ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2015;96:1262-8

ORIGINAL RESEARCH

# Resilience Predicts Functional Outcomes in People Aging With Disability: A Longitudinal Investigation

Arielle M. Silverman, PhD, Ivan R. Molton, PhD, Kevin N. Alschuler, PhD, Dawn M. Ehde, PhD, Mark P. Jensen, PhD

*From the Department of Rehabilitation Medicine, University of Washington, Seattle, WA.*

**Abstract**

**Objectives:** To investigate the links between resilience and depressive symptoms, social functioning, and physical functioning in people aging with disability and to investigate the effects of resilience on change in functional outcomes over time.

**Design:** Longitudinal postal survey.

**Setting:** Surveys were mailed to a community sample of individuals with 1 of 4 diagnoses: multiple sclerosis, muscular dystrophy, postpoliomyelitis syndrome, or spinal cord injury. The survey response rate was 91% at baseline and 86% at follow-up.

**Participants:** A convenience sample of community-dwelling individuals (N=1594; age range, 20–94y) with multiple sclerosis, muscular dystrophy, postpoliomyelitis syndrome, or spinal cord injury.

**Interventions:** Not applicable.

**Main Outcome Measures:** Patient Health Questionnaire-9 (to assess depressive symptoms) and Patient Reported Outcomes Measurement Information System (to assess social role satisfaction and physical functioning).

**Results:** At baseline, resilience was negatively correlated with depressive symptoms ($r=-.55$) and positively correlated with social and physical functioning ($r=.49$ and $r=.17$, respectively). Controlling for baseline outcomes, greater baseline resilience predicted a decrease in depressive symptoms (partial $r=-.12$) and an increase in social functioning (partial $r=.12$) 3 years later.

**Conclusions:** The findings are consistent with a view of resilience as a protective factor that supports optimal functioning in people aging with disability.

Archives of Physical Medicine and Rehabilitation 2015;96:1262-8



The mean age of persons with long-term physical disabilities is increasing because of improved medical care, older age at onset, and the general "graying" of the U.S. population.[1,2] This means that an increasing number of individuals will transition to older adulthood with conditions such as muscular dystrophy (MD), multiple sclerosis (MS), postpoliomyelitis syndrome (PPS), and spinal cord injury (SCI). Aging models often paint a bleak picture of aging with disability, equating physical impairment with a decline in both physical and psychological health. Indeed, individuals aging with physical disability have higher risk of symptoms such as chronic pain, fatigue, and depression than does the general population.[3-6] However, functional decline is not inevitable, and individuals often report high quality of life despite physical disabilities.[7-9] There is a need for more research to identify the factors that may help individuals to experience healthy aging in the context of disability, so that targeted interventions can be developed to cultivate such factors.

One protective factor is "resilience," often defined as an ability to flourish in the face of negative life events.[10] Resilience is a multifaceted construct composed of dispositional factors (eg, optimism[11]), learned skills (eg, mindfulness[12]), and environmental supports (eg, social connectedness[13]). Resilient individuals maintain stable psychological well-being after experiencing traumatic events, such as natural disasters[14] and disabling injuries.[15,16] Several longitudinal studies have suggested that resilience is common for many individuals in the first 2 years after the onset of

Supported by the Department of Education, National Institute on Disability and Rehabilitation Research (grant no. H133B080024). However, the contents of this article do not necessarily represent the policy of the Department of Education, and endorsement by the Federal Government should not be assumed.

Disclosure: none.

0003-9993/15/$36 - see front matter © 2015 by the American Congress of Rehabilitation Medicine
http://dx.doi.org/10.1016/j.apmr.2015.02.023

a traumatic injury. For example, in one study, 54% of individuals showed sustained mood and high perceived quality of life after an SCI.[17,18] Moreover, cross-sectional studies suggest that many people with chronic conditions report quality of life comparable to the general population even years after the onset of the condition.[19-21] These findings indicate that many individuals can adapt effectively to the emotional and functional impact of acquiring a chronic condition.

