Goal attainment scaling as a measure of treatment success after physiotherapy for chronic low back pain

Mannion, A F; Caporaso, F; Pulkovski, N; Sprott, H


Postprint available at:
http://www.zora.uzh.ch

Posted at the Zurich Open Repository and Archive, University of Zurich.
http://www.zora.uzh.ch

Originally published at:
Rheumatology 2010, 49(9):1734-1738.
Goal Attainment Scaling (GAS) as a measure of treatment success after physiotherapy for chronic low back pain.

Anne F Mannion¹,², Filomena Caporaso², Natascha Pulkovski², Haiko Sprott²

¹Spine Center Division, Department of Research and Development, Schulthess Klinik, Lengghalde 2, 8008 Zürich, Switzerland;
²Department of Rheumatology and Institute of Physical Medicine, University Hospital Zürich, Gloriastrasse 25, 8091 Zürich, Switzerland.

Address for reprints and correspondence:
Dr Anne F Mannion
Spine Center Division, Dept Research and Development, Schulthess Klinik, Lengghalde 2
8008 Zürich,
Switzerland
Tel: 41 44 385 7584
Fax: 41 44 385 7590
Email: anne.mannion@kws.ch

Running head: Goal attainment scaling as an outcome measure in cLBP
Abstract

Objectives In other chronic conditions, patient-specific tools with individualized items have proven to be more sensitive outcome instruments than fixed-item tools; their use has not yet been investigated in chronic low back pain (cLBP).

Methods 11 males and 21 females (mean age 44.0 ± 12.3 y) with cLBP, undergoing a spine-stabilization physiotherapy program, completed the Roland Morris disability scale (RM) and a 0-10 pain scale pre- and post-therapy. Post-therapy, Goal Attainment Scaling (GAS) scores were calculated regarding achievement of 2-6 priority GAS goals established pre-therapy; global outcome of therapy was assessed on a 5-point Likert scale.

Results Approximately one-fifth individualized goals were not covered by items of the RM. 41/121 (34%) individualized goals were achieved at the expected level, 42/121 (35%) were exceeded, and 38/121 (31%) were not reached. GAS scores correlated with change scores for pain (r=0.61, p<0.0001) and RM (r=0.49, p=0.006). 65% of the patients had a "successful outcome" according to GAS (i.e. a score ≥ 50); 55%, according to global outcome (=therapy helped/helped a lot); 39%, according to the RM score change (= score decrease ≥30%); and 44%, according to the pain score change (=score decrease ≥30%).

Conclusions GAS demonstrates the achievement of important goals undetected by fixed-item measures and is a valid and sensitive outcome measure for assessing the success of rehabilitation in patients with cLBP.

Key words: low back pain, outcome measures, goal attainment scaling, physiotherapy
Introduction

Consideration of the patient’s perspective in the planning of therapy is associated with greater adherence (1) and increased satisfaction with care (2). Similarly, outcome measures that are patient-centred provide the best indication of the success of treatment. In the field of low back pain (LBP), fixed-item condition-specific instruments such as the Oswestry Disability Index (ODI) (3) and the Roland Morris (RM) disability questionnaire (4) are commonly used to this end. In some fields of rehabilitation medicine, it has been shown that wide inter-individual variability in the manifestations of a given disorder leads to reduced responsiveness of fixed-item instruments; in contrast, individualized outcome measures allow the achievement of important goals to be demonstrated (5). Goal attainment scaling (GAS) (6) is one such instrument that overcomes the “one size fits all” limitation of fixed-item instruments by measuring program success using individualized patient goals. The instrument has not been investigated within the context of non-specific chronic LBP (cLBP), a condition with differing causes and associated disability. Assessed with traditional outcome measures, the treatment of cLBP is associated with only small to moderate effect sizes (7); this is sometimes attributed to the failure of trials to consider the heterogeneous etiology of LBP resulting in the group treatment effect being “diluted down” by the inclusion of “inappropriate” patients (8). However, it is also possible that a lack of specificity in the outcome measures is partly responsible.

This pilot study assessed the use of GAS in measuring treatment success as compared with the RM and a pain scale after a program of physiotherapy exercises for patients with cLBP.
Patients and Methods

37 patients with cLBP participated in the study, which was part of a broader investigation of various aspects of deep trunk muscle function in cLBP (9). Briefly, the patients were enrolled into the study prior to their commencement of a program of ‘spinal segmental stabilization exercise therapy’ in tertiary care physiotherapy outpatient departments. They were all diagnosed by their referring physician as having non-specific cLBP according to the diagnostic triage reported in the current European guidelines (10). The study was approved by the medical ethics committee of the canton of Zürich. The patients gave their signed informed consent to participate after receiving verbal and written information about the study.

