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SPRINT: a brief global assessment of post-traumatic stress disorder

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This report describes the reliability, validity, treatment sensitivity, diagnostic performance and normative values for the Short Post-Traumatic Stress Disorder (PTSD) Rating Interview (SPRINT), a brief, global assessment for PTSD. The SPRINT was administered to subjects participating in a clinical trial of PTSD and in a population survey assessing PTSD prevalence. The 8-item SPRINT includes questions assessing the core symptoms of PTSD, as well as related aspects of somatic malaise, stress vulnerability and functional impairment. Validity was assessed against the MINI structured interview, the Davidson Trauma Scale, Treatment Outcome for PTSD Scale, Connor–Davidson Resilience Scale, Sheehan Stress Vulnerability Scale, Sheehan Disability Scale and Clinical Global Impressions of Severity and Improvement Scales. Good test–retest reliability, internal consistency, convergent and divergent validity were obtained. The SPRINT was responsive to symptom change over time and correlated with comparable PTSD symptom measures. In victims of trauma, a score of 14–17 was associated with 96% diagnostic accuracy, whereas in those with PTSD, highest efficiency corresponded to a range of 11–13. The SPRINT demonstrates solid psychometric properties and can serve as a reliable, valid and homogeneous measure of PTSD illness severity and of global improvement. Int Clin Psychopharmacol 16:279–284 © 2001 Lippincott Williams & Wilkins

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INTRODUCTION

A number of interview-based scales are now available to evaluate the symptoms of post-traumatic stress disorder (PTSD), and its response to treatment. These include such structured instruments as the Clinicians Administered PTSD Scale (CAPS) (Blake *et al*., 1995), the Structured Interview for PTSD (Davidson *et al*., 1997a) and the Posttraumatic Stress Scale (PSS) (Foa and Tolin, 2000). All of these instruments are well validated, comprehensive in their symptom coverage of core PTSD features, and widely used. However, they are time consuming, sometimes requiring as much as 45 min of a clinician's time. Mean duration of administration of the PSS and CAPS, for example, are 22 ± 11 and 33 ± 16 min, respectively (Foa and Tolin, 2000), which can be a problem when the scale is frequently given. While the widely used Clinical Global Impressions Scale (CGI) (Guy, 1977) is often used in studies of PTSD, this scale is completely without structure, and of unevaluated psychometric properties in this population. A need exists to develop a PTSD-specific global scale, which has adequate definitions, and covers both PTSD core symptoms as well as the important related aspects of somatic malaise, stress vulnerability and impairment in function (Ballenger *et al*., 2000). If such a scale could be developed with comparable performance to the longer structured interviews, it might serve as a useful pivotal outcome measure in treatment studies, as well as other assessments of PTSD severity and/or diagnosis.

Recognizing these needs, we developed the Short PTSD Rating Interview (SPRINT), and report its utility as a measure of PTSD severity, its performance in the context of treatment response, sensitivity as a diagnostic tool and normative values for survivors of trauma in the general population.

METHODS

Eighty-three adult outpatients with chronic PTSD, diagnosed by the MINI structured interview (Shee-

han *et al*., 1998) using DSM-IV criteria, received up to 3 months of open-label treatment with fluoxetine. Subjects were given the SPRINT at each visit.

In addition, a sample of 630 adult subjects was drawn from the general population by means of a random digit dialed telephone survey evaluating the prevalence of PTSD in the community. The survey included the PTSD module of the MINI, as well as the SPRINT. Both studies received institutional review board approval and participants provided informed consent.

The SPRINT consists of four items corresponding to each of the four PTSD symptom clusters (intrusion, avoidance, numbing and hyperarousal), as well as four additional questions assessing, respectively, somatic distress, being upset by stressful events, interference with work or daily activities and relationships among family or friends. Each item is rated on a 5-point scale, not at all (0), a little bit (1), moderately (2), quite a lot (3) and very much (4). The maximum score of the scale is 32, which would represent the worst possible symptom state. The SPRINT also contains two additional items to measure global improvement according to percentage change and by severity rating.

Reliability of the SPRINT was assessed for both test–retest and inter-rater reliabilities. The test–retest reliability was calculated by means of the intraclass correlation coefficient (ICC). Test–retest was assessed for the first occasion in which there were two consecutive visits with no change in CGI-Improvement (CGI-I). Inter-rater reliability was also conducted on the basis of ICC.

Internal consistency was assessed by means of Cronbach's alpha at both baseline and end of treatment. Unrotated principal components factor analysis was conducted in the subjects with a diagnosis of PTSD.

