INVESTIGATION OF COLLABORATIVE GOAL SETTING PRACTICES IN HOSPITAL-BASED SPEECH LANGUAGE PATHOLOGISTS USING THE ELECTRONIC GOAL ATTAINMENT SCALING (EGAS) APP

by

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Title: Investigation of Collaborative Goal Setting Practices in Hospital-based Speech Language Pathologists using the Electronic Goal Attainment Scaling (eGAS) App

An extensive body of literature supports the clinical utility and feasibility of client-centric goal-setting techniques in neurorehabilitation. However, such techniques are seldom used and difficult to adopt in mainstream clinical practice. Two primary barriers that limit uptake and adoption of individualized goal-setting techniques into routine practice include: (1) lack of an operationalized framework susceptible to variations in the characteristics of the user and constraints of a medical setting and (2) limited knowledge on the part of clinicians and clients to confidently engage in goal-setting conversations. The eGAS app was designed to address the need for a semi-structured client-centric goal-setting framework for clinicians engaged in neurorehabilitation.

This study used a single-subject design to investigate the effects of using eGAS in an outpatient hospital setting on clinician behavior and client responsiveness. A nonconcurrent, multiple-baseline design was used across three clinicians to determine if use of eGAS would result in functional changes in collaborative interviewing behaviors, validity of generated goal scales, and reliability of the process. Results revealed that using eGAS had strong functional effects on collaborative interviewing behaviors and

validity of goal scales, and a weak effect on reliability. Another noteworthy finding was that eGAS could be implemented with relatively high fidelity within the constraints of a clinical context despite variations in the characteristics of the end-user, i.e. clients and clinicians. I discuss support for ecological validity of eGAS in terms of implementation barriers and facilitators that affected outcomes, methodological limitations, and future steps to improve design validity and implementation integrity.

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CHAPTER I

INTRODUCTION

The confluence of several healthcare movements and advancements in rehabilitation research, has led practitioners to recognize the patient perspective as a key component of evaluating healthcare processes and determining outcomes (Quatrano & Cruz, 2011; D'Arcy & Rich, 2012). Patient-reported outcomes (PROs), have been defined as "any patient response to questions about their health or experience of care, and about how treatments affect them (e.g., health-related quality of life)" (Locklear, 2015). Tools that enable clients to be directly involved and engaged in identification of goals, priorities, and outcomes for rehabilitation are referred to as patient-reported outcome measures (PROMs) (Donnelly & Carswell, 2002; Locklear, 2015). Since the introduction of the Patient Protection and Affordable care Act in 2010, the use of PCOMs have become the cornerstone service delivery and accountability (D'Arcy & Rich, 2012). Studies have linked the use of PROMs to decreased healthcare costs, higher chances of goal attainment, and improved self-efficacy due to increased involvement in decision-making (Bertakis & Azari, 2011; Black, Brock, Kennedy, & Mackenzie, 2010; Prescott, Fleming, & Doig, 2015; Willer & Miller, 1976; Wressle, Eeg-Olofsson, Marcusson, & Henriksson, 2002). Clinical evidence and legal mandates have provided the impetus and incentive to utilize PROMs in rehabilitation.

Despite their clinical value, PROMs are underutilized in the field of traumatic brain injury (TBI) rehabilitation, particularly cognitive rehabilitation. Authors conducting comprehensive systematic review of cognitive rehabilitation concluded that the limited evidence in favor of the function impact of cognitive rehabilitation could be attributed to

the lack of relevant outcome measures (Cicerone et al, 2011). Researchers and practitioners have predominantly relied on neuropsychological assessments and/or functional rating scales as measures to assess intervention efficacy, measures that lack ecological validity (Adamovich, 1998; Duff, Proctor, & Haley, 2002; Cicerone et al, 2011; Nichol et al, 2011; Frith, Togher, Ferguson, & Docking 2014). These measures are effective indicators of statistically significant change, however, fall short when it comes to validating meaningful change from the client's perspective (Cicerone et al, 2006; Ylvisaker, Hanks, & Johnson-Greene, 2002; Schultz & Trainor 2007; Chaytor & Schmitter-Edgecombe, 2003). Even though evolution of such measures has led to inclusion of tasks that simulate "real-world" activities; tasks are generic, not always tied to an individual's personal goals, and measurement often yields floor or ceiling effects (Ylvisaker, Hanks, & Johnson-Greene, 2002; McPherson & Pentland, 1997). Therefore, there is an urgent need for PROMs in the cognitive rehabilitation field that can produce customized and quantifiable indicators of progress.

TBI and Cognitive Rehabilitation: Understanding the Conundrum

The heterogeneity inherent in persons with TBI is a critical factor to be considered when designing or selecting PROMs for this population. The neurological, behavioral, and psychosocial sequelae of a TBI manifest differently in individuals, resulting in a diverse array of profiles, characteristics, and needs (Rosenbaum & Lipton, 2012; Tellier et al, 2009). Deficits in executive function, memory and awareness, are pervasive within this population and affect one's ability to generate realistic endpoints for rehabilitation, and compromise credibility of reported outcomes (Stuss, 2011; Schmitz, Rowley, Kawahara, & Johnson, 2006). Moreover, long-term studies on pursuit and

attainment of functional outcomes in the last decade have consistently noted psychological variables such as motivation, self-efficacy and coping style as significant predictors of outcome (Medley et al, 2010; Scheenen et al, 2017; van der Naalt et al, 2017; Noe et al, 2005; Boosman et al, 2017; Wolters et al, 2010; Tornas et al, 2017) . Therefore, PROMs for the TBI population need to be sophisticated enough to elicit reliable indices of change while also being sensitive to the multifarious outcome domains (Carlozzi, Tulski, & Kisala, 2011).

Curating PROMs for individuals with TBI is a complicated endeavor, because along with meeting the needs of a heterogenous population, the measure must align with cognitive rehabilitation and instrumentation guidelines. Evolution of the cognitive rehabilitation field has dictated ensuring that selection of a measure is congruent with the aims of a treatment approach (Cicerone, Azulay, & Trott, 2009). International guidelines on the standards for the design and selection of PROMs recommend mapping individual items on the measure to underlying constructs or impaired domains (Reeve et al, 2013). Thus, PROMs need to be constructed in a manner that connect generated outcomes to the underlying cognitive impairment and associated co-morbidities as well as the chosen intervention.

Goal-setting: A Solution to the Conundrum?

An alternative to the one- "measure"-fits-all approach is using goal-setting, a method for creating personally relevant outcomes (Levack et al, 2015). Goal attainment scaling is one such method, that has been lauded as a valid and reliable approach turning goals into measurable indicators of progress (Hurn, Kneebone, & Cropley, 2006). Despite a considerable level of evidence supporting the validity of GAS, researchers note that it

has not been adopted into routine clinical practices (Grant & Ponsford, 2014). One major issue is that the GAS has not been validated as a viable technique to implement as part of routine assessment and evaluation practices (Krasny-Pacini, Evans, Sohlberg, & Chevignard, 2016). Reimbursement models and billing systems restrict a clinician's autonomy and ability to use assessment time to collaboratively and efficiently engage clients in creating goals. GAS format must be consistent with a clinician's time constraints. Another significant concern is the lack of uniformity and standardization for writing goals as outcome measures (Krasny-Pacini et al, 2016). Goals must be written in a valid, reliable, and measurable format so they can serve as outcome measures (Playford et al, 2009). The evidence suggests that even though client-centric goal-setting approaches exist, they are impractically designed to serve as outcome measures.

Another aspect that exacerbates execution of goal-setting with clients is lack of training. Clinicians assert that the mechanics of initiating, engaging, and sustaining a conversation with a client regarding personal goals while responding appropriately to his/her concerns is a complex phenomenon (Plant et al, 2016). Insufficient training and knowledge make clinicians ineffective communicators resulting in goals that do not coincide with client's preferences and values (Jeyaraj et al, 2013). Studies reveal that clinicians prefer a client-centric goal setting process that is feasible and operationalized, so that they can conduct the conversation with a client in a replicable, reliable and viable format (Lawton et al, 2017).

Implementing the Optimal Solution. Researchers have begun to recognize the need to minimize the extensive research-to-practice gap (Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015). Classic design paradigms that adhere to the continuum of

efficacy to effectiveness for validating the impact of change, fail to consider milieu-specific factors that drive adoption and translation (Bauer et al, 2015). Traditional approaches to healthcare research have been critiqued for decelerating the advancement and uptake of care practices that have a game-changing impact on service delivery and public health outcomes (Bauer et al, 2015).

The field of implementation science is a radical approach to designing and conducting studies that integrate monitoring and evaluation of outcomes against the drivers and impediments of "real-world" contexts (Donaldson, Rutledge, & Ashley, 2004). Studies curated from an implementation standpoint are instrumental in determining the extent to which practices need to be modified while retaining their impact. One type of implementation method involves engaging formative evaluation processes that facilitate monitoring fidelity of implementation by providing ongoing feedback to the implementation team during the study (Bauer et al, 2015). This method is conducive to examining the impact of an approach in complex healthcare environments because implementation efforts accommodate rapid regulatory and organizational changes.

One overarching goal for this study was to determine the fidelity with which eGAS is implemented in a healthcare context. Fidelity indicates the degree to which efficacy of an approach is affected by the disparities in the ways that it is delivered (Proctor et al, 2009). Examining fidelity is particularly important when clinicians are implementing goal-setting processes, because expertise in steering conversations using a structured approach might directly relate to the success with which a client independently generates realistic, desirable, and measurable goals. To offset barriers related to clinical

productivity that prevent clinicians from participating in research-based endeavors, I collaborated with a research-affiliated hospital based in California. Examining the impact of eGAS in a healthcare setting would accelerate the process of discovering characteristics of the end-user and environment that directly inhibit its adoption and utility in promoting client-centric outcome measurement.

Statement of Purpose

This research study looks at the fidelity of implementation of a new client-centric goal-setting program. The electronic goal attainment scaling (eGAS) program, developed at the University of Oregon, is a client-centric goal-setting iPad application that integrates motivational interviewing (MI) strategies with goal attainment scaling (GAS). MI strategies have been implicated as valid techniques to create rapport and engage clients in the counseling psychology literature (Medley & Powell, 2010). GAS has also been claimed as a valid and reliable to technique to create client-centric, measurable goals for persons with TBI (Grant & Ponsford, 2014). The iterative design process of eGAS has been heavily influenced by stakeholder input to make the app feasible, accessible, and easily implementable. This research study utilized a single-case experimental design (SCED) to systematically analyze changes in clinician interviewing and goal-setting skills, before and after access to eGAS. Results of this study will not only bolster the evidence base but are also clinically informative for clients and clinicians.

CHAPTER II

LITERATURE REVIEW

Despite the prioritization and even mandate to use patient-centered outcome measures (PCOMs), existing instruments are limited in the degree to which they can validly and reliably measure rehabilitation treatment outcomes that are meaningful to the client (Johnston, Findley, DeLuca, & Katz, 1991). Heterogeneity inherent in the TBI population, and the corresponding diversity in treatment approaches, makes for a variety of outcomes that could serve as targets of intervention (McPherson & Pentland, 1997; Nichol et al., 2011; Quatrano & Cruz, 2011; Sander, Roebuck, Struchen, Sherer, & High, 2001). Being truly client-centric requires clinician competency in ability to engage clients, elicit values and preferences, and successfully negotiate, distal outcomes into achievable goals (Mead & Bower, 2000). Current tools are constrained in the extent of collaboration they can foster between client and clinicians to arrive at a mutually agreed upon goal, restricting the extent to which they can serve as valid measures of client-centric and treatment outcomes (Stevens, Beurskens, Köke, & Van Der Weijden, 2013).

Existing tools for gathering client input to generate rehabilitation goals within the TBI field can be classified as (1) generic or (2) condition-specific (Donnelly & Carswell, 2002; Worrall, McCooey, Davidson, Larkins, & Hickson, 2002a). Generic tools, like the Sickness Impact Profile (Gilson et al., 1975), include items focused on tasks or behaviors commonly observed across a variety of contexts (Worrall et al., 2002a). Although the tools attempt to cover the most frequently encountered behaviors across settings, items are not representative of outcome domains or the extensive diversity of challenges relevant to individuals with a mild TBI

(Duff, Proctor, & Haley, 2002; Watermeyer et al., 2016; Wilde et al., 2010). Condition-specific tools, such as the Quality of Life in Brain Injury (QOLIBRI) questionnaire, include a wider array of items centered on tasks or behaviors tied to a diagnosis-specific impairment (Worrall, McCooey, Davidson, Larkins, & Hickson, 2002b). Although more comprehensive than generic tools, they are critiqued for not being responsive to small changes in functional tasks over time or to individuals presenting with a moderate to severe TBI (McPherson & Pentland, 1997; Nichol et al., 2011). A foremost concern is the unidimensional design of such tools which assumes that each item is of equal significance to every client (Johnston & Miklos, 2002; Quatrano & Cruz, 2011; Sander et al., 2001). Both, generic and condition-specific measures rely on rating scales to obtain client input on an item. Although such tools are convenient and feasible to administer and score, the autonomy of the client in selecting a functional domain as a treatment target is controlled by the selection offered in the pre-formulated, itemized pool and the available choices on the rating scale (Nichol et al., 2011; Worrall et al., 2002b). Consequently, capturing the variety and growth in outcomes in response to treatment and in alignment with the client's preferences is constrained.

An alternative to the available tools are individualized goal setting approaches aimed at defining outcomes that are important and relevant to the client (Holliday, 2005). Client-centered goal setting processes overcome limitations in existing tools because they allow clients greater autonomy in selecting outcomes (Worrall et al., 2002a). Unlike generic and population specific PROs, selection of goals and outcomes using goal-setting approaches is driven by the client's distinct values, needs, and context irrespective of the underlying etiology or diagnosis (Donnelly & Carswell, 2002; Johnston & Miklos, 2002).

Given that selected outcomes align closely with client preferences, these measures are more likely to be sensitive to capturing changes in activities personally relevant to the clients (Turner-Stokes, 1999). The subsequent sections provide a detailed discussion of the most commonly reviewed goal-setting frameworks in the rehabilitation research literature. A review of the importance and benefits of using goal-setting frameworks is followed by a discussion on the underlying constructs in goal-setting and current barriers to incorporating these techniques into clinical practice.

Goal-setting: What Does the Evidence Suggest?

Over 100 studies have been published to date in the last 2 decades that explore the importance, benefits, and challenges with setting client-centered goals within the acquired brain injury population (Levack et al., 2015). Although researchers have critiqued study design quality and the low level of evidence, there is a substantial literature emphasizing the need for and positive effects of using client-centered goals (Prescott, Fleming, & Doig, 2015; Watermeyer et al., 2016). Although more limited in number, the existing studies with individuals with acquired brain injuries suggest that treatments are more likely to be efficacious when geared toward personally relevant goals (Bergquist et al., 2012; Doig, Fleming, Kuipers, Cornwell, & Khan, 2011; Krasny-Pacini, Chevignard, & Evans, 2014; Novakovic-Agopian et al., 2011; Sohlberg, Harn, MacPherson, & Wade, 2014). An overwhelming amount of evidence validates the idea that including clients in structured goal setting conversations is strongly linked to increased patient satisfaction and treatment adherence (Holliday, Cano, Freeman, & Playford, 2007; Levack et al., 2015; Plewnia, Bengel, & Körner, 2016; Sherer et al., 2014). Evidence is stronger in cases where structured goal-setting frameworks or

instruments or training was provided to clinicians to enable them in eliciting client feedback and preferences in a systematic fashion (Plant, Tyson, Kirk, & Parsons, 2016). There is evidence to suggest that goal attainment is linked to the degree to which clients are involved in goal-setting, albeit when moderated by quality and accuracy of the goal in representing client's current status and predicting progress (Gauggel, Hoop, & Werner, 2002; Waldersen et al., 2017; Willer & Miller, 1976).

Client-centered Goal-setting: Deconstructing the Concept

Emergence of the concept of client-centered goal-setting in the cognitive rehabilitation literature can be traced back to World War II, when the focus for treating soldiers with a brain injury shifted from remediating impairment to facilitating development of functional skills that could be applied in the real-world (Parente & Stapleton, 1997). However, the earliest structured client-centric goal-setting approaches surfaced in the 1960s in response to the need for better measures to evaluate effectiveness of mental health programs (Kiresuk & Sherman, 1968; Siegert, O´Connell, & Levack, 2015). Since then, a handful of tools, approaches and theories have been proposed with the aim of operationalizing the client-setting goal-setting process (Siegert et al., 2015). Despite minor variations, overlap in constructs across approaches, tools and theories of goal-setting (Prescott et al., 2015; Siegert et al., 2015) suggests that the notion of client-centered, goal setting could be delivered as a discrete, replicable process.

Client-centric goal-setting involves collaborating with the client to establish or negotiate selection of goals (Siegert & Levack, 2010, p.11).Researchers reviewing studies employing client-centric goal-setting approaches with persons with a brain injury consistently cite three key elements of the process: collaborative, client-centered, and

measurable (Prescott et al., 2015). Collaborative refers to inclusion of clients in goal discussion. Client-centered implies that goals selected must be relevant and important to the client and align with the client's values and priorities (Lawrence & Kinn, 2012). Measurable is an attribute deemed critical for objectifying the goal so that it can serve as a valid and reliable outcome measure (Prescott et al., 2015). Aspects fundamental to client-centric goal setting also align with leading theories on goal-setting.

Three theories are exemplary for illustrating why client-centric, goal setting practice is crucial to rehabilitation and clinical practice (Scobbie, Wyke, & Dixon, 2009). Bandura's social cognitive theory, postulates that self-efficacy, i.e an individual's confidence in their ability to succeed at a desired task or goal despite setbacks, exerts a direct influence on likelihood of attaining a goal (Bandura, 1991). Bandura theorized that exploring an individual's self-efficacy by engaging them in discussions around goal setting and planning establishes or increases motivation and resilience to pursue a task or behavior, ultimately leading to goal achievement. Self-efficacy also directly relates to outcome expectancy, i.e the drive to pursue a challenging goal. The theory implies that fostering goal-setting and planning conversations improves self- efficacy, which in turn culminates in goal achievement. Another prominent theory is Locke and Latham's goal-setting theory (GST) (Locke & Latham, 2002). According to GST, goal attributes, specifically specificity and difficulty, directly influence outcome. Individuals are more likely to achieve goals that are clearly defined and appropriately difficult or challenging as opposed to easy, vaguely stated goals. Factors such as commitment to the goal, complexity of the task, and feedback on performance moderate the effect of goals on performance. Locke and Latham also theorized that having a specific goal affects

performance by: (1) directing attention and conscious effort on a task or skill, (2) strengthening persistence to strive for the goal despite setbacks, and (3) indirectly enhancing knowledge related to the task itself or strategies that aid completion of task. Health Action Process Approach is a third theory that posits that two phases are necessary for behavior change (Schwarzer, 2008). The motivational or decision-making phase is aimed at exploring intentions to help formulate a goal. The second phase is a volitional phase aimed at engaging in discrete planning so that goal intentions can be realized as achievable outcomes.

A notion common to all theories is that the process of engaging clients in setting well-defined goals is a catalyst for eliciting or increasing self-efficacy, motivation, and resilience, traits necessary for achieving a desired behavior or skill. Despite variances in the hypothesized mechanism of action about how goals affect outcome, all three theories assert that goal-setting is fundamental to outcome achievement. Common constructs among theories also reflect principles of client-centric goal setting identified in research studies, as previously described. Although no one theory is sufficient to comprehensively describe a structured approach to goal setting, each theory provides clinicians with key elements that can be operationalized into a structured goal-setting approach.

If one considers theories to be a blueprint for engaging in goal-setting, then implementation frameworks could be considered scaffolds that transform blueprints into tangible supports aiding clinicians in facilitating goal-setting in clinical practice. Three frameworks have emerged as particularly valuable to the practice of client-centric goal-setting within rehabilitation. The first one is called Goal Action and Planning (G-AP) (Scobbie, Dixon, & Wyke, 2011). Scobbie and colleagues derived this framework using

constructs emphasized in the theories stated above, to be implemented in clinical settings (Scobbie et al., 2011). The G-AP framework proposes four discrete stages to engage in collaborative goal-setting: goal negotiation, goal identification, planning, and appraisal and feedback. Goal negotiation entails identifying problems and potential outcomes relevant to the client. These problems are then transformed into specific, measurable goals in the goal setting phase. The planning phase involves detailing plans regarding the behavior or action that would facilitate goal achievement. Finally, the appraisal and feedback phase focuses on having client evaluate performance in relation to the action plan and progress, so that the client can adjust his or her actions accordingly to ensure goal achievement. One advantage of G-AP is that its prescriptive allowing clinicians to follow a specific process to collaborate with clients in identifying and developing goals. Another benefit of G-AP is that it can be customized to clients' needs irrespective of their underlying etiology and diagnosis.

A second framework resembling the G-AP model is the MEANING framework, proposed "as a key term and acronym to underpin, remind and support rethinking actions and activities in goal setting" (Siegert & Levack, 2010, p. 112). It suggests a three-tiered approach to goal setting, beginning with strategies for clinicians to successfully move from engaging clients in a discussion about valuable and meaningful outcomes to specific goals and steps to achieve the outcome (Siegert & Levack, 2010).

A third framework was proposed by researchers interested in deriving a goal-setting framework by studying clinicians' experiences of implementing client-centric goal setting with community dwelling adults with ABI (Prescott, Fleming, & Doig, 2017). Using a grounded theory methodology, they came up with a complex, multiphase

framework that included a needs identification phase, a goal operationalization phase, and an intervention phase. Additional strategies were also part of the framework for clients facing impairments in awareness or emotional distress that affected their ability to be actively engaged in goal-setting conversations. These included strategies such as structured communication and metacognitive supports to formulate goals as well providing additional time so to establish trust and rapport. The authors hinted at the feasibility and need for formalized approaches to elicit client needs and facilitate objective measurement.

