

The Reliability and Validity of the Vernon and Mior Neck Disability Index and Comparison to the Short Form-36 Health Survey Questionnaire

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Questionnaires and Outcomes

- Valid and reliable measures
- Assess outcome of medical management
- Give us objectivity
- Allow us to compare efficacy between specialties and individual procedures

1. Condition-specific disability measures

2. General health measures

3. Pain measures

4. Satisfaction measures

5. Employment measures

The Neck Disability Index: A Study of Reliability and Validity

HOWARD VERNON, D.C.* AND SILVANO MIOR, D.C.*

Condition-specific disability measure

- Modification of ODI - 10 Questions
- Designed in an Out Patient **Physiotherapy** Dept.
- Internal Consistency
 - 52 neck pain patients
- Test-Retest reliability
 - 17 **whiplash** patients within **2 days**
- Concurrent validity
 - 30 correlated to McGill pain questionnaire

Journal of Manipulative and Physiological Therapeutics
Volume 14 • Number 7 • September, 1991

The SF 36 health survey questionnaire: an outcome measure suitable for use within the NHS?

Andrew G. Williams, J. Kenneth Buckingham, Ian T. Russell

THE SHORT FORM-36 QUESTIONNAIRE IN SPINE SURGERY

MICHAEL GREVITT, RABI KHAZIM, JOHN WEBB, ROBERT MULHOLLAND, J.

From Queen's Medical Centre, Nottingham, England

General health measure

SF-36 - 10 mins
Complex scoring system
Multiple Domains

NDI - 2-3 mins
Simple to score
Specific

Objectives of this Study

- To independently validate the NDI in the **Spinal Out Patient** setting
 - to include all causes of neck pain
- To draw comparison between the NDI, SF36 and VAS **in the same patient population**
- Why do all of this?
 - The NDI is quick, simple and easy to score
 - We need to know that it works and that it works well

Study Design

- 160 Patients with "neck pain" attending the Spinal OPD
 - over a 4 month period
 - completed our standard neck pain assessment form (demographics, VAS, NDI and SF36)
- 34 / 40 patients completed a second postal questionnaire within 1-2 weeks

Statistics

1st Rule of Statistics

=

Get help from a Statistician

- Internal Consistency of each Questionnaire
 - Cronbach alpha
 - Correlations of individual scores to the total
- Concurrent Validity between the Questionnaires
 - Pearson Correlation
- Test-Retest Reliability of each Questionnaire
 - Bland and Altman plots
 - Regression and Correlations



Results - Internal Consistency

- Cronbach alpha (160 patients)

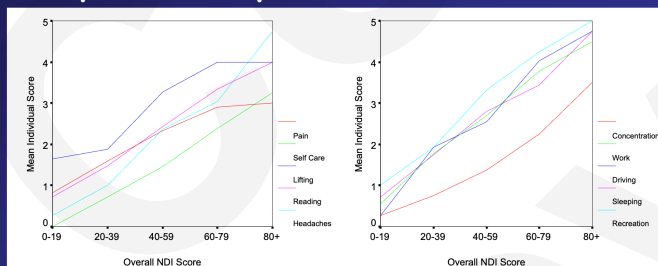
- NDI
 - 0.864 $se = 0.017$
 - 95% CI 0.825-0.894

More robust than
Vernon and Mior

Both have robust
internal consistency

- SF36
 - 0.878 $se = 0.014$
 - 95% CI 0.843-0.906

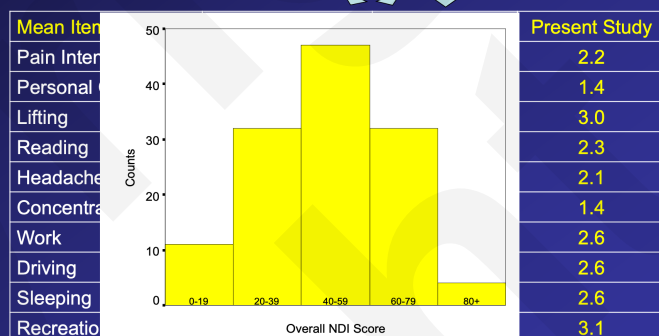
Results - Internal Consistency Graphical Representation



- The construct of each individual question correlates significantly with the overall score ($p < 0.001$)

