



Correlates of stress in long-term spinal cord injury

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Study Design: Longitudinal.

Objectives: To characterize long-injured SCI persons with high reported stress; to assess the relationship between severity of disability and perceived stress; to identify correlates of future stress and outcomes of previous stress.

Setting: Two SCI centres in England: Stoke Mandeville Hospital in Aylesbury, and the District General Hospital in Southport.

Methods: In 1990, 1993 and 1996 187 persons who sustained spinal cord injuries prior to 1971 underwent comprehensive physical evaluations and health status interviews and completed a battery of tests to measure psychosocial functioning. Using mean scores on the Perceived Stress Scale (PSS) as the reference, a range of outcomes were analyzed to identify concurrent, previous, and future variables that were significantly correlated with perceived stress.

Results: No associations were found between stress and any of the proxy variables that represented injury severity. Such common SCI-related medical conditions as pressure sores and upper extremity pain were not related to stress; not even fatigue was significantly associated with stress in both time periods studied. However, depressive symptoms, poorer life satisfaction, and poorer perceived well being were associated with future stress and were outcomes that appeared to be related to earlier stress.

Conclusion: Perceived stress in long-term SCI is not closely related to the severity of the disability or physical independence. It is, however, related to scores on several measures of adjustment and coping. Though mean stress scores in this sample did not appear to differ substantially from scores in the general nondisabled population, further controlled study is needed to definitively answer the question: Do SCI survivors report more stress than their nondisabled counterparts?

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Keywords: spinal cord injury; stress

Introduction

Stress is both a stimulus and a response, a cause and a result.¹ Indeed, it can be a stimulus for such adverse outcomes as heart disease, cancer, hypertension, migraine headaches, peptic ulcers, allergies and asthma, rheumatoid arthritis, skin conditions, and such psychological issues as adjustment problems and post-traumatic stress disorder.^{1–5} And, it can be the result of such physical, psychological and environmental factors and events as illness, injury or disability, day to day worries and financial concerns, and noise, crowding or inadequate living situations.^{2,6}

It is the dual role of causality and response that makes the study of stress so complicated. The situation is further complicated by the fact that stressors or stressful situations alone do not necessarily lead to adverse outcomes; not all stress is negative. Moreover, not all stress is created by negative events. Marriage, a new job, or the birth of a new baby, for example, are events that, to many people, are simultaneously positive and highly stressful.

In any case, it is reported that two characteristics must be present for stress to have an impact on the individual: a given situation must be felt by the individual to be demanding or threatening, and the individual must believe that he or she does not have

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the resources to cope with the situation.⁷⁻⁹ As a result, individuals will vary widely in what they view as stressful and how they respond to stress. It is precisely this variation that supports arguments for measuring perceived stress,⁹⁻¹¹ the outcome measure selected for this research with long-term spinal cord injury survivors.

Although disability has been reported to be a stressor,^{2,6,12} the precise relationship between stress and disability remains unclear. Fuhrer *et al* and Rintala *et al*^{13,14} studied 140 spinal cord injury survivors (100 men, 40 women), with a mean age of 37 years (standard deviation=11.5) and a mean duration of injury of almost 11 years (SD=7.8 years). All were living in a 13-county area in and around Houston and Galveston, Texas, USA. Members of this sample were found to have more stress than the general population, but the investigators were unable to attribute this increased stress to the severity of their participants' impairments or the extent of their disabilities. However, the extent to which this is true in more population-based samples of disabled people and the extent to which it applies to longer injured SCI survivors has not been studied. Also virtually unexamined are the factors that lead to stress and the outcomes that result, over time, from increased perceived stress among SCI survivors. The purpose of this population-based research, therefore, was to address the following questions:

- (1) What characterizes those long-injured spinal cord injured persons who report more perceived stress than others; what role, if any, does the extent or severity of the disability play?
- (2) What characteristics at one point in time are associated with future stress among SCI survivors with disabilities of more than 20 years duration?
- (3) What are later outcomes that are associated with earlier reports of stress among long term spinal cord injury survivors?