Researchers have tried to analyze goal-setting instruments and/or approaches available for adults with chronic conditions using the G-AP framework (Stevens et al., 2013). Eleven instruments were identified as measures that provided a client the opportunity to identify/visualize his/her own problems/goals and score these goals on any combination of difficulty, importance and satisfaction. Authors noted that all instruments were useful for the goal negotiation phase, however, only 4 of the 11 instruments were applicable in the goal-setting phase. A noteworthy finding was that goal-setting tools were restricted to a certain population and/or outcome domain they could address. Only one tool, goal attainment scaling (GAS), was applicable across health care settings, client diagnoses and functional domains. This finding is for individuals with a TBI, that comprise a heterogeneous group, whose needs permeate multiple outcome domains (i.e. cognitive social, emotional, physical, etc.) and continually evolve during course of recovery.

Goal Attainment Scaling (GAS). A goal setting process that has been well studied and shows promise as a client-centered outcome measure for clients with

acquired brain injuries (ABI) is GAS (Grant & Ponsford, 2014). Originally developed by Kiresuk and Sherman as a way of appraising the outcomes of mental health programs (Kiresuk & Sherman, 1968), GAS is a method for deriving personalized goals and turning them into quantifiable, measurable evaluation scales that serve as measures of progress (Grant & Ponsford, 2014; Kiresuk & Sherman, 1968). Creators of GAS recommend using a 5-point scale ranging from 'least favorable outcome' (-2 level) to 'most favorable outcome' (+2 level) (Kiresuk & Sherman, 1968). Each level of the scale must be created collaboratively with a client. Weighting the importance and difficulty of the goal is the an important step for transforming the scale into a T-score that provides a standardized estimate of the degree of progress (Kiresuk & Sherman, 1968). A T-score also serves as a statistical comparator for outcomes across goals and/or functional domains. Generally, a T-score of between 40-60 is considered an accepted degree of change or improvement. Since its inception, the utility of GAS has expanded from appraising mental health programs to being used as a primary or secondary outcome measure in studies evaluating treatment efficacy and/or exploring the value of client-centered goal setting within the adult ABI population (Hurn, Kneebone, & Cropley, 2006).

A substantial amount of evidence suggests that GAS is a valid and reliable measure of potential change resulting from cognitive rehabilitation in persons with TBI. One of the earliest seminal studies evaluated the clinical utility of GAS by comparing final GAS scores to traditional standardized outcome measures among graduates of a comprehensive outpatient brain injury program (Malec, Smigielski, & DePompolo, 1991). Although the sample was small (n = 16), approximately 75% of the participants

had a diagnosis of TBI. Final GAS T-scores correlated with global outcome measures, like the Portland Adaptability Inventory, and work outcome. Graduates with satisfactory work outcomes had significantly higher GAS scores compared to those with unsatisfactory outcomes. Authors claimed that these results provided support for the validity and clinical utility of GAS. Another seminal study evaluated the content, construct, and convergent validity as well as inter-rater reliability of GAS (Joyce, Rockwood, & Mate-Kole, 1994). Despite the small sample (n = 16), over 70% of subjects were individuals with TBI. Authors claimed content validity was supported because goals were established in 16 out of 18 recommended domains for brain injury rehabilitation, with the top two domains being memory and planning/organization. Construct and convergent validity of GAS was supported by moderate to strong correlations between GAS and clinical judgement of efficacy (Global clinical impression rating scale) and standardized measures of global outcome (Rappaport Disability Rating Scale). Evidence of inter-rater reliability was found by the strong correlations between two GAS raters at admission and discharge. A third major study evaluated responsivity of GAS in individuals receiving cognitive rehabilitation in an inpatient rehabilitation setting by comparing it against other traditional, standardized measures used to evaluate client progress (Rockwood, Joyce, & Stolee, 1997). The sample (n = 44) in the study consisted primarily of individuals with TBI (> 50% of the sample), and a smaller proportion of individuals with a subarachnoid hemorrhage, and postinfectious encephalitis. GAS was perceived as the most responsive measure when compared against seven standardized clinician-rated measures based on relative efficiency and effect size estimates (Rockwood et al., 1997). More recently, a study by Turner-stokes and colleagues (2009) also

explored the responsivity of GAS in a larger sample (n = 164) of adults receiving neurorehabilitation in a specialized, inpatient rehabilitation unit. A small proportion of the sample (30%) included individuals with TBI. Results reflected findings in previous studies that GAS is a responsive measure, due to the significant change of scores from baseline to discharge, and higher effect sizes compared to those of the standardized measures. Convergent validity of GAS was also supported in this study because of moderate correlations between GAS and functional measures such as the UK Functional Assessment Measure (FIM+FAM) and Barthel Index. Another noteworthy finding was that domains covered by some of the GAS goals could not be captured within the items of the standardized FIM+FAM scale; reinforcing support for content validity of GAS. Responsivity and convergent validity of GAS has also been demonstrated in studies exploring the efficacy or effectiveness of either multi-component neurorehabilitation programs or tailored approaches for adults seeking cognitive rehabilitation as a result of either a stroke, mild cognitive impairment, or TBI (Brands, Bouwens, Gregório, Stapert, & Van Heugten, 2013; Doig et al., 2011; Gerber & Gargaro, 2015; Malec, 2001; McPherson, Kayes, Weatherall, & Members of the Goals-SR Research Group, 2009; Rasquin et al., 2010).

Responsivity of GAS has also been noted in larger multi-site trials with bigger sample sizes, comprised of older adults that present with a variety of co-morbidities and complex problems (Rockwood et al., 2003; Stolee et al., 2012). Though different from individuals with TBI, the inherent heterogeneity of problems within the geriatric population are also reflective of the challenges in assessing the TBI population and vouch for the usefulness of GAS for identifying deficits and goal areas. Strong psychometric

properties of GAS have been shown in studies with geriatric adults and can be applied to individuals with TBI. Along with psychometric support, studies have also endorsed the clinical utility and feasibility of GAS in clinical contexts. One study concluded that it is possible to generate 3 goals per client within 30-45 minutes (Bouwens, van Heugten, & Verhey, 2009). Supporting this observation, another study reported that the mean time to develop a GAS goal ranged from 15 to 40 minutes and mean number of goals per client ranged from 2 to 4 (Stolee et al., 2012). Although validity and reliability of GAS seem promising, and there is potential to complete the GAS within a reasonable timeframe, researchers note limitations impeding adoption of the tool.

Barriers to Using GAS. Despite its potential as a valid, individualized outcome measure, researchers have critiqued the rigor with which GAS is implemented, which influences the validity and reliability of GAS as an outcome measure (Krasny-pacini et al., 2016; Tennant, 2007). In an effort to reduce variability in implementing GAS, and improving the psychometric properties of GAS an outcome measure, a group of researchers proposed 17 appraisal criteria to be able to use it as a reliable, valid measure in randomized controlled trials (Krasny-Pacini et al, 2016). However, from a feasibility standpoint, there are several barriers to using GAS in routine clinical practice. One of the most important, but difficult features is fostering a client-centric conversation, which remains an idiosyncratic, elusive concept in clinical practice (Prescott et al., 2015; Schlosser, 2004). Although the GAS methodology prescribes steps for turning goals into measurable progress indicators, the largely subjective criteria of "including client" in goal-setting often poses risks for the degree to which a goal can be considered client-centered, individualized, and meaningful (Krasny-Pacini et al., 2016). One major

predictor of success with GAS is linked to the clinician's ability to tailor the process to client-specific needs (Plant et al., 2016). From a client's perspective, communication about goals is more readily fostered if the clinician is able to develop strong inter-personal relationships where the client feels valued, connected, and perceived as an important contributor to the rehabilitation process (D 'cruz, Howie, & Lentin, 2016). Therefore, a clinician's competency in implementing the GAS process alone, may not be the only component necessary for engaging clients in a client-centric goal-setting conversation.

Collaborative Communication: An Emerging Field. In order to create a milieu conducive to GAS, clinicians must be well-versed in principles of collaborative communication. Sequelae of TBI permeate multiple aspects of functioning; requiring clinicians to employ communication techniques that reveal the impact of a TBI on an individual's life and personal identity, and depart from a biomedical approach where the focus is primarily on addressing and remediating deficits (Mead & Bower, 2000). Clients receiving cognitive rehabilitation perceive a client-centric milieu when they see clinicians display behaviors such as providing emotional support, seeking information about activities that are functional and relevant to clients, ascertaining client's preferences and values prior to initiating treatment (Cott, 2004; Lawrence & Kinn, 2012). These behaviors are reflective of shared decision-making and therapeutic alliance; constructs deemed integral not just to the process of client-centric goal setting but also to rehabilitation success (Carlson et al., 2006).

Shared decision-making (SDM) and therapeutic alliance operate in tandem to foster a collaborative communication atmosphere. Agreement on the tasks and goals of

therapy are integral to both, SDM and therapeutic alliance (Dy & Purnell, 2012; Rose, Rosewilliam, & Soundy, 2017; Sherer et al., 2007; Stiggelbout, Pieterse, & De Haes, 2015). An additional component of SDM emphasizes that all stakeholders should be active contributors in the decision making process by sharing responsibility and volunteering information, stating preferences, and asking questions to evaluate various treatment options (Charles, Gafni, & Whelan, 1997). In order to do this, stakeholders must be equipped with the pre-requisite skills, i.e. client should feel confident and empowered to share information that would influence decision-making, and the clinician should demonstrate competency in providing support and eliciting information to facilitate this conversation (Elwyn et al., 2012; Joseph-Williams, Elwyn, & Edwards, 2014). Studies have confirmed that SDM results in positive cognitive-affective outcomes in clients with TBI, i.e. increased perception of autonomy, motivation, and likelihood of treatment adherence (Aubree Shay & Lafata, 2015; Stiggelbout et al., 2015). However, despite its value, a significant hurdle often faced by clinicians is getting clients to participate in this process (Rose et al., 2017) . The deeply personal nature of expressing one's goals and dealing with the loss of identity as a result of loss in functions incurred by a TBI deters clients from being active contributors (Joseph-Williams et al., 2014; Ylvisaker, McPherson, Kayes, & Pellett, 2008). It is necessary for clinicians to build a rapport with clients so that they feel confident and empowered in sharing such information (Joseph-Williams et al., 2014). In other words, for SDM to occur, therapeutic alliance between the clinician and client is a pre-disposing factor. Therapeutic alliance or the interpersonal, emotional bond between the client and therapist is a crucial component to engaging in conversation (Bordin, 1974). A recent systematic review was conducted to

understand the role and nature of the working alliance in the acquired brain injury population (Stagg, Douglas, & Iacono, 2017). Strength of the alliance at discharge was linked to subjective outcomes, such as improved client perceptions of somatic problems, communicative problems, social interactions, and a reduction in depression symptoms (Stagg et al., 2017). The review also concluded that alliance was linked to participation outcomes, including return to work, school and driving. The need for therapeutic alliance also echoes clients' inclinations when they engage in rehabilitation. Researchers exploring the needs of adult traumatic brain injury (TBI) survivors and primary caregivers via a qualitative study found that clients identified patience and understanding, and perceived social support as their foremost needs and preferred a "problem focused, emotion focused, and avoidant coping" approach to address these needs (Adams & Dahdah, 2016).

The evidence implies that building a rapport with a client enables the person to be actively engaged in the rehabilitation process, thereby influencing the quality and extent to which the client achieves outcomes. Optimizing rehabilitation outcomes warrants creating a milieu that allows open discussion of barriers affecting decision-making and engagement in rehabilitation. Despite all stakeholders recognizing the indisputable value of therapeutic alliance, these practices are seldom seen in clinical contexts because clinicians lack the knowledge and competency in developing a rapport (Levack, Dean, Mcpherson, & Siegert, 2006; McPherson et al., 2009). Motivational interviewing is one approach that has been hailed as a successful and well-defined technique that can be implemented by clinicians to create a client-centric alliance.

Motivational interviewing (MI). MI is a client-centered communication approach to address difficulties with engagement and readiness for rehabilitation and evoke motivation for change, while ensuring the client's autonomy throughout the exchange (Miller & Rollnick, 2002). MI augments intrinsic motivation by understanding and/or resolving client's ambivalence toward change (Miller & Rollnick, 2002). Originally created as a counseling approach within the addiction field, recent evidence suggests that MI is particularly useful to the brain injury population (Medley & Powell, 2010b). Lack of concordance between client and clinician is repeatedly cited as the most notable hindrance to setting goals and obtaining treatment compliance among individuals with a brain injury (Jeyaraj et al., 2013). Another study noted that poor engagement in individuals with TBI at the beginning of treatment was predictive of dropout rates (Sherer et al., 2007). MI resolves these barriers affecting TBI individuals by providing clinicians with a framework to stimulate a collaborative discussion on readiness, drive, and capacity to pursue a goal (Holloway, 2012).

A majority of the research that has emerged in the brain injury literature using MI was primarily in the context of ameliorating substance misuse problems (Medley & Powell, 2010b). Three studies noted that MI techniques was effective in getting clients to contemplate more seriously about their drinking issues and significantly reducing drinking rate (Bombardier, Ehde, & Kilmer, 1997; Bombarider & Rimmele, 1999; Cox et al, 2003). In one of those studies, authors also assessed changes in motivational structure and noted that the intervention group displayed a shift in orientation from avoidant coping styles to pursuing fulfilling goals (Cox et al, 2003). In another study, researchers compared the effect of a telephone MI intervention in the intervention group against a

standard follow-up interview with the control group (Bell et al, 2005). After receiving individualized goal-setting, and experiencing discussions on problem-solving and motivation for change, the intervention group performed significantly better on functional and subjective quality of life outcomes as compared to the control group. In another study individuals receiving MI demonstrated improved moods (Watkins et al, 2007). Though limited, emerging evidence is compelling in recognizing the role of MI in establishing an alliance with a client to promote rehabilitation engagement (Danzl, Etter, Andreatta, & Kitzman, 2012).

MI uses a conglomeration of core communication skills, techniques, and principles, that collectively enhance the confidence and commitment necessary for therapeutic engagement (Holloway, 2012; Medley & Powell, 2010a). The MI spirit, characterized by collaboration, evocation, and autonomy, is conducive to creating a client-centric climate for evoking motivation for change. The four guiding principles of MI, i.e. express empathy, develop discrepancy, roll with resistance, and support self-efficacy; help engender a trusting, collaborative bond. This alliance fostered by MI enables the practitioner to explore traits like grief and loss and self-efficacy, and resistance to change, in a supportive, non-confrontational environment (Medley & Powell, 2010b; Prigatano, 2005). Traits such as self-efficacy and readiness have been linked to achieving outcomes, by fostering positive coping styles, and increasing participation (Braden et al., 2012; I. Brands, Stapert, Köhler, Wade, & Van Heugten, 2015; Hunt, Turner, Polatajko, Bottari, & Dawson, 2013; Scheenen, van der Horn, de Koning, van der Naalt, & Spikman, 2017). Communication strategies such as open-ended questioning, reflective listening, and affirming client's strengths and abilities, offer a

foundation for engaging in shared problem solving. Moreover, these strategies provide concrete avenues for clinicians to reconnoiter issues such as lack of awareness, known to impede rehabilitation engagement (O'Callaghan, McAllister, & Wilson, 2012; Trahan, Pépin, & Hopps, 2006; van den Broek, 2005). A scoping review on the concept of impaired self-awareness (ISA) in moderate to severe cases of TBI noted that presence of impaired ISA is predictive of reduced functional rehabilitation outcomes, such as employment (Ownsworth & Clare, 2006; Prigatano, 2005). Studies imply that one's accuracy with insight into one's current status is predictive of one's ability to set goals and eventually attain desired outcomes (Bach & David, 2006; Fischer, Gauggel, & Trexler, 2004; Kervick & Kaemingk, 2005). Of import, is that the relation between awareness and outcome is mediated by therapeutic compliance (Ownsworth & Clare, 2006; Prigatano, 2005). The evidence collectively points to the utility of MI as a collaborative process for raising awareness and procuring adherence to treatment for individuals with a TBI.

The Optimal Solution

The literature supports the clinical usefulness, validity and reliability of goal attainments scaling. Unfortunately, it has not been adopted in large part due to barriers related to clinicians not knowing how to conduct client centered goal discussions or perceiving that they are too time consuming. If MI could be used to further the GAS process, it might be possible to generate client-centric, measurable, and reliable goals. Researchers note that productivity constraints and guidelines dictating the amount of time clinicians can spend with a client are major impediments to implementation of such practices (Plant et al., 2016). Clinician turn-over is also regarded detrimental to

maintaining continuity in information flow and reinforcing alliance (Joseph-Williams et al., 2014; Plant et al., 2016). The challenge is to find a balance between a goal setting process that can be replicated across a variety of contexts and stakeholders in a manner that concedes with institutional, organizational, and individual agendas. University of Oregon researchers (Sohlberg, MacLennan, Prideaux, & Kucheria, 2017) set out to accomplish this by designing the electronic goal attainment scaling app (eGAS). The purpose of the tool was to provide an operationalized process that integrated evidence-based collaborative interviewing and goal-setting techniques in a systematic, clinically feasible and effective manner. The next section describes the development and potential utility of the eGAS app.

Development of eGAS. The eGAS app was designed to address the need for an efficient, clinically feasible, and individualized measure that facilitated creation of valid, reliable, and measurable client-centric goals. eGAS converges MI with GAS in a manner intended to balance autonomy of all stakeholders against empirically supported structured communication and metacognitive strategies that are shown to be effective in engaging in client-centric goal setting conversations (Prescott, Fleming, & Doig, 2015). A critical component that eGAS potentially brings to the practice of goal-setting is guiding all stakeholders in using GAS appraisal criteria to increase the validity and psychometric quality of scales produced by the client. The following sections describe the development process of eGAS, its features and design, and its clinical utility as supported by a pilot feasibility trial.

***Setup*.** The interface was designed with a two-fold purpose: (1) create a tool that enabled both clients and clinicians to identify an objective client-centric goal and, (2)

offer safeguards to overcome various contextual and stakeholder barriers when engaging in a client-centric conversation. To allow clinicians to conduct an interview that leads to generating client-centric goals, the developers created discrete sections to guide consideration of three elements considered vital to a goal setting interview (problem identification, strategy selection, and completing the GAS hierarchies) and one element considered optional (the client buy-in section). Each section contained scripted prompts so that a clinician could engage a client in a collaborative conversation without the cognitive burden of determining in the moment the best way to relate to and support a client in independently planning their desired rehabilitation processes. Prompts are categorized in terms of MI behaviors, such as open-ended questions, affirmations, reflections and summaries (OARS), so that clinicians can select and execute strategies that are optimal in driving the conversation forward, resolving ambiguity, and reinforcing the central theme of client being an equal and active partner while the clinician being an active listener in the decision making process.

Along with scripted prompts, the interface also provides places to document and input information. There are eight buttons that clinicians can utilize during an interview to input and store information relevant to identifying an goal and creating a scale. Salient labels on input buttons such as functional goal domain, activity and context, underlying impairment and treatment approach, draw the clinician's attention to critical data that he/she obtains from clients to facilitate goal formulation (Please see screenshots in Appendix A). The remaining four input buttons are for defining GAS levels, consulting GAS checklist, and weighting the goal, and measurement plan, are designed to cue the clinician to complete critical elements for generating a valid and reliable goal that

provides an objective scale designating five levels of progress. The input area helps converge focus on elements critical for objectively defining and measuring change and provides structured cues for navigating collaborative conversations. This intended purpose of the structured design to eGAS was to make the process efficient in terms of time and knowledge required on the clinician's part to execute a client-centric goal setting conversation. Along with the interface setup, other features also assist in overcoming stakeholder and constraint barriers.

Features. Multiple specifications in design were included to ensure that a goal-setting conversation could be implemented in a time-sensitive manner while overcoming the myriad constraints of a medical setting. One important feature included creating dropdown menus as part of the data inputting buttons so that clinicians can quickly select and record client responses. For instance, the therapy approach button consists of the various intervention approaches organized by functional domains. Another feature is the score calculation page that allows automatic calculation of T-scores to easily measure treatment outcome. Clinicians also have the option of calculating (1) the change pre- and post-treatment for a client with one goal; (2) the aggregate change pre- and post-treatment for a client with multiple goals; and/or (3) the aggregate change across multiple clients (e.g., for program evaluation or research). Along with automated conversion of GAS into change scores, the app also includes an automated report feature that converts the information inputted into the app into a transferrable format. This generated report can be transferred into the client's electronic medical record. To combat clinician-related obstacles in terms of lack of confidence and/or knowledge in conducting such conversations, we also incorporated a manual into the app. The purpose of the manual

was to ensure that clinicians could independently master the eGAS process and usage of the app. Mock interviewing sessions were recorded and incorporated into the manual to foster independent learning and fluency with understanding the eGAS process. The manual was organized into sections that could be accessed independently of the rest of the content, so that clinicians can distribute their learning over an extended period, a feature that increases adoption of the app given the productivity demands that control a clinician's time.

Feasibility Trial. In order to informally assess the clinical utility and feasibility of eGAS the research team conducted an informal pilot study. Clinicians were recruited via professional organizations' social media pages, listerves and online community forums. Of the 26 clinicians that initially signed up to use eGAS, only 16 provided feedback regarding their experience. The sample included clinicians employed in Department of Defense medical facilities, Veteran's Administration hospital, private-sector medical rehabilitation facilities with a range of inpatient and outpatient services, and university training clinics in communication disorders programs. They reported a range of experience with MI and with GAS, ranging from no experience to mid-level experience. The clinicians were provided access to the eGAS app and were asked to use it with at least one client. At the end of the eGAS trial period clinicians were asked to share any scales that they had formulated and provide feedback via an electronic survey.