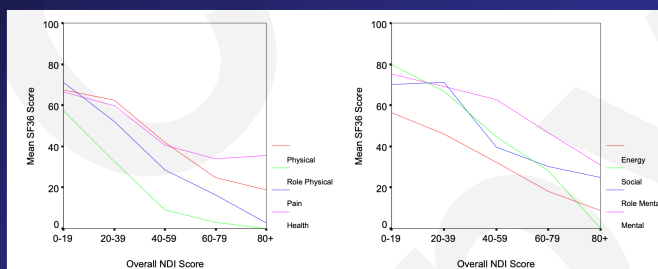
Results - NDI

Physio WAD only



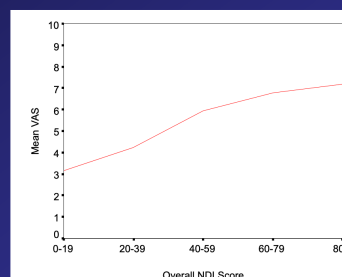
Spinal clinic population equal or higher scores

Results - Correlations



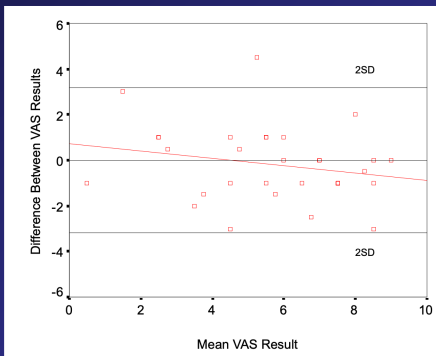
All domains of the SF36
correlate significantly with the NDI
 $p < 0.001$

Results - Correlations



So does the VAS
 $p < 0.001$

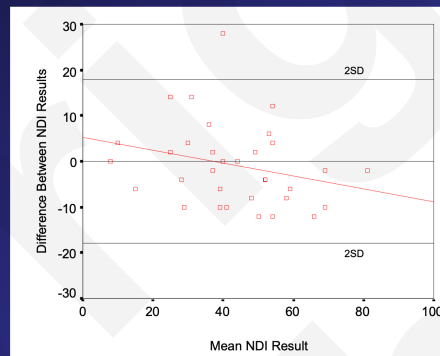
Results - Test-Retest VAS



**Reproducibility
Acceptable
Regression NS**

Similar for SF36

Results - Test-Retest NDI



**Reproducibility
Acceptable
Regression NS**

Results - Test-Retest Correlation

- **ODI** - Fairbank et al. (1980)
 - 2 day interval
 - 22 patients
 - $r=0.99$
- **NDI** - Vernon and Mior (1991)
 - 2 day interval
 - 17 patients
 - $r = 0.89$
- **NDI** - Present Study
 - 1-2 week interval (↑)
 - 34 patients (↑)
 - $r = 0.87 (=)$

**Too short?
- Memory**

Similar Results

Conclusions

- NDI is useful in spinal out patient setting
 - This is true over a wide spectrum of disease and not just whiplash associated disorders (as previously studied)
- Internal consistency similar to SF36 and correlates well to all domains (and VAS)
 - No need to use both
- Good reliability / reproducibility

The Future

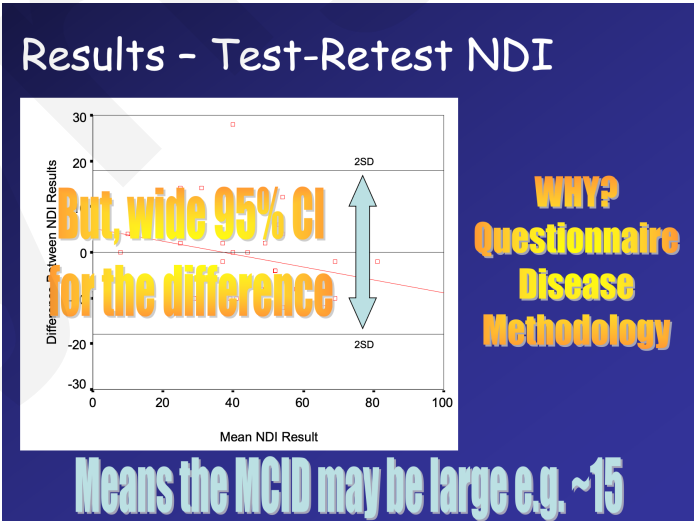
- The NDI is
 - Quick
 - Simple to use
 - Simple to administer
 - Simple to score
 - Valid
 - Reliable
- Need to study the MCID...

