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Last updated: December 31st, 2024

Research Summary – Patient Health Questionnaire-9 (PHQ-9) – Mental Health

Author Year Research Design Setting (country)	Demographics and Injury Characteristics of Sample	Validity	Reliability	Responsiveness Interpretability
Chiu et al. 2024 Psychometric study to validate the factor validity and discrimination ability of a resilience scale, CD-RISC-10 (finally CD-RISC-8), for clinical usage in adults with SCI during hospitalization Medical center in the Southern U.S.	N = 93 participants undergoing inpatient rehabilitation 58M, 35F Mean (SD) age 44.10 (16.20) years Mean (SD) time since injury 2.43 (8.29) years	Two items were deleted from CD-RISC-10 after exploratory factor analysis, forming CD-RISC-8. The correlation between the 8-item CD-RISC (M = 26.05, SD = 4.45) and the PHQ-9 (M = 5.98, SD = 4.80) was −0.39 (p < 0.001). This correlation coefficient with the original 10-item CD-RISC (M = 32.18, SD = 5.39) is similar, which is −0.39 (p < 0.001) with the PHQ-9.		
Bombardier et al. 2012 Blinded comparison of	N=142 M=111, F=31 Mean Age = 42.2 ±16.6y (18-88y)	Significant correlation between the PHQ-9 total score and each of the compared measures with the		

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the PHQ-9 with the major depression module of the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (SCID) Inpatient rehabilitation units at the University of Washington Medical Center, Seattle, Washington; Harborview Medical Center, Seattle, Washington; the Texas	Traumatic SCI patients recruited between February 2008 and December 2010 Cervical = 95 Thoracic = 32 Lumbar = 11 Sacral = 4	same underlying construct: Higher PHQ-9 scores were positively correlated with poorer subjective health on the Medical Outcomes Study Short Form-1 (SF-1) (Spearman ρ=0.37; P<.001) The PHQ-9 was inversely correlated with the Euro-QOL current health state thermometer (Spearman ρ=-0.38; P<.001) Greater depression severity on the PHQ-9 was negatively correlated with overall quality of life since injury on the Life-1 (Spearman ρ=-0.38; P<.001) The relationship between depression		

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Institute for Rehabilitation and Research, Houston, Texas; and the University of Michigan Health System, Ann Arbor, Michigan		severity and difficulty with daily role functioning was also significant (Spearman ρ=0.37; P<.001) The agreement between the PHQ-9 ≥11 and the SCID* was moderate, with k of 0.50. The area under the curve value of 0.92 was excellent, indicating that the PHQ-9 total score correctly discriminated between those with and without MDD by the SCID with a high degree of accuracy. *Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders,*		

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		Fourth Edition (SCID MDD) The SCID MDD module was used as the criterion standard to diagnose major depression Based on the Youden Index, the diagnostic accuracy of the PHQ-9 was optimized at a cutoff of PHQ-9 ≥11. At this cutoff: PHQ-9 identified 24.6% of the sample as having MDD. The PHQ-9 detected 100% of those with a diagnosis of MDD (sensitivity) and had a specificity of 84%.		
Graves & Bombardier	N=3652 (M=2863; F=789)	The relative efficiency will represent the		

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2008 Retrospective analysis National Spinal Cord Injury Database (NSCID)	Mean age at time of interview = 41.4±13.44y (range: 18-90y) Mean age at time of injury = 31.8±13.62y Traumatic SCI patients who participated in the NSCID from Oct 2000 through April 2003.	proportion of information available in the shorter scales relative to the information available in the 9-item scale. 2-item test = 0.46 3-item test = 0.67 9-item test = 1.05(for men), 0.88(for women) Positive Predictive Value for 3-item screening test with a total score cutoff of: 3 = 0.56 4 = 0.77 The squared correlation coefficient between the total scores on the 3-item scale and the 9-item scale is 0.794, meaning that the 3-		

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		item score accounts for approximately 79% of the variance in the 9-item total score. For the 3-item screening test with a total score cutoff of 3: Specificity = 0.93 Sensitivity = 0.87 For the 3-item screening test with a total score cutoff of 4: Specificity = 0.95 Sensitivity = 0.82		
[Krause et al.](#) 2009 Follow-up survey Hospital in the Southeastern United States	727 SCI subjects mean age: 47.9 70.2% male 75.8% White 53.3% cervical injury Average number of years since injury = 18.2.	<u>Spearman Rank correlations between PHQ-9 and:</u> - Major depressive disorder: 0.530 - PHQ-9>15: 0.505 - PHQ-9>10: 0.692 - Older Adult Health and	**Internal consistency:** The internal consistency of the full scale, as measured by Cronbach's alpha = 0.89	Mean (SD) PHQ-9 score: 5.57 (5.74)

