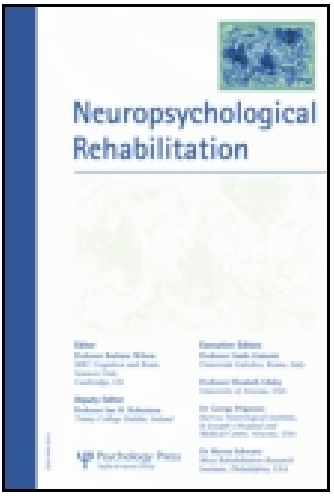

Neuropsychological Rehabilitation: An International Journal
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/pnrh20

Goal Attainment Scaling in brain injury rehabilitation: Strengths, limitations and recommendations for future applications

Michele Grant[abc] & Jennie Ponsford[abc]
[a] School of Psychological Sciences, Monash University, Clayton, Victoria, Australia
[b] Monash-Epworth Rehabilitation Research Centre, Epworth Hospital, Richmond, Victoria, Australia
[c] Centre of Excellence in Traumatic Brain Injury Rehabilitation, National Trauma Research Institute, Alfred Hospital, Prahran, Victoria, Australia
Published online: 01 May 2014.

To cite this article: Michele Grant & Jennie Ponsford (2014) Goal Attainment Scaling in brain injury rehabilitation: Strengths, limitations and recommendations for future applications, Neuropsychological Rehabilitation: An International Journal, 24:5, 661-677, DOI: 10.1080/09602011.2014.901228

To link to this article: http://dx.doi.org/10.1080/09602011.2014.901228

Neuropsychological Rehabilitation, 2014
Vol. 24, No. 5, 661–677, http://dx.doi.org/10.1080/09602011.2014.901228

Goal Attainment Scaling in brain injury rehabilitation: Strengths, limitations and recommendations for future applications

Michele Grant[1,2,3], and Jennie Ponsford[1,2,3]

[1]School of Psychological Sciences, Monash University, Clayton, Victoria, Australia
[2]Monash-Epworth Rehabilitation Research Centre, Epworth Hospital, Richmond, Victoria, Australia
[3]Centre of Excellence in Traumatic Brain Injury Rehabilitation, National Trauma Research Institute, Alfred Hospital, Prahran, Victoria, Australia

(*Received 20 February 2013; accepted 1 March 2014*)

There is increasing emphasis on the need to identify, work with and evaluate rehabilitation outcomes in ways that are personally relevant to individuals with brain injury, whether this be at a global or individual client level. This paper focuses on the use of one such method, Goal Attainment Scaling (GAS). It provides a general review of GAS and discusses what we found to be the strengths and limitations of using GAS to assess functional improvements in a rehabilitation study. Strengths included enabling the measurement of goal accomplishment on meaningful daily activities, capturing improvement on relevant functional tasks more effectively than broad measures of impairment, and facilitating collaborative goal-setting. Limitations included the time required to identify goals that could be broken down into five GAS outcome levels and defining the five levels, and compromised assessment of goal attainment due to poorly constructed GAS scales. Recommendations for minimising these potential limitations in future applications of GAS are also discussed. They include setting GAS baseline levels consistently across all scales, assigning GAS weights based on the client's ratings of importance, reviewing GAS weightings prior to each measurement phase, and using a suggested checklist to minimise the likelihood of poorly constructed scales.

Correspondence should be addressed to Professor Jennie Ponsford, School of Psychological Sciences, Monash University, Clayton, Victoria, 3800, Australia. E-mail: jennie.ponsford@monash.edu

Keywords: Goal Attainment Scaling; Brain injury rehabilitation; Outcomes; GAS.

INTRODUCTION

The assessment of the effectiveness of rehabilitation in individuals with acquired brain injury (ABI) presents many challenges. Rehabilitation is carried out in various contexts, from acute settings through to the community. There are also various levels at which efficacy may be assessed, ranging from overall rehabilitation programme outcomes to the attainment of discrete client goals. Furthermore, there is considerable variability in the nature and severity of injuries in clients with brain injury, as well as the scope of life-roles and functional activities they may wish to resume. The measures used to assess the effectiveness of rehabilitation must, therefore, be appropriate to the level and context of the intervention, as well as to the nature and severity of clients' impairments and their goals for rehabilitation.

