

# Chapter 5

## POSTTRAUMATIC HEADACHE ASSESSMENT AND INTERVENTION

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## INTRODUCTION

Posttraumatic headache (PTH) is defined as a headache that occurs within 1 week after regaining consciousness after an injury or within 1 week of head trauma.<sup>1</sup> It has recently been acknowledged that some new PTHs may have an onset outside the 7-day window required for diagnosis by these guidelines.<sup>2</sup> Most headaches resolve within 6–12 months and are associated with cervical muscle tenderness and postural abnormalities. Lew et al<sup>1</sup> found that many patients with PTH presented clinically with symptoms similar to tension headache (37%), migraine (29%), and cluster headaches (6%–10%). The number of individuals who develop PTH following a concussion/mild traumatic brain injury (c/mTBI) usually ranges from 30% to 50%,<sup>3</sup> though frequency may be underreported.<sup>2</sup> In a recent survey of Army infantry soldiers, 3 to 4 months after return from a yearlong deployment in Iraq, about 30% who had been injured with loss of consciousness also described headache as a disability affecting their overall health.<sup>4</sup> Females and those with a history of headache prior to a head injury are more at risk for PTH.<sup>2</sup> Chronic PTH can lead to poor return-to-duty rates.<sup>5</sup>

Although the type and quality of headache may be different for a service member exposed to blast injury (more often migraine<sup>6</sup>) than other mechanisms of concussive injury, a consistent means to assess pain level and the functional impact of headache is recommended. Clinicians are encouraged to use a standardized approach for a musculoskeletal evaluation. Neck pain, temporomandibular disor-

ders, and shoulder pain are common complaints reported in conjunction with c/mTBI, all of which contribute to PTH. Headache assessment includes both general measures of the frequency, severity, and limitations caused by headache pain (Numeric Pain Rating Scale [NPRS] or visual analog scale and Patient-Specific Functional Scale [PSFS]), and condition-specific measures that are used to determine the disability and severity of that disability related to the neck (Neck Disability Index [NDI]), the jaw (Jaw Functional Limitation Scale), and headache (Headache Disability Inventory [HDI]).<sup>7–10</sup>

Therapeutic interventions with the strongest evidence for treating PTH include a multimodal approach of specific training in exercise and postural retraining, stretching and ergonomic education, and manipulation and/or mobilization in combination with exercise.<sup>11,12</sup> Patient education regarding PTH and appropriate exercise program handouts are effective intervention techniques. Unique to headache is the inclusion of education regarding environmental triggers.<sup>13</sup> Pharmacologic treatment is common for headache; it is also used preventatively.<sup>2</sup> Therapists should work closely with and refer patients to physicians with headache management expertise to handle appropriate pharmacologic interventions.

PTH assessment using a standard musculoskeletal evaluation of the head, cervical spine, and other neck structures in conjunction with a pain scale and the HDI are considered **practice standards**, the therapeutic interventions are **practice options**, though recommended by experts.

## SECTION 1: POSTTRAUMATIC HEADACHE ASSESSMENT

### INTRODUCTION

In addition to a standard musculoskeletal evaluation of head and neck structures specifically looking for cervicogenic contributions to headache, a basic physical therapy clinical assessment of PTH should involve a standardized approach, including:

- A numeric or visual analog pain scale that assesses two dimensions of pain within a consistent timeframe: (1) pain limitation due to activity during the last 24 hours or last week, etc; and (2) pain intensity in the last 24 hours or last week, etc.
- Recording the number and type of headaches within a consistent timeframe.
- Recording the amount and type of head-

ache-related medications under a standard context, such as within the last 24 hours, or the amount and type of medication needed to complete a work day, or any context associated with pain management.

The PSFS is a unique tool that helps physical therapists develop an individualized approach and should be considered for patients with headache resulting from c/mTBI. It is a patient-specific outcome measure that investigates functional status.<sup>9</sup>

Condition-specific measures should be used to determine disability and severity of disability related to the neck, jaw, and headache. These measures can be administered before and after an episode

of care to determine the degree of improvement. Data can be aggregated to inform overall treatment program effectiveness. These condition-specific

measures may include the HDI, Jaw Functional Limitation Scale (see Chapter 6, Temporomandibular Dysfunction), and the NDI.