Overall, all clinicians endorsed the concept of eGAS, its utility in facilitating collaborative conversations to aid goal setting, especially the guidance provided via the buy-in section for clients displaying resistance or ambivalence. Features like automated calculation of T-scores, video examples of scale creation, access to a manual with

background information and instructions, and drop-down menu options were perceived as useful. Despite acknowledging the value of eGAS, users felt that there were hindrances affecting adoption and uptake amongst the general community of practitioners. The issue of eGAS being time consuming continued to remain a concern for realistic implementation in a private sector clinical setting. Another factor that hindered long-term uptake was that eGAS setup and design only catered to individuals seeking cognitive rehabilitation, whereas individuals with brain injuries might also encounter deficits in other areas of functioning, such as speech and swallowing. In a similar vein, though eGAS provided enough guidance and support for creating a scale, often criteria such as equidistance of goal hierarchies were compromised at the cost of honoring the client's preferred objective values or because clinicians needed more guidance in checking their generated scales. The fact that less than 50% of the scales shared by clinicians met appraisal criteria reflected the need for additional guidance and clarity on the GAS process. Finally, in order to make the goal-setting experience truly client-centric, clients needed to have access to the information they shared with a clinician to verify the accuracy and intent of their decisions. Therefore, a few changes in components and design were initiated to increase likelihood of uptake.

In response to the feedback from the initial trial, the research team at UO expanded eGAS's features. The data input component of the app included dropdown menu options that were no longer restricted to cognitive-communication cases, encompassing treatment options and functional domains relating to conditions such as dysphagia and aphasia. A page was added for client consensus that allowed the client to review and verify the client's own clinical decisions and generated scale. Modifications

to the manual were made so that additional guidance could be provided on improving scale quality (example: adding example scales for a variety of functional issues). The updated version of eGAS served as a comprehensive tool in educating clinicians on a reproducible process of engaging the client to create goals that spanned a variety of functional targets and domains. It was this version that was used for this dissertation study which focused on evaluating the implementation fidelity of eGAS.

Implementation Fidelity

Fidelity refers to the degree to which a prescribed approach is implemented as designed (Carroll et al, 2007). A systematic review concluded that fidelity moderated attainment of treatment outcomes (Durlak & Dupre, 2008). For researchers, including fidelity as a design element is critical because it impacts the internal validity, effect size, and statistical power (Allen, Shelton, Emmons, & Linnan, 2017). Including measurement of fidelity in the design enables researchers to discern failures arising from implementation versus intervention (Proctor et al, 2011). Detecting the differential impact of implementation versus intervention is relatively easy in rigorously designed efficacy trials where extraneous factors are tightly controlled. A unique challenge in this study was measuring fidelity of the eGAS approach in the context of a rapidly altering environment, i.e. the outpatient setting of a hospital.

Researchers conceptualize fidelity as a multi-faceted concept consisting of five different elements (Allen, Shelton, Emmons, & Linnan, 2017; Bellg et al, 2004; Gearing et al, 2011). For the purposes of this study, I focused on two aspects of fidelity, i.e. (1) quality of delivery, and (2) participant responsiveness or receipt. Quality of delivery referred to monitoring how well eGAS was implemented as a process. The eGAS process

was conceptualized as an interview comprised of at least three phases (problem identification, treatment selection, and GAS construction) and a sequence of strategic communicative behaviors in each phase. I developed two measures, (1) the Assessment of Client-centered Interviewing and Goal-setting (ACIG) tool, and (2) a task analysis to measure implementation integrity of the eGAS process (measures are described in further detail in the next section). We hypothesized that for all clinicians, a high fidelity could be inferred if high ratings on the scale corresponded with a high percentage of behaviors acquired as measured by the task analysis.

The other aspect of fidelity included measuring participant responsiveness or intervention receipt. In this study, participants included clinicians and their clients/patients. Clinician responsiveness referred to the extent to which clinicians accepted and were satisfied with eGAS principles, rationale, and utility. Client responsiveness referred to the client's perspective on participation in a goal-setting conversation and satisfaction with the experience and resulting goals. Findings of high fidelity on observable measures would be supported if self-reported measures of social validity and responsiveness also reflected similar trends. For instance, we hypothesized that high scores on the task-analysis in the experimental versus baseline phase for clinicians would be reflected in clients' ratings of participation and satisfaction with resulting goals.

Because eGAS was being implemented in a natural setting, implementation was susceptible to a variety of uncontrolled, extraneous factors that could diminish the strength of study findings. Researchers have identified differences in the characteristics of the service provider as one potential source of variation in fidelity

(Allen, Shelton, Emmons, & Linnan, 2017; Bellg et al, 2004). Providers that possess the requisite skill and feel confident in their abilities are more likely to implement an intervention with high fidelity (Durlak & DuPre, 2008). Therefore, I utilized evidence-based strategies (Bellg et al, 2004) to maximize and standardize provider's skill acquisition despite individual provider differences. I designed a training that comprised of structured didactic components and semi-structured role-play scenarios. I also offered debriefing meetings for the first two sessions in the experimental phase to accommodate differences in provider skill or fidelity levels. Training components are outlined in extensive detail in the methods section.

The next section describes research activities undertaken to develop two such measures, (1) the Assessment of Client-centeredness when Interviewing and Goal-setting (ACIG) tool, and (2) a task analysis. Both tools were direct measures that measured behaviors and phases signaling application and use of the eGAS process by clinicians.

Development of ACIG

The success of any behavioral intervention is incumbent upon the fidelity with which it is implemented. Therefore, to create valid and reliable attainment scales, it is important for clinicians to implement eGAS with high fidelity. In order to evaluate the fidelity of eGAS, one measure that I created was the Assessment of Client-centeredness when Interviewing and Goal-setting (ACIG) scale. It was hoped that ACIG would provide an objective and consistent way to measure a clinician's adherence to the eGAS process and the degree to which he/she was competent in assisting a client in creating client-centric goals.

Evidence Supporting Design. The ACIG tool was designed to incorporate the multi-dimensional aspect of eGAS. ACIG needed to include elements that evaluated the fidelity of its componential processes, i.e. MI and GAS, and ensuing products, i.e. outcome of each of the goal-setting phases and quality of the generated scales. The following describes the empirical evidence that informed the development of ACIG, its components, and the results of an informal pilot study that attest to ACIG's psychometric value.

Evidence regarding measuring the quality of collaborativeness in a client-practitioner interaction, fidelity of MI, and criteria for judging the psychometric quality of generated scales was explored to create ACIG. A recent study by Sabee and colleagues (2015) concluded that measuring a practitioner's ability to engage in a client-centric exchange involved analyzing two aspects of an interaction : (1) the types of activities undertaken by all stakeholders within the context of a specific interaction, and (2) identifying an underlying classification scheme to operationalize behaviors that fitted the mold of client-centric communication within those activities. The findings from this study prompted us to classify client-centric behaviors for all four sections of the eGAS interview process. Another body of literature has looked at measuring the fidelity of MI. Recent reviews of existing instruments designed to evaluate MI fidelity declared that it may not be effective to depend on a singular tool to reliably measure all the ingredients of a dynamic process such as MI (Dobber et al., 2015; Jelsma, Mertens, Forsberg, & Forsberg, 2015; Madson & Campbell, 2006). The reviews endorsed using a medley of tools that evaluated the technical ingredients (i.e. frequency of use of OARS strategies and other MI techniques) as well as relational ingredients (i.e. behaviors that were

representative of the MI spirit and collaborativeness). One tool that has emerged as a strong contender for clinical and research use is the Motivational Interviewing Treatment Integrity Scale (Moyers, 2014). Due to its reduced complexity and length compared to most other tools and evidence to support the strong inter-rater reliability of this tool, I used this measure to create a scale for assessing the degree to which clinicians' communicative acts could be deemed client-centric. Another study that influenced the development of ACIG examined goal setting practices within the disciplines of occupational, speech, and physical therapy (Leach, Cornwell, Fleming, & Haines, 2010). I identified three approaches to goal-setting along a continuum of collaboration, from therapist-controlled to client-centered. This study along with other works helped define identifiers and descriptors for each anchor of the ACIG scale to measure fidelity of eGAS implementation.

Setup. ACIG's design reflected constructs identified in the literature as sensitive indicators of collaborativeness and combined quantitative and qualitative measures. A quantitative anchor included tallying behavioral observations, i.e. the number of open-ended questions, affirmations, reflections, and summaries, to detect the ratio of questions-to-reflections or percentage of complex reflections. Global ratings of the level of client-centeredness and degree to which the clinician met the outcome for each phase of the interview are qualitative anchors of fidelity. For instance, for the problem identification section, outcome can range from unmet (no functional domain identified) to partially met (multiple functional domains identified but no domain prioritized), to met (a functional domain identified and prioritized). Similarly, for the problem identification section, clinician can receive a minimum of 0 (indicative of clinician-directed interviewing

behaviors) to a maximum of 4 (indicative of client-led interviewing behaviors) for level of client-centeredness. Scores are aggregated across all 4 elements of the eGAS interview to create a maximum score of 8 and 12, for the outcome and level of client-centeredness, respectively. A final anchor is the GAS quality appraisal scale which reflects the degree to which generated scales meet criteria for validity. The acronym 'SMARTED'(specific, measurable, attainable, relevant, time-specific, equidistant, and (uni)dimensional) reflect key characteristics emphasized in the literature (Krasny-Pacini, Evans, Sohlberg, & Chevignard, 2016) that make GAS a valid outcome measure. Scales receive a score from 0 to 2 for each of the 8 criteria, resulting in a total score of 16. The multi-faceted design of ACIG measured ingredients that are critical to eGAS. See Appendix B for a copy of the scale.

Pilot study. A small informal pilot study (n = 10) was conducted to examine ACIG's validity and reliability. Two raters, myself and another graduate student clinician, used the ACIG measure to evaluate clinicians' competency in using eGAS to create personalized, relevant, and objective goals. Training for the graduate student consisted of a "practice" and a "tool testing" phase. Before the practice phase, I reviewed the major OARS strategies and provided a document with a list of communicative acts that could be classified under the OARS strategies. We also reviewed pre-recorded sessions of either graduate student clinicians or supervisors interacting with a client and rating the interviewer's competencies using ACIG. About a handful of sessions were rated by both raters during the practice phase and a discussion regarding differences in scoring ensued after scoring each recorded session using the ACIG tool. The practice phase resulted in refining definitions of OARS so that communicative strategies were

more reliably and easily identified, and components of the scale were refined (example: labeling of constructs) for conceptual clarity and accuracy. The "tool testing" phase consisted of using the revised version of ACIG to rate another small sample of recorded session. Similar to the practice phase, we reviewed and rated recorded sessions using ACIG, but scores were not discussed. Additionally, we selected the Global Rating of Motivational Interviewing Treatment (GROMIT; Moyers, 2004) scale as a measure against which we could assess ACIG's concurrent validity. In a recent systematic review of tools, GROMIT emerged as a prominent measure of MI fidelity and could be completed by a trainer that was not an expert in MI (Dobber et al., 2015). Scores of both raters were compared across the four components of ACIG (i.e. behavioral observations, level of client-centeredness, outcome, and GAS appraisal) for all videos across both phases.

Using intra-class correlation coefficients (ICC) we looked at inter-rater reliability of ACIG for each subscale. ICC estimates and their 95% confident intervals were calculated using SPSS statistical package version 24 (SPSS Inc, Chicago, IL) based on a single rater, absolute-agreement, 2-way random-effects model. We noted that coefficients were between 0.76 to 0.97 for composite scores (i.e. question-to-reflection ratio, percent of complex reflections, levels of client-centeredness, outcome ratings, and GAS quality). These numbers suggested that inter-rater reliability was between good to excellent for all subscales. Additionally, we correlated scores on the GROMIT to composite scores for behavioral observations, level of client-centeredness, outcome rating, and GAS quality. For both raters, ACIG outcome scores moderately correlated with GROMIT ratings. The results provided indication of ACIG being sensitive to the eGAS process.

Translation of ACIG Components into a Task Analysis. In addition to having the composite scores yielded by the ACIG tool, I also created a task analysis that allowed more discrete measurement of key behaviors. The task analysis was generated on the same principles as ACIG but was a desirable format for the single subject measurement as it allowed direct observation of discrete behaviors. Descriptive indicators of ACIG's level of client-centeredness, outcome, and GAS quality appraisal scales were used to create a 23-item scale that encapsulated strategic eGAS behaviors. Clinicians were assigned a score between 0 – 2 (0 = behavior not noted, 1 = behavior noted only once, 2 = behavior noted more than once) for each item on the scale. Scoring criteria measured aspects of adherence and competence to eGAS.

Study Purpose

The purpose of this dissertation was to evaluate the fidelity of implementation for clinicians using the eGAS app. Fidelity, within the context of this study, was defined as a clinician's ability to conduct a collaborative interview using eGAS's framework and successfully generate goals that met appraisal criteria. The study evaluated the impact of the eGAS tool on clinician interviewing and collaborative goal setting and posed three primary research questions:

(1) Is there a functional relation between using eGAS and an increase in collaborative interviewing behaviors?

(2) Is there a functional relation between using eGAS and an increase in the validity of the generated goal scales?

(3) Is there a functional relation between using eGAS and an increase in the reliability of the goal-setting process?

CHAPTER III

METHODS

This chapter provides a detailed description of the research design, experimental protocol and analysis that would be used to answer the research questions. The first section describes the single-case design and rationale behind selecting this design to address research questions. The second section describes clinical setting and participant characteristics, and study protocol.

Experimental Design

I used a single-case, non-concurrent, multiple-baseline design for this study. Single-case research has been recognized as a credible, scientific research methodology for designing evidence based-practices in educational and rehabilitation research (Horner, 2005). Single-case methodologies are particularly useful in cases when researchers want to systematically evaluate the effects of treatment and analyze outcomes at the individual-level (Byiers, Rechle, & Simons, 2012). Researchers in the brain injury field note that single-case methodology yields clinically meaningful outcomes in the early phases of research, when the goal is to discern the therapeutic effect of an intervention, describe its mechanism of action, and define its optimal ingredients (Beeson & Robey, 2006). Moreover, single-case designs are a viable option for researchers to implement the study in naturalistic settings, thus bolstering the ecological validity of the research project (Smith, 2012).

Multiple baseline designs are considered a feasible methodology for studying the efficacy of interventions and approaches in clinical research. This design allows systematic replication of treatment effects across participants in a staggered manner,

eliminating bias arising from confounding variables, such as small sample sizes and clinically heterogenous populations (Smith, 2012). The multiple-baseline design is also adaptable to settings that involve managing multiple extraneous factors that affect the outcome, thereby increasing the generalizability and external validity of findings (Byiers et al, 2012; Perdices & Tate, 2009). Although a non-concurrent design is less robust than a concurrent design, it allows flexibility in recruiting clinician-client dyads within a reasonable time-frame.

Setting and Participant Characteristics

The goal of this study was to ecologically measure the fidelity of implementation of the eGAS app. I therefore sought a medical setting that met three requirements: (1) employed clinicians working on rehabilitation goals with individuals with brain injury; (2) was capable of accommodating the additional demands of a research study (for instance allowing recording and observing of sessions); and (3) had an institutional mission aligned with the objectives of the study, specifically the use of client-centered outcome measures. I sent out recruiting emails to five institutions, four of whom responded with interest for participating. I selected Casa Colina, a hospital in California as it met the basic requirements. The Casa Colina hospital has both inpatient and outpatient medical centers across a 20-acre campus that provide a variety of medical and allied health services. Of import is that this hospital specializes in rehabilitation programs for individuals with brain injuries and other acquired neurological conditions. Moreover, they have a research wing dedicated to conducting "outcomes-based research projects, which aim to measure the impact of medical rehabilitation in patients with disabilities, and clinical studies, which aim to identify novel interventions for conditions and

impairments treated at Casa Colina" (http://www.casacolina.org/Research.aspx). The existence of a research arm increases the feasibility of conducting a study that is intrusive in its observation of clinician-client dyads. When contacted, Casa Colina administrators indicated they were interested in participating in part due to upcoming changes in legal mandates for healthcare providers to employ client-centric measures of progress. Given that the organization's research objectives and interest of service delivery personnel aligned with the study's purpose, we deemed this hospital a suitable site for the study.

Clinicians. Inclusion criteria for SLPs to participate were: (1) actively delivering neurorehabilitation services to adults (approximately 50% of the caseload); (2) verbal confirmation that at least 20%-25% of the caseload includes individuals with a TBI, (3) verbal acknowledgement that they were not familiar with the eGAS app, and (4) verbal confirmation that they did not have specialized training in or exposure to either MI or GAS. An informational orientation meeting was organized for campus-wide SLPs to introduce them to the purpose of the project, study protocol, requirements for participation, and associated research tasks. At the end of the meeting, interested clinicians signed consent forms. I recruited a total of three speech-language pathologists (SLPs; clinicians) from the outpatient department for the study. All were female with experience levels ranging from 1 year to 10 years of clinical practice. Table 1 displays the experience level, ethnicity, and age of the participating clinicians.

Table 1

Clinician Characteristics

Clinician	Experience (years)	Ethnicity	Age
ML	10	Caucasian	58
HG	1	Caucasian	25
MP	5	Asian	32

Note. The experience level represents the number of years a clinician has spent in professional practice.

Clients. Because the goal of the study was to examine clinical interactions to determine whether and how eGAS potentially modifies clinicians' interviewing and goal-setting behaviors, it was important to consider client characteristics. Clients needed to meet the following inclusion criteria: (1) adults seeking neurorehabilitation provided by SLPs as a result of mild to moderate cognitive, speech, language, vocal, and/or swallowing impairment due to an acquired brain injury, a neurodegenerative condition, or other factors (example: age-related cognitive decline or medically induced neurological changes), and (2) adequate cognitive-communicative skills to engage in a goal-setting conversation. We expanded the diagnostic criteria beyond TBI for a couple reasons. Research examining factors that predict goal attainment note that clinical diagnosis is not a significant predictor (Waldersen et al, 2017). Another interesting finding is that regardless of etiology, individuals with cognitive impairments report similar challenges and characteristics but are able to participate in goal-setting conversations (Rockwood, Graham, & Fay, 2002; Regan et al, 2017; Ponte-Allan & Giles, 1998; Hanssen et al, 2014). Finally, from a research feasibility standpoint, it would be difficult to complete the study in a realistic time period if we restricted recruitment only to the TBI population.

Clients were excluded if any of these criteria were met: (1) difficulty engaging in a conversation as a result of severe speech and/or language impairment, (2) reported psychological, cognitive, and/or socioemotional concerns of a severe nature that affected their ability to set goals, and (3) reported not being their own guardian.

To recruit clients, I screened their medical records to ensure that they met eligibility criteria, then contacted them via phone to obtain verbal consent. I received access to the hospital's electronic medical record system which allowed me to examine the client's hospital documentation (i.e. referring physician's report, SLP assessments, etc.) and ensure eligibility. After a potential client was identified, I called them to confirm their upcoming evaluation appointment with the SLP, educate them about the purpose of the study, and gain verbal assent for audio recording their interaction for the first session. Clients that verbally assented to being in the study on the phone then arrived 15 minutes prior to their scheduled appointment to partake in the formal consent process. A total of 33 potential clients were contacted. Three clients refused participation because they were uncomfortable with being recorded or participating in a research project. Two clients were excluded because of severe communication impairments. Data for one client was dropped because observations revealed a more severe memory impairment than they self-reported which impacted their ability to sustain a conversation with the clinician. Therefore, the final sample contained 27 clients.

Clients ranged from 18-82 years of age, with the average age being 58 years. Approximately 56% of the sample was male and 44% female. 41% of clients were seeking cognitive rehabilitation with the remaining 59% seeking services for aphasia,

dysphagia, and/or dysarthria. The most common diagnoses were CVA (41%) and TBI (30%). Table 2 provides demographic information regarding the sample.

Table 2

Summary of Client Characteristics

Characteristics	Cumulative frequency	
Etiology		
TBI	26%	
CVA	41%	
Neurodegenerative (Multiple Sclerosis, Parkinson Disease, Systemic Sclerosis, Spinal Ataxia)	19%	
Other (Bell's Palsy, Neurofibromatosis, Cancer)	15%	
Ethnicity	Male (n = 15)	Female (n = 12)
White	40%	25%
Black	27%	17%
Hispanic	20%	42%
Asian	13%	25%
Mean age (years)	57.36 (16.27)	57.90 (16.94)
Cognitive-communicative diagnosis	Mild	Moderate
Cognitive impairment	26%	15%
Aphasia	3%	7%
Dysarthria/Apraxia	11%	10%
Dysphagia	11%	0%

Note. N = 27

Procedure

The study design consisted of two phases: baseline (Phase A), and an experimental or intervention condition (Phase B). The independent variable was use of the eGAS app. Data on the dependent variables, i.e. clinicians' behaviors, reliability of eGAS, and validity of the scales, was collected using the task analysis and the ACIG tool. Table 3 summarizes the procedures used in the study.

Table 3

Sequence of Procedures for Each Participant

Parameters	Baseline	Post-Baseline	Experimental	Post-experimental
Research aim	Observe typical interviewing routines	2-hour training session for clinicians to use eGAS during interviews	Observe interviewing routines with eGAS	Assess social validity from clinician's point of view
Measures	Task-analysis ACIG C-COGS*		Task-analysis ACIG C-COGS*	TARF-R Informal interview

Note. *C-COGS was administered to clients/patients.

The primary participants were the clinicians. Each data point correlated to when a SLP engaged in the initial goal setting conversation with a new client. Goal setting conversations typically occur once, when clients are being evaluated for rehabilitation. Data were collected in both phases by observing goal-setting interactions between the three SLPs and their clients. Sessions were conducted in the private offices typically used by the SLPs when providing services to clients. Each session was audio recorded using a

digital recorder (Olympus Model VN-541PC) to allow reliability and fidelity checks using a second-rater. The procedures were replicated for all three SLPs in the outpatient setting.

Baseline Phase. The purpose of the baseline phase was to measure the routine goal-setting practices of the SLPs and document a low rate or variable rate of goal-setting practices reflecting a performance issue requiring intervention. Per the conventions of a non-concurrent single-case design, each clinician began the baseline phase at a different time, based on time of enrollment and availability of initial patient evaluation. The baseline phase consisted of a minimum of three data points. The decision to use three data points versus the recommended five has been supported by clinical guidelines used to evaluate the methodological quality and rigor of single-case research (Tate et al, 2008). The concern of attrition of clinicians over the intrusive nature of the study was another reason to limit the data points. Clinicians were held in baseline to establish stability and experimental control. This approach resulted in expanded baseline points, i.e., up to five sessions, for the second and third clinicians. Clinicians commenced the experimental phase in a consecutive fashion, once they completed three to five goal-setting sessions with clients. Clinicians were introduced to the experimental phase one at a time, when the preceding clinician ended the baseline and initiated at least one session in the experimental phase. After completing the study, clinicians completed two questionnaires, one questionnaire assessed the social validity of the eGAS app and the other assessed the social validity of the interviewing process.