There is also evidence that resilience may buffer against the development of negative mood in individuals with physical impairments. Supporting this idea, resilience shows an inverse relationship to depressive symptoms in cross-sectional studies of people with physical disabilities.[22-24] For example, participants with MD, MS, PPS, and SCI who met criteria for major depression reported lower resilience than those who were not depressed.[23] In addition, resilience has been reported to mediate the relationship between disability-related stressors and depression in people with SCI.[22] However, because most of the published findings come from cross-sectional data, it is not possible to determine whether resilience protects individuals from developing depressed mood, depression undermines resilience, or both. Longitudinal research is needed to clarify the effects of resilience on mood over time.

In contrast to the growing scientific literature linking resilience and mood, there is little empirical research on the relationships between resilience and social and physical functioning. Socially, if resilience allows people to adapt more effectively to negative life events, one might anticipate that resilient individuals will have an improved ability to manage social roles and participate in the community. Engagement with meaningful social activity is considered an important component of healthy aging, and resilience and positive coping are thought to coexist with such healthy social engagement.[25] However, the reverse is also possible; that is, heightened social engagement could foster increased resilience. The nature of any relation between resilience and social functioning has not yet been assessed empirically. Similarly, there is a lack of empirical data on the relationship between resilience and physical functioning in individuals with long-term disabilities. In parallel to the hypothetical relationship of resilience with social participation, an element of adaptive coping in resilient individuals may include better compensation for the functional losses associated with disability.

The present study was designed to explore 2 aspects. First, we were interested in advancing the positive psychology literature in persons with disabilities by analyzing the association of resilience with psychological, social, and physical functioning in a large sample of adults with MD, MS, PPS, and SCI. On the basis of previous research, we hypothesized that individuals reporting greater resilience would report lower levels of depressive symptoms, higher levels of social role satisfaction, and higher levels of physical functioning. Second, we were interested in examining the direction of the relationship between resilience and functional outcomes by using longitudinal data. We hypothesized that greater resilience at baseline would be associated with a decrease in depressive symptoms and increase in social functioning and physical functioning over the course of 3 years.

***List of abbreviations:***

| | |
|---|---|
| **CD-RISC-10** | **Connor-Davidson Resilience Scale-10** |
| **MD** | **muscular dystrophy** |
| **MS** | **multiple sclerosis** |
| **PHQ-9** | **Patient Health Questionnaire-9** |
| **PPS** | **postpoliomyelitis syndrome** |
| **PROMIS** | **Patient Reported Outcomes Measurement Information System** |
| **SCI** | **spinal cord injury** |

# Methods

## Participants

The data for this study was obtained from a U.S. national longitudinal survey study of individuals aging with physical disabilities, including individuals with SCI, MS, MD, and PPS.[26-29] Study inclusion criteria included (1) being able to read and write English; (2) endorsing a diagnosis of MS, SCI, MD or PPS; and (3) being at least 18 years old. Participants learned about the study through a registry of previous research participants (68%) or via advertisements or word of mouth (32%). Of the 2202 individuals who expressed interest in the study, 2041 (93%) met the eligibility criteria.

## Procedures

Eligible participants were mailed a consent form and the survey between July 2009 and March 2010 (t1 survey). Reminder letters were sent to any participant who did not return a survey within 3 to 6 weeks after the initial surveys were mailed. Each completed survey was checked for missing data, and participants were called by phone to provide additional data if they were willing. All participants signed an informed consent form, and the study procedures were approved by the University of Washington Internal Review Board. Participants were reimbursed $25 for completing the survey.

The t1 survey and signed informed consent forms were completed and returned by 1862 participants (91% response rate to the initial survey). These participants were then sent 3 more surveys over the next 3 years, spaced approximately 1 year apart (t2−t4). However, surveys at points t2 and t3 did not contain measures of interest to the present study, so data from these surveys are not included here. The final survey was administered to the entire sample between August 2012 and March 2013 (ie, ∼3y after the t1 survey). A total of 1594 participants (86% of those who completed the t1 survey) completed all relevant measures administered in the t4 survey. Among those who completed the t1 but not t4 survey, 68 asked to be withdrawn, 137 did not reply to the new mails, 44 were deceased, and 17 could not be located at their previous addresses.

## Measures

Data from only a subset of the measures administered in the t1 and t4 surveys were needed to address the research questions of the present study. These included questions assessing demographic and descriptive variables, resilience, depressive symptoms, satisfaction with social participation, and physical functioning.