## HENRY FORD HEADACHE DISABILITY INVENTORY

### Purpose/Description

The HDI is a 25-item patient self-report that measures the impact of headache on daily living. There are two scales, including 12 functional and 13 emotional items that combine for a maximum total score of 100.<sup>8</sup> This self-report questionnaire can be found in Jacobson, et al<sup>8</sup> and is available on multiple external websites.

- 29 point change or greater in the total score
- 18 points for the functional scale
- 15 points for the emotional scale

If the patient's score is less than the MDC value, it is considered indistinguishable from measurement error.

**Responsiveness Estimates:** not available

### Recommended Instrument Use

This tool is useful for determining the overall impact of headache on a patient's activities of daily living. It should be used in conjunction with standard measures of impairment to cervical and jaw function and muscle performance (range of motion, strength, etc). Headache pain should also be monitored in terms of type, frequency, duration, and severity.<sup>14</sup>

### Reliability Estimates

Internal consistency: Correlations using Chronbach's alpha between the functional and emotional subscale and total score were both  $r = 0.89^8$  tested in a sample of patients that presented to a headache clinic for evaluation of their headache.

Interrater: not applicable (questionnaire)

Intrarater: not applicable (questionnaire)

Test-Retest: Test-retest scores in 77 patients (60 women, 17 men) seen in a diagnostic headache center on two occasions separated by a mean of 67 (standard deviation 27 days) days,  $r = .76$  for the functional score,  $.82$  for the emotional score.<sup>8</sup> Reliability coefficients were similar when tested one week apart ( $.76$ ), showing good test-retest reliability for the total score and the two subscale scores.<sup>15</sup>

### Administration Protocol/Equipment /Time

This is a paper-and-pencil self-test that may take up to 20 minutes to fill out. Scoring requires about 5 minutes.

### Validity Estimates

Content/Face: derived from existing scales for hearing and dizziness disability and from a clinical expert in a headache diagnostic center<sup>8</sup>

Criterion: Patients' spouses generally agreed with patients' ratings.<sup>15</sup> Age and sex or type of headache did not significantly affect the disability ratings.<sup>8</sup>

Construct: 109 patients with a mean age of 38 (standard deviation 11.6) years old, seen in a diagnostic headache center, evaluated their headache frequency and severity on a 3-point scale. This was compared to their ratings on the HDI using an analysis of variance to determine if self-perceived headache disability would increase with number of headaches and the number of severe headaches. A significant effect between headache magnitude and HDI was found for the total score and for both subscales.<sup>8</sup>

### Groups Tested With This Measure

Patients of all ages with a variety of headache etiologies are tested with the HDI. The majority of studies appear to be in patients with chronic headache.<sup>8,15</sup>

### Interpretability

Norms: A higher score indicates greater disability due to headache.

- Minimum score: 0
- Maximum emotional subscale: 52
- Maximal functional subscale: 48
- Maximum score: 100

Minimal detectable change (MDC): 95% confidence level (based on a mean of 67-day retest on patients with headache<sup>8</sup>):

## Selected References

Jacobson GP, Ramadan NM, Aggarwal SK, Newman CW. The Henry Ford Hospital Headache Disability Inventory (HDI). *Neurology*. 1994;44(5):837–842.

Jacobson GP, Ramadan NM, Norris L, Newman CW. Headache disability inventory (HDI): short-term test-retest reliability and spouse perceptions. *Headache*. 1995;35(9):534–539.

## PATIENT-SPECIFIC FUNCTIONAL SCALE

### Purpose/Description

The PSFS quantifies the amount of functional limitation for a specific patient (Form 5-1).<sup>9,22</sup> Patients are asked to nominate up to five activities with which they have difficulty due to their condition and, using a 0-to-10 scale, rate the functional limitation associated with these activities. The PSFS is intended to complement global or condition-specific measures.

### Recommended Instrument Use

The PSFS is not designed to compare patients or groups of patients. Because each patient selects items that are important to his or her quality of life, it can only be used to follow individual items over time for a specific patient. It has been validated in patients with a variety of musculoskeletal dysfunctions and could be useful in patients with temporomandibular disorders or headaches, although specific studies in these patient populations have not been identified.

