Reviewer ID: DW & JH, Jeremy Mak, John Zhu, Kyle Diab			
Type of Outcome Measure: ASIA / ISNCSCI Scales			**Total articles:** 37
Author ID Year	**Study Design**	**Setting**	**Population (sample size, age) and Group**
Aidinoff et al. 2012	Development of SCI-ARMI and examination of its validity and utility	Loewenstein Rehabilitation Hospital, Raanana. Statistical Laboratory, School of Mathematics, Faculty of Exact Sciences, Tel-Aviv University, Israel	250 successive spinal cord lesion (SCL) inpatients treated in the Spinal Department of Loewenstein Rehabilitation Hospital between 2004 and 2010 N=226 (65%M, 35%F) Mean age 51.3(18.6) 42% tetraplegia, 58% paraplegia AIS-A/B/C/D at admission: 19%/2.7%/23.9%/54.4% 38.9% traumatic, 61.1% nontraumatic
Burns et al. 2011	Cross-sectional validation of WISCI II	Regional Spinal Cord Injury Center of the Delaware Valley	Patients who are able to ambulate >= 10m N=76, 79% male Mean age: 43.3±13.8 Mean post-injury time: 6.32±5.99 years 45% paraplegia, 55% tetraplegia AIS-A/B/C/D: 3%/1%/8%/88%
Catz et al. 2004	Development of instrument and preliminary comparative before-after study	Spinal department in a rehabilitation hospital in Israel	N=79 (60M, 19F) Mean age 46±18 33 tetraplegia, 46 paraplegia AIS-A/B = 27, AIS-C/D = 52 41 traumatic, 38 nontraumatic SCI
Cifu et al. 1999	Block-design, matching sample study	Level I trauma centers 1998-1995 participating in the National Spinal Cord Injury Model Systems	375 SCI subjects Age group 1 (18-34): 15 F, 85 M Age group 2 (35-64): 15 F, 85 M Age group 3 (65+): 31 F, 69 M
Cohen et al. 1998	Pre-Post test	Instructional course 1992 ASIA	N=106 SCI professionals assessing 2 case studies 39 physicians 31 PTs 15 OTs 15 nurses 6 other rehab professionals
Curt et al. 1998	Correlation study on a prospective cohort	SCI center in University hospital	N=70 Acute=36 M/F = 31/5 Median age = 40.5y (17-77) Chronic=34 M/F = 26/8 Median age = 32y (18-73) SCI C2-T1
Ditunno et al. 2007	Single-blinded, parallel-group,	6 regional SCI inpatient rehab.	N= 146 (114M, 32F) Mean age = 32 years (range 16 – 69 years)

	multicenter randomized clinical trial	centres	Incomplete spinal cord injury patients who had a Functional Independence Measure locomotor score for walking of < 4 on entry.
Ditunno et al. 2008	Prospective cohort study to demonstrate validation for the formulation of hierarchical rankings	Denmark, Germany, Italy, USA	N= 150 (USA = 112; Europe = 38) AIS A: Tetra = 18, Para = 41 AIS B: Tetra = 12, Para = 7 AIS C: Tetra = 22 , Para = 10 AIS D: Tetra = 32, Para = 8
El Masry et al. 1996	longitudinal	Spinal Injuries center and Dept of Orthopaedic surgery in Orthopaedic District hospitals	N=62 consecutive adult patients admitted within 7 days of acute SCI (04/83-09/92) M/F=48/14 Mean age=34.1y(16-76) at time of injury Follow-up=40.6m (1-119) SCI C+T=38, L=12, below L1=12
Fattal 2004	Metrological investigation Open study aimed at studying the feasibility and acceptability; Intermediate study aimed to assess inter-rater reproducibility; Prefinal study focused on construct validity.	Bouffard-Vercelli Centre, Cerbere, France	Open Study: n=33 (23 had undergone surgery) Intermediate Study: n=30 (10 had undergone surgery) (23 male, 7 female) Age: 32±13.3, range 17-72 years Prefinal Study: n=52 (41 male, 11 female) Age: 38.32±12.76, range 18-72 years Adults, complete motor tetraplegia, C5-C7 level, AIS A or B, at least 3 months post spinal cord injury, at least 3 months post surgery.
Fujiwara et al. 1999	Cross-sectional	Subjects recruited from National Murayama Hospital (1995-1997)	N=14 (12M, 2F) C6 complete tetraplegic patients Mean age: 30.7 (13~62) Mean time since SCI: 462 (169~1080) days
Graves et al. 2006	Retrospective medical record analysis	NSCID 2002 ASIA	N=6,116 AIS motor scores 80% male 48% paraplegia SCI
Harkema et al 2016	Prospective multicenter observational; NRS 13-item version	6 outpatient rehabilitation centers in the Christopher and Dana Reeve Foundation NRN	N=152 (123M, 29F) Mean (SD) age: 36 (15) Median (range) time since SCI: 0.9 (0.1-45.2) years 110 cervical, 42 thoracic AIS-A/B/C/D: 43/21/39/49 Physician-referred outpatients without progressive lesions above T11, capable of stepping using body weight support, with ability to wean off anti-spasticity medication Median (range) number of sessions of NRN-standardized locomotor training: 70 (23-520)
Hasegawa et al. 2014	Cross-sectional	Chubu Rosai Hospital, Nagoya, Japan	N=40 (37M, 3F) Mean age: 49.9 Mean post-injury time: 138.6 days AIS-D cervical incomplete SCI patients who can walk