Tools used to measure the success of rehabilitation in individuals with brain injury may be categorised into two types: those that provide a global assessment of impairment and disability, examples of which include the Disability Rating Scale (Rappaport, Hall, Hopkins, Belleza, & Cope, 1982) and the Functional Independence Measure (FIM; Granger & Hamilton, 1987), and those that can be individually tailored to assess performance on individualised goals. Measures of this type include the Canadian Occupational Performance Measure (COPM; Law et al., 1990), the Schedule for the Evaluation of Individual Quality of Life (SEIQoL; O'Boyle et al., 1993), and Goal Attainment Scaling (GAS; Kiresuk & Sherman, 1968). This paper focuses on the authors' experience of the use of GAS in a rehabilitation intervention study.

The aims of this paper are to (1) to discuss what we found to be the strengths and limitations of GAS in assessing the outcomes of an intervention for improving the financial management skills of individuals with traumatic brain injury (TBI) and (2) to provide recommendations to assist with future applications of GAS.

BACKGROUND TO GAS

GAS was originally developed to enable a comparison of various mental health programmes. The GAS process broadly involves breaking the overall goal of an intervention down into several specific goals, and defining measurable outcome criteria for each goal using a 5 point scale (-2 = much less than expected, -1 = less than expected, 0 = expected outcome, $+1$ = better than expected, $+2$ = much better than expected). Since its

development, GAS has been used to assess the accomplishment of individualised treatment goals in various settings, including mental health (Shefler et al., 2001; Stanley, 1984), general medical health (Becker, Stuifbergen, Rogers, & Timmerman, 2000; Fisher, 2008), pain management (Fisher, 2008; Fisher & Hardie, 2002), and geriatric (Stolee et al., 2012) and rehabilitation settings (Joyce, Rockwood, & Mate-Kole, 1994; Malec, 1999; Malec, Smigielski, & DePompolo, 1991; Rasquin et al., 2010; Turner-Stokes et al., 2012).

GAS has been shown to have a number of benefits when it is used to assess the achievement of client-centred goals, including (1) measuring accomplishment through systematic, objective and quantifiably defined levels of *expected* achievement that are established *prior* to the commencement of the intervention and are personally relevant to the client (Malec, 1999), (2) enabling examination of the effectiveness of an intervention across multiple levels, within and across individuals (this is achieved by computing a standardised "Goal Attainment Score" *T*-score that aggregates performance across multiple goals), (3) enabling comparisons of goal attainment across individuals whose goals and interventions may vary considerably (Choate, Smith, Cardillo, & Thompson, 1981), (4) providing a method for differentiating between goals based upon their relative importance and/or difficulty to the overall goal of the intervention (through the assignment of weights which are used, in part, to derive the final *T*-score) (Turner-Stokes, 2009a), and (5) enabling clients and their families to be involved in establishing both the goals of rehabilitation and the criteria for assessing goal attainment (Stolee et al., 2012).

Collaborative goal-setting has been shown to enhance client motivation, produce better outcomes and maximise maintenance of treatment gains upon the completion of rehabilitation (LaFerriere & Calsyn, 1978; Webb & Glueckauf, 1994; Wressle, Eeg-Olofsson, Marcusson, & Henriksson, 2002). The involvement of clients and their families during goal-setting and evaluation stages of GAS has also been reported to enhance their understanding of their roles in achieving the established goals, to help clients to be more realistic in their goal-setting, and to help clients develop awareness of their functional limitations (Bouwens, van Heugten, & Verhey, 2009; Rockwood, Joyce, & Stolee, 1997). The provision for collaborative goal-setting and goal reviews is particularly relevant in clinical settings where client involvement in all aspects of the rehabilitation process is integral to a client-centred approach, and, more importantly, as Evans (2012) suggests, clients are likely to derive the most benefit from their rehabilitation if they participate in goal-setting.