The scale includes a pain intensity/pain limitation rating. In pain-focused patients, the PSFS may be useful to redirect questioning toward function and ability rather than pain and disability.

It is important to note that clients are asked to rate their present functional status rather than a change in functional status. Therefore, it is a different construct than scales that rely on patients to remember what their prior level of functioning was and then rate a change in that level.

### Administration Protocol/Equipment/Time

The PSFS may be administered verbally or as a pencil-and-paper task. Clients rate their functional limitations with each nominated activity on a scale of 0 to 10, where 0 represents an inability to perform the activity and 10 represents ability to perform the activity at the same level as before the injury or problem. At follow-up assessments, clients are informed of their previous ratings and asked to rate

each of their previously nominated activities on the same scale again. The score total is the sum of the activity scores divided by the number of activities. The PSFS takes only 5 to 10 minutes to complete and score.

Some tips for PSFS administration include the following:

- Encourage patients to use a selection of activities they are likely to perform prior to the subsequent assessment so that a comparison may be drawn.
- If treatment is being directed toward a work-related injury, it is important that occupational activities are included to align with the broader goal of return to work.
- Document function specifics, such as chair height and timing variables, so future comparison will be accurate.

### Groups Tested With This Measure

The PSFS has been shown to be valid and responsive to change in musculoskeletal conditions such as neck pain, cervical radiculopathy, knee pain, and low back pain.<sup>16–19</sup> When compared to other instruments in which a patient selects from a fixed set of functions, the PSFS has been shown to be more responsive than the NDI,<sup>17</sup> the pain rating index, and the Roland Morris Disability Questionnaire (RMDQ).<sup>18</sup>

In a patient population of workman's compensation patients, the PSFS was associated with timely recovery.<sup>20</sup> Originally the scale had patients list up to five activities; some studies have reduced it to three activities because patients most commonly report three activities.

### Interpretability

The PSFS is not designed to compare clients to one another, but rather individual items are followed over time.

**FORM 5-1**

**PATIENT-SPECIFIC FUNCTIONAL SCALE**

*Clinician to read and fill in. Complete at the end of the history and prior to physical.*

**Read at baseline assessment:**

*I'm going to ask you to identify up to three important activities that you are able to do or have difficulty with as a result of your problem. Today are there any activities that you are unable to do or have difficulty with because of your \_\_\_\_\_ problem? (Show scale.)*

**Read at follow-up visits:**

*When I assessed you on (state previous assessment date) you told me that you had difficulty with (read 1, 2, and 3 from the list). Today, do you still have difficulty with 1 (have patient score item), 2 (have patient score item), and 3 (have patient score item)?*

**Scoring scheme (show patient scale):**

0	1	2	3	4	5	6	7	8	9	10
Unable to perform activity at same level as before injury or problem										Able to perform activity at same level as before injury or problem

Date / score						
Activity						
1						
2						
3						
Additional						
Additional						

Reprinted with permission from: Dr. Paul Stratford, 1995.

MDC: The minimal detectable change (90% confidence interval) for an average score from three activities is 1 point, when informed ratings are made (that is, patients are reminded of their original ratings).<sup>19</sup> Note that patients in this study had neck pain.

- MDC for a single activity score was 2 points.
- A rating of pain limitation requires a 1-point change.

- A rating of pain intensity requires 2-point change for patients with neck pain.<sup>19</sup>

If the patient's score is less than the MDC value, it is considered indistinguishable from measurement error.

**Responsiveness Estimates**

According to Jolles,<sup>21</sup> responsiveness is likely greater for the PSFS when compared to fixed-item

instruments because of the patient's selection of areas of functional difficulty that are relevant to their situation. However, change scores may be exaggerated because of regression towards the mean, especially if patients select their most difficult activity. Further, selection of these difficult activities may make it harder to detect deterioration (a type of floor effect where all the scores are at the bottom end of the distribution due to the difficulty of the chosen activities).