During the baseline phase, clinicians were asked to engage in their typical goal setting interviews with clients. While sessions were in progress, I collected data on clinicians'

interactional behaviors using a task analysis and the ACIG measure (described in further detail in the Measurement section). The session was audio recorded. At the end of a session, each client was verbally administered the C-COGS, a social validity questionnaire (described in further detail in the Measurement section).

Experimental phase. The purpose of the experimental phase was to evaluate potential changes in interviewing behavior and rehabilitation goal properties when eGAS was used. The experimental phase consisted of five data points. As described below, I conducted an eGAS training session for each clinician immediately after they completed the baseline phase. Clinicians were provided feedback at the end of the training session based on their performance in a role-playing scenario to reinforce skills that were present and guided in how to use the manual to refine any identified skills that needed more practice or were absent. Each clinician was requested to use eGAS for their next five interview consults.

In order to ecologically evaluate the implementation of the eGAS app, it was important to conduct the study with practicing clinicians working with their clients as assigned in their typical work setting. However, conducting the study with practicing clinicians in a naturalistic hospital setting posed a variety of experimental concerns. The content and process of the clinical interaction is driven by the dyad. Ethical concerns preclude interfering in this patient-provider interaction thus limited my ability to give input regarding fidelity of implementation of the eGAS principles during a patient evaluation. Setting-related productivity constraints prevented clinicians from allotting more than 3 hours of the work day for research over a 3-month period which also limited the amount of time they had for feedback. Additionally, participation in a study that

required observation and monitoring of clinicians' behavior induced performance anxiety in successive sessions. To ensure a time-sensitive and minimally intrusive approach to facilitating integrity in the clinicians' the use of eGAS, I conducted one 15-minute debriefing with clinicians after the first two sessions to discuss: 1) what went well, 2) what was challenging, and 3) what could be improved for the next session. A summary email was sent after the debriefing. If clinicians expressed further concerns or questions, they were referred to corresponding sections in the eGAS manual that addressed their questions. At the end of the experimental phase, clinicians completed two questionnaires, one questionnaire assessed the social validity of the eGAS app and the other assessed the social validity of the interviewing process.

Training Protocol. A two-hour training session was scheduled at a mutually convenient time for each clinician after she completed the baseline phase. Training consisted of fixed and adaptable components. The basic format and content of training aligned with guidelines published for ensuring provider competency and skill acquisition (Madson, Loignon, & Lane, 2009). Training consisted of didactic instruction with embedded practice activities to elucidate the purpose and procedures for using the eGAS app. A checklist of sequential behaviors for each of the interview phases and corresponding time benchmarks for a hypothetical interview served as the benchmark criteria for clinicians to be considered competent in implementing eGAS. Practice activities were adapted based on the clinician's strengths and needs.

Training began by introducing clinicians to the setup and procedure of the eGAS process, sample goal attainment scales, the OARS technique, and tips and tricks for maneuvering conversations with clients that displayed limited insight or initiation using a

PowerPoint slide presentation. A verbal instruction was provided by comparing components and processes involved in a typical evaluation to those using eGAS. This introduction was followed by a set of practice activities, such as observing a sample video or a live demonstration of a clinician using eGAS. A second role-play was provided for clinicians to reinforce interviewing skills and incorporate skills that were inconsistent or absent from the first role-play scenario. For example, one clinician (ML) noted a tendency to revert to close-ended questions for identifying a functional goal. Therefore, her second role-play focused solely on scenarios that enabled opportunities for her to independently generate open-ended questions in response to clients with limited awareness. Another clinician (MP) expressed hesitation, with turning the goal into a scale. Thus, the second role-play for her was initiated with a functional goal and emphasized skills critical to navigating the conversation from the goal-identification to constructing the GAS phase. For the third clinician (HG), fluency with using eGAS in conversation was critical. Hence the second role-play for her emphasized practicing a case scenario with strategies that allowed pausing and navigating the app to locate scripts. All clinicians expressed hesitation with implementing eGAS in conjunction with a newly acquired electronic medical record system, so overall training emphasized integrity with the interview structure and process, instead of accuracy with using the app. Table 4 summarizes components of the training.

Table 4

Components of Training for Each Clinician

Components	Elements
Didactic Instruction (using PowerPoint presentation slides)	• Purpose and layout of the eGAS application • Sample goal attainment scales • OARS technique • Tips and Tricks for special cases (clients with limited insight) • Reviewing components/process of typical interviewing routine against new routine using eGAS
Practice Activities	• Observing sample video or a live demonstration of an interview with eGAS • Role-play scenario

Note. Focus and structure of the second role-play scenario differed for each clinician.

Measurement

Task-analysis. One primary measurement of eGAS fidelity was the task-analysis (included in Appendix C) that was developed from the ACIG. It was used to evaluate research question one that focused on whether eGAS implementation led to increased use of collaborative interview skills. The task analysis consisted of a checklist of 23 behaviors that corresponded to the behaviors listed in the level 2 and 3 categories on the ACIG level of client-centeredness scale and thus measured eGAS implementation fidelity. To capture whether a skill was absent, present, or occurred more than once, clinicians received a score of '0', '1', or '2', respectively. To record clinician behaviors on the checklist in real-time, I used the *Countee* application (https://www.counteeapp.com/) on an iPad which allowed me to record the frequency of each behavior throughout the observation period. (Please see Appendix D). I computed

the percentage of behaviors that received a score of 0, 1, and 2 or higher based on data generated by the app.

Assessment of Client-centeredness when Interviewing and Goal-setting (ACIG). The AGIC instrument described in the literature review (included in Appendix B) was also used to measure implementation fidelity as well as to determine whether eGAS resulted in increased validity of the goal hierarchies consistent with the theory of goal attainment scaling and reliability of the interviewing process (research questions two and three). As described below, the ACIG included three indices of interview behavior (Collaborative Interviewing Behaviors, Level of Client-centeredness Scale, and Goal-Setting Phase Outcome Scale) and one index of adhering to goal attainment scale component (GAS Quality Appraisal Scale). Collaborative Interviewing Behavior was a quantitative index that was completed across phases on the same schedule as the task analysis. Scales measuring levels of client-centeredness, outcome, and GAS quality were completed at the end of the interview.

***Collaborative Interviewing Behaviors*.** One metric derived from tallying interviewing behaviors was the percentage of complex reflections (%CR) which was used as a measure of competency in collaborative interviewing. A high percentage is suggestive of a high degree of competence in MI (Moyers et al, 2005). The *Countee* app was also used to record the frequency of simple and complex reflections. To calculate the percentage of complex reflections, the number of complex reflections were divided by the sum of simple and complex reflections, i.e. the total number of reflections, and then multiplied by 100.

Level of Client-centeredness. The level of client-centeredness is reflective of the degree to which clinicians adhere to the eGAS process. At the end of each session, clinicians received a score between 0-3 as a measure of the level of client-centeredness for each phase of eGAS. For example, in the problem identification phase, clinicians that primarily focused on exploring knowledge, beliefs, information needs and preferences, and verifies information accuracy by asking questions would receive a low score of '1'. In contrast, clinicians who used a wide range of collaborative behaviors, including simple and complex reflections to move conversation forward, and summarizing information to clearly identify a client's functional goal, would receive a score of '3. Higher scores reflect a higher degree of client-centeredness in interviewing. A composite percentage score was derived by adding ratings received in each phase, dividing it by the maximum possible rating points a clinician can attain, i.e. 9, and multiplying that by 100.

Goal-setting Phase Outcome. The goal-setting phase outcome reflected the degree to which clinicians were reliable with the eGAS process. At the end of each session, clinicians received a score between 0-2 as a measure of the degree to which they achieved the intended outcome of each phase. A high score was reflective of increased competency with the eGAS process. A composite percentage score was derived by adding ratings for each phase, dividing it by the maximum possible score a clinician can attain, i.e. 6, and multiplying that by 100.

GAS Quality Appraisal. GAS quality appraisal guidelines proposed by Krasny-Pacini and colleagues (2016) were used to create an index to measure the validity of a goal attainment scale. The authors derived the acronym 'SMARTED' (specific, measurable, attainable, relevant, time-specific, equidistant, and (uni)dimensional) to

describe 8 key parameters that are integral to making GAS a valid outcome measure. Each clinician received a score between 0-2 for each criterion. High overall scores across SMARTED criteria reflect increased validity. A composite percentage score was derived by adding ratings across 8 criteria, divided by the maximum possible rating a client can attain, i.e. 16, and multiplying that by 100.

Inter-rater Reliability. One aspect critical to ensuring the internal validity of single-case experimental designs is calculating inter-rater reliability of the dependent variable (Tate et al, 2013). In this study, I used intra-class correlation coefficients (ICC) to examine the inter-rater reliability of ACIG scores and reduce the risk of observer bias affecting measurement. As described in the literature review, a previous small pilot examined the validity and reliability of the ACIG measure and found that a novice rater could be trained to reliably measure the fidelity of the eGAS implementation. Preliminary ICC values calculated on a small sample of video ratings suggested that it was possible for raters of different experience levels to show adequate reliability using the ACIG.

For the dissertation study, I trained a research assistant (RA) who was a professional working in the management sector. He had graduated with a master's degree and his job profile included experience in supervising customer-centric interactions. He gathered data using the task analysis and the ACIG instrument. The task analysis and collaborative interviewing behavior subscale of the ACIG tool were incorporated in the *Countee* app. The training was comprised of three components: (1) review of operationalized definitions of the target behaviors on the *Countee* app and the components of the *ACIG* scale, (2) rate 3 videos together with the RA, and compare the RA's ratings with my ratings to discuss differences, provide feedback, and enhance accuracy and (3) rate eleven

additional practice videos and calculate the preliminary reliability by determining the ICC values. 70% of the practice videos comprised video recordings of sessions from the university clinic, while the remaining 30% comprised audio recordings from the dissertation data set. Training lasted approximately 1 week.

A moderate ICC estimate of 0.50 for ACIG's composite or summative scores and the task-analysis measure was used as a benchmark criterion for attaining reliability. This criterion was based on findings from a previous pilot study undertaken to examine ACIG's reliability and published guidelines on inter-rater reliability for novel measures. Inter-rater reliability of the task-analysis measure had not been explored, therefore it was assumed that a moderate level of reliability was sufficient. ICC estimates and their 95% confident intervals were calculated using SPSS statistical package version 25 (SPSS Inc, Chicago, IL) based on a single-measure, two-way random-effects model to look at the inter-rater reliability in scoring of ACIG measures and task-analysis. I ran analyses to compare consistency of rating for: (1) ACIG's level of client-centeredness and outcome scores for 3 out of 4 interview phases – problem identification, therapy selection, and constructing GAS, (2) ACIG's composite or summative client-centeredness and outcome scores, and (3) task-analysis. Strength of ICC estimates were interpreted per guidelines published in the literature (Koo & Li, 2016) and were inferred as degree of inter-rater reliability. Results are summarized in Table 5 and met acceptable standards for training adequacy.

Table 5

Inter-rater Reliability of RA based on Training Data for ACIG Scale and Task-analysis Measure

Interviewing phases	ICC estimates
Problem identification	
Client-centeredness	0.37 [-0.26, 0.78]
Outcome	0.47 [-0.14, 0.83]
Therapy selection	
Client-centeredness	0.54* [-0.05, 0.85]
Outcome	0.55* [-0.03, 0.86]
Constructing GAS	
Client-centeredness	0.80* [0.42, 0.94]
Outcome	0.83* [0.48, 0.95]
ACIG composite	
Client-centeredness	0.57* [-0.16, 0.86]
Outcome	0.81* [0.43, 0.94]
Task-analysis	0.67* [1.15, 0.90]
ACIG GAS quality appraisal scale (SMARTED)	0.85* [0.53, 0.96]

Note. $n = 11$.
*$p < .05$

Following the training, I used the randomization function in excel to select 20% of the audio recordings in the baseline and experimental phase for the RA to compute scores. This led to a sample size of 2 recordings for each clinician, and a total sample size of 6 recordings for evaluating inter-rater reliability. I handed data to the RA in batches of 3 audio recordings. To monitor the RA's drift, I randomly selected 1 audio recording from every batch and compared the RA's scores to my scores on all measures. This step was taken after the RA finished scoring one batch of audio recordings and before he

proceeded to computing scores for the next batch. Inter-rater reliability for the study data is described in the Results section.

Social Validity. To examine factors affecting long-term uptake, adoptability, and dissemination of eGAS, we examined the perspective of both the clinicians and the clients using standardized questionnaires and informal interviews. The Treatment Acceptance Rating Form-Revised (TARF-R; Reimers, Wacker, Cooper, & DeRaad, 1992) was a standardized survey completed by all clinicians and the Client-Centeredness of Goal-Setting Scale (C-COGS; Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015) was a standardized survey administered to clients. In addition to completing a standardized questionnaire, clinicians also participated in an informal interview at the end of the study.

Client-centeredness of Goal-Setting Scale (C-COGS; Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015). Every client was administered the C-COGS, a standardized questionnaire developed to measure a client's perspective on the clinical planning processes and the resultant goals developed during the evaluation (Doig et al., 2015). I administered the survey after clients completed the goal-setting session with a clinician. C-COGS consists of 13 items that ask questions to discern the client's perspective on participation (e.g., The therapist encouraged me to participate in setting the goals) and goals sub-scales (e.g., The goal is meaningful and important to me as it relates to who I am and my future) are rated on a five-point rating scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher points on the scale suggest the client perceived having a greater level of participation in the goal-setting process, greater satisfaction with

generated goals, and a higher degree of alignment of goals with a client's personal preferences. Refer to Appendix E for a copy of the questionnaire.

Treatment Acceptance Rating Form – Revised (TARF-R; Reimers, Wacker, Cooper, & DeRaad, 1992). Clinicians were asked to complete the TARF-R (Reimers et al, 1992) questionnaire at the end of the experimental phase. TARF-R was developed as a global measure of treatment acceptability. The TARF-R consists of 20 questions focused on evaluating different aspects of acceptability. Constructs measured by TARF-R include reasonableness of the treatment, perceived effectiveness, side-effects, disruption/time costs, affordability, willingness, severity of the problem, understanding of the treatment, and compliance with treatment variables. Items are rated on a seven-point scale with descriptors for anchors based on the item. Higher scores represent greater levels of acceptability. Clinicians completed two forms: one to measure acceptability of the app, and a separate form to measure acceptability of the interviewing process. Refer to Appendix F for a copy of the survey.

Informal Interview. Following completion of the project, each clinician participated in an informal interview. Social validity was also discerned from analysis of queries presented to the clinicians. Every clinician was asked what they liked and what could be improved about the training, implementation of the research project, and the eGAS app. I transcribed clinicians' responses for analysis while I interviewed them. Table 20 summarizes the responses of each clinician.

CHAPTER IV

RESULTS

This chapter presents the analyses conducted to answer the three research questions and present post-experimental social validity data. Analyses consisted of graphs plotted to compare collaborative interviewing skills, reliability of the process, and validity of scales before and after receiving training to use the eGAS app. A nonparametric test, *Tau U,* was used to supplement visual analysis trends. Post-hoc within-subject effect size estimates were also calculated using a parametric test, standardized mean difference (SMD). Along with statistical analyses, I also conducted descriptive analyses to analyze post-experimental social validity data.

I used the traditional single-case research approach of visual analysis for analyzing data (Horner, 2005). I made observations regarding changes in level, trend, variability, immediacy of effect, degree of non-overlap, and consistency within, and across phases for each participant. It is important to note that visual analysis is useful for detecting clinical meaningful change but has limited reliability and may inflate Type I errors (Mercer & Sterling, 2011). Therefore, visual analysis was supplemented with a quantitative, nonparametric approach, *Tau-U* to help detect statistically significant change (Perdices & Tate, 2009). *Tau-U* measures nonoverlap between baseline and intervention phases, as well as intervention phase trend to yield reliable estimates of effect size (Parker, Vannest, Davis, & Sauber, 2011). I interpreted *Tau-U* scores using the following benchmarks: .65 or lower: weak or small effect; .66 to .92: medium to high effect; and .93 to 1: large or strong effect (Parker, Vannest & Davis, 2011; Vannest & Ninci, 2015). No participants required baseline correction. Post-hoc analyses were

conducted using SMD to quantify the degree of change in outcome variables for each clinician and across behaviors. I used a pooled standard deviation to calculate effect-size estimates. I interpreted effect-size estimates using benchmarks observed in the single-case aphasia literature (Beeson & Robey, 2006): 2.6 to 3.89: small; 3.9 to 5.79: medium, and 5.80 or higher: large-sized effect

The task-analysis and subscales of the ACIG measure were used to measure implementation fidelity. Three specific research questions were posed to evaluate implementation fidelity and determine whether the use of the eGAS app resulted in: (1) increased clinicians' collaborative interviewing skills, (2) facilitated implementation of a reliable interviewing process, and (3) facilitated generation of goal hierarchies that were valid based on goal attainment scaling theory. Additionally, responses from social validity measures, using standardized surveys TARF-R and C-COGS, as well as clinicians' interview responses were analyzed to determine chances of eGAS uptake, adoptability, and dissemination.

Research Question 1: Is there a functional relation between using eGAS and an increase in clinicians' collaborative interviewing skills?

The hypothesis for the first research question was that there would be an increase in the percentage of collaborative interviewing behaviors following use of the eGAS. The data supported a functional relation between using eGAS and implementation fidelity. Figure 1 illustrates the degree of fidelity displayed by clinicians when the researcher analyzed the task-analysis scores to detect collaborative interviewing behaviors. The graph depicts two variables: (1) the percentage of 0s (skills or behaviors absent), and (2) the percentage of 1s (skills or behaviors present) for 22 items related to collaborative

interviewing and GAS-setting behaviors on the task analysis. (Refer to Appendix C for the task analysis). For all three clinicians, a functional relation was indicated via visual inspection by: (1) the presence of an immediacy effect from baseline to experimental phases, (2) a decrease in the level of percentage of 0s and a corresponding increase in the level of percentage of 1s from baseline to experimental phase, and (3) an increase in the trend of percentage of 1s with a corresponding decreasing trend in the percentage of 0s from baseline to experimental phase. For participant 2, HG, stability of baseline data was questionable given the increasing trend in the percentage of 1s with a corresponding decreasing trend of 0s. However, the *Tau U* scores as noted in Table 6 for all participants suggested a large or strong effect despite the increasing trend in baseline phase for the second clinician.

Table 6

Visual Analysis Trends and Tau U Scores of Task-analysis Data

	Visual				Quantitative
Clinician	Stability of Phase A	M_{phaseA} versus M_{phaseB}	Trend in Phase B	Phase B level	*Tau U*
ML	Yes	Higher	Decreases	Decrease	-1
	Yes	Lower	Increases	Increase	1
HG	Yes	Higher	Decreases	Decrease	-0.95
	Yes	Lower	Increases	Increase	1
MP	Yes	Higher	Decreases	Decrease	-1
	Yes	Lower	Increases	Increase	1

Note. For each clinician, the upper row is analysis of the number of absent skills (percentage of 0s). The lower row provides analysis of the number of present skills (percentage of 1s).

