

Research Summary – Neurogenic Bowel Dysfunction Score (NBD) – Other Physiological Systems / Quality of Life

Author Year Country Research Design Setting	Demographics and Injury Characteristics of Sample	Validity	Reliability	Responsiveness Interpretability
<p>Krogh et al. 2006</p> <p>Development/v alidation study</p> <p>University Hospital of Aarhus, Denmark.</p>	<p>SCI N: 589 (424/72%responded) Level: cervical 174, thoracic 155, 79 lumbar; 254 sensory complete, 166 incomplete in 166 Etiology: trauma (75%), spinal surgery (8%), myelomeningocele (4%), infection (4%), spinal thrombosis or hemorrhage (3%), or other causes (6%). Age: Mean 41 years, Range 8-88 years Duration: Mean 14 years, Range 0 to 59 years % Female: 29%</p>	<p>Reproducibility & validity of questions describing colorectal problems in patients with spinal cord lesions</p> <p>Item & Validity (k coefficient):</p> <ul style="list-style-type: none"> • Frequency of bowel movements k = 0.92 • Desire for defaecation (any) k = 0.89 • Normal desire for defaecation k = 1.00 • Abdominal discomfort k = 0.83 • Perspiration, headache, or general discomfort during defecation k = 0.82 		

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		<ul style="list-style-type: none"> • Oral laxatives k = 1.00 • Enemas k = 0.77 • Average time for defecation k = 0.79 • Use of Clysma k = 0.90 • Frequency of digital stimulation k = 0.77 • Need help from others for defecation k = 0.73 • How much does disturbed defecation restrict social activities? k = 0.63 • How much does disturbed defecation restrict quality of life? k = 0.83 • Frequency of faecal 		

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		<p>incontinence k = 0.79</p> <ul style="list-style-type: none"> • Flatus incontinence k = 0.53 • Medication against faecal incontinence k = 1.00 • Perianal skin problems k = 0.60 • How much does faecal incontinence restrict social activities? k = 0.62 • How much does faecal incontinence restrict quality of life? k = 0.52 <p>OR, level of significance and points in the NBD score</p>		

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		<p>for items significantly associated with impact on quality of life</p> <ul style="list-style-type: none"> • Frequency of bowel movements OR = 6.1, $p < 0.0001$, points in NBD score = 6 • Headache, perspiration or discomfort before or at defecation OR = 2.4, $p < 0.01$, points in NBD score = 2 • Tablets against constipation OR = 1.9, $p < 0.001$, points in NBD score = 2 • Drops against constipation OR = 2.3, $p < 0.0001$, points in NBD score = 2 		

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		<ul style="list-style-type: none"> • Time used for defecation OR = 6.8, $p < 0.0001$, points in NBD score = 7 • Digital stimulation or evacuation OR = 5.0 $p < 0.01$, points in NBD score = 6 • Frequency of faecal incontinence OR = 13.1, $p < 0.0001$, points in NBD score = 13 • Medication against faecal incontinence OR = 3.6, $p < 0.01$, points in NBD score = 4 • Flatus incontinence OR = 1.8, $p < 0.05$, points in NBD score = 2 • Perianal skin problems OR = 2.6, 		

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		p < 0.01, points in NBD score = 3		

Research Summary – Neurogenic Bowel Dysfunction Score (NBD) – Other Physiological Systems / Quality of Life - Cross-cultural Validation Studies