Despite the advantages of GAS, recent studies have also highlighted a number of potential limitations. First, the process of identifying a number of individual goals and defining five levels of outcome for each goal can be

time consuming, particularly for those inexperienced with GAS (Doig, Fleming, Kuipers, & Cornwell, 2010; Stolee et al., 2012; Turner-Stokes, Williams, & Johnson, 2009). Second, GAS has been criticised for not allowing recognition of partial goal attainment (Bovend'Eerdt, Botell, & Wade, 2009; Turner-Stokes & Williams, 2010). That is, the expected outcome is either achieved or not achieved; there is no provision to capture or acknowledge improvements from baseline that do not reach this level. To address these issues, the UK Rehabilitation Outcomes Collaborative (UKROC) has adopted a "GAS-light" system, whereby only the expected level (0) of achievement is defined in specific and measurable terms (Turner-Stokes et al., 2012). The client and clinician then rate goal attainment using a 6-point verbal scale (Got worse, No change, Partially achieved, As expected, A little more, and A lot more). A computer program converts the performances attained on this 6-point scale to the original GAS 5-point scale and computes the client's overall GAS *T*-score.

Concerns have also been raised about the psychometric properties and perceived subjectivity of GAS methodology (Cytrynbaum, Ginath, Birdwell, & Brandt, 1979; Lewis et al., 1987; Rockwood et al., 1997; Seaburg & Gillespie, 1977). However, following a systematic review of the psychometrics of GAS, Hurn, Kneebone, and Cropley (2006) concluded there was sufficient evidence to support the use of GAS as an outcome measure in adult physical and neurological rehabilitation settings. Subsequent to this review, Tennant (2007) has highlighted the potential for clients to be judged as having failed to achieve clinically significant change based on their GAS *T*-score, and vice versa, due to the use of non-linear ordinal scale scores in the calculation. However, he indicates that this is less likely at a group level, that is, when scores are aggregated across all individuals, as scores should balance out overall. Tennant suggests this limitation could be overcome by using "item banks" of goals pre-calibrated onto a unidimensional metric scale. However, the use of such item banks potentially limits the extent to which the goals can be truly client-centred. This is particularly so in brain injury rehabilitation settings, where clients' impairments and disabilities vary considerably, as compared with some other more homogeneous disease conditions. Selecting goals from an item bank would also potentially restrict the scope for collaborative goal-setting between the clinician and client/family.

REFLECTION ON OUR EXPERIENCE WITH GAS

In the Grant, Ponsford, and Bennett study (2012) GAS was used to identify and assess the attainment of specific client-centred goals in a project that examined whether a modified Goal Management Training (GMT) programme could help individuals with severe TBI improve different aspects of their

everyday financial management. GAS was used as the main outcome measure in order to examine whether the GMT led to meaningful improvements in the participants' everyday functioning on a variety of financial management tasks that differed across participants. GAS enabled us to set individualised outcome criteria, whilst also making group comparisons. Appendix A provides a summary of the GAS goal-setting process used in this study. Overall, GAS was found to be a useful tool for identifying and documenting individualised rehabilitation goals, and for assessing outcomes in terms of improvement in performance of important daily activities. However it was also found to have several potential limitations. These strengths and weaknesses warrant more detailed discussion.

BENEFITS OF USING GAS TO ASSESS BRAIN INJURY REHABILITATION OUTCOMES

Twelve GAS goals were developed in the GMT study (see Appendix B for examples). Because these goals were developed individually based on the specific difficulties experienced by each participant with financial management, none of the 12 goals was the same; they differed across all participants. This was one of the main advantages of using GAS; the effectiveness of the GMT intervention could be assessed by measuring the clients' progress towards achieving goals that were personally relevant to them.