**Therefore,
like the ODI
it is here to stay**



Thank
you





Neck Pain is Important

- 34% population experience neck pain / yr
- 13.8% lasts >6 months (Bovim et al. 1994)
- May cause as many days lost from work as back pain (White and Ernst 1999)
- Total estimated costs in Netherlands approx £450m / yr (Korthals de Bos et al. 2003)

Questionnaires and Outcomes

- **Validity**
 - the extent to which the NDI is a true indicator of disease
- **Reliability**
 - the extent to which the NDI yields the same results when repeated (all other variables being constant)
- **Utility**
 - the usefulness of the NDI

Previous Studies

The Neck Disability Index

Pain Intensity	Concentration
Personal Care	Work
Lifting	Driving
Reading	Sleeping
Headaches	Recreation

2001 WHO International Classification of Functioning, Disability and Health

- | | |
|-------------|----------------------------------|
| 4 questions | - impairment of bodily functions |
| 5 questions | - activity limitations |
| 1 question | - environmental factors |

SF36 Domains

Physical Health	Mental Health
Physical Functioning	Energy and Fatigue
Role Limitations 2° Physical Problems	Social Functioning
Pain	Role Limitations 2° Emotional Problems
General Health Perception	Mental Health

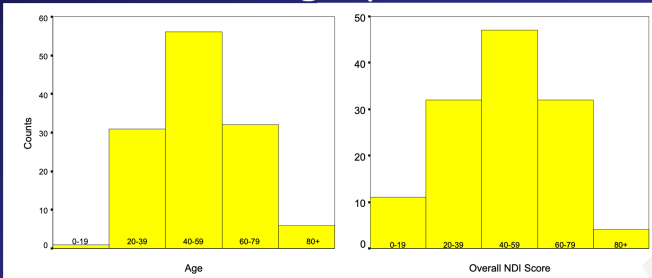
The Oswestry Disability Index

Pain Intensity	Standing
Personal Care	Sleeping
Lifting	Sex Life
Walking	Social Life
Sitting	Travelling

2001 WHO International Classification of Functioning, Disability and Health

- | | |
|-------------|----------------------------------|
| 2 questions | - impairment of bodily functions |
| 7 questions | - activity limitations |
| 1 question | - environmental factors |

Results - Demographics



Mean Age 50.4 years (14-84) 96 ♀ : 64 ♂
Histograms show normal distributions - random selection, not skewed

SF36 data similar to Garratt et al.

Results - Outcome Scores

	Mean	Range	SD
NDI	46.6	0-88	19
VAS	5.5	0-10	2.6
SF36 Physical	43.9	0-100	28.4
SF36 Role Physical	16.9	0-100	31
SF36 Pain	33.7	0-100	24.1
SF36 General Health	45.4	0-95	24
SF36 Energy	33.1	0-90	21.9
SF36 Social	47.2	0-100	28.8
SF36 Role Mental	46.9	0-100	45.9
SF36 Mental Health	60.1	0-100	20.6

SF36 data similar to Garratt et al.

Results - NDI

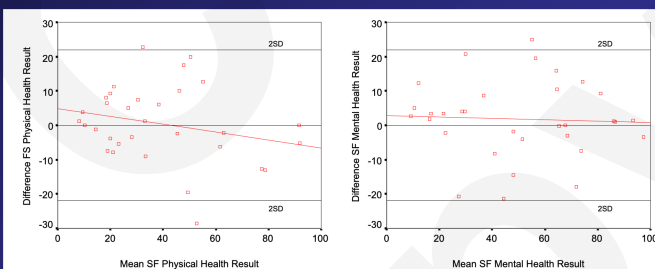
More Robust

Individual Alpha Values	Vernon and Mior	Present Study
Pain Intensity	0.79	0.79 =
Personal Care	0.78	0.82 ↑
Lifting	0.78	0.76 ↓
Reading	0.78	0.85 ↑
Headaches	0.84	0.77 ↓
Concentration	0.77	0.77 =
Work	0.76	0.82 ↑
Driving	0.76	0.84 ↑
Sleeping	0.81	0.83 ↑
Recreation	0.77	0.87 ↑
Total Index	0.80	0.878 ↑

Results - Test Retest

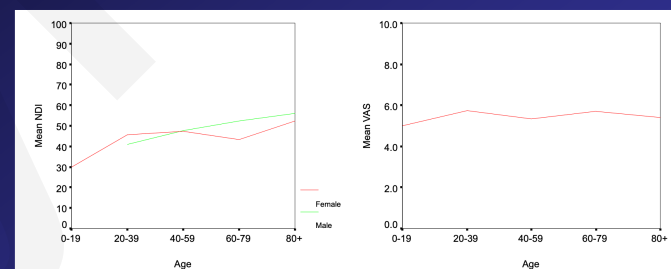
- A Bland and Altman Plot describes the spread of the score values within the same individual between the test and retest examination and provides the 95% confidence interval
- One should expect 95% of the differences to be less than two standard deviations (this is the definition of a repeatability coefficient adopted by the British Standards Institution)
- Not performed in other studies