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	A total of 1,385 participants were enrolled in the original study in 1997–1998. Participants were then contacted in 2007–2008 to participate in a follow-up survey. At that time, 306 were deceased, 34 could not be located, and 5 were eliminated. Responses were received by 727 participants, yielding an adjusted response rate of 69.5% percent	Mood Questionnaire (OAHMQ): 0.781 - Satisfaction with Life Scale (SWLS): -0.477 (P<.0001 for all the above)		
Richardson and Richards 2008 Retrospective analysis	2570 participants 1 year postinjury: 682 subjects (535 M, 147F) mean age: 38.66±15.32 5 years postinjury:517 subjects (402M, 115F) mean age: 40.26±14.53	Among persons 1 year postinjury, both affective and somatic subscores showed a significant inverse correlation with satisfaction with life (ρ =-.463, P<.001, and ρ =-.346, P<.001,	**Internal consistency:** Alpha coefficients revealed good internal consistency for the PHQ-9 scale and for the subscales across groups.	

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National Spinal Cord Injury Database (NSCID)	15 years postinjury: 653 subjects (518M,135F) mean age: 42.72±10.09 25 years postinjury: 718 subjects (558M, 160F) mean age: 49.49±8.60	respectively). Significant negative correlations were also found between SWLS scores and factor subscores at 5 years postinjury (ρ =-.415, P<.001 for the somatic subscore; ρ =-.456, P <.001 for the affective subscore) and at 15 years postinjury (ρ =-.404, P <.001, for the affective subscore; ρ =-.248, P <.001, for the somatic subscore), Regarding the 25 years postinjury group, the affective subscale also correlated significantly, and in a negative direction, with satisfaction with life (ρ =-.368, P <.001). A	Alpha coefficients: See table 1.	

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		significant negative relationship was also found with the somatic subscale for the 25 year postinjury group (ρ =-.255, P <.001).		

Table 1.

	Total 9-item scale	Affective subscale	Somatic subscale
1 year post-injury	.84	.81	.74
5 years post-injury	.87	.82	.78
15 years post-injury	.87	.84	.77
25 years post-injury	.83	.70	.70

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Williams et al. 2009 Methodological study. Factor analysis and Rasch rating scale analysis.	N = 202 people with SCI 77% male Mean (SD) age = 42.6 (13.9) years All participants were at least 1 year after injury, with a range of 1 to 44 years; the	**Content Validity:** Rasch analysis suggests the PHQ-9 is a unidimensional measure of depression.		**Floor effects:** 22% of participants reported no depressive symptoms.

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Recruit from outpatient clinics, the Midwest Regional SCI Care System and community advertisements.	sample was a median of 7 years after injury.			
[Bombardier et al.](#) 2004 Cross-sectional survey Data from the National Spinal Cord Injury Statistical Center representing 16 Model Spinal Cord Injury Systems.	N=849 (645M, 204F) Age >17yrs. 1 year post-SCI Mean age at the time of injury ± standard deviation was 36.9±15.0 years Recruited from 16 Model Spinal Cord Injury Systems throughout the USA. Patients were injured between Aug 30, 2000 and Apr 1, 2003. 47.6% AIS A complete 45.5% paraplegia	Spearman correlations and chi-square tests to compare PHQ-9 values to those of quality of life, subjective health and difficulty in role functioning from other established measures (Short Form-36, Satisfaction With Life Scale). *Sample size indicated by subscript number after rho symbol (ρ). There were significant inverse correlations	**Internal consistency:** Overall α=0.87. Corrected item total correlations ranged from 0.72 (depressed mood) and 0.69 (feelings of failure) to 0.45 (psychomotor agitation/depression) and 0.48 (suicidal ideation).	**Interpretability:** Mean PHQ-9 score: 5.48 (95% CI: 5.07-5.88) See table 1.

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		between higher depressive scores as determined by the PHQ-9 and SWLS (ρ_{144}=-.51; P<.001) and subjective health (ρ_{144}=-.50; P<.001). There were significant positive correlations with greater difficulty in daily role functioning (ρ_{638}=.62; P<.001). Sensitive indicators of probable Major Depressive Disorder (MDD) (>80%): depressed mood (93.8%), disturbed sleep (89.5%), decreased energy (87.5%), anhedonia (84.4%) and feelings of failure (80.2%).		