Methods

Research participants were initially drawn from a population-based sample of 412 long-term SCI survivors meeting the following broad criteria:

- (1) residence, at the time of injury, in one of 13 counties served by the National Spinal Injuries Centre at Stoke Mandeville Hospital in Aylesbury and by the Northwest Regional Spinal Injuries Centre at the District General Hospital in Southport, England;
- (2) onset of traumatic spinal cord injury prior to December 31, 1970;
- (3) age between 15 and 55 years at the time of onset, to include only persons with non-elderly, yet adult-onset spinal cord injuries;
- (4) admission to one of the two participating SCI centers within 1 year of injury;

- (5) documentation—via the British Office of Population Censuses and Surveys and/or the National Health Services—that the individual was still alive at the study's inception in 1990.

In 1990, all of the 412 known survivors were invited to participate in a longitudinal research effort studying outcomes of long-term spinal cord injury. Two hundred and seventy-nine agreed and underwent comprehensive assessments at the SCI centre which included a full battery of health, medical, and functional evaluations conducted by a physician and physical therapist, an extensive interview querying them about their perceived health, quality of life, and functional concerns, and a battery of psychometric tests in order to assess depression, perceived stress, well-being, and life satisfaction. Two hundred and twenty-seven participants returned for the second round of longitudinal data collection in 1993, and in 1996 198 returned. However, it was the 187 individuals who participated in all three of the data collection efforts and who had valid scores on Cohen, Kamarack, and Mermelstein's Perceived Stress Scale⁹ in both 1993 and 1996 who comprised the sample

Table 1 Participant descriptions as of 1993 data collection effort (*n* = 187)

	Number	Percent
<i>Gender</i>		
Men	161	86.1
Women	26	13.9
<i>Age</i>		
Mean	53.6	
Range	37-77	
<i>Age groups</i>		
< 50 years	69	36.9
50-59 years	75	40.1
60-69 years	32	17.1
> 69 years	11	5.8
<i>Duration of disability</i>		
Mean	29.7	
Range	23-49	
<i>Duration of disability groups</i>		
< 30 years	111	59.4
30-39 years	60	32.1
> 39 years	16	8.6
<i>Neuro grouping</i>		
Para (ASIA A, B, C)	93	49.7
Tetra (ASIA A, B, C)	57	30.5
All ASIA D*	37	19.8
<i>Marital status</i>		
Married	121	64.7
Single	45	24.1
Divorced/Separated	16	8.6
Widowed	5	2.7
<i>Employment</i>		
Working	74	39.6
Not working (Unemployed/Retired)	113	60.4

*There were no study participants who had been classified ASIA E

targeted by this particular research. Table 1 describes the participants. It is noteworthy that those who participated did differ somewhat from those who were eligible but did not participate in this research. While limited data on non-participants obviously prevented extensive comparisons, the two groups did differ significantly with respect to age and level of neurologic impairment ($P < 0.01$). Participants, as a group, were 4.8 years younger than non-participants, and more of the participants were described as tetraplegics at the time of their injury (24.6% versus 10.2%), while fewer had neurologically incomplete injuries (26.7% versus 42.7%). There were no differences between the two groups with respect to gender or duration of injury.

Instruments and analyses

The Perceived Stress Scale (PSS) assesses the degree to which individuals living in the community appraise situations in their lives as stressful, unpredictable, uncontrollable, and overloading. Using five response options—'never', 'almost never', 'sometimes', 'fairly often', and 'very often'—the PSS asks subjects how often they have had particular thoughts or feelings, specifically during the past month. Questions are general, rather than descriptive of specific situations, and target such general feelings as nervousness, being overwhelmed, inability to cope with life hassles, and anger over lack of control. For example, one question asks, 'In the last month, how often have you felt that you could not cope with all the things that you had to do?'

