Minimum Important Differences for the Patient-Specific Functional Scale, 4 Region-Specific Outcome Measures, and the Numeric Pain Rating Scale

The assessment of change in patients’ symptoms and function over time is essential to both clinical practice and research. Patient-reported outcome measures are ubiquitous, but interpretation of the meaningfulness of change between one administration and another requires an understanding of the measurement properties of the outcome measure. The most important clinimetric property for interpreting change over time is the minimum important difference (MID), also called the minimum clinically important difference or minimum important change. The MID is best established against a patient-rated external “anchor,” but may vary depending on the external anchor that defines patient-perceived importance. Currently, there is no consensus regarding the cut point of the external anchor that best defines important change.

In choosing the appropriate patient-reported outcome measure, clinicians and researchers have myriad available options. The principal types of outcome measure for musculoskeletal disorders are region-specific (specific to body region, such as the Neck Disability Index [NDI]) and the Lower Extremity Functional Scale [LEFS]), dimension-specific (specific to a single domain of health or function, such as pain rating scales or the Borg Scale of Perceived Exertion), and patient-specific measures (with items...
specific to each individual patient, such as the Patient-Specific Functional Scale (PSFS). The PSFS has become popular in clinical practice and has demonstrated some evidence of excellent responsiveness to change. At this stage, the evidence of the responsiveness of the PSFS across musculoskeletal conditions of all body regions is still incomplete, with only 2 studies reporting the MID for back disorders, 2 for neck disorders, 1 each for knee and upper extremity disorders, and no studies reporting evidence for the hip, leg, ankle, or foot.

The aim of this study was to investigate the MID of the PSFS. To provide additional context, we assessed the PSFS alongside a succinct set of 4 region-specific outcome measures and a pain rating scale used to assess patients with musculoskeletal disorders in the physical therapy clinical setting, and defined the MID across 3 levels of patient-perceived importance.

**METHODS**

We selected 4 region-specific outcome measures (the Oswestry Disability Index [ODI], Neck Disability Index [NDI], Upper Extremity Functional Index [UEFI], and Lower Extremity Functional Scale [LEFS]), 1 dimension-specific outcome measure of pain (the numeric pain rating scale [NPRS]), and 1 patient-specific outcome measure (the PSFS) (TABLE 1). All selected measures are well-validated instruments in common use in musculoskeletal clinical practice and research, with the possible exception of the UEFI. We chose this particular set of region-specific outcome measures because the ODI and NDI are a sibling pair based on the ODI and are therefore structured, formatted, and scored in the same manner, whereas the UEFI and LEFS are similarly a sibling pair based on the LEFS. These commonalities were intended to improve feasibility, acceptability, and completion of the instruments in clinical practice.

In this prospective, multicenter, inception cohort study, we recruited consecutive eligible patients with musculoskeletal disorders presenting to physical therapists and undergoing an episode of care. Patients were recruited from 5 physical therapy clinics (located in 3 New Zealand cities) over a 6-month period in 2007. Patients were eligible if they reported a problem in their neck, back, or upper or lower extremity, which essentially included all musculoskeletal conditions, and had a patient-reported outcome measure recorded at baseline. Patients were assessed at the initial and final physical therapy visits. Only those with complete initial and final data were included. The 15-point global rating of change (GROC) was assessed at discharge. The GROC is the recommended reference standard for studies of MID.

As there is no consensus and wide variability in the literature regarding a cut point on the external anchor that best defines important change, we used the 3 levels of change described on the GROC instrument as “somewhat better” (coded 11 or greater), “moderately better” (coded 12 or greater), and “quite a bit better” (coded 13 or greater) to indicate patient-perceived important change. These levels were used to define the minimal difference in initial to final scores to detect a small, medium, or large change in patient status, respectively. MID was calculated for the PSFS and
NPRS (overall and for each body region) and each region-specific outcome measure across the 3 levels of change, using a receiver operating characteristic (ROC) curve. We also reported the area under the curve (AUC), a measure of overall accuracy for each clinical scale in distinguishing individuals who have improved from those who have not improved. Calculations were performed using ROC analysis programs in Stata Version 11 (StataCorp LP, College Station, TX).

RESULTS

One thousand seven hundred eight consecutive patients with musculoskeletal disorders were recruited from 5 physical therapy clinics. Complete initial and final PSFS data with corresponding GROC were collected from 1062 patients (62%), complete region-specific outcome measure and GROC data from 1039 patients (61%), and complete NPRS and GROC data from 1057 patients (61%). The sample is described in TABLE 2.