### Demographic and diagnosis-specific descriptive variables

Participants provided information on their age, sex, ethnicity, disability diagnosis, education, income, and diagnosis-specific information (eg, level of SCI, type of MS, and type of MD) for descriptive purposes.

### Resilience

Resilience was measured at t1 using the short-form (10-item) version of the Connor-Davidson Resilience Scale (CD-RISC-10).[30] This questionnaire assesses the extent to which the respondent is able to adapt and deal with change and stress on a 4-point scale, ranging from "Not true at all" (0) to "True nearly all the time" (4). Research supports the reliability and validity of the CD-RISC-10 in a variety of samples,[30-32] including individuals with physical disabilities.[33] The internal consistency coefficient (Cronbach $\alpha$) in our sample was .92 for t1 survey, indicating excellent reliability.

### Depressive symptoms

We used the Patient Health Questionnaire-9 (PHQ-9)[34] to assess depressive symptoms at both time points. This measure asks respondents to indicate the frequency of experiencing each of the 9 *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition,* symptoms of depression on a 4-point scale, ranging from "Not at all" (0) to "Nearly every day" (3). The PHQ-9 is commonly used in clinical and research settings and has abundant support for its validity as a measure of depressive symptoms in samples of individuals with physical disabilities.[35-37] The internal consistency (Cronbach $\alpha$) in the present sample was .85 for t1 and t4 surveys, indicating good reliability.

### Satisfaction with social participation

Participants completed items selected from the Patient Reported Outcomes Measurement Information System (PROMIS) social role satisfaction item bank.[38] The PROMIS item banks have been developed such that any subset of items can be used to estimate the latent trait of the domain reflected by those items.[39] As with any of the PROMIS scales, total scores are converted to T scores using standardized conversion tables based on a U.S. normative comparison sample, with a mean of 50 and an SD of 10. This allows for direct comparison of separate administrations even if the number and specific items administered differ. In the present survey, participants at t1 completed the 7-item PROMIS social role satisfaction short form, which asks how satisfied they were with various aspects of their social activity rated on a 5-point scale ranging from "Not at all" (1) to "Very much" (5). At t4, we administered the 4-item PROMIS Profile 29 short form, which includes 3 of the t1 items and an additional item asking the respondent to indicate their level of satisfaction with ability to do regular personal and household responsibilities. These measures have been shown to be valid and reliable in a wide variety of samples, including persons with physical impairments.[40] In the present sample, the internal consistency coefficients at t1 and t4 were .94 and .93, respectively, indicating excellent reliability.

### Physical functioning

Physical functioning was assessed using items selected from the PROMIS physical functioning item bank.[41,42] The PROMIS physical functioning items are designed to estimate the respondent's perceived ability to perform a variety of physical activities on a 5-point scale, ranging from "Unable to do" (1) to "Without difficulty" (5). For the t1 survey, we selected 12 items that we thought would reflect a wide variety of key activities, including dressing, preparing food, cleaning, exercising, and walking. For the t4 survey, we used the 8-item PROMIS physical functioning short form designed specifically for mixed mobility aid users and assessed similar functional domains.[43] The physical functioning item bank has demonstrated validity in samples of people with physical impairments.[27,44] In the present sample, the internal consistency coefficients for the physical functioning scale at t1 and t4 were .93 and .93, respectively, indicating excellent reliability.

## Analytic strategy

Consistent with common practice, we controlled for demographic variables that could plausibly serve as a third variable, specifically age, sex, and disability diagnosis (MD, SCI, PPS, or MS), in all analyses. We also controlled for education and household income because both were correlated significantly with resilience ($r=.12$ and $r=.14$, respectively; $P<.001$ for both). We also tested the interactions between resilience and diagnostic group and between resilience and age to determine whether these variables served as moderators. Resilience was uncorrelated with disability duration ($r=.02$; $P=.39$), so we did not examine disability duration further.

We first used linear regression to assess the association between resilience and each outcome measure (depressive symptoms, social role satisfaction, physical functioning) at t1 (with covariates included). Then, to assess change in outcomes as a function of resilience, we regressed each t4 outcome onto its t1 value, the demographic variables, and resilience, in order to assess the longitudinal relationship between resilience and change in outcomes over time. Significant resilience effects indicate an association between resilience and change in outcomes between t1 and t4.[45] All predictor variables were mean centered and standardized to aid interpretation of regression coefficients.