A second benefit was that GAS captured meaningful changes in performance between baseline and post-intervention on tasks that were specifically targeted by the intervention. Compared to baseline, participant performances improved from either the "much less than expected" (−2) or "less than expected" (−1) levels to at least the "expected level" on 6 of the 12 GAS goals following the GMT intervention, and 6 of 12 goals at two-month follow-up. In contrast, only one of the four participants' performances improved on any of five traditional neuropsychological tests of executive function, and little change was observed on a measure of everyday dysexecutive behaviours, as rated by either participants themselves or their significant others. Thus, of the measures used, GAS was the most effective in capturing improvement on the everyday activities targeted by the GMT. This represents the key advantage of GAS; it is able to demonstrate attainment of important and meaningful personalised functional rehabilitation goals, which are unlikely to be adequately assessed by broad measures of impairment or disability.

The processes of specifying the baseline level of performance on the GAS scale and defining the other four levels of predicted/possible outcomes were also found to be beneficial. First, they helped the participants to understand what aspects of their performance needed to improve in order to achieve their goals ("All I need to do is to set my budget, amend it if need be, work

out what I'm going to need to spend money on over the next few weeks and set money aside, and save $30."). It also provided a method for reviewing participants' performances during the intervention phase in a non-threatening manner and was used as a central focus for discussing their performances and goals. In one participant's case, this contributed to improved performances at two-month follow-up from the "less than expected" range to within the "expected" range on three of four goals. Second, for some participants, having three clearly defined target outcome levels appeared to motivate them to strive to achieve and/or exceed the expected level of performance. For example, all four participants were insistent that they would achieve either a +1 or +2 on at least one of their goals at post-intervention and/or follow-up. This would not have occurred had a traditional global outcome measure or a single level of expected performance been used, and would have been less likely if a GAS-light methodology had been adopted. Documenting baseline levels of performance and expected outcomes prior to the commencement of an intervention is also helpful for employers and insurance funding bodies who may seek this information prior to approving rehabilitation plans. From a research design perspective, it also addressed the common failure in intervention studies to establish a priori outcome targets (Burke, Zencius, Wesolowski, & Doubleday, 1991; Cicerone & Wood, 1987; Kim, Burke, Dowds, & George, 1999; Levine, Dawson, Boutet, Schwartz, & Stuss, 2000).

Another benefit of using GAS was that it enabled the effectiveness of the GMT intervention to be assessed at both the individual goal level and as a whole for each participant via the aggregated Goal Attainment Score. This provided a more objective method of ascertaining the overall effectiveness of the GMT programme than trying to determine efficacy based on comparison of the achievement of individual goals across participants.

GAS also provided a method for differentiating the importance of individual goals through the application of goal weightings. This was valuable because the goals differed in the extent to which they were integral to achieving the overarching goal. One oversight in the Grant et al. (2012) study, however, was that the referring therapist assigned the goal weightings, rather than the individual participants. Upon inspection of the individual GAS scores, it was apparent that participants' performances tended to improve on the goals that more directly reflected outcomes they had hoped to achieve (e.g., managing lay-bys, reducing weekly shopping expenditure, planning for future expenditure) as opposed to more process-oriented goals set by therapists (e.g., establishing and meeting a fortnightly budget, identifying required items on a shopping list, making a single banking withdrawal), which were less clearly related to their desired outcome. For this reason, we recommend not only ensuring that rehabilitation goals are tied as closely as possible to client aims, but also assigning goal weightings based

on the client's prioritisation as opposed to those of a third person. Furthermore, as participant motivation or their perceptions of goal importance may fluctuate according to mood and other life events (Bouwens et al., 2009; Grant et al., 2012) it is recommended that these ratings be reviewed prior to each assessment phase. It should also be noted that GAS goals are also commonly rated according to their level of difficulty (Khan, Pallant, & Turner-Stokes, 2008; Turner-Stokes, 2009a; Turner-Stokes et al., 2009), whereby the sums of the importance and difficulty ratings are used to weight GAS goals. This approach was not adopted in the Grant et al. (2012) study because the 12 goals were considered to be of comparative difficulty.