Scores for the PSS can range from 0 to 56, with higher scores indicating more perceived stress. The PSS is reported to be reliable and to correlate with life-event scores, depressive and physical symptomatology, utilization of health services and, social anxiety.⁹ It has also been reported to be a good predictor of health and health-related outcomes, and has been shown to have good internal and test-retest reliability.⁹ While this research effort utilized the 14 question PSS, it is important to note that the Texas study described earlier utilized a ten item version of the Perceived Stress Scale.^{13,14} There is also a four item version in use.¹² In addition to this study of spinal cord injury survivors, another report of PSS usage among persons with physical impairments involved subjects with tempromandibular pain and physical therapy patients being treated for various types of joint and muscle pain.¹⁵

The long-term spinal cord injury survivors' scores on the Perceived Stress Scale—administered in 1993 and 1996—served as the focus around which all analyses were conducted. Treated as a continuous variable, PSS scores were associated, using Pearson correlations, with other data, other test scores, and outcomes to identify significant relationships. One hundred and twenty comparisons were performed using the $P < 0.01$ significance level. Assuming that

all tests were independent of each other, the chances of four or more being significant due to chance alone is conservatively estimated at 2.5%.

The first level of analyses targeted relationships within one time period. 1993 PSS scores were compared with other 1993 outcomes to characterize SCI survivors with high perceived stress; the same was done with 1996 scores and 1996 outcomes. Then, building on the longitudinal design of this research, analyses were conducted across time periods in an effort to identify factors and phenomena that were associated with later stress as well as those that were associated with previous stress. First, the variables collected during 1990 were associated with the 1993 PSS scores to identify correlates of future stress; the same was done with 1993 variables and 1996 PSS scores. Then, the 1993 PSS scores were associated with 1996 outcomes in order to identify the results and longer term implications of earlier perceived stress.

Variables examined in all of these time periods included such standard variables as gender, age, and duration of injury, as well as the potential role of the level and severity of injury. The latter was assessed in five ways: by hours of attendant care utilized each day; by Functional Independence Measure scores (FIM)¹⁶; by physical independence subscale scores measured by CHART,¹⁷ by American Spinal Injury Association (ASIA)/International Medical Society of Paraplegia (IMSOP) motor scores;¹⁸ and, finally, by comparison of three functional impairment subgroups, based on the ASIA/IMSOP classification:¹⁸

- those with functionally complete paraplegia who typically had intact upper extremities but used wheelchairs for their mobility (Para: ASIA ABC)
- those with functionally complete tetraplegia who similarly used wheelchairs but also had impaired function in their upper extremities (Tetra: ASIA ABC)
- those with functionally incomplete SCIs at any neurological level who had neurological sparing such that ambulation was typically possible (All ASIA, D)

Additionally, a range of reported medical complications and health interview responses were analyzed. These included the existence of pressure sores, urinary and bowel-related complaints and diagnoses, neurologic changes, joint pain, fatigue, medication concerns, dietary issues, sexuality issues, functional decline, and a host of others.

Also analyzed were outcomes related to adjustment and function, as measured by the following scaled tests and instruments:

- The Center for Epidemiological Studies Depression Scale (CES-D)¹⁹ is a 20 item scale that asks users to report how many days during the past week they have experienced symptoms like feeling happy or fearful, or being unable to 'shake off the blues'.