			independently for >= 10m
Johnston et al. 2005	Cross-sectional survey	New Jersey Outpatient SCI Center	N=107 (88M, 19F) Mean age 39.1(11.16) Median age 38.0 Mean post-injury time: 11.36(9.56) yrs Median post-injury time: 8.71 yrs Community-living traumatic SCI individuals AIS-A/B/C/D: 56.4%/20.2%/14.9%/8.5% Neurologic Category: Tetraplegia complete: 38.7% Tetraplegia incomplete: 15.1% Paraplegia complete: 37.6% Paraplegia incomplete: 8.6%
Jonsson et al. 2000	Inter-rater reliability	Dept PT and Neurology within Inpatients at Rehab Med Hospital 1992 ASIA	N=23 M/F= 15/8 C/T/L=12/6/5 Traumatic/non-traumatic=16/3 Complete/incomplete =3/20 SCI
Kalsi-Ryan et al. 2016	Multicenter, observational, longitudinal, cohort study	5 centers (7 sites) in Ontario, Canada	N=53 (48M, 5F) Mean (SD) age 49.6 (15.6) All acute SCI, 0-10 days post-injury AIS-A/B/C/D: 11/5/16/21 51 cervical, 2 thoracic
Marino & Graves 2004	Secondary analysis of prospectively collected data	Model SCI Systems center NSCID	N=4338 (3443M, 895F) People with traumatic SCI discharged between Jan. 1994 and Mar. 2003 Median age: 33 (IQR= 22~46) Median time from injury to rehab admission: 15 (IQR= 9~28) days Median time in rehab: 46 (IQR= 29~73) days AIS-A/B/C/D: 2049/511/655/1123 Neurologic category: Complete tetraplegia: 854 Incomplete tetraplegia: 1464 Complete paraplegia: 1195 Incomplete paraplegia: 825
Marino et al 2015	Repeated measures Studying the CUE-Test (CUE-T)	Outpatient rehab center	N=50, 36 male Mean age 48.1, SD=18.2, range 17~81 Neurological levels of injury: C2~T6 AIS-A/B = 20/50 AIS-C/D = 30/50
Marino et al. 1998	Cross-sectional survey	Regional Spinal Cord Injury Center	154 tetraplegic patients Avg. age = 37 years, injured for avg. of 8 years. 99% of subjects had neurological examinations within 2 years of completing study. AIS-A/B/C/D: 93/12/24/25
Marino et al. 2008	Inter-rate and intra-rater reliability study.	Inpatients and outpatients from the Kessler Institute for Rehabilitation.	N = 16 patients with SCI (2 inpatient, 14 outpatient) 10 men, 6 women, age range from 18-65 years N = 16 examiners (8 physicians, 8 physical therapists) > 2 years of experience in field of SCI
Marino et al. 2012	Cross-sectional study of the CUE-Test		N=30 (23M, 7F) Mean age 44.8

	(CUE-T)		Chronic SCI participants SCI participants with level of injury at: C4-6: 9 complete, 6 incomplete C7-T1: 7 complete, 4 incomplete T2-6: 4 complete, 0 incomplete
Morganti et al. 2005	Retrospective analysis	Rehab Hospital in Italy	Total sample: N=284 patients (184 M, 100 F) Mean age: 50.4±19.3 years Mean (SD) time since SCI at admission to spinal unit: 56.9(43.9) days Concurrent validity sample: N=76 "Traumatic or non-traumatic SCLs admitted between 1997-2001. Non-traumatic etiology was present in the majority of the patients (177/284): inflammatory (40), vascular (36), neoplastic (39), degenerative (62); traumatic lesions (107/284): car accident (38), motorcycle accident (15), sport accident (7), act of violence (6), suicide attempts (6), and accidental falls (31)."
Oleson and Marino 2014	Longitudinal, with convenience sample Studying the revised CUE-Questionnaire (CUE-Q; 5pt instead of 7pt scale)	"Data were obtained at admission and discharge from acute inpatient rehabilitation"	N = 46, 42 male Median age 44±21 yrs AIS-A = 14, B = 5, C = 8, D = 19 Right motor level: C1-C4 = 11, C5 = 25, C6 = 7, C7-C8 = 3 Left motor level: C1-C4 = 9, C5 = 27, C6 = 5, C7-C8 = 5 28 Caucasian, 18 African-American Etiology: fall = 18, MVA = 17, sports = 8
Ovechkin et al. 2013	Prospective cohort study	University of Louisville	N= 11 (3F, 8M) Age: 48 ± 19 AIS A: 4 AIS C: 1 AIS D: 6
Priebe & Waring 1991	Pre-Post test	Dept. of PMR 1982 and 1989 ASIA	N(Q1)= 14, N(Q2)=15 ("house officers", physician/faculty member) 5 unique SCI cases per Quiz, (1st set of 5 used by Donovan et al ~'91 or '92)
Rudhe et al. 2009	Cross-sectional analysis. Part of larger international multicenter GRASSP study.	2 German centers and 1 Swiss center	N = 29 with traumatic or ischemic SCI Time since injury = 1-15 months (mean = 4.5 ± 3 months) Age= 19-81 years (mean = 50 ± 18 years) 16 males, 13 females ASIA-A/B/CD: 12/4/13
Saboe et al. 1997	Prospective longitudinal study	Tertiary care acute, rehabilitation hospitals and home settings.	N=160 (125M, 35F) Mean age at injury: 30±13 Admission ASIA-A/B/C/D/E: 97/14/7/37/5 Admission ASIA-A/B/C/D/E: 80/11/10/58/1 Lvls of Injury - Cervical/Thoracic/Thoracolumbar/Lumbar: 72/32/49/7
Savic et al. 2007	Prospective observational study to examine inter-rater reliability of motor and sensory	National Spinal Injuries Centre, Stoke Mandeville Hospital, Buckinghamshire	N=45 Mean age=40.3 Male=38 Female=7