Finally, the collaborative process of GAS, whereby clients were involved in identifying their specific goals and the criteria that would be used to assess outcomes, was helpful in building rapport between the client and therapist/researcher and promoted client engagement with the intervention. Importantly, it also assisted the clients to understand what they needed to do to achieve their individual goals (e.g., save money regularly; follow a budget) and overarching goal (e.g., assume independent control of finances). The GAS process also appeared to enhance clients' awareness of their difficulties and thereby enabled them to become more realistic about their future goals. For example, one client who believed at the beginning of the intervention that he could independently save money, but failed to do so, stated, "I am never going to be able to save money if it is given to me, it needs to go into a separate account I cannot touch." Finally, although the participants were only able to describe their overall goal (e.g., save money, spend less on shopping) and were not able to break this down into smaller more specific goals, the GAS concept of defining goals and five outcome levels was readily adopted and understood by all participants.

LIMITATIONS OF GAS

Despite these advantages, GAS was found to have three main limitations. First, there is no clear guide as to how to interpret the aggregated Goal Attainment Scores. The Goal Attainment Score is a *T* statistic which provides a measure of the overall effectiveness of an intervention and/or programme. Therefore a Goal Attainment Score of 50 reflects an overall outcome at the expected level. However, the developers did not specify a range within which acceptable Goal Attainment Scores fall. This was problematic because the Goal Attainment Scores ranged from 24.44 to 56.67. Some previous studies have interpreted Goal Attainment Scores as being "close" to the theoretically expected result of 50 (e.g., 46.6), and, therefore, at the expected level (Stolee, Rockwood, Fox, & Streiner, 1992). However, the decision as to

whether a score is "close" to 50 is subjective, particularly when an acceptable range is not specified prior to commencement of the intervention.

To provide a more objective means of interpreting Goal Attainment Scores, as in Bouwens et al.'s (2009) study, the standard deviation of the *T*-score was used to specify the "expected outcome" range (i.e., scores of 40–60 represented an expected overall outcome) in the Grant et al. (2012) study. This method was considered most appropriate, as clinically, scores falling within one standard deviation of the "expected score" are generally accepted as being within the "expected" range. Nevertheless, the lack of a formally specified methodology for interpreting Goal Attainment Scores needs to be taken into account if GAS *T*-scores are to be used. Ideally, the range of "acceptable" scores should be specified prior to commencement of the intervention programme.

The second limitation of GAS was that the initial goal-defining process was time-consuming. Although the overall goal of the intervention could be easily described for each participant, it was often difficult to identify at least three related goals which could each be defined with five meaningful outcome levels. This process took two to four hours for each participant, which is not realistic within many clinical settings. Nevertheless the investment of such time may save therapy time later, given GAS's potential to maximise clients awareness of and motivation towards their goals. It is also important to note that the goal-setting process is likely to become more efficient with increasing experience in using GAS. Furthermore, the time required will in part depend upon the nature of the goals – outcome levels for goals that can be meaningfully assessed based on five levels of the "frequency" of a behaviour occurring are likely to be easier, and therefore quicker, to define than those based on non-frequency or less concrete criteria. Adopting the GAS-light method would also circumvent this limitation, as only the baseline and expected level of outcome need to be objectively defined (Turner-Stokes, 2009a, b). However, it should be noted that Turner-Stokes recommends using the traditional GAS version for research purposes to ensure due rigour.

To facilitate the goal-setting process, Stolee et al. (2012) also suggest developing and using a list of broad goal areas (e.g., physical mobility, community access) to identify general goal domains, from which more specific individualised goals can be defined (e.g., walk the dog; dress self; do the weekly household shopping). This may be particularly helpful for clinicians with little experience in client goal-setting or GAS. However, we would caution against using goal-banks where specific goals and outcome levels are pre-defined as this would negate one of the main advantages of GAS; that of developing individualised goals. It would also limit the collaborative aspects of goal-setting.