Therapy

Twelve specially-trained physiotherapists administered the treatment once/week for 9 weeks; it was based on the methods described by Richardson et al (11) and involved the preferential activation of the deep abdominal muscles, using the abdominal drawing in manoeuvre. After mastering the basic exercise, patients integrated the deep trunk muscle contractions into their activities of daily living/sport. Patients performed home exercises comprising 10 repetitions, 10 times a day, documented in an exercise diary.
**Questionnaires**

Approximately 1-2 weeks before and 1-2 weeks after therapy, the patients completed a questionnaire containing (in addition to sociodemographic, medical and pain history questions):

- Roland and Morris disability scale (RM), which measures 24 activity limitations due to back pain (score 0 – 24: higher score, increased disability) (4);
- Pain Graphic Rating Scale (pain) (12) : a 0-10 scale to record average back pain intensity during the last week.

After therapy further questions inquired about the global outcome of treatment (“overall, how much did the treatment you received in the last few months help?”), with a five-item Likert scale dichotomized for describing the success of the treatment into “good outcome” (“helped”, or “helped a lot”) or “poor” (“helped only little”, “didn’t help”, “made things worse”) (13)) and the changes that had taken place since before therapy in relation to back pain, independence in everyday activities, ability to do sport, general physical capacity (at home/work), frequency and quality of social contacts, and mental well-being (13) (response options: much better, better, unchanged, worse, much worse).

**Goal Attainment Scaling (GAS)**

GAS was implemented in accordance with the original model described by Kiresuk and Sherman (6). According to a recent systematic review, GAS delivers reliable and valid scores when employed as an outcome measure in working age and older people within a physical and neurological
rehabilitation environment (14). Before therapy, two to five goals were chosen through negotiation and consensus between the treating physiotherapist and the patient; for each goal, five levels of possible outcome were specified. The goals were to be specific, measurable, achievable, realistic and timed (SMART) [Khan, 2008 #4529; Kiresuk, 1968 #4534;]. A score of –1 indicated where the patient saw himself at baseline, i.e. pre-treatment. After treatment each goal was examined by the corresponding treating therapist together with the patient, and its relative achievement rated as follows: at the expected level (=score of 0), less than expected (-1, no change from baseline; -2, much less than baseline) or more than expected (+1, more; +2, much more).

The scores were then converted to a GAS T-score, using the formula provided by Kiresuk et al (15), and interpreted as follows: 50, expected level of achievement; <50 performance below the expected level; >50 performance above the expected level.

A content analysis was carried out to investigate how many of the individual GAS goals were reflected in the items in the RM.

**Statistical analysis**

Descriptive data are presented as means and standard deviations (SD), or medians and interquartile ranges (IQR), as appropriate. Responsiveness was given by the standardized response mean [SRM = (posttest mean – pretest mean)/SD changes]. The relationships between GAS scores and the change scores for RM disability and pain were examined using partial correlation
coefficients, holding baseline values for these variables constant, as recommended by Heavlin et al (16).
Significance was accepted at the 5% level, with no corrections for multiple testing (17).

Results
32/37 (86%) patients completed the physiotherapy program and questionnaires. 5 patients were considered dropouts: 2 had never actually fulfilled the study’s admission criteria (1 language, 1 medical), and 3 chose not to continue due to the time commitment.

The baseline characteristics and main outcome results for the 32 completers have been reported elsewhere (9). Briefly, there were 11 men and 21 women and their mean (SD) age was 44.0 (SD 12.3) years. They had had LBP on average for 92 (SD 129) months, and had a RM disability score of 8.9 (SD 4.7) and an average pain intensity of 4.7 (SD 1.7). The main outcomes after therapy comprised a 2.3-point (SD 4.2) reduction in RM disability and 1.1-point (SD 2.1) point reduction in average pain (each p<0.01); these constituted standardized response means (SRM) of 0.54 and 0.53 respectively (9).

In total, 134 individual goals were recorded for the whole group before treatment began (median 4 goals/patient (IQR 2; range 2-5)). With a score of −1 attributed to each GAS item pre-treatment, the group mean baseline GAS score was 35.7 (SD 1.0).

The proportion of goals related to each of the RM items is shown in Table 1. Nine RM items did not feature in any of the GAS goals. Altogether, 105/134
(78%) goals could be matched to an RM item; those that could not tended to be related to sporting performance, work, or psychological factors.