# Results

## Participant characteristics

Table 1 summarizes demographic characteristics and baseline status on key measures at t1 for the entire sample and separated by diagnostic group. The final sample consisted of 1594 participants (SCI, n=414; MD, n=282; MS, n=509; PPS, n=389). The participant's age at t1 ranged from 20 to 94 years (mean age, 56.00±12.90y). The final sample consisted of 64% women and 92% white. Participants had experienced their disability condition for an average of 15.30±10.46 years (range, 0–79y). The participants were highly educated on average, with 86% reporting some education beyond high school. Mean resilience for the sample was 28.07±7.18 (median, 28; range, 0–40).

Diagnostic group and age did not moderate any of the associations, so we collapsed across these variables in the analyses.

## Cross-sectional effects

Table 2 lists the standardized regression weights, $t$ values, $P$ values, and residual variance explained ($\Delta r^2$) for resilience in predicting each t1 outcome. We also include predicted levels of each outcome for individuals low in resilience (below the median) and high in resilience (above the median). Higher levels of resilience predicted much lower levels of depressive symptoms, much higher levels of social role satisfaction, and slightly higher levels of physical functioning cross-sectionally, even after controlling for age, sex, disability diagnosis, education, and income.

## Longitudinal effects of resilience

Table 3 lists the standardized regression weights, $t$ values, $P$ values, and residual variance explained ($\Delta r^2$) for resilience in predicting

**Table 1** Selected demographic characteristics and baseline functioning for the sample stratified by diagnostic group

| Measure | Entire Sample | MD | MS | PPS | SCI |
|---|---|---|---|---|---|
| Sample size | 1594 | 282 | 509 | 389 | 414 |
| Sex | | | | | |
| Male | 577 (36) | 113 (40) | 92 (18) | 93 (24) | 279 (67) |
| Female | 1016 (64) | 169 (60) | 416 (82) | 296 (76) | 135 (33) |
| Age (y) | 56.0±12.9 | 52.7±12.6 | 54.3±10.5 | 66.8±8.1 | 50.2±13.6 |
| Ethnicity* | | | | | |
| African American | 52 (3) | 1 (0) | 1 (0) | 5 (1) | 34 (8) |
| Asian | 13 (1) | 2 (1) | 0 (0) | 4 (1) | 7 (2) |
| White | 1454 (92) | 269 (96) | 476 (94) | 361 (93) | 348 (84) |
| Hispanic/Chicano | 20 (1) | 1 (0) | 6 (1) | 7 (2) | 6 (1) |
| Native American | 9 (1) | 1 (0) | 1 (0) | 2 (1) | 5 (1) |
| Pacific Islander | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Other | 37 (2) | 5 (2) | 11 (2) | 8 (2) | 13 (3) |
| Education* | | | | | |
| Some high school | 23 (1) | 5 (2) | 5 (1) | 5 (1) | 8 (2) |
| High school graduate | 189 (12) | 43 (15) | 48 (9) | 35 (9) | 63 (15) |
| Some college: vocational, technical | 376 (30) | 71 (25) | 165 (33) | 100 (26) | 140 (33) |
| College graduate | 499 (31) | 86 (31) | 173 (34) | 113 (29) | 127 (31) |
| Advanced degree | 405 (25) | 77 (27) | 117 (23) | 136 (35) | 75 (18) |
| Household income* | | | | | |
| <$25,000 | 340 (22) | 41 (15) | 90 (19) | 82 (22) | 127 (32) |
| $25,000–$40,000 | 259 (17) | 33 (12) | 69 (14) | 87 (23) | 70 (18) |
| $41,000–$55,000 | 208 (14) | 35 (13) | 71 (15) | 51 (14) | 51 (13) |
| $56,000–$70,000 | 184 (12) | 33 (12) | 54 (11) | 51 (14) | 46 (12) |
| $71,000–$85,000 | 142 (9) | 28 (11) | 47 (10) | 29 (8) | 38 (10) |
| $86,000–$100,000 | 149 (10) | 33 (12) | 62 (13) | 31 (8) | 23 (6) |
| >$100,000 | 240 (16) | 63 (24) | 93 (19) | 42 (11) | 42 (11) |
| Disability duration | 15.3±10.5 | 14.5±11.1 | 15.1±9.8 | 15.6±9.9 | 15.9±11.3 |
| Baseline resilience | 28.07±7.2 | 27.2±7.7 | 27.7±7.1 | 29.0±6.8 | 29.1±7.0 |
| Baseline PHQ-9 | 6.2±5.0 | 6.4±5.2 | 7.0±5.3 | 5.8±4.4 | 5.5±4.9 |
| Baseline social function | 45.4±8.3 | 46.3±9.2 | 45.5±8.8 | 44.0±7.0 | 45.8±8.0 |
| Baseline physical functioning | 37.2±10.2 | 38.5±10.2 | 41.1±10.7 | 35.2±7.4 | 33.3±9.8 |