The final limitation of GAS is that its effectiveness as an outcome measure is dependent upon the soundness of the criteria used to define the individual GAS scales. The results of the Grant et al. (2012) study were confounded by poorly constructed GAS scales which compromised the evaluation of the GMT

TABLE 1
Problematic GAS Scales

			A	*B*	*C*	*E*
	Type of GAS Problem		*Activity dependent*	*Process focused*	*Overlap between GAS goals*	*Multiple variables*
GAS Outcome Level	Much better than expected	+2	As per +1 level, plus records purchases and returns change to envelopes	100% of required items identified plus more than one regularly used item on special or meal item on special for the following week	Purchases 100% of items on shopping list, including at least two bulk items and/or additional regularly used items in advance whilst spending no more than $54.00 and no non-identified items purchased	Makes one withdrawal of $110 before 12 noon on Monday
	Better than expected	+1	As per 0 level, plus keeps receipts for purchased items	100% of required items identified on shopping list plus one regularly used item on special or meal item on special for the following week	Purchases 100% of items identified on shopping list, including one appropriate bulk item and/or one additional regularly used item in advance, whilst spending no more than $54.00 and no non-identified items purchased	Makes one withdrawal of $110 between 12 noon and 3 p.m. on Monday
	Expected outcome	0	Puts $10 into each envelope per fortnight	86–100% of required items identified on shopping list	Purchases 86–100% of items identified on shopping list and/or up to 2 non-identified items	Makes one withdrawal of $110 after 3 p.m. on Monday
	Less than expected	−1	Puts $10 into each envelope per fortnight but spends money on non-specified items	75–85% of required items identified on shopping list	Purchases 75–85% of items identified on shopping list and/or 3–8 non-identified items	Makes 2–4 withdrawals and/or withdraws a total of $111–$155 during the fortnight
	Much less than expected	−2	Puts less than $10 into each envelope per fortnight	Less than 75% of required items identified on shopping list	Purchases less than 75% of items identified on shopping list and/or more than 8 non-identified items	Makes more than 4 withdrawals, withdraws a total of more than $155 or less than $110 during the fortnight

intervention. An example of each type of confounded scale is provided in Table 1. Column A depicts a GAS goal on which the participant was not able to score a +1 or +2 because the activity relating to those levels (purchasing specific items) did not occur during the assessment period. This highlights a limitation of including activity dependent variables as an outcome measure.

Column B provides an example of a process oriented goal, that is, a goal that assessed the use of a particular strategy/tool (shopping list) designed to achieve a certain outcome (purchasing all required items). A potential problem with assessing processes rather than intended outcomes is that the client may achieve the intended outcome without adopting the process. In our study, at the two month follow-up assessment, the participant did not highlight all of his required items on the shopping list because the process of using the shopping list throughout his training and during the preceding weeks had helped him to "remember items without writing them down". Therefore, although the participant achieved a good functional outcome that reflected improved performance (purchasing everything he required), we were only able to score his performance as meeting the "less than expected" (−1) level.

Column C depicts a second goal which is not only process oriented, but also focuses on measuring the use of the same process (the shopping list) as that of the goal in Column B. This is problematic because of the inter-relatedness of the two goals. More specifically, because the participant did not highlight all of his required items on the shopping list (the focus of the first goal) yet still purchased them, he consequently purchased more than two non-identified items (an outcome variable of the second goal) which placed his performance at the "less than expected" (−1) level on this goal. This highlights the importance of trying to ensure that the outcome criteria for individual goals are mutually exclusive; failure to do so may mean that poor goal attainment on one goal translates to poor attainment of another.

Finally, Column D has been included to highlight a scale that incorporated too many variables: the timing of a banking withdrawal, the amount of money withdrawn and the number of withdrawals. In this case, the aim was to restrict the participant's disposable expenditure to $110 per fortnight. The number of withdrawals was included because he was considered to be more likely to withdraw and spend only $110 if he made a single withdrawal, and the timing of the withdrawal was incorporated to encourage him to get out of bed earlier. In hindsight, however, given that the main aim was for the participant to withdraw no more than $110 per fortnight, this should have been the only goal incorporated onto the scale. The number of banking withdrawals was irrelevant as long as the participant only withdrew a total of $110 for the fortnight. Furthermore, if getting out of bed earlier was related to demonstrating improvement in the participant's financial management skills, which was the overall aim of the intervention, this should have been assessed as a separate goal.