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<p>Van Doorn et al. 2022</p> <p>Prospective validation study for a Dutch-version</p> <p>Patients with SCI visiting the urology department or general practitioner in Rotterdam, the Netherlands.</p>	<p>55 patients with SCI Mean ± SD age 54 ± 15.8 years Gender: 36 male and 19 female</p> <p>Level of injury: Cervical (n = 14), Thoracic (n = 29), Lumbar (n = 9), and unknown (n = 3) AIS A (n = 15), AIS B (n = 7), AIS C (n = 10), AIS D (n = 9), AIS E (n = 1), and unknown (n = 13) Time since injury 13.6 ± 8.4 years</p> <p>Reference group: 50 patients with multiple sclerosis Mean ± SD age 38.4 ± 14.4 years Gender: 11 male and 39 female</p>	<p>Content validity (n = 17 patients): The questions were found to be relevant, clear, and easy to fill in; content validity was confirmed without the necessity of adjustments.</p> <p>Criterion validity: Moderate significant correlations were found between total scores of the NBD score and total scores of the FIQL, FISl, and EQ-5D-3L.</p> <p>Please see Table 1 below.</p> <p>Construct validity: Good construct</p>	<p>Internal consistency: Moderate to low for the total scores of the NBD score, Cronbach’s alpha was measured to be 0.56 for the test and 0.30 for the retest.</p> <p>Reproducibility: The mean change between total scores of the NBD score of the test and retest was -0.5 ± 3.46. For the total score of the questionnaire, the ICC was 0.87, indicating adequate reliability. The LOA ranges of the total scores were -7.28 to 6.78.</p>	<p>Floor and ceiling effects: There were no floor and ceilings effects present in the patient group; one patient (1.8%) had the lowest score possible, no patient had the highest score possible. Floor effects were seen in the reference group, 52% of the participants had the lowest score (0) possible, indicating they experience no neurogenic bowel symptoms. Ceiling effects were not present in the reference group; no one scored the highest score possible.</p>

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		validity was found because references had significant lower scores in the NBD score than patients.																	
	<p>Table 1.</p> <table border="1" data-bbox="474 646 1860 899"> <thead> <tr> <th data-bbox="474 646 751 724"></th> <th data-bbox="751 646 995 724">FIQL</th> <th data-bbox="995 646 1239 724">FISI</th> <th data-bbox="1239 646 1524 724">EQ-5D-3L index score</th> <th data-bbox="1524 646 1860 724">EQ-5D-3L VAS score</th> </tr> </thead> <tbody> <tr> <td data-bbox="474 724 751 812">Test, NBD total score</td> <td data-bbox="751 724 995 812">-0.648^a (p < 0.001)</td> <td data-bbox="995 724 1239 812">0.367^a (p < 0.001)</td> <td data-bbox="1239 724 1524 812">-0.589^a (p < 0.001)</td> <td data-bbox="1524 724 1860 812">-0.428^a (p < 0.001)</td> </tr> <tr> <td data-bbox="474 812 751 899">Retest, NBD total score</td> <td data-bbox="751 812 995 899">-0.491^a (p < 0.001)</td> <td data-bbox="995 812 1239 899">0.301^b (p = 0.042)</td> <td data-bbox="1239 812 1524 899">-0.394^a (p = 0.007)</td> <td data-bbox="1524 812 1860 899">-0.499^a (p = 0.001)</td> </tr> </tbody> </table> <p data-bbox="474 915 1373 948">^aCriterion validity tested by Spearman correlation coefficient.</p> <p data-bbox="474 959 1362 992">^bCriterion validity tested by Pearson's correlation coefficient.</p>					FIQL	FISI	EQ-5D-3L index score	EQ-5D-3L VAS score	Test, NBD total score	-0.648 ^a (p < 0.001)	0.367 ^a (p < 0.001)	-0.589 ^a (p < 0.001)	-0.428 ^a (p < 0.001)	Retest, NBD total score	-0.491 ^a (p < 0.001)	0.301 ^b (p = 0.042)	-0.394 ^a (p = 0.007)	-0.499 ^a (p = 0.001)
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<p data-bbox="218 1076 436 1141">González Viejo et al. 2021</p> <p data-bbox="205 1195 449 1292">Validation of the Spanish-version of the NBD</p> <p data-bbox="285 1346 369 1378">Spain</p>	<p data-bbox="474 1052 810 1260">59 patients in total: 30 patients with disability due to SCI and 29 patients with disability due to cerebral vascular accident.</p> <p data-bbox="474 1313 590 1378">SCI: 24M, 6F</p>		<p data-bbox="1199 1052 1514 1260">The construct reliability in the group of patients with SCI shows a Cronbach's score of 0.897 for all variables.</p> <p data-bbox="1199 1305 1499 1406">The reliability result of the NBD score for the SCI group in the</p>																