NOTE. Values are mean ± SD or as n (%).
* Numbers may not add to total due to missing data.

each t4 outcome after controlling for t1 levels. The table also includes predicted values of each t4 outcome for individuals low and high in resilience. After inclusion of covariates, a higher level of resilience was associated with a slight decrease in depression and a slight increase in social participation over time from t1 to t4, but was not associated with change in physical functioning.

## Discussion

The findings indicate that in individuals with physical disability, resilience is associated with improved functional outcomes. Cross-sectionally, resilience shows a strong negative association with depression, a strong positive association with social role participation, and a weak positive association with physical functioning. Higher initial levels of resilience were also associated with a slight decrease in depressive symptoms and a slight increase in social participation over 3 years. Although the magnitude of change over time was small, it bears clinical significance. For example, people who met criteria for clinical depression at t1 (with a PHQ-9 score of $\geq$10) were less likely to remain clinically depressed at t4 if they were more resilient ($\Delta\chi^2=10.63$; $P=.001$ or $P=.955$), whereas those who were not depressed at t1 were less likely to become depressed by t4 if they were more resilient ($\Delta\chi^2=35.29$; $P<.001$ or $P=.901$).

Our findings replicate and extend previous research in 2 ways. First, consistent with previous work,[22-24] resilience showed a strong negative association with depressive symptoms. In previous cross-sectional studies, however, it was unclear whether resilience

**Table 2** Association between resilience and functional outcomes at baseline

| Measure (t1 Survey) | Resilience β | *t* | *P* | $\Delta r^2$ | Low Resilience | High Resilience |
|---|---|---|---|---|---|---|
| Depressive symptoms | −.55 | 27.08 | <.001 | .30 | 8.55 | 4.18 |
| Social participation | .49 | 24.07 | <.001 | .24 | 41.83 | 48.25 |
| Physical functioning | .16 | 7.43 | <.001 | .03 | 35.41 | 37.77 |

**Table 3** Longitudinal effects of resilience on outcomes 3y later

| Measure (t4 Survey) | Resilience β | *t* | *P* | $\Delta r^2$ | Low Resilience | High Resilience |
|---|---|---|---|---|---|---|
| Depression | −.1100 | −4.63 | <.001 | .01 | 7.14 | 3.55 |
| Social participation | .1230 | 4.96 | <.001 | .02 | 42.34 | 48.30 |
| Physical functioning | −.0087 | −0.61 | .55 | 0 | 37.21 | 38.64 |

protects against depression or is simply an indicator of the absence of depression. Our longitudinal findings extend this literature, suggesting that resilience may protect mood over time. Resilience could protect against the development of depression, enable people experiencing depression to recover more fully, or both.

Second, our findings extend the resilience literature by showing association between resilience and social participation. Although resilient responding has been linked to high quality of life after disability,[15-18] there has been limited inquiry into the specific positive consequences of resilience. Social participation could be an important variable through which resilience helps to stabilize quality of life. Baseline resilience predicted increased social participation 3 years later, supporting our hypothesis that resilience resources may help people aging with disability to remain engaged in important social roles and activities. Future research should examine how resilience benefits social participation—for example, if positive emotions play a role.[46]

Interestingly, resilience did not predict change in physical functioning over the course of 3 years, although resilience and physical functioning were positively correlated at baseline. This suggests that people who maintain their functional independence tend to be more resilient, perhaps because of an unmeasured third variable or because of higher levels of physical functioning contributing to more resilience. It is possible that physical functioning may be less responsive to the effects of psychosocial factors, such as resilience, instead of being a relatively stable consequence of a disability progression. However, if resilience buffers the impact of symptoms on quality of life,[23] then resilience could potentially moderate the relations between poor physical functioning and overall quality of life. Supporting this, we found that resilience moderated the association between depressive symptoms and low physical functioning at t1 (ie, there was a slight but significant interaction between resilience and baseline physical functioning in predicting baseline depressive symptoms; $t=2.40$; $P=.017$; $r^2=.004$). This pattern warrants further examination.