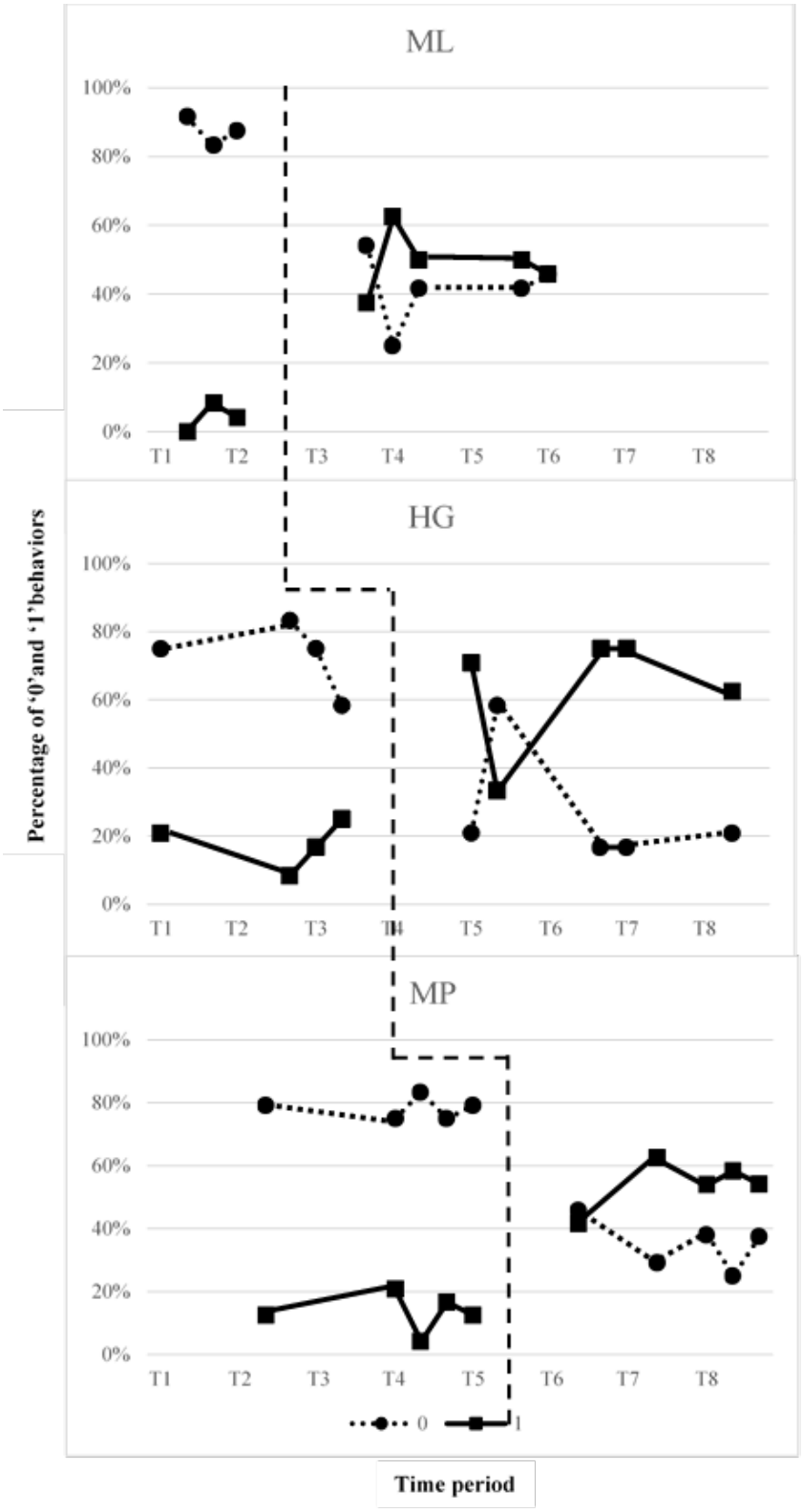


Figure 1. Task analysis scores depicting percentage of behaviors that are present (score of 1) or absent (score of 1)

A *post-hoc* analysis was completed to quantify the degree of change in each item on the task analysis from baseline to experimental phase in response to eGAS use. *Post-hoc* effect size estimates were also calculated to determine the degree of change in behaviors present for each clinician. Table 7 displays the results of this analyses. At baseline, between 4% and 25% of the behaviors or items on the task analysis were present for all clinicians. In the experimental phase, at least 49% of the behaviors or items on the task analysis were consistently present for all clinicians. Effect size estimates were moderate for two of three clinicians, and small for the third clinician (HG). Conventional guidelines suggest that single-case designs typically use within-subject data for calculating SMD. However, given trends of consistently present or absent behaviors across clinicians, I pooled data for each phase to calculate effect sizes for behaviors/items on the task analysis. When data were aggregated across phases, three behaviors (i.e. defining 3 of 5 GAS levels) showed small changes, and one behavior (ensuring unidimensional scales) showed a large change as a result of eGAS. Behaviors that were consistently missed differed by clinician. For example, MP and ML consistently missed weighting the goal and discussing how clients would measure progress on a goal within their natural context. HG missed asking clients about effective or ineffective strategies or approaches that they had tried to address the problem.

Table 7

Post-hoc Effect Size (ES) Estimates of Task-Analysis Items Between Clinicians

Items	*SMD*	*SE*	*95% CI*
Problem Identification Phase Behaviors			
Identifies context	1.52	0.43	0.68, 2.36
Identifies functional domain	1.84	0.45	0.95, 2.73
Identifies observable task	1.24	0.41	0.43, 2.04
Connects client goal with impairment	1.24	0.41	0.43, 2.04
Treatment Selection Phase Behaviors			
Asks client about what they have already tried for therapy	0.55	0.38	-0.20, 1.31
Asks client if self-formulated strategies were effective	0.19	0.38	-0.55, 0.93
Connects therapy rationale with impairment	0.47	0.38	-0.28, 1.21
Goal relates to purpose of therapy	0.63	0.39	-0.12, 1.39
GAS Construction Phase Behaviors			
Goal measures one behavior**	3.19	0.58	2.06, 4.32
Goal under client control	1.84	0.45	0.95, 2.73
level +1 defined	1.53	0.43	0.69,2.38
level +2 defined*	3.19	0.58	2.06,4.32
level 0 defined	2.50	0.51	1.51,3.50
level -1 defined*	4.68	0.74	3.23,6.14
level -2 defined*	3.19	0.58	2.06,4.32
Negotiates /ensures equidistance	0.89	0.39	0.11,1.66
Discusses measurement plan in natural context	0.63	0.39	-0.28,1.21
Weights goal	0.33	0.38	-0.41,1.08
Other Collaborative Behaviors			
Notifies client of transitions	-0.46	0.38	-1.20,0.29
Permission to provide info/educate	0.63	0.39	-0.13,1.38
Seeks client choice/endorsement	1.12	0.41	0.33, 1.92
Sets Agenda	0.17	0.38	-0.57,0.91
Percentage of Behaviors Present (Score of '1')			
ML**	5.10	1.43	2.30, 7.90
HG*	2.86	0.90	1.09, 4.63
MP**	5.19	1.30	2.63, 7.74

Note. **ES* estimates larger than 2.6. **moderate *ES* estimates (between 2.6 and 5.8)

Figure 2 also addresses the first research question and illustrates degree of fidelity for each clinician in following client-centered interviewing practices for the four goal setting phases (problem identification, buy in, strategy selection and construction of goal hierarchies) as measured on the ACIG. The level of client-centeredness composite percent score was compared before and after eGAS use to test the hypothesis that using eGAS had a functional relation with promoting client-centric interviewing across the phases. For all three clinicians, a functional relation was evident via visual inspection by: (1) the presence of an immediacy effect from baseline to experimental phases, and (2) an increase in the overall level of scores from baseline to experimental phase. For 2 of the 3 clinicians, percentage increase in the levels of client-centeredness were maintained during the experimental phase. For participant 3, MP, a decrease in the trend of the score percentage was noted. However, the *Tau U* scores in Table 8 of 1,1, and 0.96 for the first, second, and third participant respectively, suggested a large or strong effect despite the decreasing trend in the experimental phase for the second clinician.

Table 8

Visual Analysis Trends and Tau U Scores of ACIG Composite Client-centeredness Score

	Visual				Quantitative
Clinician	Stability of Phase A	M_{phaseA} is less than M_{phaseB}	Increasing trend in Phase B	Increase in Phase B level	*Tau U*
ML	Yes	Yes	Yes	Yes	1
HG	Yes	Yes	Yes	Yes	1
MP	Yes	Yes	No	Yes	0.96

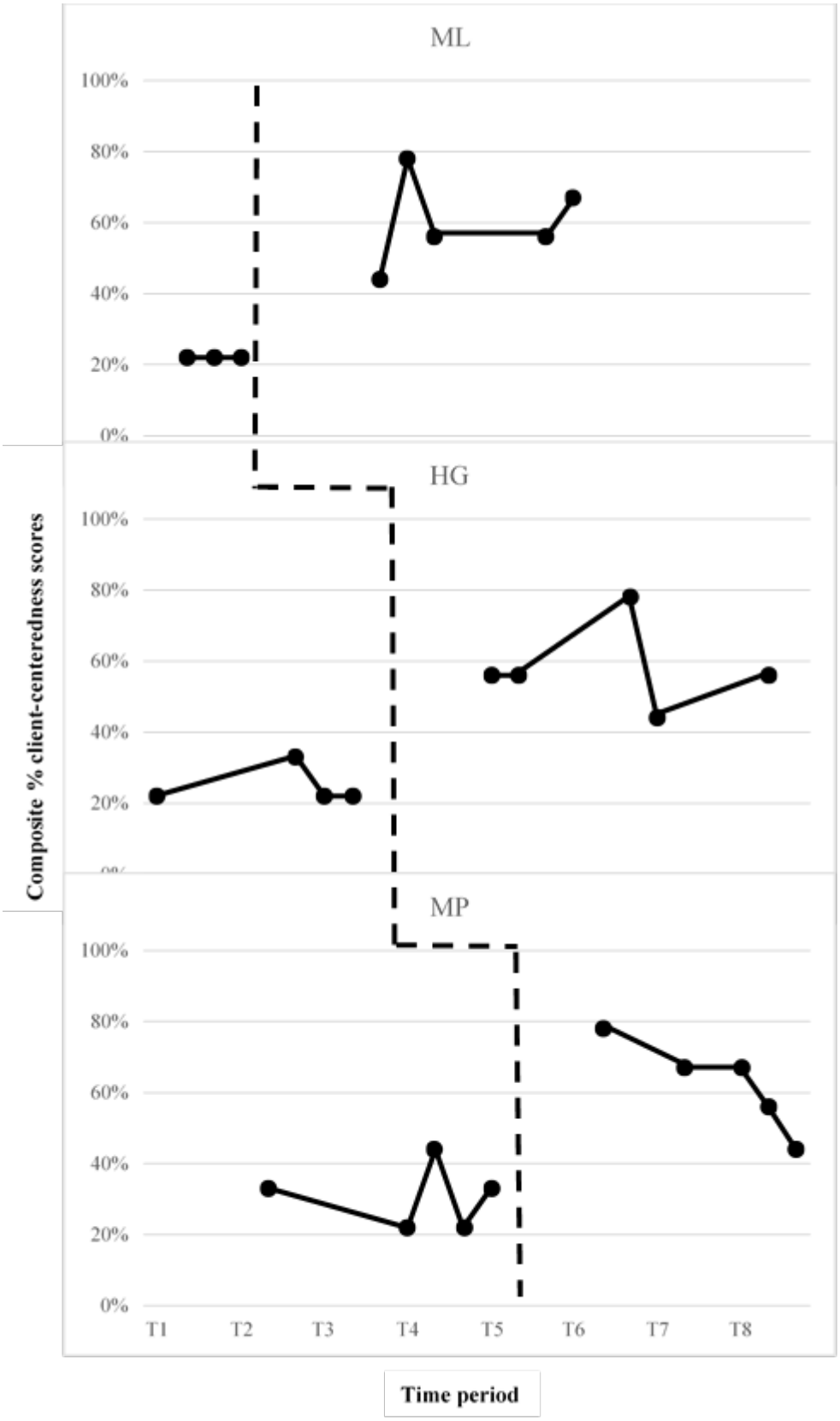


Figure 2. ACIG Composite levels of client-centeredness scores

Table 9 displays the results of *post-hoc* analysis to quantify the degree of change in composite client-centeredness scores. SMD calculated for each clinician reveal that effect sizes were observed to be small for two of three clinicians. Comparative analysis of mean ratings of client-centeredness for each of the interview phases (problem identification, strategy selection, and constructing GAS) revealed that for all 3 clinicians, mean ratings for client-centeredness for the problem identification, therapy selection, and GAS construction portions of the interview were consistently higher in the experimental phase.

Table 9

Post-hoc Effect Size Estimates for ACIG Composite Client-centeredness Scores Within Clinician

Clinician	*SMD*	*SE*	*CI*
ML*	3.17	1.02	1.17, 5.16
HG*	2.96	0.92	1.15, 4.76
MP	2.55	0.81	0.96, 4.14

Note. *indicates clinician effect size estimates larger than 2.6

Figure 3 sheds further light on the impact of eGAS in promoting collaborative interview skills by specifically evaluating clinicians' use of the motivational interviewing skills involved in using complex reflections. It compares the percentage of complex reflections used before and after eGAS implementation as measured by the ACIG. For 2 out of 3 clinicians, an increase in the overall level of scores from baseline to experimental phase was evident. For the first clinician, ML, a functional relation was evident because of immediacy of effect and an increasing trend in the percentage of complex reflections

in the experimental phase. For the second clinician, there was 100% overlap of data between both phases with no immediacy of effect. For the third clinician, 60% of the data in the experimental phase overlapped with the data in the baseline phase. *Tau U* scores in Table 10 also support trends noted in visual analysis, suggesting that only the first clinician displayed a strong effect.

Table 10

Visual Analysis Trends and Tau U Scores of ACIG's CR Percentage

	Visual				Quantitative
Clinician	Stability of Phase A	M_{phaseA} is less than M_{phaseB}	Increasing trend in Phase B	Increase in Phase B level	*Tau U*
ML	Yes	Yes	Yes	Yes	1
HG	Yes	Yes	No	No	0.10
MP	Yes	Yes	Yes	Yes	0.44

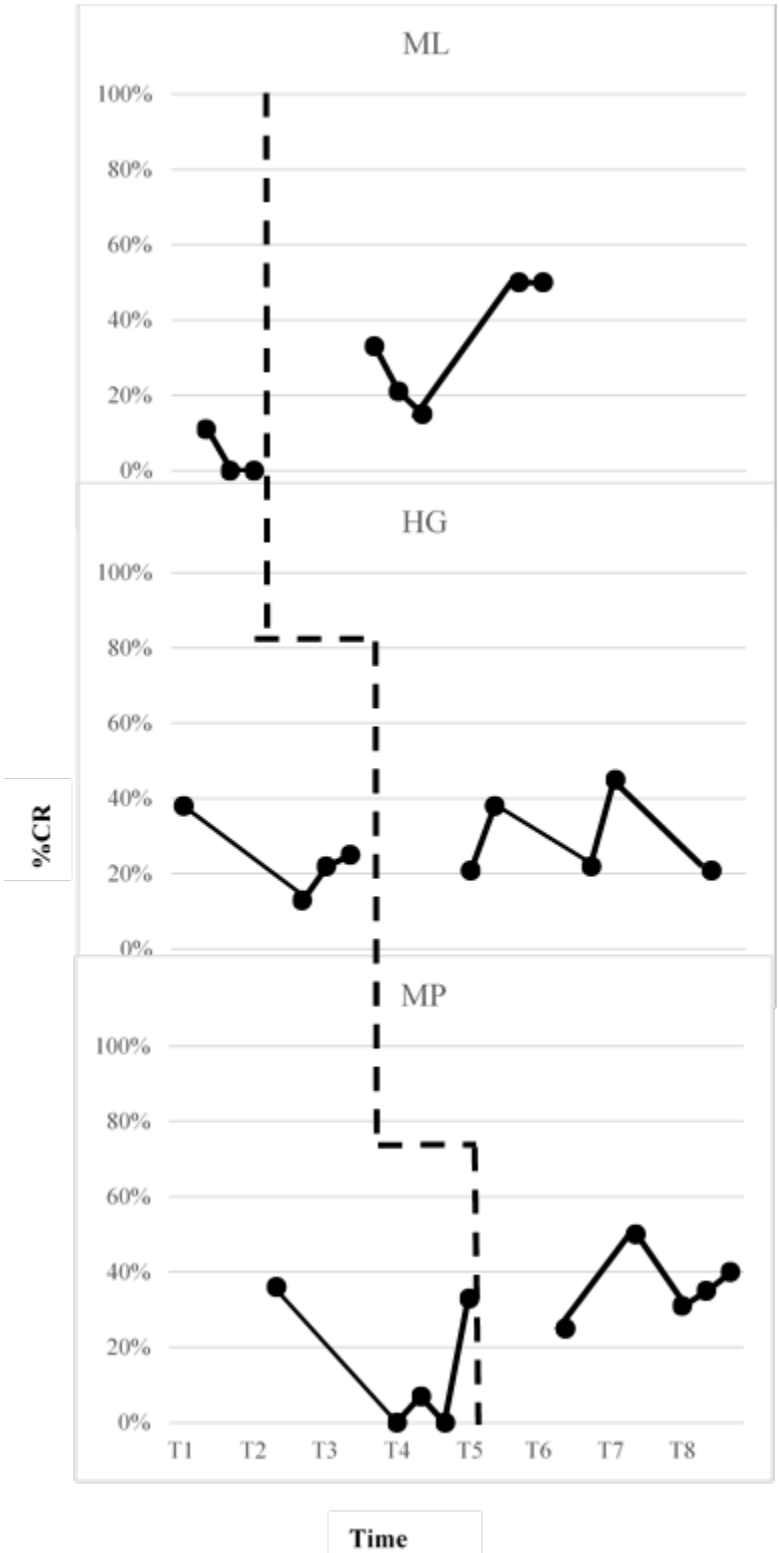


Figure 3. ACIG Percentage of Complex Reflections

Inter-rater Reliability. Table 11 displays ICC estimates and 95% confidence levels for all measures, calculated on 20% of the data in each phase ($n = 6$). Inter-rater reliability was weak ($ICC < 0.50$) for measures of client-centeredness and outcome for problem identification and treatment selection phase. Moderate ($ICC = 0.51 – 0.70$) inter-rater reliability was found for ratings of client-centeredness in the GAS construction phase and composite client-centeredness scores. Good inter-rater reliability was found for ratings of outcome for the GAS construction phase and composite outcome scores. Inter-rater reliability for the task analysis measure was excellent ($ICC > 0.80$).

Table 11

Inter-rater Reliability of ACIG Subscale and Composite Scores and Task-Analysis Measures for Study Data

Interviewing phases	ICC estimates
Problem identification	
Client-centeredness	0.41 [-0.50, 0.89]
Outcome	0.50 [-0.41, 0.91]
Therapy selection**	
Client-centeredness	0.00
Outcome	0.00 [-0.75, 0.75]
Constructing GAS	
Client-centeredness	0.55 [-0.35, 0.92]
Outcome	0.83* [0.19, 0.97]
ACIG composite	
Client-centeredness	0.58 [-0.31, 0.93]
Outcome	0.78* [0.06, 0.96]
Task-analysis	0.96* [0.75, 0.99]
ACIG GAS quality appraisal scale (SMARTED)	0.98* [0.85, 0.99]

Note. $n = 6$.

*$p < .05$

**For the therapy selection phase, 4 out of 6 cases had 100% agreement on outcome (score of 0), while in the remaining 2 cases there was a 1-point difference (RA had a rating of 1, researcher had rating of 0 for both cases). There was 100% agreement on the client-centeredness ratings (score of 0) for the therapy selection phase.

Research Question 2: Is there a functional relation between using eGAS and an increase in the validity of the generated scales?

Research question two focused on whether clinicians could implement the eGAS app to develop goal hierarchies that met the SMARTED criteria (specific, meaningful, attainable, relevant, time-specific, equidistant, and unidimensional; (Krasny-Pacini, Evans, Sohlberg, & Chevignard, 2016). Figure 4 displays the percentage of SMARTED

criteria that each goal attainment scale met for each client evaluated by the three clinicians. Functional relation between use of eGAS and goal validity was supported for all clinicians by: (1) presence of an immediacy effect from the baseline to experimental phase, (2) an increase in the level from baseline to experimental phase, and (3) an overall increase or maintenance of trend of data in the experimental phase. For participant 2, HG, stability of baseline was questionable given the increasing trend of appraisal scores. However, as noted in Table 12, *Tau U* scores for all three clinicians suggested the presence of a strong effect.

Table 12

Visual Analysis Trends and Tau U Scores of ACIG GAS Appraisal Score

	Visual				Quantitative
Clinician	Stability of Phase A	M_{phaseA} is less than M_{phaseB}	Increasing trend in Phase B	Increase in Phase B level	*Tau U*
ML	Yes	Yes	Yes	Yes	1
HG	No	Yes	Yes	Yes	0.95
MP	Yes	Yes	Yes	Yes	0.96

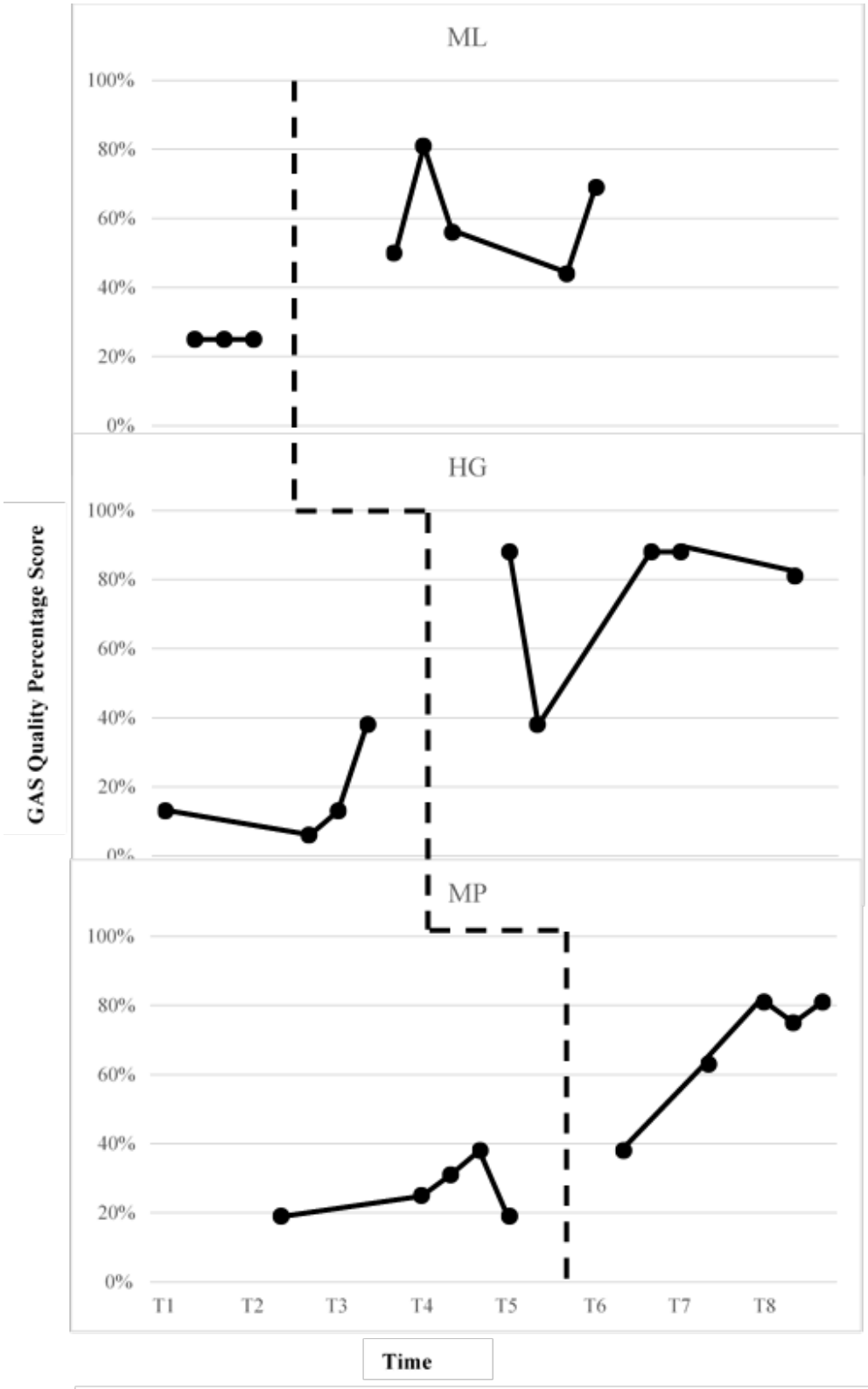


Figure 4. GAS appraisal scores

Table 13 displays *post-hoc* effect size estimates for composite GAS appraisal scores for each clinician. SMD estimates suggest that changes were small for two of the three clinicians. Table 14 shows results of effect size estimates for the individual appraisal criteria for each clinician. Although effect sizes would be interpreted as weak from the standpoint of single-case data from the aphasia literature, conventional group design guidelines suggest large effects (greater than 1) for 4 out of 8 criteria: describing levels, goal measurability, equidistance and unidimensionality of the scale.

