72.7 years ($sd=7.2$; range 60 to 91). Seventy-six percent were non-Hispanic white, 14% were Hispanic, 3% were Asian/Pacific Islander, and 3% were African American. Sixty percent were currently married. Nearly all (98%) had completed a high school education, with the median educational attainment of some college/associate's degree. The mean self-rating of successful aging was 8.2 ($sd=1.4$) out of ten. The mean number of days per week visiting family or friends was 4.1 ($sd = 3.2$). The mean score on the CAST-R was 37.6 ($sd = 2.1$), and that on the CFQ was 46.0 ($sd=8.8$). Finally, the means and standard deviations for Life Orientation Test (optimism), SF-36 Emotional Health/Well-Being and SF-36 Physical Functioning Scales were 24.3 ($sd=3.2$), 84.1 ($sd=12.5$), and 74.0 ($sd=44.3$), respectively.

CD-RISC Psychometric Properties

The mean total score on the CD-RISC in our sample was 75.7 ($sd =13.0$). [The mean score in the original study describing the CD-RISC in a younger healthy community sample of Connor and Davidson (2003) was 80.4 ($sd=12.8$)]. Table 1 shows means, standard deviations of individual items on the CD-RISC, correlations between item and total scores, and factor loadings. The item with the highest mean score (i.e., highest level of agreement with the statement) was "I have close and secure relationships" (3.5, $sd = 0.7$), whereas the lowest mean score was on the item "I have to act on a hunch" (1.9, $sd=1.0$). Cronbach's Alpha for the scale was 0.923, which is considered satisfactory (Bland & Altman, 1997). Correlations between individual item scores and total score on the CD-RISC ranged from $r = 0.32$ ('I believe that sometimes fate or God can help me') to $r = 0.75$ ('I believe I can achieve my goals'), with a mean item-total correlation of $r = 0.61$, $sd=0.13$).

Principal Components Analysis

We conducted a principal components analysis with varimax rotation. In the rotated component matrix, the CD-RISC was multi-dimensional, with four factors that had eigenvalues ≥ 1 . The percentages of variance explained by the four factors were as follows: Factor 1=21%; Factor 2=17%; Factor 3=10%; Factor 4=8%. The factors were interpreted as follows: Factor 1 (9 items) included items related to goal orientation, tenacity, and personal control; Factor 2 (10 items) involved tolerance for negative affect and adaptability; Factor 3 (4 items) included items on leadership and acting on a hunch; and Factor 4 (2 items) involved spiritual orientation. The original factor structure of this instrument reported by Connor and Davidson (2003) yielded 5 factors; the first factor in that analysis was similar to that found in our factor analysis, along with the spirituality factor. However, there was little agreement between that study and ours in terms of other factors.

Relationship of CD-RISC Score to Successful Aging Variables

In terms of demographic variables, the CD-RISC total score was weakly and negatively correlated with chronological age ($r=-0.098$, $df=1395$, $p<0.001$), but not with education ($r=0.058$, $df=1395$, $p=0.034$). CD-RISC scores were positively correlated with SF-36 Emotional Health/Well-Being score ($r=0.494$, $df=1385$, $p<0.001$), optimism (Life Orientation Test) ($r=0.438$, $df=1366$, $p<0.001$), self-rated successful aging ($r=0.425$, $p<0.001$), days spent with family and friends per week ($r=0.142$, $df=1308$, $p<0.001$), and SF-36 Physical Functioning

($r=0.116$, $df=1385$, $p<0.001$). With regard to cognitive scales, the CD-RISC score was negatively correlated with CFQ total score ($r=-0.403$, $df=1349$, $p<0.001$), but was not significantly correlated with the CAST-R ($r=0.065$, $df=1348$, $p=0.028$).