### Reliability Estimates

Internal consistency: not available

Interrater: not applicable (questionnaire)

Intrarater: not applicable (questionnaire)

Test-Retest: measured by standard error of measurement (SEM) during a period of time that the patient was known to be stable, SEM = .41; intra-class correlation coefficient (ICC) = 0.97 (reported for neck disability)<sup>19</sup>

### Validity Estimates

Content/Face: not available

Criterion: moderate to excellent relationship between the PSFS<sup>19</sup> and:

- RMDQ ICC = .53–.74<sup>9</sup>
- NDI ICC = .73–.83<sup>19</sup>

Construct: for patients with neck pain<sup>19</sup>:

- Easier activities have greater ability scores than harder activities ( $P < .001$ ).
- The amount of change over two measurement intervals was as predicted; that is, greater change was seen for easier activities than harder ones ( $P < .005$ ).
- Ability to detect change over time was similar to the RMDQ and to a global rating of change evaluated by therapists and patients ( $P < .006$ ).

### ADDITIONAL RESOURCES FOR PATIENT-SPECIFIC FUNCTIONAL SCALE

In addition to Form 5-1, the PSFS can be found in the following:

- Stratford PW, Gill C, Westaway M, Binkley J. Assessing disability and change on individual patients: a report of a patient specific measure. *Physiother Can.* 1995;47(4):258–263.
- Horn KK, Jennings S, Richardson G, Vliet DV, Hefford C, Abbott JH. The Patient-Specific Functional Scale: psychometrics, clinimetrics, and application as a clinical outcome measure. *J Orthop Sports Phys Ther.* 2012;42(1):30–40.
- Rehabilitation Measures Database. <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=890>. Accessed July 24, 2013.

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Stratford P, Gill C, Westaway M, Binkley J. Assessing disability and change on individual patients: a report of a patient specific measure. *Physiother Can.* 1995;47(4) 258–263.

Horn K, Jennings S, Richardson G, van Vliet D, Hefford C, Abbott JH. The Patient-Specific Functional Scale: psychometrics, clinimetrics, and application as a clinical outcome measure. *J Orthop Sports Phys Ther.* 2012;42(1)30–40.

### NUMERIC PAIN RATING SCALE

#### Purpose/Description

The NPRS is a subjective measurement of pain intensity administered either by a therapist or used as a self-report tool.<sup>23,24</sup> Clients rate their pain intensity on an 11-point scale (0–10), with 0 indicating no pain and 10 indicating pain as bad as it can be (Exhibit 5-1).

The Visual Analog Scale is a similar measure with a 10-cm (100-mm) straight line anchored by

the same 0 and 10 as above, with patients marking their perceived pain level on the line and a clinician measuring the distance from the 0 (“no pain”) anchor in millimeters with a ruler.

#### Recommended Instrument Use

The NPRS is a quick, effective method to measure pain intensity during an episode of care or before and after performance tests. Measuring pain

intensity with the NPRS after performance tests, such as the Timed Up and Go and the Six-Minute Walk test, have demonstrated similar psychometric properties as other investigations that only studied the NPRS in diagnostic groups or different health-care settings.<sup>25</sup>

Pain scales associated with disability measures (eg, Patient-Specific Functional Limitation Scale or HDI) may not measure the same understanding of pain intensity as the NPRS.<sup>25</sup>

#### Administration Protocol/Equipment/Time

- Self-report: Clients are presented with a copy of the NPRS and instructed to circle the number that represents their pain intensity.
- Interview: The clinician describes the scale and its reference points and asks for a verbal rating of clients' perceived pain intensity.
- Scoring is the numbered response given by clients; that is, the score circled or the verbal rating provided by clients.
- When clients rate their "usual pain" after an intervention rather than pain over the previous 24 hours, larger changes have been recorded. Consistent instruction wording should be used so that scores can be compared.

#### Groups Tested With This Measure

This test has been used on individuals with a variety of orthopedic diagnoses that involve neck, back, upper extremity, and lower extremity dysfunction.<sup>26,27</sup> Studies have also involved acute (emergency department and post surgical) as well as chronic (rheumatoid arthritis) patient populations.<sup>23,28-31</sup>

#### Selected References

- Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. *Pain*. 1986;27:117-126.
- Stratford PW, Spadoni G. The reliability, consistency, and clinical application of a numeric pain rating scale. *Physiother Can*. 2001;53(2):88.