Item scores are then summed, yielding a total score which can range from 0–60, with higher scores indicating greater depressive symptomatology. The CES-D is widely used in community populations, including the elderly, and it correlates significantly with clinical depression ratings, with other measures of depression, and with actual diagnoses of depression.^{20–24} Developed as a tool for measuring sample-wide characteristics of depression, its reliability has been measured using corrected split half correlations (0.85) and an alpha coefficient (0.92).²⁵ Himmelfarb and Murrell have shown the CES-D to have high reliability among elderly populations.²⁶ Validity of the CES-D is reinforced by the persistence and consistency of relationships between depression and health, gender, and marital status across ages.^{27–29} Within the realm of spinal cord injury, the CES-D has been used in studies of adjustment,³⁰ pain,³¹ substance abuse,³² as well as to assess the overall levels of depression.^{33,34}

- The Life Satisfaction Index (LSI-Z³⁵) assesses morale or satisfaction with life by asking respondents to agree or disagree with 13 statements like, ‘These are the best years of my life’, and ‘The things I do are as interesting to me as they ever were’. This instrument was developed after item analysis of the longer LSI-A version and correlates adequately with the Life Satisfaction Rating.^{35,36} Its validity and reliability have been studied, and have been found to be satisfactory, particularly among elderly populations where it has been used extensively (Kuder-Richardson Coefficient Alpha = 0.079).^{37–43} Additionally, the LSI-Z has also been used in studies of aging and spinal cord injury.^{44,45}
- The Index of Psychological Well-being (IPWB⁴⁶) consists of eight items, with response options of ‘never’, ‘sometimes’, and ‘often’. Examples of questions are: ‘How often do you feel bored?’ and ‘How often do you feel particularly excited or interested in something?’ The instrument is scored on a seven-point scale, and scores higher than ‘4’ typically indicate poorer—and less than average—well-being. The Index of Psychological Well Being has been validated through its similarity in relationships to a stress-factor and its association with an index of neurotic traits.⁴⁶ While not extensively used in spinal cord injury, a few studies have shown that people with SCI scored similarly to Bergman’s general population sample.^{30,45}
- The Functional Independence Measure (FIM;¹⁶), quantifies the extent of disability by assessing an individual’s level of physical and cognitive independence. Performed of 18 tasks in six life care areas—including self-care, locomotion, mobility, sphincter control, communication, and social cognition—is assessed with a seven point scale describing varying degrees in the amount of assistance or supervision that is needed from others as the result of an impairment. Subscores for each of the six life areas, as well as a total score are obtained. The FIM’s

ability to detect changes in independence over time is reported to be high, and inter-rater reliability is good among rehabilitation clinicians who administer the instrument. In a multi-center study involving over 1000 patients, pairs of clinicians obtained a inter-rater correlation coefficient of 0.99 for the total FIM score; for none of the six subscores was the coefficient lower than 0.97.^{47,48} Its face validity and construct validity have been demonstrated in studies with clinicians, and the FIM has been shown to accurately predict burden of care, defined as minutes of help received per day.⁴⁷

- The Craig Handicap Assessment and Reporting Technique (CHART¹⁷) is a tool for measuring handicap or level of social integration for people with disabilities. It uses six subscales which closely parallel the domains of handicap described by the World Health Organization⁴⁹—orientation, physical independence, mobility, occupation, social integration, and economic self-sufficiency. The instrument contains 32 questions which attempt to quantify the extent to which individuals fulfill various social roles. It is normed on a nondisabled sample such that majority of those completing CHART attained the maximum score of 100 in each subscale—indicating that they had no handicap(s). For the total CHART score, the test-retest reliability coefficient was found to be 0.93; the reliability coefficient between subjects and their proxies was 0.83 and independent raters have established CHART’s validity. Rasch analysis further verified CHART’s scaling and scoring procedures.¹⁷

Results

Mean PSS scores

First, Table 2 depicts the mean PSS scores for various subgroups of the sample. No significant ($P < 0.01$) differences—during either time period—could be demonstrated with respect to age, duration of injury, gender, or severity of the impairment. However, mean PSS scores did decrease significantly between the 1993 and 1996 administrations ($P < 0.001$).

Analysis within the same time period: characteristics of SCI survivors with higher perceived stress

As Table 3 shows, not only were there no significant correlations between stress and age or duration of injury, but neither were there associations that could be found linking stress levels to the extent or severity of the SCI survivors’ disability. There were no significant associations between PSS scores and ASIA Motor scores, FIM scores, the level of physical independence (as measured by the CHART subscale), or the number of hours of attendant care used per day. Even when those with tetraplegia were compared to those with paraplegia and with functionally incomplete spinal cord injuries, there were no differences.