We conducted a stepwise regression analysis with the seven significant variables (e.g., age, SF-36 Physical Functioning, Emotion Health/Well-Being, days spent with family/friends, optimism, CFQ score, and self-rated successful aging) among participants with complete data on all of these measures. In the final model, five variables remained at $p<0.01$, with SF-36 Physical Function and chronological age dropping out. The final model accounted for 38% of the variance in CD-RISC scores (in order of entry): Emotional Health/Well-being (overall adjusted $r^2=0.237$; $p<0.001$), CFQ score (overall adjusted $r^2=0.303$, $p<0.001$), self-rated successful aging (overall adjusted $r^2=0.353$, $p<0.001$), Optimism (overall adjusted $r^2=0.386$, $p<0.001$), and days spent with family and friends (overall adjusted $r^2=0.386$, $p<0.001$).

Discussion

Our study indicated that the level of resilience as measured by the CD-RISC was similar to that seen in younger adults. In Connor and Davidson (2003), the mean score among middle-aged persons (mean age 42) was 80.4 ($sd=12.8$) in a general population sample, and 71.8 ($sd=18.4$) in a smaller primary care patient sample. The results in our sample were intermediate between those two groups in terms of the CD-RISC scores (75.3, $sd=13.1$), although these differences are relatively small and likely to be clinically non-significant, especially given the standard deviations. The internal consistency of the CD-RISC was also similar to that found in the developmental study sample (0.92 in our sample, and 0.89 in Connor-Davidson's study). Therefore, the instrument appeared to have basic psychometric characteristics in older persons that were comparable to those in younger adults.

However, when the factor structure of the CD-RISC was assessed, the dimensionality of the instrument was somewhat different from that reported by Connor and Davidson (2003). Differences in results of exploratory factor analysis could arise from multiple elements (e.g., sample characteristics), so it is not possible to definitively conclude that factor structure of this instrument differs as a result of chronological age. In the investigation by Connor and Davidson (2003), the most consistent factor corresponded to a different set of items assessing "personal competence, high standards, and tenacity" (8 items). In college age participants, CD-RISC scores were positively associated with task-focused coping strategies, and negatively related to emotion-focused coping (Campbell-Sills et al., 2006). The first factor to emerge in our factor analysis conformed to previous findings; however, the second factor in older women appeared to correspond to tolerance for negative affect and adaptability, which differed from previous study. Therefore, it may be that resilience in older adults reflects a somewhat different process, perhaps one that involves contributions from acceptance and toleration of negative affect versus problem- or task-focused active coping (e.g., tenacity) (Patterson et al., 1990). Two possible reasons for this difference could be a difference in the nature of life events encountered by older adults, who tend to face more chronic and uncontrollable challenges (e.g., health problems, bereavement) than do younger adults (Karel, 1997). Alternatively, developmental changes in older age may affect the way in which resilience manifests (e.g., wisdom, (Baltes, Smith, & Staudinger, 1991) or it may be that resilience is a characteristic that is associated with survival to older ages. In any case, our results suggest a need for research on intra-individual change in resilience over the lifespan.

In our investigation, resilience correlated with a number of psychological components of successful aging. Recent longitudinal research has shown that older individuals who endorse greater levels of optimism (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004) and more positive attitudes toward aging (Levy, Slade, & Kasl, 2002) may live longer and healthier lives

(Vaillant & Mukamal, 2001). Resilience in our study was strongly related to optimism, as well as to emotional well-being. It is possible, but untested, that long-term health benefits are associated with resilience as with other positive psychological constructs. With regard to the relationship between resilience and cognition, we found that self-rated problems in cognitive functioning correlated strongly and negatively with resilience. However, resilience was not significantly correlated with the score on the cognitive screening test we administered at a 0.01 level; it should be noted, however, that this measure was designed as a screening tool to detect clinically significant cognitive impairment (Swearer et al., 2002). Given the strong relationship between self-rated cognitive functioning and resilience, more sensitive neuropsychological tests may be necessary to evaluate the relationship between more subtle deficits in cognitive functioning and resilience. Finally, resilience was related to physical function, but to a lesser extent than the psychological variables listed above, suggesting that resilience is not simply a trait of the healthiest older adults.