Table 13

Post-hoc Effect Size Estimates for ACIG Composite GAS Quality Appraisal Scores Within Clinician

Clinician	*SMD*	*SE*	*CI*
ML	2.49	0.89	0.75, 4.24
HG*	2.78	0.89	1.04, 4.53
MP*	2.65	0.83	1.03, 4.27

Note. *indicates effect size estimates larger than 2.6

Table 14

Post-hoc Effect Size Estimates for Each GAS Appraisal Criteria by Clinician

GAS appraisal criteria	*SMD*	*SE*	*95% CI*
Levels*			
ML	2.72	0.93	0.89, 4.55
HG	2.10	0.78	0.58, 3.63
MP	5.14	1.29	2.61, 7.68
Context			
ML	-0.87	0.67	-2.19, 0.45
HG	0.86	0.63	-0.38, 2.09
MP	-0.36	0.58	-1.49, 0.77
Specificity			
ML	0.99	0.68	-0.35, 2.33
HG	1.26	0.67	-0.05, 2.57
MP	1.08	0.62	-0.13, 2.30
Measurability*			
ML	2.86	0.96	0.98, 4.74
HG	2.10	0.78	0.58, 3.63
MP	2.00	0.73	0.57, 3.43
Attainability			
ML	0.79	0.67	-0.51, 2.10
HG	2.27	0.80	0.70, 3.85
MP	1.02	0.62	-0.19, 2.23
Relevance			
ML	-0.48	0.65	-1.74, 0.79
HG	0.68	0.62	-0.53, 1.89
MP	-0.57	0.59	-1.72, 0.58
Equidistance*			
ML	1.91	0.79	0.35, 3.46
HG	1.84	0.74	0.39, 3.29
MP	1.81	0.70	0.43, 3.18
Unidimensionality*			
ML	1.99	0.81	0.41, 3.58
HG	1.60	0.71	0.21, 2.98
MP	1.79	0.70	0.42, 3.16

Note. *indicates criteria with effect size estimates larger than 1.00 for all clinicians.

Inter-rater Reliability. To evaluate inter-rater reliability the GAS quality appraisal scale that rated goals based on SMARTED criteria, 20% of the audio recordings in each phase were analyzed by a trained research assistant. ICC estimates and their 95% confident intervals were calculated using SPSS statistical package version 25 (SPSS Inc, Chicago, IL) based on a single-measure, two-way random-effects model. Results presented in Table 11 suggest excellent inter-rater reliability (*ICC* = 0.98) between the researcher and RA for scoring scales based on the SMARTED criteria.

Research Question 3: Is there a functional relation between using eGAS and an increase in the reliability of the interviewing process?

The third research question focused on whether clinicians would reliably address each phase of the interview process (identify a functional goal, address any barriers to patient buy-in, identify a specific intervention approach, and construct a goal hierarchy). Using the ACIG, a clinician could receive a score of 0-3 for each phase which was added up to receive a total outcome score. Figure 5 displays the phase outcome percentage score for each clinician gathered to determine the reliability of the goal-setting process. A weak functional relation between eGAS and an increase in the reliability of the process was suggested based on: (1) the presence of an immediacy effect, and (2) an increase or maintenance of positive trend in the experimental phase. No change in level and 100% overlap was noted for the third clinician (MP). *Tau U* score of 0.44 for this clinician also indicated a weak effect. However, *Tau U* scores (in Table 15) for the remaining two clinicians demonstrated a strong effect.

Table 15

Visual Analysis Trends and Tau U Scores of ACIG Composite Outcome Scores

	Visual				Quantitative
Clinician	Stability of Phase A	M_{phaseA} is less than M_{phaseB}	Increasing trend in Phase B	Increase in Phase B level	*Tau U*
ML	Yes	Yes	Yes	Yes	1
HG	No	Yes	No	Yes	1
MP	Yes	Yes	Yes	No	0.44

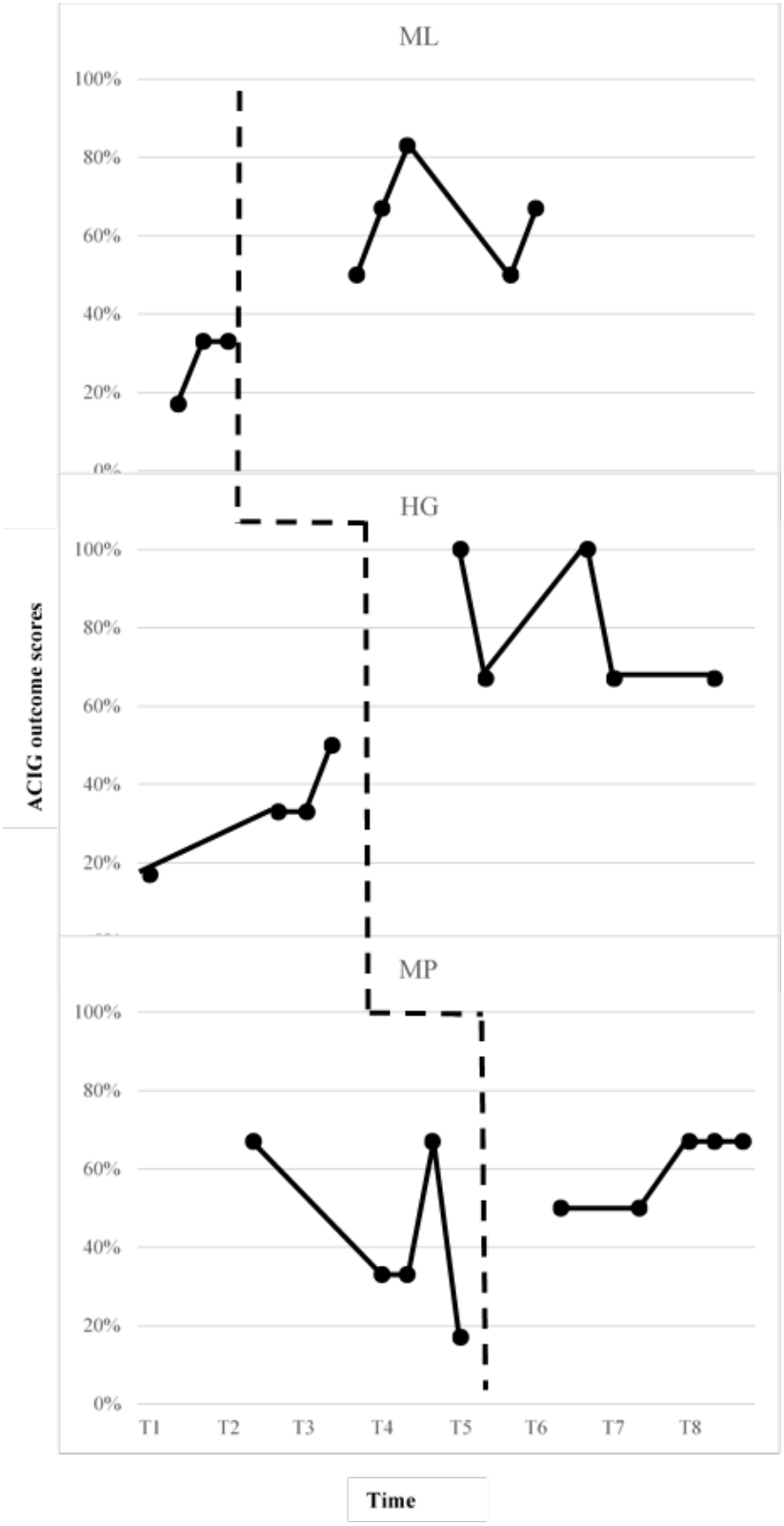


Figure 5. ACIG composite leves of outcome scores

Table 16 presents the results of *post-hoc* effect size estimates calculated using SMD for each clinician. Per guidelines from the aphasia literature on interpreting SMD estimates, only one of three clinicians displayed small changes as a result of eGAS. Comparative analysis of mean ratings of outcome and client-centeredness by the interview phases (problem identification, strategy selection, and constructing GAS) revealed that for all 3 clinicians, mean ratings for outcome were consistently higher in the experimental phase for 2 out of 3 interviewing phases, i.e. the problem identification and construction of GAS. For the treatment selection phase, this trend was observed for 2 out of 3 clinicians, ML and HG, but not for the third clinician, MP. MP's outcome scores reduced from baseline to experimental phase for the treatment selection portion of the interview.

Table 16

Post-hoc Effect Size Estimates for ACIG Composite Outcome Scores Within Clinician

Clinician	*SMD*	*SE*	*CI*
ML	2.48	0.89	0.74, 4.23
HG*	2.97	0.92	1.16, 4.78
MP	0.88	0.60	-0.30, 2.07

Note. *indicates effect size estimate is larger than 2.60

Inter-rater Reliability. To evaluate inter-rater reliability for ACIG's outcome scale, 20% of the audio recordings in each phase ($n = 6$) were analyzed by a trained research assistant. Table 11 displays ICC estimates and their 95% confident intervals calculated using SPSS statistical package version 25 (SPSS Inc, Chicago, IL) based on a single-measure, two-way random-effects model. Inter-rater reliability was weak (*ICC* <

0.50) for scoring outcome for problem identification and treatment selection phase. Raters demonstrated good inter-rater reliability ($ICC > 0.75$) when scoring outcome of the GAS construction phase and composite outcome scores.

Social Validity: Client Perspective

All clients were administered the C-COGS (Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015) questionnaire as a measure of social validity. Table 17 shows effect size estimates of C-COGS subscale and total scores for each clinician. Only clients treated by clinician ML displayed large changes in participation scores. Clients treated by MP and HG showed weak to no changes in perceptions of client-centeredness as a result of eGAS.

Table 17

Mean C-COGS Subscale and Total Scale Scores and Post-hoc Effect-size Estimates By Clinician

	Clinician		
C-COGS	ML	HG	MP
Participation subscale score			
M	0.88 0.96	0.96 0.91	0.96 0.85
SMD	9.83*	-1.09	-0.54
SE	2.55	0.65	0.54
95% CI	4.83, 14.82	-2.36, 0.19	-1.61, 0.53
Goals subscale score			
M	5.46 5.66	5.55 5.51	5.66 5.30
SMD	0.27	-0.93	-0.33
SE	0.64	0.64	0.58
95% CI	-0.98, 1.52	-2.17, 0.32	-1.45, 0.80
Total score			
M	6.34 6.62	6.51 6.41	6.62 6.15
SMD	0.40	-1.05	-0.39
SE	0.64	0.65	0.58
95% CI	-0.86, 1.66	-2.31, 0.22	-1.52, 0.74

Note. Values in the *M* row display mean scores. The upper value indicates mean scores of the baseline phase and lower value indicates mean scores of the experimental phase.
*indicates effect size larger than 5.80

Social Validity: Clinician Perspective

Clinicians completed two TARF-R (Reimer et al, 1992) questionnaires at the end of the experimental phase. One questionnaire focused on discerning the clinicians' perspectives relevant to the utility and feasibility of the app, and the other focused on understanding their perspective of the overall eGAS process. Table 18 presents descriptive data summarizing clinician responses to both questionnaires. On both questionnaires ML displayed the highest scores and MP displayed the lowest scores. Two out of the 3 clinicians had higher scores, indicative of greater agreement or likability for the process versus the app.

Overall, items regarding clinicians' understanding of the app and the interviewing process accounted for the highest score on the TARF-R survey. Scores were lowest on items asking clinicians to rate discomfort with using the app, disruption caused by the app, and the amount of time needed for familiarizing oneself with the app. When responding to TARF-R questions regarding the app specifically, clinicians had the highest scores when asked about their confidence level in eGAS being an effective technique for engaging in patient centered communication and goal-setting, and feeling supported when using eGAS. When responding to the TARF-R survey pertaining exclusively to the interviewing process, clinician ratings were high when asked if they found the process acceptable and if they liked it. Table 19 displays items that received the highest ratings when clinicians completed the TARF-R.

Table 20 presents clinician responses from the informal interview, organized by the category of study implementation, eGAS app, and training. Responses during the informal interview also supported trends found in the TARF-R responses. All three

clinicians felt that the feedback and debriefing after the first two sessions in the experimental phase was instrumental in helping them learn and feel confident about the process. Aspects of the interface that were helpful included the MI portion with sample verbiage and scripts for conducting the interview, as well the layout for inputting client information. Even though the interface was positively received, 2 out of 3 clinicians noted that the layout could be simplified for use in a session with clients by reducing the scripting content. The role play component of the training was useful to clinicians in learning the app. Two out of three clinicians felt that training needed to more specifically address steps to turn a goal into a scale, and additional examples would have been beneficial.

Table 18

TARF-R Ratings on Use of eGAS App and eGAS Process

Clinician	Application	Process
ML	72	73
HG	64	68
MP	61	58

Table 19

Questions on TARF-R Survey with the Highest Score

	eGAS app	eGAS process
Difference	Question	Question
Questions with the highest scores	• How clear is your understanding of the eGAS app? • How confident are you that eGAS will provide an effective technique for engaging in patient-centered communication and goal-setting? • How well supported did you feel using the eGAS?	• How clear is your understanding of the eGAS procedure? • How acceptable do you find the eGAS procedure? • How much do you like the eGAS ?

Table 20

Informal Interview Responses

Questions	ML	HG	MP
Study implementation	• Sessions should be 1 hour 15 minutes long • Study should incorporate Medicare requirements and should focus on writing long-term, not short-term goals. • Learning the EMR system while using/learning eGAS tripled workload and time investment • Challenging with "stacking up" evaluations in a short period of time.	• Accommodate to get the patients consent early. • Having researcher in the room, doing the consent ahead of time and then me walking in was weird • I acted differently because researcher was in the room; aspect of me being observed; nervous with learning something new and someone else being in the room. • Shuffling around evaluation sessions between clinicians was difficult	• More education for SLPs regarding research study logistics: how it works, how I take data. • Informational session with the front desk staff and admin regarding the study logistics. • Availability of iPads was an issue.
eGAS app	• Verbiage/script interface grounded me when I was stuck in the interview.	• Script guidelines was helpful because it gave ideas of what to say in situations. Buy-in section seemed helpful. • Layout seemed intuitive. Button for GAS levels was a good reminder to help me talk through the GAS portion • Too much content on app - had to look at it ahead of time, can't just launch into session without looking it. Too many suggestions of what to say. There should be lesser examples.	• Simplifying the app a little more, content is overwhelming. GAS levels section could be a "blanket" statement. • Easy to enter client information; layout was self-explanatory • App interface was good for training • Adopting the process is easy
Training	• No time to read the manual. An audio version would be helpful	• Role play was helpful; seeing trainer do it was also helpful; hands-on practice was helpful	• Blanket statements you gave me were helpful

• Need more training on how to break down a goal into levels • Input/periodic feedback was really helpful	• Training time was lengthy and unfeasible given institutional constraints training would be hard to do for other settings. • Getting feedback email helped me feel more confident	• Role play scenarios were helpful, when we played the clinician • Scaling is the hardest; more examples of different areas of different goals; sample goals • Needed more training but in a manner that would be helpful for institutional constraints • Helpful to have you available via email

Appraisal of Design

Single-case research methodologies are being increasingly used in medicine and encompass a diversity of methodologies that meet guidelines despite departing from stringent standards for single-case research (Tate et al, 2013). Several tools exist to evaluate the degree to which designs meet guidelines for single-case research. I chose one such tool, Risk of Bias in *N*-of-1 Trials (*ROBiNT*) scale (Tate et al, 2013), to evaluate the degree to which the single-case design used in this study adhered to published standards. The recently developed *ROBiNT* scale provides latitude for evaluating the rigor of implementing single-case methodologies in medical contexts and addresses gaps found in traditional tools, such as the Single-Case Experimental Design (SCED) scale.

ROBiNT was a 15-item scale that provides a thorough and efficient evaluation of the rigor with which the design meets critical single-case parameters. Items are classified into two subscales – (1) internal validity and (2) external validity and interpretation of the design. Items are rated on a 3-point scale (0, 1, 2). Designs can receive a maximum possible score of 30 points suggesting that all criteria are met fully. A study designed to assess *ROBiNT's* psychometric properties confirmed that the scale showed evidence of discriminative validity and inter-rater reliability (Tate et al, 2013).

Table 21 presents the scores for items on the scale, subscale, and a summative score. The single-case design employed in this work received a total score of 21 out of 30 possible points. On the internal validity subscale, the design in this study received a total score on of 9 out of 14 possible points. Two items of the subscale (design and blind assessors) met criteria fully, and the remaining five items met criteria partially. On the external validity subscale, the design scored 12 out of 16 possible points. Five items of

the subscale met criteria fully, two items met criteria partially (raw data record and generalization), and one item (replication) did not meet criteria.

Table 21

Appraisal of Single-Case Design based on ROBiNT Scale*

Item	Score	Rationale
Internal validity		
Design	2	At least 3 demonstrations of the treatment effect
Randomisation	1	Onset of treatment phase was randomized (i.e. order in which clinician would enter the treatment phase first was randomly determined)
Sampling of behavior (all phases)	1	Less than 5 data points but a minimum of 3 data points in baseline phase. 5 data points in treatment phase.
Blinding patient/therapist	1	Patient blinded to condition
Blinding assessors	2	Rater was blind to the phase to which audio recording belonged
Inter-rater reliability	1	20% of recordings in each phase sampled for inter-rater agreement with at least 70% agreement on rating scales
Treatment adherence	2	Person rating adherence was independent of the therapist, explicit statement regarding aspect of the intervention being rated (implementation of process) and method used to rate it (ACIG/task-analysis) which involves a direct, quantitative measure; a minimum of 20% of experimental sessions were rated; adherence check performed to ensure at least 60% adherence to protocol
External validity and interpretation		
Baseline characteristics	2	Provided a description of client's pre-requisite medical and functional status. Clinical variables included: age, sex, etiology, and severity. Clinician's pre-requisite information such as caseload requirement and clinical experience was specified.
Therapeutic setting	2	Description of Casa Colina hospital provided
Dependent variable (target behavior)	2	Precise and repeatable measures used with operational definitions (ACIG and task analysis); specification of correct/incorrect response provided
Independent variable (intervention)	1	Training described in detail – duration, components, and periodicity. Independent variable -'eGAS use' - needed specification.

Raw data record	1	Data presented in an aggregated format (each time period on the graph represents a period of 72 hours)
Data analysis	2	Systematic visual analysis completed aided by quasi-statistical techniques
Replication	0	Entire experiment not repeated
Generalisation	1	Generalisation of client-centered interviewing and goal-setting techniques across clients programmed into training. Strategies for conversing with clients with limited awareness/insight were given to clinicians during training.
Scores		
Internal validity	10 (71%)	
External validity and interpretation	11 (69%)	
Total	21 (70%)	

Note. *ROBinT stands for 'Risk-of-Bias in N-of-1 Trials'

CHAPTER V

DISCUSSION

The purpose of this study was to examine the impact of training clinicians to use eGAS on the fidelity of implementation of this approach and on the quality of client goals that were generated. A growing body of research supports the use of client-centric and collaborative goal-setting techniques to evaluate health outcomes, however time-related constraints and lack of knowledge have been major barriers to translation and adoption of such practices into clinical contexts. This study evaluates the adherence to, and uptake of the processes and behaviors supported in the patient-centered goal setting eGAS app designed to increase interviewing and goal-setting conversations with clients by hospital based SLPs. It represents the first study of the responsivity of SLPS to training and support for engaging in collaborative goal setting practices.

I hypothesized that training clinicians to use eGAS would improve adherence by (1) increasing the percentage of collaborative interviewing and goal-setting behaviors, (2) increasing the reliability of the process, and (3) fostering goal scales that were valid based on goal attainment scaling theory (Krasny-Pacini et al, 2016). A theory-driven tool called ACIG and a task analysis, were developed to measure changes in interviewing and goal-setting behaviors. This chapter discusses findings from both measures in relation to the hypotheses. The section also reviews challenges of implementing the project in a clinical context, especially on the rigor of the study design and the results. The section concludes with a discussion on the implications of this work on SLP practices and future directions for research.

Research Question 1: Relation between using eGAS and fidelity

I hypothesized that using eGAS would result in a functional increase in collaborative interviewing fidelity. Fidelity was assessed using the ACIG scale and the task-analysis. Specific indices of fidelity on these measures included: (1) the percentage of collaborative interviewing and goal-setting behaviors measured via the task analysis and ACIG's level of client-centeredness scale, and (2) the percentage of complex reflections measured via ACIG's collaborative MI behavior scale. Results revealed that eGAS had a strong effect on interviewing fidelity. Chief indicator of this deduction was a functional increase in the percentage of collaborative interviewing and goal-setting behaviors on two out of three indices -- ACIG levels of client-centeredness and task-analysis. No functional changes were noted on the third index, i.e., percentage of complex reflections (%CR), as a result of using eGAS. Rationale for these findings and related trends in data speculated to affect fidelity are discussed below.