Taken together, our findings suggest that resilience is an important correlate of healthy aging with disability, associated with health in the psychological, sociological, and physiological domains.[25] A number of promising interventions to target resilience, such as well-being therapy,[47] gratitude building,[48] and relation skills training,[49] may be adapted to increase resilience and therefore promote healthy aging in persons with physical impairments. The present findings suggest that research examining this possibility is warranted. In addition, certain therapies, such as acceptance and commitment therapy,[50] focus on enhancing the meaningful elements of one's life despite the presence of suffering and may also be useful in promoting resilience across the psychological, sociological, and physiological domains.

### Study limitations

This study had some important limitations. First, our sample consisted of participants who were primarily non-Hispanic whites and well-educated, so the observed patterns may not generalize to other segments of the population. Second, although we used a longitudinal design and measured outcomes at both time points, we did not measure resilience again at t4. Therefore, we could not evaluate the presence of any bidirectional, reciprocal relations between resilience and outcomes. Third, the response rate was not 100%, so participants who did not respond could differ systematically from those who did.

## Conclusions

Although this study and others suggest that resilience is important for people with disabilities, there is much we do not know about the construct. For example, we do not know what constitutes a meaningful or ideally high level of resilience. Future studies should also identify the subdimensions of resilience that are most significant in the lives of people with disabilities, including biological tendencies, dispositional factors, learned skills, and environmental supports. Knowledge of these factors could inform clinical care. Finally, it would be interesting to examine whether the components of resilience differ depending on disability duration and timing.

## Keywords

Aging; Multiple sclerosis; Muscular dystrophies; Postpoliomyelitis; Psychological resilience; Quality of life; Rehabilitation; Spinal cord injuries

## Corresponding author

Arielle M. Silverman, PhD, Department of Rehabilitation Medicine, University of Washington, 1959 NE Pacific St, Box 356490, Seattle, WA 98195. *E-mail address:* arielles@uw.edu.

## Acknowledgment

We thank Aimee Verrall, MPH, and Amanda Smith, BS, for assistance with data collection and management.

## References

1. Lin SF, Beck AN, Finch BK, Hummer RA, Master RK. Trends in U.S. older adult disability: exploring age, period, and cohort effects. Am J Pub Health 2012;102:2157-63.
2. Kaufman DW, Reshef S, Golub HL, et al. Survival in commercially insured multiple sclerosis patients and comparator subjects in the U.S. Mult Scler Related Dis 2014;3:364-71.
3. Amtmann D, Borson S, Salem R, Johnson KL, Verrall A. Aging with disabilities: comparing symptoms and quality of life indicators of