	examinations performed by two experienced examiners	Hospitals NHS trust, UK.	Injury level Cervical=15 Thoracic=29 Lumbar=1 AIS A (complete SCI)=24 AIS B (sensory incomplete)=4 AIS C=4 AIS D=13 Time since SCI ranged from 3 months – 43 years
Scivoletto et al. 2013	Analysis of prospectively collected data Studying the ISNCSCI	SCI unit of a rehab hospital in central Italy	N=600, 440 male Mean age 50.35±18.8 Mean time from lesion 51.6±36.8 days Mean time in rehab 123.6±86.3 days 334 traumatic, 266 nontraumatic Lesion level: cervical 192, thoracic 289, 110 lumbar 233 AIS-A, 67 B, 158 C, 142 D
Scivoletto et al. 2015	Validation and further development of the SCI-ARMI formula using data from 6 countries	Spinal cord injury centers from 6 countries and the Statistical Laboratory, Tel-Aviv University, Israel.	N=661 (478M, 183F) Mean age at admission: 47.6±18.2 AIS-A/B/C/D: 214/55/144/248 patients 387 traumatic, 274 nontraumatic SCI Patients from: Israel = 233 (151M, 82F) Italy = 237 (183M, 54F) Portugal = 26 (17M, 9F) Spain = 30 (24M, 6F) UK = 58 (47M, 11F) US = 77 (56M, 21F)
Sisto et al 2016	Cross-sectional; NRS 11-item version	7 NRN outpatient rehabilitation clinics	N=350 (267M, 83F) AIS-C/D: 101/249 Mean (SD) age: 42 (16) Median (range) time since SCI: 0.9 (0.1-53.1) Incomplete SCI Presence of nonprogressive lesion above T11 No current inpatient rehabilitation No anti-spasticity medication use in the past 3 months Capable of stepping using body weight support Referred to PT by physician
Tester et al 2016	Prospective; testing the Neuromuscular Recovery Scale 14-item version	6 outpatient sites in the Christopher and Dana Reeve Foundation NeuroRecovery Network	N=72 (57M, 15F) completing 20 sessions of standardized locomotor training Mean (SD) age: 36 (15) Median (range) time since SCI: 0.7 (0.1-14.7) years N=45 longer than 6 months 44 cervical, 28 thoracic AIS-A/B/C/D: 17/10/20/25
van Hedel et al. 2006	Longitudinal study	European Multicenter Study of Human Spinal Cord Injury	N = 22 (18M, 4F) Mean age = 45.5 years (range 17 – 78 years) Incomplete spinal cord injury patients who were able to stand or walk withIn the first month after SCI.
Velstra et al. 2015	Prospective longitudinal multicenter study	5 European SCI centers; Recruitment	N = 74, 51 male Mean age 49, SD=18 SCI patients <= 10 days post-injury at enrollment AIS at 1 month: A=18, B=12, C=10, D=34

		between Jan 2009 ~ Jun 2011	69/74 traumatic SCI
Yavuz et al. 1998	Cross-sectional	Ankara Rehabilitation Center	N=29 (20M, 9F) Mean age 37yrs (range 14-66yrs) C3-T1 tetraplegic (18 complete, 11 incomplete). Consecutive patients of the Ankara Rehab Centre between May 1994 and January 1996. Mean time since injury to admission 20wks (range 2-72wks).
1. RELIABILITY			
Author ID	**Internal Consistency**		**Test-retest, Inter-rater, Intra-rater**
Priebe & Waring 1991	No data available		Percent correct for '82 and '89 versions of AIS Sensory 82:14,71-100 Sensory 89: 83-100 Motor 82: 14,50-100 Motor 89: 77-100 Overall Kappa: 0.44 (82), 0.67 (89).
Cohen et al. 1998	No data available		Pre / Post % agreement Case 1: Neurological level 71-92 / 73-97 ZPP (zone of partial preservation): 91-95 / 90-93 Overall ASIA: 94 / 98 Complete injury: 96/100 Case 2: Neurological levels: 16-87 / 21-87 ZPP: 19-20 / 65/66 Overall ASIA: 58 /65 Incomplete injury: 95/97 Further revisions to 1992 and further training required.
Jonsson et al. 2000	No data available		Weak inter-rater reliability for 1992 version of AIS for incomplete SCI. Before/after standardization Kappa : PP (pin prick) scores 0.02-0.69 / 0.06-0.83 LT (light touch) scores 0.017-0.91 / 0.23-1 Motor scores 0.3-0.87 / 0.46-0.89 The majority of Kappas for PP were in the range of moderate and fair for most dermatomes. Similar for LT & MS (motor scores) except good–moderate. In general a standardizing assessment (i.e. training) involving all assessors (i.e. 4) improved level of agreement, except in classification of neurological level (Kappa 0.7-0.25).
Savic et al. 2007	No data available		**Total motor scores:** **Pearson correlation**: Patients who had motor examination performed by both examiners **r=0.999** Patients remaining after exclusion of cases with complete paraplegia **r=0.990** **ICC:** Patients who had motor examination performed by both examiners=**0.999**