Percentage of Complex Reflections (%CR). Based on the theory-driven design of eGAS, it is reasonable to assume that to implement eGAS with fidelity, one must be able to skillfully combine its evidence-based components, MI with GAS. Proficiency in only one of the components may result in little to no improvements in fidelity. %CR has been traditionally used as one of several metrics for evaluating clinician proficiency in MI (Moyers, Manuel, & Ernst, 2014). Per expert opinion, proficiency thresholds for %CR need to be between 0.40 (indicating fair competency) to 0.50 (indicating good competency) (Moyers, Manuel, & Ernst, 2014). These estimates must be used in conjunction with other metrics because their clinical value is derived from expert consensus, not normative or validity data (Moyers, Manuel, & Ernst, 2014). In this study,

two out of three clinicians (MP and HG) already attained these levels at baseline, suggesting some proficiency with MI. No functional changes were noted for both these clinicians. For the third clinician (ML), %CR displayed a strong functional increase because at baseline she was below proficiency levels. These data trends suggest that using eGAS might help clinicians become proficient with MI but proficiency with MI alone might not guarantee fidelity in implementing eGAS.

Task-analysis. Per the task analysis, eGAS resulted in improved fidelity as indicated by an increase in the percentage of collaborative interviewing and goal-setting behaviors present in session. Unlike the %CR metric, the task-analysis comprised of items that fused MI and GAS techniques. It may therefore be a more sensitive indicator of behavior change and consequently, fidelity. Findings from the post-hoc analysis data suggested that using eGAS resulted in large improvements in scale construction behaviors. Prior to being introduced to the eGAS, clinicians identified the cognitive domain that was affected in their patients and described how therapy could address the underlying impairment. After using eGAS, clinicians consistently displayed behaviors critical to the problem identification and GAS construction phase. Client discussions moved from a narrow focus on identifying cognitive impairments to constructing and scaling a goal hierarchy across all clinicians.

Despite an overall increase in fidelity, provider-specific differences emerged when analyzing gains in fidelity. HG who had the least amount of professional experience demonstrated the highest gain in fidelity scores, followed by MP with more experience. ML, with the most amount of professional experience demonstrated the lowest gain in fidelity scores. Differences in fidelity could be tied to variations in

training, specifically the second role-play. For instance, ML's role-play focused exclusively on consolidating one aspect of eGAS – using open-ended questions, whereas HG's second role-play targeted fluency with all components of the app. Including multiple opportunities for repeated practice of all components of eGAS might contribute to greater variation in fidelity as opposed to professional experience.

ACIG Levels of Client-centeredness. Statistically significant increases in the mean composite scores of ACIG's levels of client-centeredness were evidence that using eGAS increased the fidelity of collaborative interviewing behaviors. The level of client-centeredness scale measured the degree to which clinicians demonstrated client-centric interview and goal setting behaviors in each phase on a 4-point rating (between 0 – 4). Using eGAS resulted in functional increase in the level of client-centeredness for all three phases of the interview. Highest gains were observed for the problem identification and GAS construction phase for all clinicians. An increase in scores typically reflected conversations moving from either clinician-led or directed (score of 0 or 1) to client-led or directed (score of 2 or 3). Although scores in the treatment selection phase improved, levels remained between 0 and 1, suggestive of a clinician-led interview. It is interesting to note that analysis from the ACIG client-centeredness scale resonates with findings on the task-analysis measure. On both measures, clinicians demonstrated higher fidelity for two of the three interview phases. The treatment selection phase was implemented with the least fidelity.

One reason for this tendency of diminished fidelity in the treatment selection phase could be that treatment selection was a complex component of eGAS. Discussions on treatment selection are abstract and dependent on client profile. Using eGAS

improved client-centeredness by prompting clinicians to elicit functional goals meaningful to clients and transform elicited goals into levels of progress scales. Task analysis trends and ratings of client-centeredness for the problem identification and GAS construction phases suggest that these sets of behaviors are more concrete and thus more easily learned and implemented. In the baseline phase, conversations targeted the identification of cognitive impairments and their impact on activities on daily living, and directed the client to the best intervention approach, followed by standardized testing. After the three clinicians were trained to use the eGAS process, time spent on proposing a treatment approach was replaced by a complex discussion on eliciting a tangible behavior/task/activity relevant to the client as a rehabilitation target, followed by scaling that goal into quantifiable levels of progress. To observe higher levels of collaborative behaviors in the treatment identification phase, more training with different exemplars might be required.

Client Perception of Involvement. C-COGS was a questionnaire administered to clients that measured social validity and degree to which clients were responsive to the eGAS process. I hypothesized that if eGAS was implemented with high fidelity, it would reflect in C-COGS scores. In other words, clients in the baseline phase would have significantly lower mean scores compared to clients in the experimental phase on the C-COGS scale. Findings did not support this *a priori* hypothesis. Results revealed that using eGAS had no effect on total C-COGS scores for all three clinicians. Post hoc analysis also revealed that clients interacting with ML experienced an increased participatory role as a result of eGAS. However, no changes in participation subscale scores for C-COGS for the remaining two clinicians suggests that clients experienced

adequate level of participation and inclusion in goal-setting conversation regardless of eGAS use. These findings are interpreted through the lens of construct validity and instrument design.

One conceivable explanation for these findings is that researchers' theoretical conceptualizations of what constitutes adequate engagement and participation in patient-provider interactions differs vastly from patient perceptions of these interactions (Eliacin, Salyers, Kukla, & Matthias, 2015). A recent study proposes that instead of using universal indicators to denote interactions as "participatory", patients assign more weight to both parties agreeing on the outcome of the conversation (Shay & Lafata, 2014). During the baseline phase, SLPs in this study sought a patient's consent to pursue the recommended treatment plan. In the experimental phase, though there was a rise in behaviors signaling partnership, these nuanced behaviors were not an essential to shaping clients' perception. Studies reviewing existing patient-reported measures of satisfaction recognize this marked heterogeneity in the underlying constructs of patient satisfaction, shared decision-making, and engagement; that lead to disparities in measurement and perception (Kasper et al, 2011; Elwyn et al, 2001).

A related issue that adds to the challenge of measuring patient satisfaction is the approach used to design and develop these tools (Ree, Wiig, Manser, & Storm, 2019). Systematic review of tools designed to measure patient participation and satisfaction note the lack of involvement of patient experience and input in constructing items that signal satisfaction and participation (Ree, Wiig, Manser, & Storm, 2019). This observation stands true for the development process of C-COGS. C-COGS was developed by practitioners wanting to be client-centered and needing an objective index to guide and

evaluate individually orientated practice (Doig et al, 2015). Moreover, the tool was designed primarily to measure goal alignment, goal planning participation, and client-centeredness of goals for adults with cognitive impairment related to acquired brain injury (Doig et al, 2015). In the context of this study, patients with a variety of diagnoses, beyond acquired brain injury, were completing C-COGS. Development of C-COGS and its exclusive focus on a specific population could be factored into the lack of its discriminative utility in the context of this study.

Nevertheless, a logical conclusion that can be drawn from the lack of difference in the scores between clients in baseline versus experimental phase is that using eGAS is also perceived as a client-centric experience. From a social validity standpoint, clients were accepting and receptive to clinicians using eGAS. Discriminative scores would be noted if the same client had the conversation with the same clinician before and after she received training. However, given the context of this research design and various ethical and organizational constraints, this would be difficult scenario to curate. At the very least, no change in C-COGS scores suggests that the eGAS process was favored as much as the typical routine, if not more by clients.

Clinician Perception. Clinicians endorsed the concept and clinical value of eGAS. One expected finding was that clinicians rated the process more highly than the app. This trend is not surprising because training emphasized mastery over the techniques, not the app. Clinicians also reported feeling confident in implementing the process and continuing to use the MI techniques post completion of the study. The two clinicians with lower fidelity reported the need for more training and less complexity on the app in the feedback interview. From the standpoint of the clinician as an end-user,

eGAS has the potential to be adopted if the setup of the app is less complex and training expands to include multiple opportunities for practice.

Research Question 2: Functional relation between using eGAS and validity of goal hierarchies

I hypothesized that using eGAS would lead to functional improvement in validity of goals as measured by ACIG's GAS quality appraisal scale. The quality appraisal scale was designed to assess the validity of goal attainment scales based on eight criteria proposed by Krasny-Pacini and colleagues (2016). Results suggested that using eGAS had a strong effect on overall goal validity. Comparative analysis of scores attained on each criteria suggest that using eGAS had a large effect on enhancing clinicians' ability to: (1) identify and prioritize a solitary functional task or behavior that clients wanted to address (unidimensionality), (2) transform the goal into a multi-level scale (scaling into levels), (3) with measurable descriptors (measurability) and, (3) somewhat consistent increments of progress (equidistance). Changes captured by the ACIG's GAS quality appraisal scale also corresponded with change in behaviors as captured by the task-analysis. Using eGAS improved clinicians' ability to identify functional tasks and turn them into scales that tended to have characteristics like unidimensionality and attainability.

Responses from the clinicians' social validity questionnaires and interviews suggested that setup of the app and training contributed to functional changes in validity. Clinicians reported that verbiage on the left-hand side of the app was instrumental in steering conversations from identifying a goal to transforming into a scale. Features like the GAS levels button were useful in monitoring the conversation for which levels

had/had not been discussed. Clinicians also reported that aspects of training delivery and/or components were especially useful in conceptualizing and feeling confident with implementation of the eGAS process. Exposure to a range of examples of scales that met and/or partially met criteria, specific tips in initiating the conversation ("start with the highest level - +2 – because it might be easier for a client to describe an ideal scenario, before addressing descriptions of intermediate levels") and role play scenarios were reported as helpful in understanding conditions that led to creation of a valid scale.

Attention to the more overarching aspects of the eGAS process – like identifying a functional goal, transforming goal into 5 levels that were measurable and unidimensional – took precedence over regularly monitoring validity of scales. Factors that were predictive of breakdowns in meeting validity criteria included client profile, self-reported barriers, and gaps in implementation integrity. Clients with a mild to moderate difficulties in verbal expression including word-finding deficits and/or highly verbose clients, compounded the problem of attending to validity criteria. Both client profiles were indicative of special cases that were highlighted in the manual as examples where clinicians would need to supplement the collaborative format with other techniques such as alternative communication supports and/or ability to re-direct the conversation using reflections. Clinicians HG and ML displayed diminished validity when they encountered clients that matched this profile.

Breakdowns that clinicians self-reported during training were predictive of struggles that they would encounter during the session. MP's lack of an immediacy effect after training was because she reported struggling with transitioning from identifying a goal to scaling it during training. This was exacerbated by her difficulty to download and

access the app in a timely manner. ML noted that creating the scale would be impeded by (1) the challenge of simultaneously attending to all the criteria, and (2) applying it to unique cases like clients with impaired insight. This was evident in the variation in her validity scores throughout the second phase of the study.

Finally, gaps in consistently using the app throughout the interview reflected in validity scores. HG demonstrated the highest compliance in using the features of the app during conversation. Her validity scores were noted to be above 80% for a majority of the scales. ML displayed the greatest inconsistency with app use, which might explain why she has the lowest validity scores.

Research Question 3: Functional relation between using eGAS and reliability of the eGAS process

My final hypothesis was that using eGAS would improve the reliability of the interview process. Reliability was measured using ACIG's level of outcome subscale that evaluated the degree to which clinicians attained the intended outcome of each eGAS phase using a 3-point scale (score of 0, 1, 2). I hypothesized that eGAS use would result in functional increase in scores on ACIG's outcome scale for all clinicians suggestive of high reliability. Results indicated that using eGAS had a moderate effect on reliability. Improvement in reliability was strongly evident for 2 out of 3 clinicians. For the third clinician, MP, although results indicated no significant improvements in reliability, variability in interviewing structure and maintenance of interviewing skills were observed post eGAS training.

Deeper analysis of trends in outcome scores by clinician imply that using eGAS resulted in differential improvements in reliability and largely dependent on certain

phases of the interview. Increase in the outcome level score for two phases - the problem identification and constructing GAS phases – influenced the overall composite reliability score. Relatively small to no changes occurred for the outcome scores of buy-in and treatment selection portions of the interview. The buy-in phase was not encountered for every client and could therefore be considered an adaptable component of the interview. Gaps in training and barriers associated with implementation contributed to low reliability in implementing the treatment selection phase.

Conversations in the treatment selection phase were limited to asking clients what they had already tried to address their concerns. Discussion on introducing evidence-based approaches and discussing pros/cons were seldom covered. Clinicians tended to focus on introducing strategies (example: "have you tried to use a calendar to help remember appointments") and eliminating options sequentially, as opposed presenting a variety of evidence-based practices (example: "I have two ideas that might be effective ways to address the problem. Do you want to hear about them?") Training needed to cover the taxonomy of available approaches, corresponding pros/cons of each approach, and setup of the dropdown menu of the treatment approaches button in extensive detail. Training structure and implementation of eGAS was circumscribed by setting-specific regulations.

Time allotted for research-based activities limited the amount of information that could be conveyed to clinicians in a two-hour training. Third-party payor regulations also mediated how sessions were structured. Inclusion of standardized test scores was necessary for reimbursing evaluation sessions. Time left for engaging clients in conversations was driven by time spent in test administration.

Summary

Literature argues that engaging clients in goal-setting conversations has a positive impact on health outcomes, but such frameworks have yet to be adopted into routine clinical practice. eGAS was derived from two such evidence-based approaches to provide clinicians with a practical, collaborative goal-setting framework. A primary goal of this study was to determine the integrity of implementation of eGAS and its corresponding impact on reliability and validity. This study provides preliminary support that it is feasible to train hospital-based SLPs working in the field of neurorehabilitation to implement eGAS with reliable degree of fidelity to produce valid client-centric goal hierarchies. Clinicians with varying degrees of experience were successfully able to elicit functional targets for rehabilitation and transform them into multi-level scales of progress that shared common properties characteristic of valid scales. Phases of eGAS that were consistently noted in the interview across clinicians were the problem identification and construction of GAS. One speculation that can be made was that the scripted portion of the eGAS app and the GAS levels input feature were critical to implementation fidelity. A noteworthy clinical implication is that it is possible to train and adapt a collaborative, goal-setting format despite variations in characteristics of the end-user (clinician experience or client profile), organizational barriers, and professional regulations on implementation integrity. This study also provides firsthand experience into factors that directly influence how eGAS is implemented and received by end-users. Clinicians endorsed the concept and utility of eGAS in improving communication practices. Although clients did not recognize the difference in communication when eGAS was in

effect, their responses suggested that eGAS techniques were at par with alternative interviewing techniques when it came to eliciting perceptions of client-centeredness.

Another important contribution of the project was the design of measures that can be used to validly assess clinician collaborative interviewing for the purpose of goal setting. The ACIG and task-analysis may have potential to be used in SLP graduate training programs. These measures also have utility to be used as generic indices of client-centeredness and collaborative interactions across rehabilitation disciplines.

This study provides critical insight into facilitators and barriers distinct to implementation versus fidelity. Clinician buy-in and access to logistical systems that accommodated research needs were indispensable to implementing this study. Buy-in into the rationale for modifying interviewing behaviors and the potential effect of the app was necessary for clinicians to participate in this study. Buy-in also enable the researcher to modify clinician schedules for meeting design requirements. Organizational authorization to use the electronic scheduling system of the hospital enabled access to patient records and contact information, clinician schedules, etc. Mediators of implementation fidelity included training and advanced access to eGAS. Debriefing sessions offered to clinicians was another implementation strategy adopted during the protocol to moderate fidelity.

Implementing all components of eGAS with full fidelity was mitigated by several factors. A primary concern was lack of time spent on familiarizing oneself with eGAS by reading the manual. Professional demands set limits on the amount of time and effort clinicians could invest outside of a regular work day to learn new approaches. Another barrier arose from the conflict of meeting organizational and professional regulations

while gradually adapting to the eGAS process. Despite these complications, the study provides promising evidence that conforming to the eGAS process creates a reliable structure for eliciting functional and meaningful goals. Replication of these findings in other healthcare contexts can be achieved if we address implementation and design related limitations.

Study Limitations

Although the study provides compelling evidence of the effect of eGAS training on interviewing and goal-setting skills, findings must be interpreted with caution. Conducting the study in a dynamic healthcare environment that dealt with resource-restraints, regulated by complex organizational and legal mandates posed indomitable challenges for successfully attaining research objectives. This section highlights three such critical limitations that affect adherence to design standards, strength of the evidence, and the conclusions that can be drawn. Limitations are described in terms of (1) contextual, (2) methodological, and (3) instrumentation barriers that preclude our ability to generalize results. Factors in each of these areas and their influences on the strength and credibility of the evidence are discussed below.

Contextual Factors. Compromises in design validity were a primary drawback as a result of conducting the study in an ecological context. Results appraising the design using the *ROBiNT* scale suggest that the design met criteria with reservations. Basic criterion for demonstrating methodological soundness, i.e. at least 3 replications of treatment effect was met, but professional and organizational regulations, limited the extent to which other criteria, like randomization of phase sequence or onset, inclusion of a maintenance phase, were met. An important prerequisite for the clinical director,

participating SLPs and the institution to accommodate this project was to provide approximate, if not precise information regarding study duration, number of sessions, and training schedules in advance. It was difficult to ensure stability of the baseline phase against the need for defining expectations and parameters for involvement in a research study. Reserving a two-hour slot for training in the clinician's work schedule and staggered introduction of treatment phase competed with organizational priorities like monitoring client cancellations, client's scheduling priorities, and clinicians' holiday/weekend/off-day work schedules. Raw data was aggregated and presented across a 72-hour period to accommodate rapid changes in clinicians' schedules. Organizational conflicts also drove the decision to deviate from the original design of including a maintenance phase. Although the exclusion of a maintenance phase did not violate design standards, its absence prevented the analysis of whether the clinician's behavior changes are durable which is an essential characteristic for the tool to be impactful.

For participating clinicians, meeting the demands of the research project conflicted with institutional-level prerogatives. Construction of an entirely new speech-language pathology outpatient department and introduction of new electronic medical record (EMR) software was disruptive to participation. SLP offices were in proximity to the workspace under construction and resulting noise levels were a deterrent for the client and clinician to participate in the session. Dissemination and training of a hospital-wide EMR system clashed with study objectives. Learning to use an EMR system while interviewing took priority over using the eGAS app. Introduction of the EMR also reduced the amount of time clinicians invested in study-related activities like consulting

the manual to gain fluency with the process. Unanticipated extraneous factors, inherent within natural contexts, collectively influenced the strength of outcomes.

Restricting the study to the outpatient department of a research-affiliated hospital precludes one's ability to understand barriers and facilitators unique to other settings, such as acute-care or skilled nursing facilities. Clinical format, alignment of institutional mission with the study's objectives, and time allotted to evaluation at a research-affiliated hospital like Casa Colina proved to be an ideal environment for exploring the impact and feasibility of using eGAS. Sessions were typically an hour, a time frame that was suitable for implementing the eGAS approach during interviewing. However, clients that arrived later than the scheduled time negatively influenced a clinician's ability to complete the entire process. Requirements that clinicians must include a standardized test in an evaluation further limited time available for the goal setting process. The training period of two hours was conducive to learning and implementing the process with a reasonable level of adherence. More than two hours of training might have assured complete adherence, but the requirement would have opposed the organization's productivity standards. Therefore, a critical gauge of external validity is setting-specific constraints. Replication of these findings in alternative settings would require modification of the research design.

Methodological Factors. The small number of clinicians in this study was a major methodological limitation. Ideally, I would need 5-6 clinicians to replicate the effect and bolster the power of the findings. Another limitation was the difficulty in identifying the active ingredients of eGAS because distinction between the features of actual eGAS app and the components of the interview process supported by the app was

blurry. In this study, the IV was defined as "eGAS use", but whether that meant use of the app or process was unclear. Clinician feedback provided at the end of the study suggested that it was important to have access to the eGAS app, specifically the scripts, but being adept at using the app was not considered an active ingredient for mastery of the process. Observations in the experimental phase reflected clinician report. Clinicians were observed to have the iPad with the app present on the table during the interview and intermittently refer to it to guide conversations or provide cues about next steps. However, clinicians were inconsistent with using the app throughout the session to note client input before proceeding with the interview. Presence of the eGAS app seems to be a critical component but future work needs to include a functional analysis component to determine which components are most important for improving fidelity -- using the app without training, providing training without insistence on using the app, or a combined approach.

The ideal focus of the training remains unclear. The structure and goal of training used in the study emphasized mastery of the eGAS process and did not address fluency in navigating the app. Clinical behaviors emphasized in the task-analysis and ACIG measures were a gauge of adherence to the eGAS process. Feedback during role-play activities and post sessions underscored strategies that facilitated creation of goal hierarchies that met criteria for validity, addressed client-specific barriers and reinforced fluency with the process. Fluency with navigating the app and using features as intended was not measured or highlighted as a vital indicator of mastery with the process. Including practice scenarios that reinforce success with using the app accurately during conversation might result in a stronger functional relation between eGAS and adherence.

Broad inclusion and exclusion criteria pertaining to patient profiles affected validity of goals. Individuals that presented with word-finding difficulties or aphasia were included in the study, but the assigned evaluation time was insufficient for completing the interview using the eGAS process. Training alluded to sections in the manual that dealt with developing alternative approach to communication for persons with aphasia, but practice scenarios or role plays were not catered to such scenarios. Limiting implementation of eGAS process to clients with completely intact verbal communication skills might be helpful for clinicians in the early phases of learning eGAS. The design would need to incorporate additional training time to allow practice with communicating with individuals with deficits in verbal communication.

Measurement. In addition to the above limitations, piloting of instruments used to measure clinicians' behaviors would have enabled greater inter-rater reliability and precision in measurement. A preliminary pilot study provided support for ACIG's construct validity, but validity or reliability of the task analysis measure that was based on the ACIG was not established prior to the study onset. Inclusion and operationalization of certain criteria used for assessing validity of goal hierarchies need to be reviewed. For example, the criteria for 'relevance' (one of the SMARTED goal criterion) is somewhat abstract and difficult to detect simply by listening to recorded sessions. Specificity was another SMARTED criterion that was difficult to detect because clinicians did not always have the time to broach the subject of treatment and intervention in the assessment session. A final aspect to consider is the dynamic structure of the interview that does not consistently map on to the interview phases of eGAS. ACIG was designed to correspond to the interviewing phase setup of the eGAS app. Tracking

multiple variables (client centeredness, outcome, etc.) for each aspect of the interview makes data-taking susceptible to errors.