individuals aging with disabilities to U.S. general population norms. J Am Ger Soc 2012;60:S185.
4. Bombardier CH, Ehde DM, Stoelb B, Molton IR. The relationship of age-related factors to psychological functioning among people with disabilities. Phys Med Rehabil Clin N Am 2010;21:281-97.
5. Mitchell JM, Adkins RH, Kemp BJ. The effects of aging on employment of people with and without disabilities. Rehabil Couns Bull 2006;49:157-65.
6. Molton IR, Terrill AL, Smith AE, et al. Modeling secondary health conditions in adults aging with physical disability. J Aging Health 2014;26:335-59.
7. Albrecht GL, Devlieger PJ. The disability paradox: high quality of life against all odds. Soc Sci Med 1999;48:977-88.
8. Dunn DS, Uswatte G, Elliott TE. Happiness, resilience, and positive growth following physical disability: issues for understanding, research and therapeutic intervention. In: Lopez SJ, editor. Oxford handbook of positive psychology. 2nd ed. New York: Oxford Univ Pr; 2009. p 651-64.
9. Montross LP, Depp C, Daly J, et al. Correlates of self-rated successful aging among community-dwelling older adults. Am J Geriatr Psychiatry 2006;14:43-51.
10. Bonanno GA. Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? Am Psychol 2004;59:20-8.
11. Smith BW, Zautra AJ. Vulnerability and resilience in women with arthritis: test of a two-factor model. J Consult Clin Psychol 2008;76:799-810.
12. Senders A, Bourdette D, Hanes D, Yadav V, Shinto L. Perceived stress in multiple sclerosis: the potential role of mindfulness in health and well-being. J Evid Based Complementary Altern Med 2014;19:104-11.
13. Yeung EW, Arewasikporn A, Zautra AJ. Resilience and chronic pain. J Soc Clin Psychol 2012;31:593-617.
14. Pietrzak RH, Tracy M, Galea S, et al. Resilience in the face of disaster: prevalence and longitudinal course of mental disorders following hurricane Ike. PLoS One 2012;7:E38964.
15. Ehde DM. Application of positive psychology to rehabilitation psychology. In: Frank RG, Rosenthal M, Kaplan B, editors. Handbook of rehabilitation psychology. Washington, DC: American Psychological Association; 2009. p 417-24.
16. Phelps LF, Williams RM, Raichle KA, Turner AP, Ehde DM. The importance of cognitive processing to adjustment in the first year following amputation. Rehabil Psychol 2008;53:28-38.
17. Bonanno GA, Kennedy P, Galatzer-Levy IR, Lude P, Elfstom ML. Trajectories of resilience, depression, and anxiety following spinal cord injury. Rehabil Psychol 2012;57:236-47.
18. Quale AJ, Schanke AC. Resilience in the face of coping with a severe physical injury: a study of trajectories of adjustment in a rehabilitation setting. Rehabil Psychol 2010;55:12-22.
19. Boyd NF, Sutherland HJ, Heasman KZ, Tritchler DL, Cummings BJ. Whose utilities for decision analysis? Med Decis Making 1990;10:58-67.
20. Hurst NP, Jobanputra P, Hunter M, Lambert M, Lochhead A, Brown H. Validity of Euroqol—a generic health status instrument—in patients with rheumatoid arthritis. Br J Rheumatol 1994;33:655-62.
21. Riis J, Loewenstein G, Baron J, Jepson C, Fagerlin A, Ubel PA. Ignorance of hedonic adaptation to hemodialysis: a study using ecological momentary assessment. J Exp Psychol Gen 2005;134:3-9.
22. Catalano D, Chan F, Wilson L, Chiu LY, Muller VR. The buffering effect of resilience on depression among individuals with spinal cord injury: a structural equation model. Rehabil Psychol 2011;56:200-11.
23. Terrill AL, Molton IR, Ehde DM, et al. Resilience, age, and perceived symptoms in persons with long-term physical disabilities. Health Psychol 2014 May 8 [Epub ahead of print].
24. White B, Driver S, Warren AM. Resilience and indicators of adjustment during rehabilitation from a spinal cord injury. Rehabil Psychol 2010;55:23-32.
25. Young Y, Frick KD, Phelan EA. Can successful aging and chronic illness coexist in the same individual? A multidimensional concept of successful aging. J Am Med Dir Assoc 2009;10:87-92.
26. Alschuler KN, Gibbons LE, Rosenberg DE, et al. Body mass index and waist circumference in persons aging with muscular dystrophy, multiple sclerosis, post-polio syndrome, and spinal cord injury. Disabil Health J 2012;5:177-84.
27. Alschuler KN, Jensen MP, Goetz MC, Smith AE, Verrall AM, Molton IR. Effects of pain and fatigue on physical functioning and depression in persons with muscular dystrophy. Disabil Health J 2012;5:277-83.
28. Jensen MP, Smith AE, Bombardier CH, Yorkston KM, Miro J, Molton IR. Social support, depression, and physical disability: age and diagnostic group effects. Disabil Health J 2014;7:164-72.
29. Molton IR, Goetz MC, Jensen MP, Verrall AM. Evidence for "accelerated aging" in older adults with disability? J Am Geriatr Soc 2012;60:S239-40.
30. Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. J Trauma Stress 2007;20:1019-28.
31. Coates EE, Phares V, Dedrick RF. Psychometric properties of the Connor-Davidson Resilience Scale 10 among low-income, African American men. Psychol Assess 2013;25:1349-54.
32. Notario-Pacheco B, Solera-Martinez M, Serrano-Parra MD, Bartolome-Gutierrez R, Garcia-Campayo J, Martinez-Vizcaino V. Reliability and validity of the Spanish version of the 10-item Connor-Davidson Resilience Scale (10-item CD-RISC) in young adults. Health Qual Life Outcomes 2011;9:63.
33. Hayter MR, Dorstyn DS. Resilience, self-esteem and self-compassion in adults with spina bifida. Spinal Cord 2014;52:167-71.
34. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16:606-13.
35. Bombardier CH, Kalpakjian CZ, Graves DE, Dyer JR, Tate DG, Fann JR. Validity of the Patient Health Questionnaire-9 in assessing major depressive disorder during inpatient spinal cord injury rehabilitation. Arch Phys Med Rehabil 2012;93:1838-45.
36. Fann JR, Bombardier CH, Dikmen S, et al. Validity of the Patient Health Questionnaire-9 in assessing depression following traumatic brain injury. J Head Trauma Rehabil 2005;20:501-11.
37. Milette K, Hudson M, Baron M, Thombs BD. Comparison of the PHQ-9 and CES-D depression scales in systemic sclerosis: internal consistency reliability, convergent validity and clinical correlates. Rheumatology (Oxford) 2010;49:789-96.
38. Hahn EA, DeVellis RF, Bode RK, et al. Measuring social health in the Patient-Reported Outcomes Measurement Information System (PROMIS): item bank development and testing. Qual Life Res 2010;19:1035-44.
39. Fries JF, Bruce B, Rose M. Comparison of the health assessment questionnaire disability index and the short form 36 physical functioning subscale using Rasch analysis: comment on the article by Taylor and McPherson. Arthritis Rheum 2008;59:598-9; author reply 599.
40. Cook KF, Bamer AM, Amtmann D, Molton IR, Jensen MP. Six patient-reported outcome measurement information system short form measures have negligible age- or diagnosis-related differential item functioning in individuals with disabilities. Arch Phys Med Rehabil 2012;93:1289-91.
41. Cella D, Riley W, Stone A, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005-2008. J Clin Epidemiol 2010;63:1179-94.
42. Cella D, Yount S, Rothrock N, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS): progress of an NIH Roadmap cooperative group during its first two years. Med Care 2007;45:S3-11.