After therapy, it was possible to assess the level of achievement for 121 of the original 134 goals set (goals from the drop-outs, or goals related to seasonal sports, or influenced by subsequent musculoskeletal injuries, could not be assessed after therapy): 41 (34%) were achieved at the expected level; 38 (31%) were not reached and 42 (35%) were exceeded.

The mean GAS score after treatment was 51.0 (SD 13.7; range 24.6-80.2). This represented a mean change from pre-treatment of 15.3 (SD13.9), giving a standardized response mean (SRM) for the GAS of 1.10.

The GAS scores correlated with the change in pain (corrected for baseline pain; partial r=0.61, p<0.0001) and RM (corrected for baseline disability; partial r=0.49, p=0.006), and with the post-therapy ratings of global treatment effectiveness (corrected Rho=0.39, p=0.034). They also showed low but significant correlations with the post-therapy ratings of improvement in the domains back pain, independence, ability to do sport, and mental well-being (Table 2).

The proportions of patients achieving a minimum 30% reduction in RM and in pain (i.e., clinically relevant changes (18)) were 39% and 44% respectively. The global outcome was rated as “good” (=therapy helped/helped a lot) in 55% patients. 64.5% patients achieved their goals or more, as judged by a GAS score ≥ 50.
Discussion

A major challenge in the evaluation of treatment outcome is the identification of methods that adequately measure the success of a program. Clinicians have long sought standardized tests against which an entire patient population can be measured; equally, however, such measures are criticized for being insensitive to the uniqueness of the goals of each patient within a given program (19). Overall, the findings of the present study supported those in other fields of rehabilitation, namely that there was a moderate correlation between the scores given by the fixed-item and patient-specific measures (suggesting adequate construct validity for the GAS), but that GAS was more responsive to change after treatment than were the fixed-item instruments.

Following the methods reported in previous studies on GAS (e.g., (5,20)) and for the purposes of comparison, we assessed the instrument’s responsiveness using the standardized response mean (SRM) (whilst mindful of the objections to doing so (6)). Encouragingly, the conclusions based on the SRMs (i.e., that GAS was the most responsive instrument) were wholly substantiated by those based on non-parametric methods of inferential analysis, such as frequency analysis of the proportion of patients with a successful outcome. It was established that almost two-thirds (65%) patients had a GAS score ≥ 50, indicating that they had achieved or exceeded their goals, whereas only approximately 40% patients achieved the minimum clinically important change of a 30% reduction in score for pain or disability, and 55% reported a “good global outcome”. Hence, GAS does indeed appear to demonstrate the achievement of important goals that are less well detected by fixed-item measures.
We attempted to examine the content validity of GAS by performing a qualitative content analysis of the individual goals declared pre-treatment. At face value, the goals appeared to be typical of those commonly identified in normal clinical practice for patients of this type. Also, most of the goals were approximated by the items of the RM, an instrument devised on the basis of typical complaints in a large group of LBP patients in primary care (4). It was interesting that 22% of the goals set using the GAS — most notably those to do with sports, work, or psychological manifestations of the pain — could not be linked to any items of the RM, even in their broadest context of understanding. This highlights one of the benefits of GAS, i.e., it is able to obtain a comprehensive record of items that are important to the patient, regardless of how ambitious they may appear to be on an “average patient” basis. Interestingly, many of the goals, although expressed in terms of “function”, were actually placed within a context of pain; this might explain why the GAS score correlated better with improvements in pain than with improvements in RM score. Despite what we might like to think or hope, it would seem that it is still the level of pain that is most important to these patients.

One of the potential disadvantages of GAS is that clinicians require sufficient knowledge, training and experience to carry out the procedure of goal-setting. Nonetheless, the various steps in the process are all well documented (15). The GAS formula is designed such that if goal achievement is predicted accurately and in an unbiased manner, the GAS at outcome should exceed and fall short of expectations in roughly equal proportions, and there should be an approximately normal distribution of GAS T-scores with a mean of 50.
and SD of ±10 (6). This was the case in the present study (GAS score 51 ± 14, range 25-80) suggesting there was no or little bias in estimating the potential for gain, and providing some support for the validity of the method applied. To the authors’ knowledge, the impact of the actual number of goals set on the subsequent GAS scores has not been investigated in detail, and within the confines of the present study we could not shed any further light on this. The use of more than 2 goals is reported to deliver more reliable scores, as is the use of a 5-point rather than 3-point scale for rating their achievement, but the number set must also be considered in relation to the length and scope of the programme and the needs of the patient (15). We were also unable to assess the test-retest reliability of the GAS scores in the present study; however, a recent systematic review has testified to the reliability of GAS when employed as an outcome measure in other physical rehabilitation settings (14).