Convergent validity was evaluated by comparing the total SPRINT versus the total Davidson Trauma Scale score (DTS) (Davidson *et al*., 1997b) at endpoint. The SPRINT item-6, which evaluates vulnerability to being upset by stress, was correlated against the Sheehan Stress Vulnerability Scale (SVS) (Sheehan *et al*., 1990) and the Connor-Davidson Resilience Scale (CD-RISC) (unpublished). SPRINT item-7, which evaluates impairment in work or daily function, was correlated against the respective item in the Sheehan Disability Scale (SDS) (Sheehan, 1983), in the subgroup of patients who had already reported at baseline that they were employed. SPRINT item-8 which evaluates impairment in social and family functioning was correlated against the SDS family and social function items, respectively. Pearson correlation coefficients were employed when the data were normally distributed. Spearman correlation and Wilcoxon Rank Sum tests were used where one-item ordinal measures were involved or where data were non-normally distributed. Divergent validity of the SPRINT was assessed against the Sheehan Social Support Scale (Sheehan *et al*., 1990) at baseline and at endpoint.

Construct validity was assessed by comparing end of treatment CGI-Severity (Guy, 1977) with the total SPRINT score. Construct validity was also assessed by comparing the percentage change in the SPRINT score with treatment against the CGI-I.

Sensitivity of the SPRINT to treatment effects during the administration of fluoxetine was evaluated by comparing the effect sizes of change from baseline to endpoint on the SPRINT against changes on the DTS and the Treatment Outcome for PTSD Scale (TOP-8) totals (Davidson and Colket, 1997). Effect size was calculated according to Cohen (1988), using the formula: $\text{mean}_1 - \text{mean}_2$. Also, we pooled SD correlated changes on the SPRINT and the DTS, and the corresponding SPRINT items against the DTS intrusion, avoidance, numbing and hyperarousal subscales. Changes in SPRINT item-6 were compared against the SVS. As far as disability and functional impairment were concerned, the total SPRINT was compared to change in the total SDS score from baseline to endpoint.

Diagnostic performance of the SPRINT was assessed in two ways. Baseline SPRINT scores in the fluoxetine sample ($n = 80$) were combined with the scores from trauma survivors from the general population sample ($n = 438$). Sensitivity analyses were conducted which would indicate the most appropriate threshold score corresponding to highest levels of diagnostic accuracy. This comparison would provide information on the diagnostic utility of the SPRINT assuming that a population ($n = 518$) comprised approximately 20% ($n = 100$) with PTSD. The second comparison, limited to the fluoxetine sample taken at treatment endpoint ($n = 47$), assumes a somewhat higher prevalence rate of PTSD (62%), and compares those who were PTSD positive ($n = 29$) and those PTSD negative ($n = 18$) at the end of treatment. In each case, PTSD was diagnosed by means of the MINI structured interview. Sensitivity, specificity, positive and negative likelihood ratios and diagnostic accuracy (efficiency values) were calculated at different cut-of scores.

Finally, for normative general population reference, we calculated the mean $\pm$ SD of the SPRINT total for trauma survivors in the general population ($n = 438$) and also the mean scores for those with

full PTSD ($n = 14$), subthreshold PTSD ($n = 104$) and no PTSD ($n = 321$). Mean item scores are also calculated for the full population.

RESULTS

Sample characteristics

Eighty-three patients entered treatment with fluoxetine, of whom 53 were female (64%), 56 were Caucasian (67%), with mean (SD) age of 39.9 (11.1) years (range 18–66 years). The mean (SD) number of traumatic experiences reported in the sample was 4.5 (2.2). The worst reported trauma included incest ($n = 9$), childhood sexual abuse ($n = 4$), traumatic bereavement ($n = 13$), rape ($n = 6$), violent crime ($n = 8$), physical abuse ($n = 12$), accident ($n = 7$), military combat ($n = 17$) and other traumata ($n = 7$). Of note, SPRINT data were missing for three subjects at baseline.

Four hundred and thirty-nine respondents in the population survey reported a history of at least one traumatic event and evaluable SPRINT data were available for 438 of these subjects. Of these, 14 met diagnostic criteria for PTSD and 104 subthreshold PTSD, while 320 had no evidence of posttraumatic sequelae. The sample was comprised of 270 females (62%) and 347 Caucasian (80%) subjects with a mean age of 44.8 (16.3) years (range 18–93 years).

Reliability

Acceptable test–retest reliability was found, with an ICC of 0.778 ($P < 0.0001$) ($n = 67$). Inter-rater reliability, testing pairwise concordance between three pairs of raters, revealed an ICC of 0.998 for rater one versus two, 0.995 for rater one versus three and 0.996 for rater two versus three ($n = 8$ patients).