#### Interpretability

Norms: not applicable

MDC:  $\pm 3$  points on scale (90% confidence interval).<sup>24</sup> This amount of change reflects over 25% of the scale range, which indicates it may not be sensitive to small changes in pain intensity. If the patient's score is less than the MDC value, it is considered indistinguishable from measurement error.

#### Responsiveness Estimates

Patients (124 total) with neck, back, upper extremity, or lower extremity problems were tested on two occasions 7 days apart. Patients considered to be stable demonstrated a change of less than 3 points or 27% of the scale range.<sup>24</sup> In 79 new patients with pain complaints treated by chiropractic student interns supervised by clinical tutors, the effect size for NPRS was .77 when patients were asked to rate their current pain level, and 1.34 when instructed to measure their usual pain level.<sup>26</sup>

#### Reliability Estimates

Internal consistency: not applicable

Interrater: not available

Intrarater: not available

Test-Retest: ICCs reported in patients with orthopedic dysfunction, acute or chronic, ranged from 0.6 to 0.96.<sup>23,24,30,31</sup>

#### Validity Estimates

Content/Face: not available

Criterion: not available

Construct: assessed in patients in emergency department and immediate postoperative period the NPRS correlated with the visual analogue scale: 0.79 to 0.95.<sup>28,29</sup>

**EXHIBIT 5-1**

**NUMERIC PAIN RATING SCALE**

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**PAIN INTENSITY**

Over the past 24 hours, how bad has your pain been?

(Point to one number or circle one number)

*Pain as bad as it can be*

10

9

8

7

6

5

4

3

2

1

0

*No pain*

## NECK DISABILITY INDEX

### Purpose/Description

The NDI is a patient self-report questionnaire that measures clinical change in individuals that have acute or chronic neck pain due to a musculoskeletal or neurogenic origin.<sup>10</sup> Ten items are measured on a 6-point scale from 0 (no disability) to 5 (full disability), with a maximum score of 50 indicating full disability (see Attachment).

### Recommended Instrument Use

The NDI can be used to describe levels of disability due to impairments of the cervical spine and neck pain due to musculoskeletal dysfunction, whiplash disorders, and cervical radiculopathy. The NDI should be scored out of 50, as recommended by the developer.<sup>10</sup> Benchmarks, if used, have not been sufficiently validated nor can they predict outcomes for such factors as return to work.<sup>32</sup> Ceiling (score of 40–50) and floor (score of 0–10) effects may be concerning; consider using the PSFS in conjunction with the NDI when scores are less than 10 and greater than 40.

### Administration Protocol/Equipment/Time

The NDI is a paper-and-pencil self-test that takes 5 to 10 minutes to administer and 5 minutes to score. It has been translated into several languages. NDI scores vary from 0 to 50, where 0 is considered no activity limitation and 50 is considered complete disability. Some authors suggest that if more than two or three items are missing, the score is not considered valid.<sup>32</sup>

### Groups Tested With This Measure

The NDI has been studied in patients with both acute and chronic neck pain (including those with traumatic etiology) and in a variety of settings (hospitals, rural clinics, urban settings, tertiary care).<sup>32</sup>

### Interpretability

Norms: A score of 0 indicates no disability and 50 is considered complete disability. MacDermid and colleagues<sup>32</sup> propose three benchmark schemes (described below). Note that these studies involved subjects with whiplash syndrome.

- A “normal” score of between 0 to 20 points represents no to mild disability.<sup>33</sup>
- A score between:
  - 0 and 4: no disability
  - 5 and 14: mild disability
  - 15 and 24: moderate disability
  - 25 and 34: severe disability
  - greater than 35: complete disability<sup>10</sup>
- Individuals who have recovered have an NDI score of 8 or less, those with mild disability have a score of 10 to 28, and those with moderate to severe disability have a score greater than 30.<sup>34</sup>

MDC: The most common estimate for MDC is 5/50, or a 10% change.<sup>35</sup> Other estimates vary from 1.66 to 10.5, depending on diagnosis.<sup>32</sup> If the patient’s score is less than the MDC value, it is considered indistinguishable from measurement error.