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<tr>
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<td>Patients remaining after exclusion of cases with complete paraplegia=0.998

Total light touch
r=0.994
ICC=0.997

Pin prick
r=0.978
ICC=0.988

Analysis by myotomes
The agreement for individual muscle testing of the 10 ASIA key muscles showed substantial to almost perfect agreement for all the muscles (weighted Kappa coefficient 0.649-0.993, P<0.01, depending on the muscle tested)

Secondary analysis
The agreement was substantial to almost perfect (weighted Kappa coefficient 0.785-0.981, P<0.05, depending on the muscle tested)

Agreement in neurological level
Kappa
Motor level
Right: 0.76
Left:0.68

Sensory level
Right:0.78
Left:0.70

All P-values were P<.01

For total ASIA scores, the agreement was slightly better for motor than for sensory scores, and better for light touch than for pin-prick scores, but still well in the “substantial” range for all three scores (all ICCs>0.96, P<.01)</td>
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<tr>
<td>Marino et al. 2008</td>
<td></td>
<td>Inter-rater:
<table>
<tr><td></td><td>All Patients</td><td>Complete</td><td>Incomplete</td></tr>
<tr><td>AIS light touch</td><td>0.96[a]</td><td>0.99[a]</td><td>0.86[a]</td></tr>
<tr><td>AIS pin-prick</td><td>0.89[a]</td><td>0.99[a]</td><td>0.69[b]</td></tr>
<tr><td>AIS total motor</td><td>0.98[a]</td><td>1.00[a]</td><td>0.95[a]</td></tr>
<tr><td>UEMS (tetra)</td><td>0.96[a]</td><td>n/a</td><td>n/a</td></tr>
<tr><td>LEMS</td><td>n/a</td><td>n/a</td><td>0.98[a]</td></tr>
<tr><td colspan="4">a- Excellent reliability(ICC ≥0.75)
b- Adequate reliability(ICC 0.4<0.74)</td></tr>
</table>
Intra-rater:

Excellent AIS Light Tough ICC= 0.99
Excellent AIS Pin-Prick ICC = 0.99
Excellent AIS UEMS ICC = 0.98

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2. VALIDITY	
Author ID	**Validity**
Curt et al. 1998	UE (upper extremity) ASIA MS (motor score) correlated with nonstandardized assessment of hand function= 0.79 (acute), 0.83 (chronic) LE (lower extremity) ASIA MS and nonstandardized ambulatory capacity=0.79 (acute), 0.78 (chronic)
El Masry et al. 1996	Correlation Coefficient R=0.954-0.996 for MDP (motor deficit percentage) /MRP (motor recovery percentage): CMSvs ASIA/NASCIS. All correlations high between CMS and NASCIS or ASIA
Marino & Graves 2004	R^2 =0.59 for total ASIA MS in predicting total FIM motor. R^2 = 0.71 for separate UE/LE ASIA scores in predicting total FIM (Functional Independence Measure) motor. R^2=0.44 for predicting FIM UE score with total ASIA MS R^2=0.72 for predicting FIM LE score with separate UE/LE ASIA scores R^2=0.60 for predicting FIM LE score with total ASIA MS R^2=0.65 for predicting FIM UE score with separate UE/LE ASIA scores
Graves et al. 2006	Separate UE/LE motor scores more accurately represented motor function than a single combined score : P<.0001 (82% in 1D model and 87% of variance in 2-D model)
Fattal 2004	Correlation between the ASIA and an instrument measuring the same construct: ASIA motor score & Motor Capacities Scale: r=0.744, P<.0001
Yavuz et al. 1998	Spearman correlation of ASIA & QIF (Quadriplegia index of function): ASIA motor: r=0.91 (P<.001) ASIA light touch: r=0.64 (P<.001) ASIA pinprick: r=0.65 (P<.01) Dressing: r=0.91 Transfers: r=0.82 Mobility: r=0.90 Bladder program: r=0.79 Bowel program: r=0.79 P<0.001 for the 5 above. Spearman correlation of ASIA & FIM: ASIA motor: r=0.91 (P<.001) ASIA light touch: r=0.58 (P<.01) ASIA pinprick: r=0.55 (P<.01) Dressing: r=0.80 Transfers: r=0.80 Mobility: r=0.86 Bladder program: r=0.77 Bowel program: r=0.74 P<.001 for the 5 above. The percent improvement indicated by the ASIA motor score correlated strongly with the per cent gain in QIF (r=0.68, P=.001) but did not exhibit such a significant correlation with gain in the FIM score (r=0.38, P<.05).
Ovechkin et al. 2013	AIS Spearman's rho with: FIM Motor Score: r= 0.57 (not significant) SCIM III total: r=0.72 (p< 0.01) SCIM III mobility: r=0.76 (p<0.05)