RECOMMENDATIONS FOR USING GAS

Cardillo and Choate (1994) refer to the abovementioned oversights in establishing GAS goals as "technical problems" and indicate that they are commonly committed by goal setters who have had little or no training and/or experience in using GAS. Our experience supports this view and our examples highlight the importance of goal-setters being aware of common "technical problems" before using GAS. Another step that could minimise the likelihood of assessments being compromised by poorly constructed scales would be to have the scales reviewed by an independent person who has experience with GAS (or is at least aware of the common pitfalls) but is not involved in the rehabilitation process. Had this occurred in the Grant et al. (2012) study, the two process-oriented goals might have been replaced with two new goals and the levels of outcome for three of the other goals may have been redefined. Using a checklist, such as that in Appendix C, will also help to minimise common technical errors during scale construction.

A methodological problem in the Grant et al. study was inconsistency in setting the participants' baseline level of performance on the individual GAS scales. As in other studies (Doig et al., 2010; Khan et al., 2008; Turner-Stokes et al., 2009), if the participants were performing at floor level at baseline, their baseline level was set at −2 on the GAS scale, otherwise, it was set at −1. This meant that participants' performances needed to improve by 2 points on 5 of 12 goals where the baseline level was set at −2, compared to only 1 point on the remaining goals where the baseline level was set at −1. This led to inconsistencies both within and across participants and, as a result, individual goals could not always be directly compared. Furthermore, the overall Goal Attainment Score incorporates the individual goal weightings and outcome GAS scores (−2 to +2), and is therefore also compromised if the baseline level of performance is not consistently set across all goals. Therefore, we would recommend setting the baseline level at the same point on the GAS scale for all goals. If the client is not performing at floor level across all goals, then the baseline level should be set at −1 when using the traditional GAS method.

Finally, previous authors have highlighted that GAS does not make provision for recognising improvements in performance that are insufficient to meet the expected outcome criteria (Bovend'Eerdt et al., 2009; Turner-Stokes & Williams, 2010). It has been suggested that this may negatively impact upon client motivation to engage in further therapy or pursue other goals. This was not found to be the case in the Grant et al. (2012) study, possibly because participant performances were regularly reviewed and compared to the GAS criteria throughout the intervention. During these reviews, any progress towards goal attainment was verbally acknowledged and discussions were held about how to further minimise the existing gap between the participant's

current level of performance and the "expected" level. However, if client motivation does seem to be negatively affected by lack of significant change in GAS scores, one option would be to expand future scales to a 6-point scale to include a −0.5 "Partially achieved" level, as described by Turner-Stokes and Williams (2010). A general list of further recommendations for using GAS based on our experiences is provide in Appendix D, and it is suggested that this be used in combination with a checklist, such as that shown in Appendix C, and previously published guides to GAS (Bovend'Eerdt et al., 2009; Turner-Stokes, 2009a, b).

SUMMARY

GAS was found to be a flexible and useful tool for developing individualised rehabilitation goals and assessing corresponding outcomes for various meaningful daily activities in the Grant et al. (2012) study. GAS also captured small functional gains which were not detected by neuropsychological or everyday behavioural measures of executive function. From a clinical perspective, GAS was associated with a number of therapeutic benefits, including enabling client collaboration and close involvement during goal-setting, fostering client–therapist rapport, enhancing client motivation and providing a simple mechanism for reviewing performance and providing feedback to clients. Another strength of GAS was its provision for weighting goals based on their perceived level of importance. However, GAS also presented some challenges. In particular, the efficacy of GAS as an outcome measure was dependent upon the soundness of the individual Goal Attainment Scales. It was found that technical errors during scale construction may significantly compromise the ability of GAS to assess outcomes. A checklist and general recommendations are provided for minimising these errors. The successful implementation of GAS requires care and time. However its potential benefits for achieving meaningful outcomes for individuals with brain injury are significant. Ideally, training in the use of GAS should become a routine aspect of education of allied health professionals working in brain injury rehabilitation.