Results - Test Retest SF36



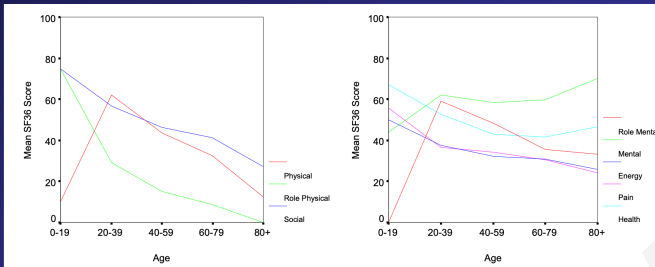
Reproducibility Acceptable
Regression NS

Results - Age and Sex



Not significant

Results - Age and Sex



p < 0.01

NS

Results - SF36

Similar

Individual Alpha Values	Jenkinson et al.	Present Study
SF36 Physical	0.90	0.79
SF36 Social	0.76	0.84
SF36 Role Physical	0.88	0.78
SF36 Role Mental	0.80	0.70
SF36 Mental Health	0.83	0.83
SF36 Energy	0.85	0.87
SF36 Pain	0.82	0.84
SF36 General Health	0.80	0.80

Alpha	Neck Pain	SF Paper
SF36 Physical	0.79	0.92
SF36 Social	0.84	0.8
SF36 Role Physical	0.78	0.89
SF36 Role Mental	0.70	0.86
SF36 Mental Health	0.83	0.86
SF36 Energy	0.87	0.86
SF36 Pain	0.84	0.86
SF36 General Health	0.80	0.83
Total Index	0.88	N/A

- Care experience and perception varies in a 6 week time lapse (Pat Educ Couns 2002)

Results - Correlation and Regression of NDI to SF36

	Correlation coefficient	Regression coefficient (se)	
		Constant	Independent variable
SF36 Physical	-0.55	63.0 (2.6)	-0.36 (0.05)
SF36 Role Physical	-0.52	52.5 (1.6)	-0.32 (0.05)
SF36 Pain	-0.74	66.5 (2.0)	-0.57 (0.05)
SF36 General Health	-0.46	63.4 (3.2)	-0.36 (0.06)
SF36 Energy	-0.63	64.8 (2.4)	-0.53 (0.06)
SF36 Social	-0.65	67.1 (2.5)	-0.42 (0.05)
SF36 Role Mental	-0.41	54.9 (2.2)	-0.17 (0.03)
SF36 Mental Health	-0.53	76.0 (4.4)	-0.48 (0.07)

All p < 0.001

ODI	Correlation coefficient	Regression coefficient (se)	
		Constant	Independent variable
SF36 Physical	-0.77	67.2 (3.6)	-0.62 (0.05)
SF36 Role Physical	-0.48	41.7 (3.1)	-0.26 (0.04)
SF36 Pain	-0.64	58.6 (4.0)	-0.51 (0.06)
SF36 Energy	-0.55	59.6 (4.0)	-0.58 (0.09)
SF36 Social	-0.67	70.0 (4.8)	-0.55 (0.06)
SF36 Role Mental	-0.50	51.9 (4.4)	-0.31 (0.05)
SF36 Mental Health	-0.40	64.8 (8.3)	-0.51 (0.11)
SF36 General Health	-0.54	59.5 (5.2)	-0.51 (0.08)

All p < 0.001

Correlation coefficient	NDI	ODI
SF36 Physical	-0.55	-0.77
SF36 Role Physical	-0.52	-0.48
SF36 Pain	-0.74	-0.64
SF36 General Health	-0.46	-0.54
SF36 Energy	-0.63	-0.55
SF36 Social	-0.65	-0.67
SF36 Role Mental	-0.41	-0.50
SF36 Mental Health	-0.53	-0.40

All $p < 0.001$

	NDI Regression coefficient (se)		ODI Regression coefficient (se)	
	Constant	Independent variable	Constant	Independent variable
SF36 Physical	63.0 (2.6)	-0.36 (0.05)	67.2 (3.6)	-0.62 (0.05)
SF36 Role Physical	52.5 (1.6)	-0.32 (0.05)	41.7 (3.1)	-0.26 (0.04)
SF36 Pain	66.5 (2.0)	-0.57 (0.05)	58.6 (4.0)	-0.51 (0.06)
SF36 General Health	63.4 (3.2)	-0.36 (0.06)	59.5 (5.2)	-0.51 (0.08)
SF36 Energy	64.8 (2.4)	-0.53 (0.06)	59.6 (4.0)	-0.58 (0.09)
SF36 Social	67.1 (2.5)	-0.42 (0.05)	70.0 (4.8)	-0.55 (0.06)
SF36 Role Mental	54.9 (2.2)	-0.17 (0.03)	51.9 (4.4)	-0.31 (0.05)
SF36 Mental Health	76.0 (4.4)	-0.48 (0.07)	64.8 (8.3)	-0.51 (0.11)