	WISCI: r= 0.71 (p<0.05)
Catz et al. 2004	Pearson's r btwn SCI-ARMI & AIS motor score: Admission to rehabilitation: 0.296 (p<0.01) During rehabilitation: -0.248 (p<0.16, nonsignificant) At rehabilitation completion: -0.123 (p<0.62, nonsignificant) Pearson's r btwn SCI-ARMI (regression-based score) & Time since rehabilitation admission: 0.46 (p<0.01) No significant correlation found btwn SCI-ARMI improvement and Patient age, gender, or spinal cord lesion level or severity (p>0.05)
Scivoletto et al. 2015	Pearson's r btwn SCI-ARMI gain and: ASIA Motor Score at admission: -0.14, p<0.0001 ASIA Motor Score gain: 0.13, p<0.0006 Age: -0.23, p<0.0001
Aidinoff et al. 2012	Pearson's r btwn SCI-ARMI and ASIA Motor Score at discharge: 0.28, p=0.00001
Fujiwara et al. 1999	Spearman's rho btwn ASIA Motor Score with FIM Motor Score: 0.73 (p<0.01) Spearman's rho btwn ASIA Motor Score with FIM Transfer Score: 0.64 (p<0.01)
Saboe et al. 1997	Correlation coefficient btwn: ASIA Motor score and ASIA Impairment at rehab admission: 0.74 ASIA Motor score and ASIA Impairment at rehab discharge: 0.74 ASIA Motor score at rehab admission and ASIA Impairment at rehab discharge: 0.55 ASIA Motor score at rehab discharge and ASIA Impairment at rehab admission: 0.78 FIM score 2 years after SCI onset and: ASIA Motor Score at rehab admission: 0.68 ASIA Motor Score at rehab discharge: 0.80 ASIA Impairment at rehab admission: 0.50 ASIA Impairment at rehab discharge: 0.53
Burns et al. 2011	Spearman correlations: Btwn ASIA Upper Extremity Motor Score (tetraplegic only, N=41) and: Self-selected WISCI level: 0.496 (p<0.0001) Self-selected WISCI Speed: 0.491 (p<0.05) Max WISCI level: 0.502 (p<0.0001) Max WISCI speed: 0.469 (p<0.0001) Btwn ASIA Lower Extremity Motor Score (N=76) and: Self-selected WISCI level: 0.704 (p<0.0001) Self-selected WISCI Speed: 0.509 (p<0.05) Max WISCI level: 0.717 (p<0.0001) Max WISCI speed: 0.572 (p<0.0001) More details of paraplegic/tetraplegic values available in article.
Dittunno et al. 2008	WISCI II Total Spearman correlation w/ Lower Extremity Motor Score (LEMS) (p<0.001): Initial = 0.47 Final = 0.91 Improvement = 0.59 Final for those who progressed = 0.71
Ditunno et al. 2007	WISCI II Spearman correlation w/ LEMS (P < 0.001): At 3 months: r = 0.85 At 6 months: r = 0.85 At 12 months: r = 0.88 WISCI II @ 12 months Spearman correlation w/ LEMS: Baseline: 0.73 At 3 months: 0.81 At 6 months: 0.86
Hasegawa et al. 2014	ASIA UEMS and LEMS are correlated with community ambulation (ability to walk >480m): Logistic regression:

<table>
<tr><td></td><td>LEMS: β=0.71, p=0.008
UEMS:β=0.41, p=0.015
Univariate regression:
UEMS: r=0.54, p<0.01
LEMS: r=0.68, p<0.01
ROC Analysis for community ambulation (ability to walk >480m):
ASIA UEMS cutoff at 36.5pts: AUC=0.85, Sensitivity=0.91, Specificity=0.67
ASIA LEMS cutoff at 41.5pts: AUC=0.92, Sensitivity=0.91, Specificity=0.89
ASIA Light-touch score cutoff at 77.5pts: AUC=0.52, Sensitivity=0.44, Specificity=0.56
ASIA Pin-prick score cutoff at 83.5pts: AUC=0.45, Sensitivity=0.50, Specificity=0.67</td></tr>
<tr><td>Johnston et al. 2005</td><td>Pearson’s r btwn ASIA Motor Score and:
CHART Total: 0.07 (P=0.54)
CHART Physical Total: 0.46 (P=0.001)
CHART Mobility Total: 0.04 (P=0.75)
CHART Occupational Total: -0.11 (P=0.37)
CHART Social Interaction Total: -0.22 (P=0.06)
CHART Economic Total: -0.04 (P=0.72)</td></tr>
<tr><td>Marino et al. 1998</td><td>Correlation of ASIA UEMS with:
Capabilities of the Upper Extremity (CUE) Instrument:
Motor incomplete patients (N=49): Pearson’s r = 0.683, Spearman’s ρ = 0.650
Motor complete patients (N=105): Pearson’s r = 0.798, Spearman’s ρ = 0.815
All patients (N=154): Pearson’s r = 0.782, Spearman’s ρ = 0.798
Functional Independence Measure (FIM):
Motor incomplete patients (N=49): Pearson’s r = 0.593, Spearman’s ρ = 0.580
Motor complete patients (N=105): Pearson’s r = 0.772, Spearman’s ρ = 0.825
All patients (N=154): Pearson’s r = 0.741, Spearman’s ρ = 0.803</td></tr>
<tr><td>Marino et al. 2012</td><td>Spearman correlation of ASIA UEMS with Capabilities of Upper Extremity Test (CUE-T): 0.91</td></tr>
<tr><td>Marino et al 2015</td><td>Spearman’s correlation btwn AISA UEMS and Capabilities of Upper Extremity Test (CUE-T): 0.827</td></tr>
<tr><td>Morganti et al. 2005</td><td>“The initial ASIA [impairment] grade was predictive of mobility outcome in WISCI”

