

Goal Attainment Scaling in Rehabilitation

Background

Measuring effectiveness of brain injury rehabilitation poses major problems due to the heterogeneity of patients' deficits and desired outcomes. Particularly at the level of handicap (participation), goals are very much dependent on the individual's lifestyle and aspirations and standardised measures become increasingly difficult to apply.

For example, for some patients being able to move about independently in a wheelchair may be a triumph, while for others this would mean abject failure.

Goal attainment scaling (GAS)

Measurement through GAS was first introduced in the 1960s by Kirusek and Sherman¹ for assessing outcomes in mental health settings. Since then it has been modified and applied in many other areas including:

- Elderly care settings^{2, 3}
- Chronic pain⁴
- Cognitive rehabilitation⁵
- Amputee rehabilitation⁶

What is GAS?

GAS is a method of scoring the extent to which patient's individual goals are achieved in the course of intervention. In effect, each patient has their own outcome measure but this is scored in a standardised way as to allow statistical analysis.

Generic measures include a standard set of tasks (items) and a standard set of levels. In GAS, tasks are individually identified to suit the patient, and the levels set around their current and expected levels of performance.

Why use it?

GAS avoids some of the problems of standardised measures including:

- Floor and ceiling effects
- Lack of sensitivity – particularly of global measures, where individuals make change in one or two important items but this change is lost in the overall scores, where a large number of irrelevant items do not change.

GAS has some other important advantages such as:

- **Encouraging communication and collaboration** and between the multi-disciplinary team members as they meet together for goal-setting and scoring
- **Encouraging patient involvement** - there is emerging evidence that goals are more likely to be achieved if patients are involved in setting them. Moreover, there is also evidence that GAS has positive therapeutic value in encouraging the patients to reach their goals⁴
- There is growing evidence for the sensitivity of GAS over standard measures^{7, 8}

How is GAS rated?

GAS is essentially conducted on a 5-point measure, with the degree of attainment captured for each goal area. An important part of GAS is the establishment of the clinical outcome that is viewed as 'successful' on an *a priori* basis (i.e. before the intervention starts).

If the patient achieves the expected level, this is scored at 0.

If they achieve a **better** than expected outcome this is scored at:

+1 (*Somewhat better*)

+2 (*much better*)

If they achieve a **worse** than expected outcome this is scored at:

-1 (*Somewhat worse*) or

-2 (*much worse*)

Although not in the original method described by Kirusek and Sherman, goals may be weighted to take account of the relative importance and emphasis of treatment and/or difficulty of the goal.

How is the overall score calculated?

Overall Goal Attainment Scores are then calculated by applying a formula:

$$\text{Overall GAS} = 50 + \frac{10 \sum(w_i x_i)}{[(1-\rho) \sum w_i^2 + \rho(\sum w_i)^2]^{1/2}}$$

Where:

w_i = the weight assigned to the i th goal (if equal weights, $w_i = 1$)

x_i = the numerical value achieved (between -2 and + 2)

ρ = the expected correlation of the goal scales

For practical purposes ρ is usually taken as 0.3. In which case the equation simplifies to:

$$\text{Overall GAS} = 50 + \frac{10 \sum(w_i x_i)}{\text{sq root } (0.7 \sum w_i^2 + 0.3(\sum w_i)^2)}$$

In effect, therefore the composite GAS (the sum of the attainment levels x the relative weights for each goal) is transformed into a standardised measure with a mean of 50 and standard deviation of 10.

Given that the results should exceed and fall short of expectations in roughly equal proportions, over a sufficiently large number of patients, one would expect a normal distribution of scores and the GAS thus performs at interval level.

(NB: Mathematically challenged readers take heart – you can simply look it up in a table in the book by Kiresuk⁹!)

Procedure for Goal Attainment Scoring

1. Identify the goals

Interview the patient to identify the main problem areas
Establish an agreed set of priority goal areas (with the help of the team) for achievement by an agreed date (usually discharge or the end of the programme)

2. Weight the goals

Assign a weight to each goal
Rushton and colleagues⁶ use the following method:

Weight = importance x difficulty

Importance and difficulty are each rated on a 5 point scale

Importance	Difficulty
0 = not at all (important)	0 = not at all (difficult)
1 = a little (important)	1 = a little (difficult)
2 = moderately (important)	2 = moderately (difficult)
3 = very (important)	3 = very (difficult)

(Note when applied in the formula, weighting for difficulty although this enhances the change score if the goal is achieved, it also enhances the negative score if a goal is not achieved – ie it has an effect opposite to that expected. Therefore, it may be simpler to use these weight scores to note difficulty, but to apply in the formula. Importance has the same effect, only the logic is better since to fail a more important goal should rightly exert a negative effect on overall outcome)

3. Define expected outcome

The ‘expected outcome’ is the most probably result if the patient receives the expected treatment

Define also the levels for

- ‘somewhat less’ and ‘much less’
- ‘somewhat more’ and ‘much more’

These are defined by the team or investigator, and should be *as objective and observable as possible*

4. Score baseline

This is usually rated –1, unless the patient is as bad as they could be in that particular goal area, in which case the baseline rate is –2.

5. Goal Attainment scoring

Rate the outcome scores and the appointed review date.
Calculate the GAS by applying the formula or looking the summated scores up in the published tables⁹

References

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