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		Items with high specificity (>90%): psychomotor changes (97.7%), difficulty concentrating (93.8%), feelings of failure (92.8%), appetite changes (92.2%) and depressed mood (90.9%). All symptoms had low PPV (40.8% to 67.9%), suggesting that a large proportion of those reporting a particular item will not have MDD. NPV was higher (92.5% to 99.1%; i.e. the probability of not having MDD was high with a negative response to an item). Likelihood ratios for a positive response		

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		were high (5:1 for sleep disturbance to 18:1 for psychomotor changes). Likelihood ratios for a negative test were lower (0.07:1 for depressed mood to 0.64:1 for psychomotor changes).		
	Table 1.			

Table 1.

PHQ-9 SCI Norms:		
Diagnostic Category/Label	Definition: (PHQ-9 =)	N (%)
No depressive symptoms	0	199 (23.4)
Minimal depressive symptoms	1 to 4	294 (34.6)
Mild depressive symptoms	5 to 9	170 (20.0)
Moderate depressive symptoms	10 to 14	101 (11.9)
Moderate/severe depressive symptoms	15 to 19	48(5.7)
Severe depressive symptoms	20 to 27	37 (4.4)

Research Summary – Patient Health Questionnaire-9 (PHQ-9) – Mental Health - Cross-cultural Validation Studies

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Summaka et al. 2019 Cross-sectional study to test the psychometric properties of the Arabic version of the PHQ-9 including validity and reliability among Lebanese individuals with SCI Three Lebanese rehabilitation centers	N = 51 51M Mean (SD) age 37.2 (12.6) Cause of injury: War and explosions (n = 27), motor vehicle accident (n = 7), falling (n = 7), disease (n = 7), others (n = 3) Physical disability: Paraplegia (n = 37), tetraplegia (n = 14)	**Convergent Validity:** Significant correlation was found between the PHQ-9-A total scale and the Hamilton Depression Rating Scale-Arabic (HDRS-A) scale (r = 0.713, p < 0.001). **Discriminatory Validity:** The discriminatory validity indicated that the PHQ-9-A has good discrimination validity. It showed a statistical difference between depressed SCI persons and non-depressed SCI subjects (11.8 ± 5.2 vs. 5.8 ± 4.5; P value < 0.001).	**Internal Consistency:** PHQ-9-A had a good internal consistency with an alpha coefficient of 0.71. **Test-retest, inter-rater, intra-rater:** Test-retest reliability assessed using ICC with 95% confidence interval. The results showed that ICC = 0.88 (0.711-0.955), P<0.001, which reflects a strong reproducibility of the PHQ-9-A total scale.	**Interpretability:** Mean (SD) PHQ-9 score: 7.2 (5.2)

Research Summary – Patient Health Questionnaire-2 (PHQ-2) – Mental Health

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Poritz et al. 2018 Cross-sectional study to establish the clinical utility of the PHQ-2 as a depression screener in community-residing individuals with SCI Veterans Affairs Medical Center, Texas, USA	N = 116 96.6% males, 3.4% females Mean (SD) age 56.0 (12.4) years Injury characteristics: Tetraplegia (AIS A, B, C), n = 24.2%; paraplegia (AIS A, B, C), n = 31.7%; AIS D, n = 38.8% Cause of injury: Traumatic (81.0%), non-traumatic (19.0%)	**Diagnostic accuracy:** Receiver operating characteristic (ROC) analysis revealed an AUC value of 0.979	**Internal Consistency:** Cronbach α = 0.91	1. Using a PHQ-9 cutoff score of 10 or higher as a proxy for diagnosis, the estimated prevalence of Major Depressive Disorder in this sample was 20.7%. In this outpatient, non-psychiatric sample of Veterans with SCI/D, 12% endorsed experiencing suicidal ideation several days or more during the previous 2 weeks. 2. The average PHQ-2 score was 1.17 (SD = 1.948). The average PHQ-9 score was 5.23 (SD = 7.451). The operating

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				characteristics of the PHQ-2 at various cutoff scores are reported in Table 3. 3. Using a cutoff score of 3 or greater outperformed other cutoff scores, correctly classifying 94.8% of the cases. This cutoff score had a sensitivity of 83.3% and a specificity of 97.8%, yielding a positive predictive value of 90.9% and a negative predictive value of 95.7%.