Correlation btwn ASIA LEMS and WISCI:
For all patients (N=200): 0.58 (P<0.001)
For WISCI lvls 1-19 only (N=63): 0.57 (P<0.001)
For patients aged <50 (N=35): 0.50 (P<0.01)
For patients aged >= 50 (N=28): 0.64 (P<0.01)
For traumatic SCI patients (N=37): 0.49 (P<0.01)
For non-traumatic SCI patients (N=26): 0.58 (P<0.01)</td></tr>
<tr><td>Oleson and Marino 2014</td><td>Spearman correlations btwn ASIA UEMS and:
Revised CUE-Q total at:
Admission: r=0.89
Discharge: r=0.70
FIM Self-care subscale at:
Admission: r=0.76
Discharge: r=0.73

Spearman correlations btwn change in ASIA UEMS and:
Change in CUE-Q total: r=0.07
Change in FIM Self-care subscale: r=0.41</td></tr>
<tr><td>Rudhe et al. 2009</td><td>SCIM III scores correlated well with UEMS, MMT and hand capacity tests total scores (P<0.001):
<table>
<tr><th colspan="4">Spearman’s correlations between SCIM-III and other measures</th></tr>
<tr><th>SCIM III</th><th>UEMS</th><th>MMT</th><th>Hand Capacity Tests</th></tr>
<tr><td>Feeding</td><td>0.73</td><td>0.75</td><td>0.67</td></tr>
<tr><td>Bathing upper body</td><td>0.80</td><td>0.77</td><td>0.77</td></tr>
</table></td></tr>
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	<table><tr><td>Bathing lower body</td><td>0.72</td><td>0.76</td><td>0.71</td></tr><tr><td>Dressing upper body</td><td>0.73</td><td>0.76</td><td>0.76</td></tr><tr><td>Dressing lower body</td><td>0.64</td><td>0.70</td><td>0.60</td></tr><tr><td>Grooming</td><td>0.88</td><td>0.89</td><td>0.80</td></tr><tr><td>Self-care Total</td><td>0.82</td><td>0.84</td><td>0.80</td></tr><tr><td>Respiration & Bladder Total</td><td>0.63</td><td>0.68</td><td>0.65</td></tr><tr><td>Mobility Total</td><td>0.65</td><td>0.71</td><td>0.72</td></tr><tr><td>Total Score</td><td>0.78</td><td>0.78</td><td>0.76</td></tr><tr><td colspan="4">UEMS = upper extremity muscle score MMT = manual muscle testing</td></tr></table> Estimation of SCIM-III Self care score using ASIA UEMS: $R^2_{adjusted} = 0.69$
Van Hedel at al. 2006	Spearman correlation of ASIA LEMS with other measures at various post-injury time: WISCI II: Within 1 month: 0.49 (P=0.02) After 3 months: 0.50 (P=0.02) After 6 months: 0.38 (P=0.08) After 12 months: 0.32 (P=0.15) 6 Minute Walk Test: Within 1 month: 0.54 (P=0.01) After 3 months: 0.34 (P=0.12) After 6 months: 0.49 (P=0.02) After 12 months: 0.55 (P<0.01) 10 Meter Walk Test: Within 1 month: -0.45 (P=0.04) After 3 months: -0.30 (P=0.18) After 6 months: -0.40 (P=0.06) After 12 months: -0.39 (P=0.07)
Velstra et al. 2015	Spearman Correlations (p<0.0001): At 1 month postinjury: GRASSP-MMT subscale & ASIA UEMS = 0.95 GRASSP-SWM subscale & ASIA LT = 0.58 At 3 month postinjury: GRASSP-MMT subscale & ASIA UEMS = 0.94 GRASSP-SWM subscale & ASIA LT = 0.64 At 6 month postinjury: GRASSP-MMT subscale & ASIA UEMS = 0.94 GRASSP-SWM subscale & ASIA LT = 0.65 At 12 month postinjury: GRASSP-MMT subscale & ASIA UEMS = 0.88 GRASSP-SWM subscale & ASIA LT = 0.66 (GRASSP-MMT = Manual Muscle Testing subscale – based on Daniels and Worthington, 1995)
Harkema et al 2016	Pearson's r (95%CI) with ASIA Motor Scales: UEMS with: Berg Balance: 0.3 (0.19, 0.41) 6MWT: 0.24 (0.15, 0.34) 10MWT: 0.24 (0.15, 0.34) LEMS with: Berg Balance: 0.79 (0.74, 0.85) 6MWT: 0.7 (0.64, 0.76) 10MWT: 0.69 (0.63, 0.75) ASIA Motor Score with: Berg Balance: 0.75 (0.69, 0.81) 6MWT: 0.64 (0.58, 0.71)