With respect to physical symptoms, those with more stress also had significantly more fatigue in 1993, but not in 1996. They also had more stomach pain and nausea in one time period but not the other. No other medical health complaints—including pressure sores and upper extremity pain—were significantly associated with PSS scores at either time period.

However, as Table 3 also shows, stress in both 1993 and 1996 was correlated with several concurrent psychological outcomes. These included lower life satisfaction (as measured by the LSI-Z), lower self-rated quality of life, lower psychological well-being (as measured by the IPWB), and depressive symptoms. In fact, in addition to the total CES-D score, each depression subscale itself was significantly related to perceived stress, with higher levels of the latter being associated with more affective symptoms, more somatic symptoms, less well-being, and lower interpersonal affect.

Additionally, those who had higher occupation subscores on CHART—indicating that they were more active vocationally and avocationally—also had higher stress scores in 1993. Moreover, the entire CHART score itself—a measure of handicap and community integration—was related to stress. Those survivors with the highest CHART scores—those who were the least handicapped and seemingly the most involved in typically expected social roles—reported the most stress in 1993. However, neither of these relationships with CHART scores retained their significance in 1996. Regression analysis showed that 47% of the variance in the 1993 PSS scores could be accounted for by the significant associated variables listed in Table 3, while in 1996, 52% of PSS score variance was accounted for by its significantly associated variables.

Table 2 Mean PSS scores

	PSS 1993		PSS 1996	
	Mean score	Standard deviation	Mean score	Standard deviation
Overall	18.02	8.43	17.61	8.53
Age groups				
< 50	18.68	8.17	18.33	8.63
50–59	18.76	8.99	17.64	8.70
60–69	16.47	7.72	16.06	7.97
> 69	13.27	6.66	17.36	8.92
Duration of injury				
< 30 years	18.30	8.54	17.63	8.68
30–39 years	19.02	8.13	18.27	8.53
> 39 years	12.31	6.84	15.00	7.44
Gender				
Men	17.76	8.57	17.44	8.68
Women	19.62	7.45	18.65	8.53
Impairment				
Tetra ASIA ABC	18.16	9.23	17.82	9.08
Para ASIA ABC	18.01	7.90	18.09	8.38
All ASIA D	17.81	8.65	16.08	8.07

Analysis across time periods: characteristics and factors associated with stress 3 years later

With the exception of fatigue in 1996, medical issues and complaints—including pressure sores and upper extremity pain—had no consistent relationship with stress reported 3 years later. However, scores on the psychological instruments were again significant. Lower life satisfaction in 1990 was associated with higher

Table 3 Associations with Perceived Stress Scale score: during the same time period

Variable		PSS 1993 correlation	PSS 1996 correlation
Age	1993	-0.172	
	1996		-0.053
Duration of injury	1993	-0.161	
	1996		-0.036
Employed	1993	0.148	
	1996		0.114
Occupation (CHART subscore)	1993	0.191**	
	1996		0.037
Gender	1993	0.076	
	1996		0.049
Extent of disability FIM score	1993	0.010	
	1996		-0.051
Extent of disability ASIA motor scores	1993	-0.006	
	1996		-0.032
Extent of disability Para ABC	1993	-0.001	
	1996		0.056
Tetra ABC	1993	0.011	
	1996		0.017
All DE	1993	-0.012	
	1996		-0.089
Extent of disability hours of care	1993	0.017	
	1996		0.037
Extent of disability (CHART physical independence subscale score)	1993	0.015	
	1996		-0.049
Fatigue	1993	0.258***	
	1996		0.185
Upper extremity pain	1993	-0.006	
	1996		0.040
Increased c/o stomach pain	1993	0.276***	
	1996		0.109
Increase c/o nausea	1993	0.110	
	1996		0.180
Absence/presence of pressure sore (any grade, anywhere)	1993	0.081	
	1996		0.123
Total CHART score	1993	0.216**	
	1996		0.048
Life satisfaction (LSI-Z score)	1993	-0.275***	
	1996		-0.374***
Depression (CES-D score)	1993	0.645***	
	1996		0.713***
Psychological Well-being score	1993	0.461***	
	1996		0.536***
Perceived quality of life	1993	-0.353***	
	1996		-0.444***