43. University of Washington Center on Outcomes Research in Rehabilitation. UWCORR and PROMIS physical function scale for samples that use mobility aids. The Seattle, WA: University of Washington Center on Outcomes Research in Rehabilitation. Available at: http://uwcorr.washington.edu/publications/PF_SF_instructions_and_forms_version1.pdf. Accessed October 2, 2014.
44. Alschuler KN, Jensen MP, Sullivan-Singh SJ, Borson S, Smith AE, Molton IR. The association of age, pain, and fatigue with physical functioning and depressive symptoms in persons with spinal cord injury. J Spinal Cord Med 2013;36:483-91.
45. Judd CM, McClelland GH, Ryan CS. Data analysis: a model comparison approach. 2nd ed. New York: Routledge; 2009.
46. Garland EL, Fredrickson B, Kring AM, Johnson DP, Meyer PS, Penn DL. Upward spirals of positive emotions counter downward spirals of negativity: insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. Clin Psychol Rev 2010;30:849-64.
47. Fava GA, Tomba E. Increasing psychological well-being and resilience by psychotherapeutic methods. J Pers 2009;77:1903-34.
48. Emmons RA, McCullogh ME. Counting blessings versus burdens: an experimental investigation of gratitude and subjective well-being in daily life. J Pers Soc Psychol 2003;84:377-89.
49. Gottman JM, Gottman JS, Atkins CL. The comprehensive soldier fitness program family skills component. Am Psychol 2011; 66:52-7.
50. Hayes SC, Strosahl K, Wilson KG. Acceptance and commitment therapy: an experiential approach to behavior change. New York: Guilford Pr; 1999.