**Responsiveness Estimates:** clinically important difference is approximately 5 points<sup>35</sup> to 7 points.<sup>17,32</sup>

### Reliability Estimates

Internal consistency: Consistently high Chronbach’s alpha (0.70–0.96) was found in multiple studies. More rigorous studies using a highly powered Rasch analysis (n = 521 patients) suggest that the NDI items did not contribute to a single underlying construct. The item on headaches did not fit with other items in the scale. A newer, eight-item version is being developed to further test just one construct.<sup>32,36</sup>

Interrater: not applicable (questionnaire)

Intrarater: not applicable (questionnaire)

Test-Retest: reliability coefficients of 0.94 to 0.99; SEM of 0.64 to 8.4.<sup>32</sup> Others report retest reliability ICCs of 0.50 to 0.68.<sup>17,37</sup>

### Validity Estimates

Content/Face: The NDI was developed using the Oswestry Low Back Pain Index as a template,<sup>10</sup> with additional questions based on recommendations of a consulting team.

Criterion: A single pain item and the total score both predicted visual analog pain ratings.<sup>32</sup>

Construct: correlated with Patient-Specific Functional Scale, Northwick Park Neck Pain Questionnaire, Neck Disability and Pain Disability Score, Disability Rating Index.<sup>32</sup>

### **Selected References**

MacDermid JC, Walton DM, Avery S, et al. Measurement properties of the neck disability index: a systematic review. *J Orthop Sports Phys Ther.* 2009;39(5):400–417.

Vernon HT, Mior SA. The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther.* 1991;14:409–415.

## SECTION 2: POSTTRAUMATIC HEADACHE INTERVENTION

### BACKGROUND

It may be difficult to distinguish between different types of headache because the clinical presentation of one headache disorder can mimic or co-exist with others. In addition to resulting from trauma to the head, headaches are also reported following trauma to the body that did not involve head or whiplash trauma.<sup>38</sup> High levels of muscle tenderness, as well as postural and mechanical abnormalities, have been reported in patients with tension headaches, migraine, whiplash syndromes, and cervicogenic headaches.<sup>3,11,39</sup> Headaches following

exposure to blast appear to occur more frequently than following other types of head injury and often resemble migraines.<sup>6</sup>

Physical therapy appears to have at least a modest impact on outcome in patients experiencing headache.<sup>11</sup> Multimodal approaches that include manual therapy in combination with exercise and postural training are generally more effective. Patient education on medication management, avoidance of headache triggers, and home exercises is considered essential.

### STRENGTH OF RECOMMENDATION: PRACTICE OPTION

A structured review of the literature that examined treatment for headache<sup>11</sup> concluded that physical therapy appears to have a modest impact on outcome in patients experiencing headache of

both traumatic and nontraumatic origin with individualized evaluation and intervention considered the best approach.

### INTERVENTION METHODS

Address physical deficits (including movement-related disabilities, postural deficits, and muscle tenderness) that result in increased head, neck, and jaw pain. A thorough cervical spine evaluation is appropriate. Movement-related disabilities may additionally include low back pain or dysfunction, poor trunk stability, and poor scapular stability.

Symptom management of head and neck pain includes self-care instruction (practicing cervical range of motion in the pain-free range, using ice, avoiding headache triggers) and education, stretching (without aggravating pain) and strengthening (such as pain-free isometrics, scapular stabilization, and trunk stabilization) exercise, manual therapy, and application of therapeutic modalities.

Pharmacologic interventions are the primary

medical approach for the treatment of PTH<sup>2</sup>; therefore, it is important for therapists to monitor patients' medication changes along with their pain levels. Use of pain-relieving medications can impact pain ratings, so the timing of medication use is relevant to pain-level evaluation (ie, patient ratings on a pain rating scale may be impacted by recent ingestion of pain-relieving medications).

Individualized goal setting (as with the PSFS) has shown promise in developing a more positive tone to the physical therapy episode of care, focusing on change in function that is most important to an individual patient. Support service member participation in and refer the service member for interventions for anxiety, depression, posttraumatic stress, and other psychological comorbidities associated with PTH.