Good internal consistency was found for the SPRINT, for which Cronbach's was 0.77 at baseline and 0.88 at endpoint. Factor analysis revealed one factor, with an eigen value of 4.49. Item loading on this factor ranged from 0.57 (item 5, somatic malaise) to 0.87 (social or family impairment).

Validity

Convergent validity was assessed, and the correlations were as follows: SPRINT versus DTS, $r = 0.73$ ($n = 66$) ($P < 0.0001$); SPRINT item-6 versus the SVS, $r = 0.46$ ($n = 66$) ($P < 0.0001$); SPRINT item-6 versus CD-RISC, $r = -0.72$ ($n = 10$) ($P < 0.02$); SPRINT item-7 versus the Sheehan Work Disability item, $r = 0.31$ ($n = 55$) ($P < 0.03$); SPRINT item-8 versus Sheehan Family Disability item, $r = 0.69$ ($n = 66$) ($P < 0.0001$); and SPRINT item-8 versus Sheehan Social Functioning Disability item, $r = 0.72$ ($n = 66$) ($P < 0.0001$). Divergent validity was demonstrated with lack of significance in the correlation between total SPRINT and social support at both baseline ($r = 0.10$, NS, $n = 66$) and endpoint ($r = 0.12$, NS, $n = 66$).

Table 1. Relationship between SPRINT Score and Global Severity of Illness at endpoint or week 12

CGI-Severity	*n*	SPRINT	
		Mean	SD
No symptoms (1)/minimal (2)	6	6.5	4.7
Mild (3)	13	10.6	4.3
Moderate (4)	19	16.9	4.8
Marked (5)	18	18.7	5.6
Severe (6)	7	22.9	3.1

$F = 15.1$, d.f. 3, $P < 0.0001$. Pairwise comparisons 1, 2 versus 4; 1, 2 versus 5; 1, 2 versus 6; 3 versus 6; 3 versus 5; 3 versus 4; all significant ($P < 0.05$) by Tukey's test. Groups 1 and 2 collapsed due to small *n*.

Construct validity for the SPRINT was demonstrated relative to the categories of severity as assessed in the CGI (Table 1). ($F = 13.3$, d.f. = 5, $P < 0.0001$). Similarly, levels of global improvement correlated significantly with the percentage change in the SPRINT score from baseline to endpoint (Table 2). ($F = 15.0$, d.f. = 5, $P < 0.0001$).

Sensitivity to treatment effects

Effect sizes of change for the SPRINT, DTS and TOP-8 were 1.34, 0.92 and 0.41, respectively. Changes between baseline and endpoint on the SPRINT correlated significantly with all comparable PTSD symptom measures (Table 3).

Diagnostic performance

The diagnostic sensitivity of the SPRINT was assessed and results are shown in Table 4. Analysis of the larger sample shows that a score of 14–17 was associated a with 96% diagnostic accuracy. In the

Table 2. Relationship between change in SPRINT and Global Improvement Scores at endpoint or week 12

CGI-Improvement	*n*	SPRINT (% change)	
		Mean	SD
Very much improved (1)	12	67.7	24.0
Much improved (2)	17	44.6	16.8
Minimally improved (3)	31	26.7	21.3
No change (4)/minimally worse (5)/moderately worse (6)	13	2.4	15.2

$F = 25.4$, d.f. = 3, $P < 0.0001$. All pairwise comparisons significant by Tukey's test ($P < 0.05$). Groups 4–6 collapsed due to small *n*.

Table 3. Correlations of change in SPRINT with change in other measures of features associated with PTSD

Scale comparisons	Spearman *r*	*P*-value
Total		
SPRINT versus DTS	0.66	0.0001
Intrusion		
SPRINT item 1 versus DTS items 1–5	0.54	0.0001
Avoidance		
SPRINT item 2 versus DTS items 6–8	0.59	0.0001
Numbing		
SPRINT item 3 versus DTS items 9–12	0.50	0.0001
Hyperarousal		
SPRINT item 4 versus DTS items 13–17	0.40	0.0003
Stress vulnerability		
SPRINT item 6 versus SVS	0.41	0.0001
Disability		
SPRINT total versus SDS	0.56	0.0001

DTS, Davidson Trauma Scale; SVS, Stress Vulnerability Scale; SDS, Sheehan Disability Scale.

clinical sample, a range of 11–13 corresponded to highest efficacy (Table 4).