	10MWT: 0.63 (0.57, 0.69) Pearson's r (95%CI) with Neuromuscular Recovery Scale (NRS): NRS Overall Phase with: ASIA UEMS: 0.41 (0.31-0.50) ASIA LEMS: 0.70 (0.63-0.77) ASIA Motor: 0.73 (0.67-0.78) NRS Summary Score with: ASIA UEMS: 0.49 (0.39-0.59) ASIA LEMS: 0.80 (0.74-0.86) ASIA Motor: 0.84 (0.80-0.88) NRS Body Weight Supported Treadmill Subscale with: ASIA UEMS: 0.24 (0.13, 0.36) ASIA LEMS: 0.72 (0.65, 0.80) ASIA Motor: 0.66 (0.59, 0.73) NRS Trunk & Leg Subscale with: ASIA UEMS: 0.39 (0.28, 0.50) ASIA LEMS: 0.87 (0.84, 0.91) ASIA Motor: 0.85 (0.81, 0.89) NRS Arm & Shoulder Subscale with: ASIA UEMS: 0.63 (0.54, 0.71) ASIA LEMS: 0.38 (0.25, 0.51) ASIA Motor: 0.61 (0.52, 0.69) NRS Arm & Shoulder + Trunk & Leg Subscales with: ASIA UEMS: 0.54 (0.44, 0.63) ASIA LEMS: 0.78 (0.71, 0.84) ASIA Motor: 0.85 (0.81, 0.89)
3. RESPONSIVENESS	
Author ID	**Responsiveness**
Oleson and Marino 2014	Effect size of admission-discharge ASIA UEMS change: 0.87
Velstra et al. 2015	SRMs with respect to 1~3, 1~6, 1~12, 3~12, 3~6, 6~12 months post-injury: In all patients: ASIA UEMS: 0.69~1.29 ASIA Light Touch: -0.08~0.30 In AIS-A/B patients: ASIA UEMS: 0.79~1.21 ASIA Light Touch: 0.02~0.39 In AIS-C/D patients: ASIA UEMS: 0.63~1.33 ASIA Light Touch: -0.29~0.33 Breakdown by motor completeness and other time intervals available in article
Harkema et al 2016	Standardized Response Means after Locomotor Training: UEMS: All individuals: 0.38 AIS-A/B: 0.21 AIS-C: 0.64 AIS-D: 0.35 LEMS: All individuals: 0.23 AIS-A/B: -0.10 AIS-C: 0.72 AIS-D: 0.16 ASIA Motor Score: All individuals: 0.33

<table>
<tr><td></td><td>AIS-A/B: -0.01
AIS-C: 0.82
AIS-D: 0.27
Median (range) number of sessions of NRN-standardized locomotor training: 70 (23-520)</td></tr>
<tr><td>Kalsi-Ryan et al. 2016</td><td>Mean Difference, Std Error, Std Response Mean and Effect Sizes (Mean diff; SE; SRM; ES) at different post-injury intervals:
ISNCSCI (ASIA) UEMS:
1 month -> 3 month: 5.06; 0.72; 1.00; 0.38
1 month -> 6 month: 7.21; 0.99; 1.10; 0.54
1 month -> 12 month: 10.03; 1.24; 1.31; 0.76
ISNCSCI (ASIA) Light Touch:
1 month -> 3 month: 1.06; 0.49; 0.31; 0.12
1 month -> 6 month: 0.82; 0.46; 0.27; 0.09
1 month -> 12 month: 0.76; 0.49; 0.25; 0.09
Breakdown by motor completeness and other time intervals available in article</td></tr>
<tr><td colspan="2">4. FLOOR/CEILING EFFECT – no data available</td></tr>
<tr><td>Author ID</td><td>Floor/Ceiling Effect</td></tr>
<tr><td>Marino & Graves 2004</td><td>Upper Extremity Motor Score: 42% of subjects at ceiling (50)
Lower Extremity Motor Score: 53% of subjects at floor (0)</td></tr>
<tr><td colspan="2">5. INTERPRETABILITY</td></tr>
<tr><td>Author ID</td><td>Interpretability</td></tr>
<tr><td>Furlan et al. 2008 [literature review]</td><td>Results based on 79 peer reviewed articles: (please refer to Furlan et al. 2008 for further details)

Based on data from Kirshblum et al. 2004
Mean (SEM) ASIA motor score at 1 year post-injury: 45.2 (22.8)
Mean (SEM) ASIA motor score at 5 years post-injury: 46.6 (23.3)

Based on data from Clifton et al. 1996, for the 1992 ASIA/IMSOP:
MDC for ASIA motor score: 0.29
ASIA pin-prick sensory subscore: 7.8
ASIA light-touch sensory subscore: 12.95</td></tr>
<tr><td>Curt et al. 1998</td><td>ASIA scores – mean (SD) – of acute and chronic patient groups with cervical SCI
<table>
<tr><th>ASIA scores</th><th>Acute SCI – Initial Examination</th><th>Acute SCI - Increment after 6 months</th><th>Chronic SCI</th></tr>
<tr><td>Motor (total)</td><td>39 (30.4)</td><td>18.4 (19.1)</td><td>44.8 (27.3)</td></tr>
<tr><td>Upper limb</td><td>23.6 (15)</td><td>8.1 (7.7)</td><td>28.4 (13.2)</td></tr>
<tr><td>Lower limb</td><td>15.4 (19.9)</td><td>10.3 (14.4)</td><td>14.4 (17.2)</td></tr>
<tr><td>Light touch</td><td>65.2 (33.4)</td><td>8 (16.8)</td><td>60.4 (34.9)</td></tr>
<tr><td>Pin prick</td><td>53.3 (36.2)</td><td>12.1 (21.4)</td><td>49.3 (34.9)</td></tr>
</table></td></tr>
<tr><td>Yavuz et al. 1998</td><td>Improvement of complete and incomplete quadriplegics according to ASIA:
<table>
<tr><th></th><th>Test</th><th>Average score at admission</th><th>Average score at discharge</th></tr>
<tr><td rowspan="2">Complete quadriplegics</td><td>ASIA motor</td><td>21.1 (7.3)</td><td>24.8 (8.8)</td></tr>
<tr><td>ASIA light touch</td><td>30.5 (13.5)</td><td>37.5 (22.6)</td></tr>
<tr><td rowspan="2">Incomplete quadriplegics</td><td>ASIA motor</td><td>68.43 (16.3)</td><td>81.58 (11.8)</td></tr>
<tr><td>ASIA light touch</td><td>77.3 (20.9)</td><td>93.3 (21.6)</td></tr>
</table></td></tr>
<tr><td>Cifu et al. 1999</td><td>Outcome Measures for Each Injury Group:
<table>
<tr><th></th><th>ASIA Motor Admission</th><th>ASIA Motor Discharge</th><th>FIM Motor Admission</th><th>FIM Motor Discharge</th></tr>
<tr><td>AIS A,B; C2-C4</td><td>4.85</td><td>16.90</td><td>13.20</td><td>23.50</td></tr>
<tr><td>AIS A,B; C5-C8</td><td>14.62</td><td>24.33</td><td>16.53</td><td>33.58</td></tr>
<tr><td>AIS C; C2-C4</td><td>25.08</td><td>57.21</td><td>15.55</td><td>48.58</td></tr>
<tr><td>AIS C; C5-C8</td><td>34.31</td><td>59.93</td><td>20.89</td><td>57.75</td></tr>
</table></td></tr>
</table>