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## ATTACHMENT: THE NECK DISABILITY INDEX

An instrument for measuring self-rated disability due to neck pain or whiplash-associated disorder

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### 1. Introduction

The Neck Disability Index (NDI) was developed in the late 1980s by Dr. Howard Vernon and first published in the *Journal of Manipulative and Physiological Therapeutics* in 1991.<sup>1</sup> The NDI was modeled on a similar instrument for assessing self-rated disability in low back pain patients: the Oswestry Low Back Pain Disability Questionnaire, which had been in existence for about eight years. Dr. Vernon received permission from the developer of the “Oswestry Index” to modify it for use in neck pain patients.

After selecting some of the original items from the Oswestry Index and then developing new items for neck pain patients, the prototype of the NDI was tested on a group of neck pain patients as well as chiropractors. Several modifications were made until a final version was acceptable. This version was then tested for reliability and validity and the results of these tests were published in the 1991 article. When it was published, the NDI became the first instrument for testing self-rated disability in neck pain patients.

Since 1991, a number of other questionnaires for neck pain patients have been developed, but the NDI remains the oldest and most widely used of these instruments.<sup>2</sup> Here are some more details:

- As of mid-2008, over 350 articles in the scientific literature have cited the NDI
- It has been used in 40 studies related to whiplash injury
- It has been translated into over 20 languages
- It has been used in 103 treatment studies, including 43 surgical studies, 57 studies of non-surgical treatments; 46 of these studies have been randomized clinical trials

### 2. Primary findings on the NDI

Vernon’s review paper of 2008<sup>3</sup> is included in this manual and provides specific data from all of the studies of the psychometric properties of the NDI. The following is a summary of these findings:

The NDI has been shown to be highly reliable on what is called “test-retest” reliability.<sup>1</sup> The individual items have been shown to group together well as a single measure of self-rated physical disability.<sup>4</sup> The NDI has also been shown to be valid by comparing NDI scores to other measures of pain and disability.<sup>1,5</sup>

An important finding was published in the late 1990s by Riddle and Stratford.<sup>6</sup> They found that, for patients with scores in the mild-to-moderate range (where most patients score), there was a certain number of NDI points that could be regarded as “minimally important clinical change” by patients. This number is 5 or 10%. So, if your patient first scores 15 out of 50, and then, two weeks later, scores 12, this would not be regarded as a clinically important change. However, if they scored 10 or less, then this would be regarded as a clinically important change.

### 3. Scoring the NDI

The NDI consists of ten items, each with a score up to 5, for a total score of 50. The lower the score, the less self-rated disability. Dr. Vernon established the following guide to interpretation of a patient’s score [1]:

- 0–4 = No disability
- 5–14 = Mild disability
- 15–24 = Moderate disability
- 25–34 = Severe disability
- 35 or over = Complete disability

#### 4. Item issues

Users should attempt to have all ten items completed at all administrations. Some patients may find 1–2 items not applicable to their lives. This is especially true of “driving.” This item may be omitted and the instrument scored out of 45, converted to 100% and then divided by 2.

The other item which may cause some problem is “work.” While the term “work” was meant for any circumstance, many people interpret it as “work at my job.” Therefore, if they are not employed, they may decline to complete this item. In that case, please re-interpret this item as “housework” for anyone not working out of the house.

For missing items not explained above (simple omissions, etc), only up to two missed items should be allowed. With three or more missed items, the administration would be regarded as unacceptable.

For 1–2 missed items, there are two strategies that amount to the same result:

- take the score out of 45 or 40, convert to 100% and divide by 2
- insert the average item score (total score divided by 9 or 8) into each missing item

#### 5. Using the NDI

The NDI should be an important part of your first assessment of any patient with neck pain, especially due to trauma. The question arises, “when should I repeat the NDI?” Remember that the NDI measures self-rated disability, not just current pain level. This applies to a person’s ability to perform their daily activities. A single, composite measure of this ability (the NDI score) is not likely to change over a short period of time. So, we recommend that the NDI be used on two-week intervals over the course of your treatment of a patient with neck pain.