** $P < 0.01$; *** $P < 0.001$

perceived stress in 1993; similarly, lower life satisfaction in 1993 was related to stress in 1996. Depressive symptoms, poorer perceived well-being, and poorer reported perceived quality of life were also associated with stress 3 years later, as Table 4 illustrates. Regression analysis showed that 15% of the variance in the 1993 PSS scores could be accounted for by the significant associated variables listed in Table 4. In 1996, 25.6% of the variance in PSS scores was accounted for by its significantly associated variables.

Analysis across time periods: the relationship of earlier stress to outcomes 3 years later

As in the preceding analyses, psychological outcomes as measured by the various instruments proved to be the most significant outcomes of earlier stress. First, individuals with higher PSS scores in 1993 were likely to have high PSS scores again 3 years later. They were also more likely to report lower life satisfaction 3 years later based on LSI-Z scores, lower well-being as measured by the Index of Psychological Well-Being, and more depressive symptomatology as reflected by higher total CES-D scores. People with more stress in 1993 also used more alcohol in 1996. Interestingly, stress in 1993 was also associated with higher economic

self-sufficiency in 1996, as measured by the CHART subscale. Total CHART scores also were higher, indicating more stress among those who became more highly integrated into and active within their communities. Finally, of all the health issues and physical complications—including all those reported previously—only fatigue in 1996 was significantly associated with previous stress.

Discussion

Perhaps the most important contribution of this research—and perhaps its most significant implications for clinicians—is three relationships it appears to demonstrate:

- (1) the non-relationship between stress and the severity of the disability among long-term spinal cord injury survivors.
- (2) the seemingly strong relationship between stress and other psychological outcomes, particularly depression, life satisfaction, and quality of life.
- (3) the lack of strong relationships between stress and medical outcomes, despite the plethora of scientific research and reports in the popular press on the impact of stress on physical health.

Table 4 Previous characteristics significantly associated with stress 3 years later

Variable		PSS 1993 correlation	PSS 1996 correlation
Life satisfaction (LSI-Z)	1990	-0.207**	-0.216**
	1993		
Psychological well-being	1990	0.389***	0.350***
	1993		
Depressive (total CES-D score)	1990	Not administered	0.468***
	1993		
Perceived quality of life	1990	-0.167	-0.238**
	1993		
Fatigue	1990	0.159	0.270***
	1993		
Stomach pain	1990	0.190	0.234**
	1993		
Nausea	1990	0.149	0.220**
	1993		

P < 0.01 *P < 0.001

Table 5 The relationship of stress in 1993 to 1996 outcomes

Outcome in 1996	PSS 1993 correlation
Perceived stress scale	0.599***
Life satisfaction (LSI-Z)	-0.156
Psychological well-being	0.362***
Depressive symptoms (total CES-D score)	0.369***
Economic self-sufficiency (CHART subscale)	0.238**

P < 0.01 *P < 0.001

All three of these findings are supported by recently published research with an American sample of SCI survivors. In two reports from the Baylor College of Medicine Life Status Study, a similarly non-significant relationship between stress and severity of the impairment or disability was found. Involving 661 Texans with a mean age of 37 and a mean duration of injury of almost 11 years, this study found no PSS score differences with respect to participants' level and completeness of injury, their ASIA Total Motor Index scores, self-reported FIM scores, or the amount of personal assistance they received.^{13,14} Nonetheless, relationships were identified between stress and measures of life satisfaction, depressive symptomatology, and self-assessed health, while no relationships were found between stress and two key SCI-specific medical complications: urinary tract infections and pressure sores.¹⁴ The absence of a relationship between stress and pressure sores, perhaps the most prevalent and certainly one of the most devastating complications faced by long-term spinal cord injury survivors is particularly conspicuous in both studies and seems almost counter-intuitive. Further research seems indicated.