Another possible limitation of GAS as an outcome instrument is that it is designed for assessing the effectiveness of treatment after a designated period of time only. In many instances, however, it is desirable to follow-up patients for longer to see how well any treatment effect is maintained. For this, the serial application of fixed-item instruments, which simply focus on “current status” at each assessment, are required. GAS scores also tell us nothing about the absolute level of adjustment or disability of the individual. Important decisions regarding the quality of therapy and health policy are based on patient outcomes, and so it is essential to identify the most appropriate assessment tool. Our findings lead us to concur with previous authors (5,20) that, in addition to documenting pre-treatment expectations on
change and sharpening the focus of treatment, GAS is able to capture subtle
but important change in client-centered functioning. It appears more suited to
complement rather than replace established outcome measures — since both
have their own unique advantages and disadvantages — and will perhaps
have more relevance in one setting than in another. However, overall, GAS
should be considered a useful adjunct to the present fixed-item options for
assessing patient outcomes after rehabilitation for chronic LBP.

**Acknowledgements**

This work was supported by a grant from the Swiss National Research
Program NRP 53 “Musculoskeletal Health – Chronic Pain” of the Swiss
National Science Foundation (Project 405340-104787/2) and the Schulthess
Klinik Research Fund.

We would like to express our thanks to: Prof Beat A. Michel for providing the
infrastructure to carry out this work within the Department of Rheumatology
and Institute of Physical Medicine, University Hospital Zürich, Switzerland;
Deborah Gubler and Valeriu Toma for their assistance with the data
collection; Gordon Adam for assisting with the content analysis of the GAS
items; the physiotherapists Martin Litschi, Tamar Bon, Konstanze Wagner, Elfi
Raffainer, Luca Scascighini, Raymond Denzler, Wiebke Schubien, Manuela
Meier, Melanie Knecht, Selina Bühler, Christina Gruber and Diana Brun-
Walser for treating the patients and completing the necessary documentation;
Doctors Bischoff, Camenzind, Distler, Haltinner, Klipstein, Rörig, Schmidt,
Stärkle-Bär, Tamborrini, Thoma, Zimmermann (USZ), Bartanusz, Kramers-de
Quervain, Marx, Pihan (Schulthess Klinik), Brunner (Balgrist), Kern, Kurmann,
Schuler, Stössel and Zoller (GP practices) for referring patients into the study;
and all the patients who took part in the study.
References


Table 1. Frequency of items in the Roland Morris disability questionnaire that featured as the “area to be addressed” in the individual’s goals.

<table>
<thead>
<tr>
<th>RM item no.</th>
<th>Count</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>21</td>
<td>15.7</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>15</td>
<td>11.2</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>15</td>
<td>11.2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>13</td>
<td>9.7</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>11</td>
<td>8.2</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>9</td>
<td>6.7</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>5</td>
<td>3.7</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>5</td>
<td>3.7</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-</td>
<td></td>
<td>29</td>
<td>21.8</td>
</tr>
<tr>
<td>TOT</td>
<td></td>
<td>134</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 2. Spearman Rank correlation coefficients between the global improvements in each domain measured post-therapy and the GAS scores, the change scores for pain, and change scores for RM disability.

<table>
<thead>
<tr>
<th></th>
<th>Change score Ave LBP</th>
<th>Change score RM</th>
<th>GAS score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global improvement in pain</td>
<td>0.51</td>
<td>0.49</td>
<td>0.44</td>
</tr>
<tr>
<td>Global improvement in independence</td>
<td>0.59</td>
<td>0.54</td>
<td>0.40</td>
</tr>
<tr>
<td>Global improvement in ability to do sport</td>
<td>0.48</td>
<td>0.66</td>
<td>0.43</td>
</tr>
<tr>
<td>Global improvement in physical activities in general</td>
<td>0.46</td>
<td>0.50</td>
<td>0.33</td>
</tr>
<tr>
<td>Global improvement in quality/quantity social contacts</td>
<td>0.13</td>
<td>-0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Global improvement in mental well-being</td>
<td>-0.25</td>
<td>-0.08</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

Values in bold are p<0.05
Competing interests

The authors declare that they have no conflicts of interest.

Key messages

- Important decisions regarding therapy and health policy are based on patient outcomes.
- GAS is able to capture subtle but important changes in functioning in patients with LBP.
- GAS appears more suited to complement rather than replace established fixed-item outcome measures.