#### 6. Links

- <http://www.proqolid.org/>
- [http://www.pedro.fhs.usyd.edu.au/CEBP/index\\_cebp.html](http://www.pedro.fhs.usyd.edu.au/CEBP/index_cebp.html)
- <http://www.worksafe.vic.gov.au>
- <http://www.medigraphsoftware.com>
- <http://www.painworld.zip.com>
- <http://medal.org>
- <http://outcomesassessment.org>
- <http://www.maa.nsw.gov.au>
- [http://apa.advsol.com.au/physio\\_and\\_health/research/evidence/outcome\\_measures.cfm](http://apa.advsol.com.au/physio_and_health/research/evidence/outcome_measures.cfm)
- <http://caretrak-outcomes.com>
- <http://ccachiro.org>
- <http://www.unisa.edu.au/cahe/>
- <http://www.tac.vic.gov.au>
- <http://clinicaltrials.gov/ct/show/NCT00349544;jsessionid=26CC121CFA39CE943448CF75822A8C60?order=1>
- <http://www.cks.library.nhs.uk>

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## NECK DISABILITY INDEX

This questionnaire is designed to help us better understand how your neck pain affects your ability to manage everyday-life activities. Please mark in each section the one box that applies to you. Although you may consider that two of the statements in any one section relate to you, please mark the box that most closely describes your present-day situation.

### SECTION 1–PAIN INTENSITY

- I have no neck pain at the moment.
- The pain is very mild at the moment.
- The pain is moderate at the moment.
- The pain is fairly severe at the moment.
- The pain is very severe at the moment.
- The pain is the worst imaginable at the moment.

### SECTION 2–PERSONAL CARE

- I can look after myself normally without causing extra neck pain.
- I can look after myself normally, but it causes extra neck pain.
- It is painful to look after myself, and I am slow and careful.
- I need some help but manage most of my personal care.
- I need help everyday in most aspects of self-care.
- I do not get dressed. I wash with difficulty and stay in bed.

### SECTION 3–LIFTING

- I can lift heavy weights without causing extra neck pain.
- I can lift heavy weights, but it gives me extra neck pain.
- Neck pain prevents me from lifting heavy weights off the floor but I can manage if items are conveniently positioned (ie, on a table).
- Neck pain prevents me from lifting heavy weights, but I can manage light weights if they are conveniently positioned.

### SECTION 4–READING

- I can read as much as I want with no neck pain.
- I can read as much as I want with slight neck pain.
- I can read as much as I want with moderate neck pain.
- I can't read as much as I want because of moderate neck pain.
- I can't read as much as I want because of severe neck pain.
- I can't read at all.

### SECTION 5–HEADACHES

- I have no headaches at all.
- I have slight headaches that come infrequently.
- I have moderate headaches that come infrequently.
- I have moderate headaches that come frequently.
- I have severe headaches that come frequently.
- I have headaches almost all the time.

### SECTION 6–CONCENTRATION

- I can concentrate fully without difficulty.
- I can concentrate fully with slight difficulty.
- I have a fair degree of difficulty concentrating.
- I have a lot of difficulty concentrating.
- I have a great deal of difficulty concentrating.
- I can't concentrate at all.

### SECTION 7–WORK

- I can do as much work as I want.
- I can only do my usual work, but no more.
- I can do most of my work, but no more.
- I can't do my usual work.
- I can hardly do any work at all.
- I can't do any work at all.

### SECTION 8–DRIVING

- I can drive my car without neck pain.
- I can drive my car with only slight neck pain.
- I can drive as long as I want with moderate neck pain.
- I can't drive as long as I want because of moderate neck pain.
- I can hardly drive at all because of severe neck pain.
- I can't drive my car at all because of neck pain.

### SECTION 9–SLEEPING

- I have no trouble sleeping.
- My sleep is slightly disturbed for less than 1 hour.
- My sleep is mildly disturbed for up to 1–2 hours.
- My sleep is moderately disturbed for up to 2–3 hours.
- My sleep is greatly disturbed for up to 3–5 hours.
- My sleep is completely disturbed for up to 5–7 hours.

**SECTION 10–RECREATION**

- I am able to engage in all my recreational activities with no neck pain at all.
- I am able to engage in all my recreational activities with some neck pain.
- I am able to engage in most, but not all, of my recreational activities because of neck pain.
- I can hardly do recreational activities because of neck pain.
- I can't do any recreational activities because of neck pain.

Patient name \_\_\_\_\_ Date \_\_\_\_\_  
Score \_\_\_\_\_

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