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APPENDIX A

Initial GAS goal-setting process (Grant et al., 2012)

Session	*Purpose*	*Comments*
1	Identification of specific goals	Participants only able to state broad goals (e.g., save money). None were able to break their overall goals down into smaller goals. Researcher and therapist identified specific goals between Sessions 1 and 2
2	Participant selection of 3–6 subgoals. GAS weightings assigned by referring therapist.	1 = low importance, 2 = somewhat important, 3 = moderately important, 4 = very important, 5 = extremely important
3	Collection of baseline data	Establish current baseline level of performance on identified goals
4	Five GAS outcome levels defined by researcher and therapist	Baseline set at −1 or −2, depending upon whether participant performing at floor level (then set at −2)
5	GAS scales presented to and discussed with participants	Scales then referred to throughout the intervention sessions to focus participants on their goals, to discuss how the therapy strategies may help them achieve their goals, to provide objective feedback on current performance, and to identify what they needed to do/change to achieve their goal. Used to assess outcomes immediately following the intervention phase and at 2-month follow-up

APPENDIX B

Example of GAS scales (Grant et al., 2012)

GAS Outcome Level	*Goal 1*	*Goal 2*	*Goal 3*
Much better than expected (+2)	Weekly shopping expenditure < $42.99	Planned > 13 weeks ahead for future expenditure	Pays > $40 off outstanding monies
Better than expected (+1)	Weekly shopping expenditure $43–$46.99	Planned 9–12 weeks ahead for future expenditure	Pays $30.01–$40 off outstanding monies
Expected outcome (0)	Weekly shopping expenditure $47–$54	Planned 4–8 weeks ahead for future expenditure	Pays $20.01–$30 off outstanding monies
Less than expected (–1)	Weekly shopping expenditure $54.01–$63	Planned < 4 weeks ahead for future expenditure	Pays $10.01–$20 off outstanding monies
Much less than expected (–2)	Weekly shopping expenditure > $63	Has not planned ahead for future expenditure	Pays $10 or less off outstanding monies

APPENDIX C

Suggested GAS checklist

- Has only one variable been included per scale?
- Have all possible outcomes been considered?
- Have all five outcome levels been defined?
- Are all five levels mutually exclusive?
- Are all individual goals mutually exclusive?
- Are the five outcome levels continuous – i.e., are there any gaps between levels?
- Are all outcome levels defined in concrete, non-ambiguous, observable, measurable terms?
- Are follow-up times clearly specified?
- Do any of the individual scales assess criteria that are process oriented (e.g., using a shopping list) rather than the intended outcome of those processes (e.g., to purchase everything required)? If so, consider redefining the goal(s) to measure the intended outcome, not the client's use of processes.
- Are the "expected" outcomes realistically attainable (i.e., not too easy or too difficult?)
- Has the baseline level been set at the same point on the GAS scale for every subgoal?
- Has an independent person with GAS experience reviewed the individual scales?
- Has the acceptable range for the overall Goal Attainment Score(s) to fall in been specified?

APPENDIX D

Recommendations for using GAS

1	Ensure everyone involved is aware of the common "technical problems"
2	Use a checklist to minimise potential confounds and technical errors
3	Have an independent person, preferably someone familiar with GAS, review the individual Goal Attainment Scales (possibly using the same checklist)
4	Use the client's perceived level of importance to assign weights to goals
5	Use GAS in combination with existing outcome measures
6	Regularly review performance using the established GAS scales, and amend/redefine scales if indicated
7	Review the client's perceived level of importance for each goal immediately prior to each assessment phase
8	Expect goals and GAS criteria to take up to 2 hours or more to establish initially, particularly for therapists inexperienced with GAS