These findings must be interpreted with caution given the limitations of our study. All our subjects were women, and a majority of the sample was Caucasian and the median level of educational attainment was some college. Further work will be needed to examine the validity of the CD-RISC in people from different gender, ethnic, educational, and socioeconomic backgrounds. Furthermore, the study was cross-sectional, and thus, conclusions about the effect of aging on resilience, such as by comparison with the relatively younger development sample (Connor and Davidson, 2003), are likely to be confounded by cohort effects and/or differences in sample collection. In addition, resilience, in our study, was measured by self-report, which may be biased by social desirability (Ahern, 2006). Moreover, resilience in a broader sense has been measured by neurobiological and immunological markers of compensation or accommodation to stress (Charney et al., 2004). As such, future work with resilience will benefit from integrating self-report with other methods, particularly those that examine biological indicators of resilience (Glatt, Chayavichitsilp, Depp, Schork, & Jeste, 2007). Finally, resilience is a construct that is controversial, including whether it is a personality trait or a response to a particular stressor. Our sample indicates shared variance with other positive psychological constructs, particularly optimism. Therefore, the extent to which resilience represents a unique construct among positive attitudes or coping mechanisms in older people deserves further study.

In conclusion, resilience appears to be a relevant psychological construct in older people, and one that may relate to successful aging. The CD-RISC appears to have adequate psychometric properties in older people, although aging may relate to alterations in the underlying factor structure of this instrument, perhaps favoring more acceptance-based (versus problem- or task-focused) coping. Longitudinal research will be needed to determine whether aging changes the nature of resilience, and whether long-term health benefits are associated with it as with other positive psychological constructs.

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Table 1
CONNOR-DAVIDSON RESILIENCE SCALE (CD-RISC): Item Means, Standard Deviations, Item-Total Correlations, and Factor Loadings Based on a 5-level Likert Scale

CD-RISC ITEMS	MEAN	SD	ITEM-TOTAL CORRELATION ¹	FACTOR ² 1	FACTOR 2	FACTOR 3	FACTOR 4
I work to attain my goals.	3.1	0.8	0.70	0.79			
I take pride in my achievements.	3.4	0.8	0.61	0.76			
I believe I can achieve my goals.	3.2	0.8	0.75	0.68			
I have a strong sense of purpose.	3.0	0.9	0.74	0.68			
I am in control of my life.	3.2	0.8	0.68	0.65			
I like challenges.	2.7	1.0	0.70	0.61			
I give my best effort no matter what.	3.3	0.7	0.63	0.59			
I think of myself as a strong person.	3.3	0.8	0.73	0.58			
When things look hopeless, I don't give up.	3.2	0.8	0.72	0.53			
I tend to bounce back after illness or hardship.	3.3	0.7	0.64		0.66		
I see the humorous side of things.	3.3	0.7	0.49		0.63		
I have close and secure relationships.	3.5	0.7	0.45		0.61		
I can deal with whatever comes my way.	3.2	0.7	0.68		0.60		
I believe coping with stress strengthens me.	2.9	1.0	0.64		0.58		
I am able to adapt to change.	3.4	0.7	0.50		0.56		
I know where to turn for help.	3.3	0.8	0.58		0.55		
Past success gives me confidence for new challenges.	3.2	0.8	0.73		0.53		
I can handle unpleasant feelings.	2.7	0.9	0.66		0.48		
Under pressure, I can focus and think clearly.	2.9	0.9	0.68		0.46		
I make unpopular or difficult decisions.	2.1	1.0	0.41			0.73	
I prefer to take the lead in problem solving.	2.7	0.9	0.64			0.57	
I have to act on a hunch.	1.9	1.0	0.48			0.51	
I am not easily discouraged by failure.	2.8	0.9	0.70			0.49	
I believe that sometimes fate or God can help me.	2.8	1.4	0.34				0.84
I believe things happen for a reason.	2.8	1.2	0.50				0.80

CD-RISC = Connor-Davidson Resilience Scale.

¹All item coefficients were significant at the alpha 0.01 level.

²Coefficients below 0.40 are not displayed in the Table.