TABLE 2 Description of the Sample at Baseline*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (n = 1062), y</td>
<td>33.0 ± 16.5 (9-91)</td>
</tr>
<tr>
<td>Gender, n</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>504</td>
</tr>
<tr>
<td>Female</td>
<td>558</td>
</tr>
<tr>
<td>LEFS (n = 547), 0-80</td>
<td>49 ± 17 (0-78)</td>
</tr>
<tr>
<td>UEFI (n = 186), 0-80</td>
<td>53 ± 19 (0-80)</td>
</tr>
<tr>
<td>NDI (n = 90), 0-100</td>
<td>28 ± 12 (6-60)</td>
</tr>
<tr>
<td>ODI (n = 235), 0-100</td>
<td>27 ± 17 (0-96)</td>
</tr>
<tr>
<td>NPRS (n = 1057), 0-30</td>
<td>8.45 ± 5.0 (0-27)</td>
</tr>
<tr>
<td>PSFS (n = 1062), 0-10</td>
<td>4.5 ± 2.1 (0-10)</td>
</tr>
</tbody>
</table>

*Values are mean ± SD (range) unless otherwise indicated.

There has been debate as to whether patient-specific outcome measures are appropriate for use in group-level data; however, we have recently shown that the PSFS is valid for group-level applications, which allow its use in clinical research.

Stratford et al, used the GROC levels proposed by Jaeschke et al, defining a change of 9 to 11 as small, 12 and 13 as medium, and 14 and 15 as large. The authors used discrete categories to assess construct and discriminative validity of the outcome measure, rather than cut points dichotomizing the sample, as contemporary studies of responsiveness using ROC methodology do. Only the large category is therefore comparable, and the present study’s MID for large change among people with low back pain (3.3) is likely lower than that of Stratford et al (4.3) due to the inclusion of GROC levels 13 to 15 versus 14 to 15, respectively. The PSFS MIDs reported in this study for the neck, back, and knee are consistent with those available in the literature, which were 1.2 (whiplash-associated disorders), 2.0 (neck, low back), and 3.0 (knee). The MID reported in this study for the PSFS patients with upper extremity disorders differs slightly from that reported in the literature, despite being derived from the same patient sample. This is likely a result of the ROC methodology used, with Hefford et al employing visual determination of “the point of the ROC curve nearest the upper left-hand corner,” which is inherently susceptible to human error and bias in its interpretation. In contrast, the ROC intercept of the optimal tangent line was computed mathematically in this report. To our knowledge, there are no other reports in the literature that provide PSFS MIDs for other lower extremity conditions, such as hip, leg, ankle, or foot disorders.

We included region-specific instruments and a commonly used pain rating scale in this study to illustrate the responsiveness of the PSFS against other known instruments in the same population. We limited this study to 4 region-specific outcome measures that are, with the possible exception of the UEFI, in common use in musculoskeletal clinical practice and research. Reports of their
reliability and validity can be found elsewhere in the literature and are beyond the scope of this study. Our data show that all 6 outcome measures in this study demonstrated AUC estimates that indicated good to excellent ability to distinguish between patients who did and did not change, across all 3 levels of change. However, the lower bound of the 95% confidence interval of the AUC statistic for the ODI for small and medium change ventured into the poor-to-fail range, indicating greater uncertainty about the estimate. While the MID for the LEFS, UEFI, and NPRS increased incrementally in relation to small, medium, and large patient-perceived change, the MIDs for the NDI and ODI were remarkably stable across the 3 levels of patient-perceived change. Although this appears to indicate that those instruments may show little distinction between the adjacent GROC levels 11 to 13, it may be due to fewer data at GROC levels 11 and 12. However, the stability of the estimates does simplify interpretation of change in NDI and ODI scores.

**Strengths and Limitations**

The prospective longitudinal design, which included a large cohort of consecutive patients with a wide range of musculoskeletal disorders in a multi-center physical therapy clinical practice setting, lends strength to generalizability of these findings to similar populations and settings. Although the sample adequately covered the spectrum of severity for all body regions other than the neck (TABLE 2), scores on the region-specific outcome measures were mostly of mild to moderate severity. This may limit the ability to generalize our results to populations with very high baseline pain and disability levels.

**CONCLUSION**

This is the first study to report the MID corresponding to small, medium, and large patient-perceived change based on the GROC for the PSFS, ODI, NDI, UEFI, LEFS, and NPRS. The PSFS demonstrated good responsiveness that is relatively consistent across body regions. These results will facilitate the interpretation of outcomes for patients with musculoskeletal disorders in physical therapy clinical practice and research.

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**REFERENCES**


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