Normative values for the general population

All subjects in this sample had been exposed to at least one major psychological trauma. The mean (SD) SPRINT score was 4.25 (5.24) ($n = 438$). Because the distribution of scores was non-normal, we also provide the median (quartile) value: 2.3 ($Q_1 = 0.0$, $Q_3 = 6.0$). Mean (SD) and median scores for full PTSD ($n = 14$), partial PTSD ($n = 104$) and non-PTSD groups ($n = 320$) were: 17.23 (6.26) and 17.5; 7.91 (5.46) and 7.0; and 2.50 (3.41) and 1.1. Differences between groups were significant (Kruskal–Wallis chi-squared = 140.06, d.f. 2, $P < 0.0001$).

DISCUSSION

The SPRINT demonstrated solid psychometric properties and can serve as a reliable, valid and homogenous measurement of PTSD illness severity and of global improvement, as well as a measure of somatic distress, stress coping, work, family and social impairment. Factor analysis revealed one factor, with strongest loading occurring on the item which measured functional impairment in interpersonal relationships.

Sensitivity to treatment effects of fluoxetine was demonstrated by the SPRINT, which is comparable to those measured by the global improvement scale. When treatment effect sizes were compared, the SPRINT yielded the strongest effect size of treatment compared to the two comparator scales (i.e. DTS and TOP-8), an important consideration when deciding upon sample sizes as treatment studies are being planned.

As a diagnostic instrument, a threshold score of 14–17 distinguished best between people with and without PTSD in the full sample. In the clinical trial sample, where PTSD had a higher prevalence, a threshold score of 11–13 served to better distinguish between those with and without the disorder. The

Table 4. Sensitivity analysis of SPRINT

SPRINT	Entire sample ($n = 518$)					Clinical population ($n = 47$)				
	Sens	Spec	PLR	NLR	Efficiency	Sens	Spec	PLR	NLR	Efficiency
11	0.97	0.92	11.4	0.03	0.92	0.83	0.83	4.97	0.21	0.83
12	0.97	0.93	14.2	0.03	0.94	0.79	0.89	7.14	0.23	0.83
13	0.96	0.95	20.3	0.04	0.95	0.76	0.94	13.66	0.26	0.83
14	0.95	0.96	23.6	0.06	0.96	0.62	0.94	11.17	0.40	0.74
15	0.94	0.96	23.4	0.07	0.96	0.59	1.00	10.55	0.40	0.72
16	0.91	0.96	25.9	0.09	0.96	0.59	1.00	NA	0.41	0.74
17	0.89	0.97	31.6	0.11	0.96	0.59	1.00	NA	0.45	0.72
18	0.84	0.97	32.4	0.16	0.95	0.45	1.00	NA	0.55	0.66

Sens, sensitivity; Spec, specificity; PLR, positive likelihood ratio; NLR, negative likelihood ratio.

lower scores in each range (11 or 14) could be selected if the goal is to enhance sensitivity (i.e. optimize the probability of including a positive diagnosis), whereas the higher score (i.e. 13 or 17) would be more useful if the goal is to optimally identify people without the disorder. At the best threshold, the probability of correctly diagnosing someone who has the disorder ('sensitivity') is 95% and 83% according to populations base and the PTSD clinical sample, respectively; the probability of correctly identifying a person who does not have the disorder ('specificity') is 96% and 94%, respectively. The likelihood of PTSD being present given a positive score (at 17 and 13 in each population) is 31.6 and 13.6; usually a positive likelihood ratio of 10 is considered strongly positive (Rampes *et al*., 1998). A negative likelihood score indicates the likelihood of disease absence given a negative test: 0.1 is considered strongly negative. At scores of 14 and 11, negative likelihood ratios were 0.06 and 0.21 in the two populations, respectively. Based on these findings, the SPRINT seems a promising instrument as a diagnostic screening instrument.

On average, the SPRINT takes 5–10 min to complete, assuming that the rater has the necessary clinical information about the subject. We would suggest that, with this advantage, the scale has the potential to contribute as a reliable, valid, economical and primary measure in PTSD studies. The SPRINT appears to cover comprehensively the major domains of concern in PTSD. In design, it is not unlike the Panic Disorder Severity Scale (Shear *et al*., 1997) and the Yale–Brown Obsessive–Compulsive Scale (Goodman *et al*., 1989) in that it consists of the core symptoms of the disorder and important associated features (somatic complaints, vulnerability to the effects of general stress and functional impairment).

The need for a shorter, yet comprehensive and sensitive rating procedures in PTSD has been alluded to elsewhere (Davidson and Colket, 1997; Foa *et al*., 2000; Montgomery *et al*., 2000). Also, given the widespread use of global scales in psychiatry, it is of concern that their psychometric properties are so poorly described. We hope that the SPRINT may be a useful addition to the field.

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