Two other medical correlates of stress identified in the British population-based sample also seem to merit further study. Both fatigue and bowel and stomach-related complaints exhibited some inconsistent association with stress. Though these may not be as dramatic as the hypertension or cardiovascular disease associations found in the nondisabled population, both fatigue and gastrointestinal problems are concerns that are prevalent in long-term SCI survivors and as

such may merit further monitoring for their impact on survivors' perceptions of themselves and their ability to function effectively. Further study is also needed to better understand why some outcomes were significantly associated with stress across one time period, but not the other.

There are several limitations to this study. First, it is important to keep in mind that this research identified only relationships and associations. It's difficult to conclude that stress in these British SCI survivors is the cause of particular concomitant or later outcomes, or that particular symptoms or characteristics were themselves the direct causes of later reported stress. Any of the identified stress correlates could be the result of a more complex interrelationship among numerous variables, or of some other, unstudied variable. Indeed, despite the significant correlations identified, there is still a large amount of variance unaccounted for by the variables assessed in this study. Perhaps unmeasured variables unrelated to SCI play a role in the perceived stress measured by this research.

Additionally, it is not known to what extent the study participants' perceived stress was confounded by psychological distress. This has been a limitation of the PSS itself, according to its authors.¹² It is not known how directly the SCI survivors' stress, as well as their life satisfaction, well being, and depressive symptomatology, were influenced by or were a function of their own self-perceptions, adjustment and personal coping strategies. While others have studied the role of coping strategy on distress^{8,50} this was not examined in our population.

In addition, the extent to which these findings are generalizable is not known. With the exception of the recently published findings of the Baylor College of Medicine Life Status Study,^{13,14} few, if any, other uses of the PSS with SCI survivors are reported. That the British and Baylor studies were similar with respect to the three main findings described above is encouraging. However, other questions remain, and it must be kept in mind that while the British sample as a whole was population-based, the group of long-term SCI survivors who chose to participate in this research contained a disproportionate number of individuals who are younger and who have more severe injuries.

Perhaps the most important question relates to how mean stress levels compare across groups of disabled and nondisabled persons. Direct comparisons with the Baylor group are limited by the fact that different versions of the PSS were used. However, if scores are prorated to adjust for the use of 14 and 10 item instruments, it appears that the American sample—which is considerably younger—had higher mean stress scores than the British group. Though such a score prorating is clearly an oversimplification, it does further substantiate one finding that has appeared repeatedly: stress levels decrease with age. In the British sample, younger participants had higher stress

scores; in both samples, mean stress scores dropped when the PSS was administered 3 years later; and, in the older British sample mean scores were lower than in the younger American group. Even in Cohen and Williamson's general population sample, scores decreased as age increased.¹²

What about more direct comparisons with the general population? Do SCI survivors have more stress than nondisabled people? Though the Baylor study concluded that its SCI survivors did have more perceived stress than their general population counterparts,^{13,14} this was less clear in the older British sample. Compared with Cohen and Williamson's report,¹² stress scores for the British SCI participants actually seemed to be very slightly lower than for the general population. However, the extent to which this was affected by differences in how age groups were defined, by the use of different versions of the PSS, by cross-cultural differences—or whether it truly reflects an increasing similarity in stress levels as both disabled and nondisabled people age—cannot be determined. Clearly, only further research which samples SCI survivors of many ages and durations of injury and includes matched contemporary nondisabled controls, will definitively answer this question.

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