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	<p>Mean age of 43.6 years (SD 11.7) Mean disability progression time of 15, 4 years (SD 8.4)</p> <p>Cerebral Vascular Accident: 12M, 17F Mean age of 59.2 years (SD 14.2) Mean disability progression time for was 4.51 years (SD 7.2)</p>		<p>test-retest using the ICC on the total score was 0.886 (95% CI 0.764-0.946).</p>	
<p>Erdem et al. 2017</p> <p>Psychometrics study, Turkish version</p> <p>Dokuz Eylül University Faculty of Medicine, Turkey.</p>	<p>SCI N: 42 Level: 12 cervical, 24 thoracic 24,6 lumbar; AIS 23 A, 4 B, 11 C, 4 D Etiology: traffic accident 21, 4 firearm injury, 11 falling down, 3 crushing underweight, 1 diving into shallow water, 2 Others</p>	<p>Correlations between total NBD score & SF-36 subscales, a statistically significant negative correlation was detected between:</p> <ul style="list-style-type: none"> • bodily pain (r=-0.382, P=0.013) • general health (r=- 0.560, P<0.001) 	<p>Internal consistency: NBD score is not a Likert type scale, but the additivity of the total score was tested with Tukey's nonadditivity test and the additivity characteristic was demonstrated. Due to the presence of</p>	

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	<p>Age: Mean 39 years, SD 16 years</p> <p>Duration: ≤1 year - 15 2-5 year- 17 6-9 year- 6 ≥10 year- 4</p> <p>% Female: 19%</p>	<ul style="list-style-type: none"> • vitality ($r=-0.626$, $P<0.001$) • social role functioning (SF) ($r=-0.741$, $P<0.001$) • emotional role functioning ($r=-0.604$, $P<0.001$) and • mental health ($r=-0.687$, $P<0.001$) subscales, <p>No significant correlation was found with the following subscales of SF-36:</p> <ul style="list-style-type: none"> • physical functioning (PF) ($r=-0.233$, $P=0.138$) and • physical role functioning (RP) ($r=0.067$, $P=0.674$) 	<p>additivity characteristic of the test and ordinal characteristic of the answers, Cronbach alpha coefficient was calculated to determine the reliability of internal consistency.</p> <p>Cronbach's alpha coefficient for internal consistency was 0.547</p> <p>Test-retest, Inter-rater, Intra-rater: Test-retest answers of each question $r=1.000$, $P<0.001$ Consistency of frequency distribution $r=1.000$, $P<0.001$</p>	

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		<p>The highest correlation among these was found in the social function subscale.</p> <ul style="list-style-type: none"> • Significant negative correlation with the mental component summary score (MCS) ($r=-0.872$, $P<0.001$) • No significant correlation with the physical component summary score (PCS) ($r=-0.187$, $P=0.235$). • Significant positive correlation between NBD total score and 		

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		<p>PGA ($r=0.91$, $P<0.001$).</p> <ul style="list-style-type: none"> Significant positive correlation was found between NBD total score and patients' assessment of impact of NBD on QoL ($r=0.92$, $P<0.001$). <p>The patients were divided into 2 groups according to their NBD scores:</p> <ul style="list-style-type: none"> NBD scores between 0 and 9 were classified as mild and NBD scores >10 were classified as significant NBD. 		

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		<p>According to this, a statistically significant difference was detected in all SF-36 subscales and MCS score ($P < 0.05$), except PF and RP subscales and PCS score in both groups ($P > 0.05$).</p> <p>When total NBD score before and after treatment was compared with Wilcoxon test, it was demonstrated that improvement in NBD score at the end of 2 months was significant ($P = 0.011$). Also, there was a statistically significant positive correlation between Global Rating of Change scale and the change in total NBD score at</p>		

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		the end of 2 months ($r=0.821$, $P=0.007$)		