AIS D; C2-C4	63.12	78.07	33.63	73.62
AIS D; C5-C8	65.32	78.63	35.53	72.43

Discharge Scores by Age Category:			
	18-34yrs	**35-64yrs**	**65+yrs**
Admission			
ASIA Motor	38.61	39.02	43.15
FIM Motor	25.01	25.80	22.82
FIM Cognitive	31.02	29.54	27.65
Discharge			
ASIA Motor	57.67	57.52	56.56
FIM Motor	62.38	56.37	49.74
FIM Cognitive	33.86	32.54	29.86

Scivoletto et al. 2013	Total Motor Score: SEM=0.67, MDC95=1.87, MCID=4.48, ES-based estimate for small change=4.26, substantial change = 10.65 Total Sensory Score: SEM=1.40, MDC95=3.87, MCID=5.19, ES-based estimate for small change=5.1, substantial change = 12.75 Admission mean =74.4, SD=25.5, Discharge mean = 79.9, SD=26.4 Upper Extremity Motor Score: Admission mean =40.15, SD=14.9, Discharge mean = 42.9, SD=12.2 MCID=2.72, ES-based estimate for small change=2.98, substantial change = 7.45 Lower Extremity Motor Score: Admission mean =13.8, SD=16.8, Discharge mean = 20.2, SD=19.7 MCID=3.66, ES-based estimate for small change=3.36, substantial change = 8.4 Breakdown of Means, SEMs, MDC95s, MCIDs, Substantial and small changes are available according to level of injury and AIS grade (A/B/C/D).
Marino et al. 2008	Minimal Detectable Change: • Smallest Real Difference o Light tough = 4.1 o Pin-prick = 5.9 o UEMS = 2.0
Marino & Graves 2004	Normative data (N=4338): Median ASIA Motor at discharge: 50 (IQR= 31~70) Median Upper Extremity Motor Score at discharge: 44 (IQR= 23~50) Median Lower Extremity Motor Score at discharge: 0 (IQR= 0~30)
Tester et al 2016	Smallest Real Difference (SRD): UEMS: 1.3 LEMS: 1.3
Harkema et al 2016	Mean (SD) UEMS: All individuals: Enrollment: 35 (14) Discharge: 37 (13) AIS-A/B: Enrollment: 33 (16) Discharge: 34 (15) AIS-C: Enrollment: 31 (12) Discharge: 35 (10) AIS-D:

	Enrollment: 40 (10) Discharge: 42 (9) Mean (SD) LEMS: All individuals: Enrollment: 16 (18) Discharge: 18 (19) AIS-A/B: Enrollment: 1 (6) Discharge: 0 (1) AIS-C: Enrollment: 13 (11) Discharge: 20 (16) AIS-D: Enrollment: 39 (8) Discharge: 40 (10) Mean (SD) ASIA Motor Score: All individuals: Enrollment: 51 (25) Discharge: 54 (26) AIS-A/B: Enrollment: 34 (18) Discharge: 34 (15) AIS-C: Enrollment: 44 (16) Discharge: 55 (21) AIS-D: Enrollment: 79 (13) Discharge: 81 (14) * Enrollment = pre-intervention; discharge = post-intervention; median (range) number of sessions of NRN-standardized locomotor training: 70 (23-520)
Sisto et al 2016	Mean (SD) initial UEMS scores: All patients: 39 (11) Cervical SCI: 35 (10) High Thoracic SCI: 50 (1) Low Thoracic SCI: 50 (0) Mean (SD) initial LEMS scores: All patients: 31 (14) Cervical SCI: 33 (14) High Thoracic SCI: 26 (14) Low Thoracic SCI: 27 (15) Mean (SD) initial ASIA Motor scores: All patients: 70 (19) Cervical SCI: 68 (20) High Thoracic SCI: 76 (14) Low Thoracic SCI: 77 (15) Median (range) initial UEMS scores: All patients: 41 (4-50) Cervical SCI: 36 (4-50) High Thoracic SCI: 50 (48-50) Low Thoracic SCI: 50 (50-50) Median (range) initial LEMS scores: All patients: 34 (0-50) Cervical SCI: 36 (0-50) High Thoracic SCI: 28 (0-50)

	Low Thoracic SCI: 32 (2-50) Median (range) initial ASIA Motor scores: All patients: 73 (9-100) Cervical SCI: 71 (9-99) High Thoracic SCI: 76 (50-100) Low Thoracic SCI: 82 (52-100)