Clinical Implications

This work is a pioneering effort into examining the feasibility, validity, and reliability of a structured collaborative goal-setting framework facilitated on the eGAS app. Lack of knowledge and constraints inherent in clinical environments are significant barriers impeding adoption of goal-setting frameworks into practice (Lenzer et al, 2017). From a research standpoint, the traditional and arduous route of designing trials without accounting for the infrastructure of real-life contexts for which they were intended also delays adoption (Bauer, Damschroder, Hagedorn, Smith, and Kilbourne, 2015). Results of the study suggest that is possible to train clinicians to use a theoretically driven, semi-structured collaborative interviewing framework to generate client-centric goals. The eGAS app provides a client-centered, goal-setting format for clinicians to effectively absorb and translate into routine assessment practices in clinical milieus fraught with barriers. A noteworthy clinical implication to be drawn from this work is that eGAS technique is responsive to heterogenous client profiles and can be adopted by clinicians with varying degrees of professional expertise.

The study paves the way for further investigation into the utility of eGAS on creating client-centric goals across multiple clinical contexts. Hybrid designs that integrate implementation science principles and single-case research standards will serve as efficient conduits for examining feasibility and psychometric soundness of eGAS as an outcome measure. Further research is warranted to facilitate translation and sustained

adoption of eGAS across different clinical settings. Future work requires studies that establish the feasibility, validity and reliability of eGAS in various clinical milieus.

Future Directions. This study responded to a need for demonstrating the feasibility of a well-operationalized client-centric, collaborative, goal-setting technique for clinicians to use in routine practice. Future studies need to focus on incorporating factors that would increase the uptake, adoption, and dissemination of this tool across medical settings. Altering the research design to facilitate complete adherence and confidence with using eGAS would be a likely first step. One major alteration is to replicate the study using a larger number of clinicians. Additionally, altering the design might make it feasible to implement the study in clinical contexts. A multiple-baseline design with an extended training phase and inclusion of a maintenance phase might improve outcomes as well as design validity. Training format would comprise of multiple thirty-minute slots with each session focused on one aspect of learning the app and process in unison till clinicians gain complete fluency. Adding a maintenance phase might help to demonstrate durability of the intervention. Changes in design would accommodate the myriad time and scheduling constraints in a medical setting while enabling clinicians to demonstrate increased fidelity and efficacy with eGAS.

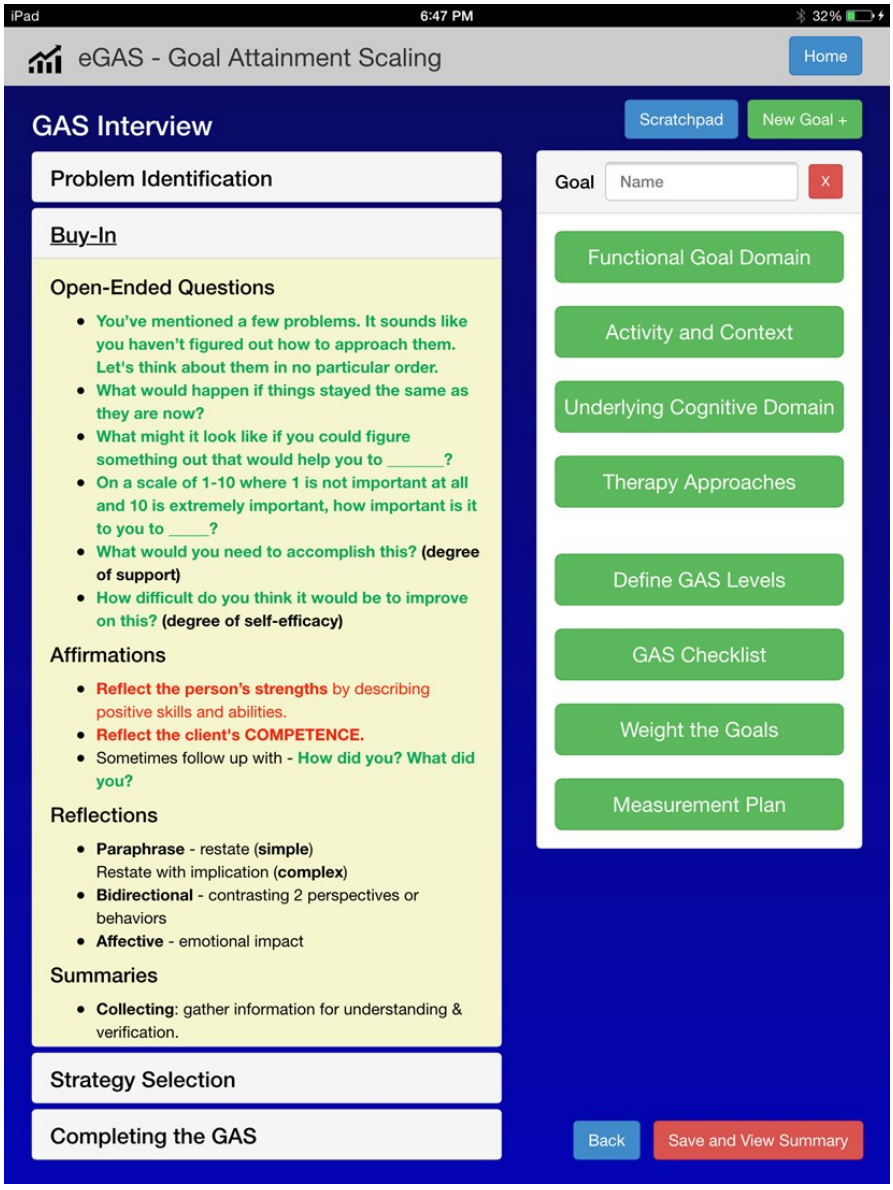
Another promising next step that would support uptake efforts to other contexts would be to increase the reliability and sensitivity of eGAS as an outcome measure. Using a measure of client perception regarding types and relative importance of functional goal areas will provide an estimate of the reliability of eGAS process. Comparing client's performance on eGAS against existing client-centric tools like the

Canadian Occupational Performance Measure in conjunction with an external index of change will help evaluate sensitivity of eGAS.

eGAS has the potential to be embraced as a valid and reliable client-centric measure across therapy disciplines and rehabilitation contexts. Designing trials that combine single-case standards with implementation science approaches are an effective route for further testing the psychometric properties of eGAS while simultaneously evaluating the feasibility and fidelity of the process.

APPENDIX A

SCREENSHOT OF eGAS APP



APPENDIX B

ASSESSMENT OF CLIENT-CENTEREDNESS WHEN INTERVIEWING AND GOAL-SETTING (ACIG) SCALE

Goal Setting Phase	Use of OARS	Level of Client-Centeredness	Outcome
Problem identification: Clinician collaborated with client in identifying a functional goal or honing in on a functional domain	Open ended questions (Q): Affirmations (A): Simple reflections (SR): Complex reflections (CR): Summaries (S):	0=clinician-directed (e.g., clinician uses client file to state problems; confirming medical history and providing direction for rehab) 1 = clinician-led (e.g., clinician explores knowledge, beliefs, information needs and preferences; verifies information accuracy) 2 = client-led (e.g., uses questions to let client share all information and details; occasionally affirms client's strengths while empathizing; uses client's contributions to move interaction toward identifying a specific goal) 3 = Client-led with clarity (e.g., uses simple and complex reflections regularly to move conversation forward; moves clearly from eliciting goal areas to identifying a priority; summarizes and confirms client's goal priorities before moving into next phases; clearly indicates to client whether interview is moving into buy-in or strategy selection/goal setting phase)	0 = not met (No functional domain identified) 1 = partially met (One or more functional domain explored but not adequately defined) 2 = met (One or more functional domain explicitly described)
Buy-in: Clinician enables client to endorse need for therapy or positive expectation for receiving help.	Open ended questions (Q): Affirmations (A): Simple reflections (SR): Complex reflections (CR): Summaries (S):	0 = clinician-directed (e.g., confronts client about client's insight/awareness; does not attend to client perspective; proposes solution) 1 = clinician-led (e.g., enables client to verbalize b/f; acknowledges client's perspective; misses opportunities to resolve ambiguity) 2 = client-led (e.g., clinician explores ambiguity; shares information to facilitate decision-making toward a goal; uses client's language to identify motivation, ability, and likelihood of need to seek rehab) 3 = client-led with clarity (e.g., confirms motivation for seeking treatment and indicates a clear transition to strategy selection phase by summarizing and affirming client's needs)	0 = not met (potential barriers/facilitators not explored) 1 = partially met (potential barriers/facilitaors partially explored) 2 = met (client demonstrates buy in or engages in change talk)
Strategy selection – Clinician able to assist client in selecting a specific approach to address overarching problem	Open ended questions (Q): Affirmations (A): Simple reflections (SR): Complex reflections (CR):	0 = clinician-directed (e.g., identifies what has/has not worked; proposes approach for client) 1 = clinician-led (e.g., uses client's language during interaction; predominantly relies on forced choice to determine client preferences) 2 = client-led (e.g., shares information about different approaches; integrates goals stated previously into approach; pros/cons; seeks client's choice/preference in decision-making	0 = not met (client does not know what approach will be used to address issue) 1 = partially met (client has vague understanding of approach) 2 = met (client

		Summaries (S):	and understands rationale/motivation behind decision) 3 = client-led with clarity (e.g., confirms approach with client; makes a clear transition to this phase from previous conversations; affirms client's decision with evidence-base, client profile that would make this treatment route a good match and indicates to client how this approach would help meet goal)	could describe basic approach)
Constructing goal hierarchies – Clinician enables client to identify 5 levels of progress towards an overarching goal	Open ended questions (Q): Affirmations (A): Simple reflections (SR): Complex reflections (CR): Summaries (S):		0 = clinician-directed (e.g, patient not involved in goal operationalization process) 1 = clinician-led (eg., patient provides input by answering questions regarding preferences but clinician decides goal details) 2 = client-led (e.g., negotiates goal setting by asking client's permission; uses client language to write goals; provides rationale for modifying goal; and/or confirms GAS with client) 3 = client-led with clarity (eg., clearly defines purpose of phase; evaluates SMARTED criteria and asks permission to modify goals to fit criteria; and makes suggestions for improving goal clarity, validity, and measurability whenever opportunity is presented)	0 = not met (scale met 0- 1 criteria) 1 = partially met (scale met 2-4 criteria) 2 = met (scale met at least 5 criteria)
Composite/total scores	Time: ___ to ___	R:Q = Total reflections/total questions	**_____/9 (without buy-in)** **_____/12 (with buy-in)**	**_____/6 (without buy-in)** **_____/8 (with buy-in)**
	Time: ___ to ___	%CR = CR/(SR + CR)		

Note. b/f = barriers/facilitators

Scale: Quality appraisal			
Levels described Five GAS levels have been precisely described preintervention for each scale.	**0 – Not met** Only one level (baseline) has been objectively described	**1 – Partially met** Two levels (baseline) and (expected outcome) described	**2 – Met** All 5 levels have been objectively described
Context of measurement – Context of performance measurement is clearly defined (prompts, cueing, support, amount of help/guidance, location) and is	**0 – Not met** Cuing/prompting/level of assistance not clearly defined GAS level (-1): Does not prepares school bag; GAS level (0): Manages to prepare the school bag; GAS	**1 – Partially met** Cuing/prompting/level of assistance is clearly defined but not at every level GAS level (-1): Prepares school bag but requires constant verbal guidance	**2 – Met** Cuing/prompting/level of assistance is clearly defined at every level GAS level (-1): Prepares school bag but requires constant verbal guidance from the parents or

controlled for during GAS rating	level (+1): Manages to prepare school bag alone	from the parents or teacher; GAS level (0): Manages to prepare the school bag; GAS level (+1): Manages to prepare school bag alone, using a check-list of necessary steps	teacher; GAS level (0): Manages to prepare the school bag using a check-list of necessary steps and under supervision; GAS level (+1): Manages to prepare school bag alone, using a check-list of necessary steps
Goal: Quality appraisal			
Specificity - whether goals set specifically relate to the intervention being tested	**0 – Not met** Goal is unrelated to the purpose of the intervention (Example: A goal targeting using safe swallow strategies, is the end result of attention process training)	**1 – Partially met** Goal is partially related the purpose of the intervention (Example: A goal targeting managing appointments independently using an app, could be the end result of attention process training)	**2 – Met** Goal is directly related to the purpose of the intervention (Example: A goal targeting managing appointments independently could be the end result of external aid training)
Measurability – objective and measurable (quantifiable) goal attainment indicators are used	**0 – Not met** Subjective nonquantitative criteria of performance (Example: Ms. Smith will manage her appointments)	**1 – Partially met** Attainment indicator is objective but may not be directly observable (Example: Ms. Smith will report back on number of appointments attended)	**2 – Met** Attainment indicator is objective and directly observable (Example: Ms. Smith will have CNA verify the number of appointments attended via phone during sessions)
Attainability – Scales align with expected performance	**0 – Not met** Skill/Behavior is not under control of the client (e.g.,	**1 – Partially met** Skill/behavior is partially under control of client	**2 – Met** Skill/behavior is fully under control of client

	doesn't have access to scheduler)	(sometimes has access)	
Relevance – Functional goal represents clinically meaningful change	**0 – Not met** Goal is not a priority or importrant for client/family	**1 – Partially met** Goal is somewhat important for client/family	**2 – Met** Goal is important to the client/family
Equidistance – difficulty from one level to the next is roughly equal	**0 – Not met** None or only one of the three descriptions are equilibrated appropriately	**1 – Partially met** Two of the descriptions are equilibrated appropriately in reference to the goal	**2 - Met** All of the three descriptions relative to the goal are equilibrated and scaled appropriately)
Unidimensionality Goal is created to measure only one dimension / construct	**0 – Not met** Goal attends to > 2 constructs at a time (Example: Ms. Smith will attend to reading for X minutes, retain X% of information and demonstrate comprehension by answering 5 questions to related content)	**1 – Partially met** Goal attends to 1 construct but multiple behaviors/stimuli to capture (Example: Ms. Smith will read expository text for X minutes; but narrative type texts for Y minutes without distractions)	**2 – Met** Goal is designed to measure only 1 construct / domain / behavior at a time (Example: Ms. Smith will attend to reading for X minutes)
TOTAL SCORE:		**8 X 2 = 16**	

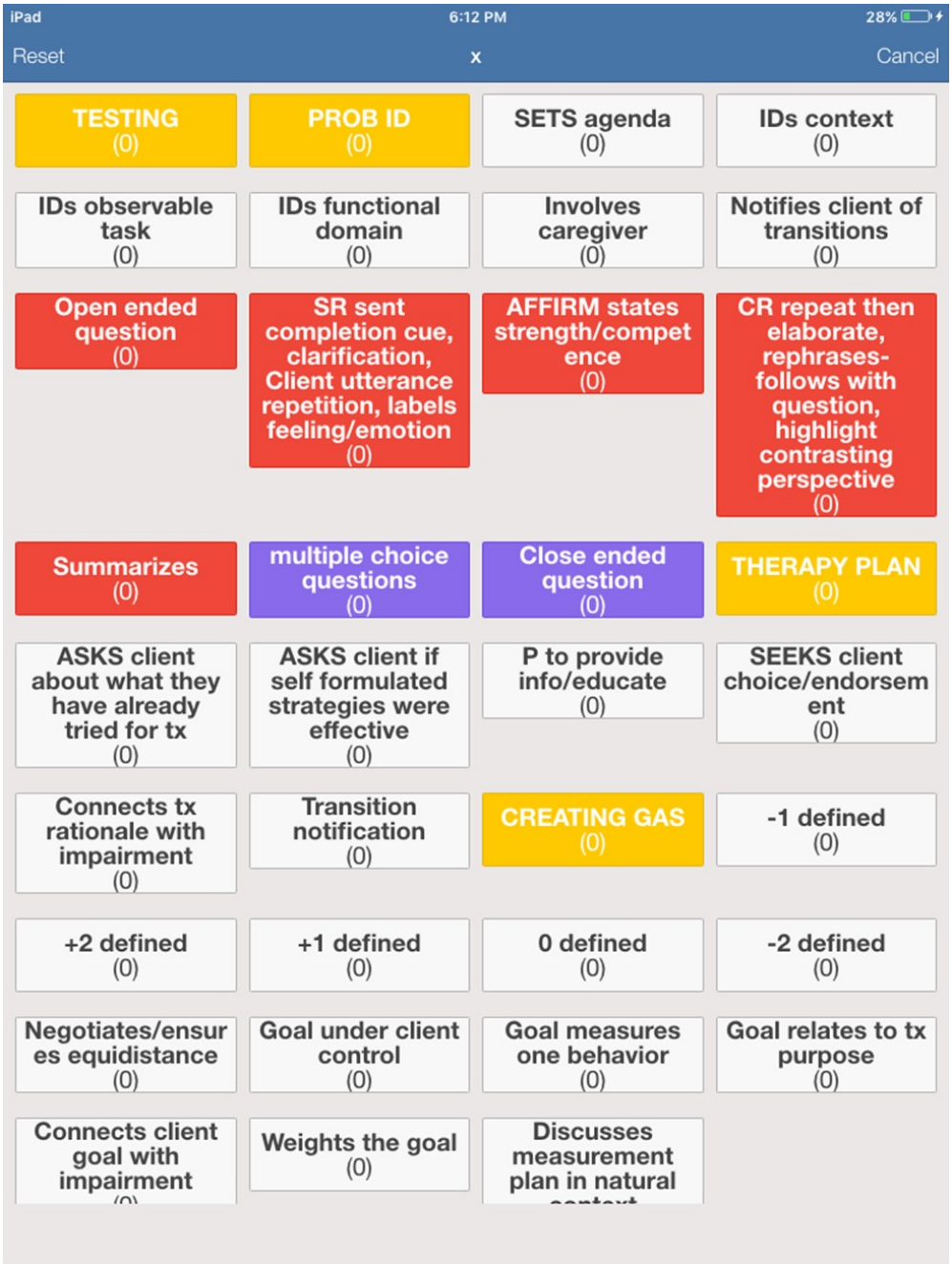
APPENDIX C

TASK-ANALYSIS

ITEMS	0	1	2
Problem Identification Phase Behaviors			
Identifies context			
Identifies functional domain			
Identifies observable task			
Connects client goal with impairment			
Treatment Selection Phase Behaviors			
Asks client about what they have already tried for therapy			
Asks client if self-formulated strategies were effective			
Connects therapy rationale with impairment			
Goal relates to purpose of therapy			
GAS Construction Phase Behaviors			
Goal measures one behavior			
Goal under client control			
level +1 defined			
level +2 defined			
level 0 defined			
level -1 defined			
level -2 defined			
Negotiates /ensures equidistance			
Discusses measurement plan in natural context			
Weights goal			
Other Collaborative Behaviors			
Notifies client of transitions			
Permission to provide info/educate			
Seeks client choice/endorsement			
Sets Agenda			

APPENDIX D

SCREENSHOT OF COUNTEE APP



APPENDIX E

CLIENT-CENTEREDNESS OF GOAL-SETTING SCALE (C-COGS; Doig, Prescott, Fleming, Cornwell, & Kuipers, 2015)

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	C-COGS subscale	
						Alignment	Participation
1. The goals are what I want to work on	1	2	3	4	5	No score generated. Review responses for meaning.	
2. The goals are what my friend/relative wants me to work on	1	2	3	4	5	No score generated. Review responses for meaning.	
3. The goals are what my therapist wants me to work on	1	2	3	4	5	No score generated. Review responses for meaning.	
4. Significant people in my life (i.e. family, friends) were involved in planning the goals as much as I wanted them to be	1	2	3	4	5	No score generated. Review responses for meaning.	
5. The therapist encouraged me to participate in setting the goals	1	2	3	4	5		
6. I was an active participant in the goal-setting session	1	2	3	4	5		
7. My views and opinions about the goals were listened to	1	2	3	4	5		
8. I felt like a partner in the goal-setting process (along with the other people involved in my goal-setting session(s))	1	2	3	4	5		
9. I made the final decision about which goals were set	1	2	3	4	5		
Participation subscale score (total of items 1, 5, 6, 7, 8 and 9)							/ 30

	Goal	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	Average: Total ratings for each goal and divide by number goals
10. The goal is	1	1	2	3	4	5	Average

meaningful and important to me as it relates to who I am and my future	2	1	2	3	4	5	goal meaningfulness: /5
	3	1	2	3	4	5	
	4	1	2	3	4	5	
	5	1	2	3	4	5	
	6	1	2	3	4	5	
11. The goal is **relevant** to my everyday life as it relates to what I want to do at home, work or in the community	1	1	2	3	4	5	Average goal relevancy: /5
	2	1	2	3	4	5	
	3	1	2	3	4	5	
	4	1	2	3	4	5	
	5	1	2	3	4	5	
	6	1	2	3	4	5	
12. The goal is what I am **motivated** to work on	1	1	2	3	4	5	Average goal motivation /5
	2	1	2	3	4	5	
	3	1	2	3	4	5	
	4	1	2	3	4	5	
	5	1	2	3	4	5	
	6	1	2	3	4	5	
13. The goal is my **own goal**	1	1	2	3	4	5	Average Goal ownership /5
	2	1	2	3	4	5	
	3	1	2	3	4	5	
	4	1	2	3	4	5	
	5	1	2	3	4	5	
	6	1	2	3	4	5	
Goals subscale score (total of average score for items 11, 12, 13 and 14)							/ 20
Total C-COGS score (Participation subscale + Goal subscale scores)							/ 50

APPENDIX F

TREATMENT ACCEPTABILITY RATING FORM-REVISED (TARF-R; Reimers & Wacker, 1988)

Please score each item by circling the number that best indicates how you feel about the eGAS app/procedure.

1. How clear is your understanding of the eGAS app/procedure?

1	2	3	4	5
Not at all clear		Neutral		Very clear

2. How acceptable do you find the eGAS app/procedure?

1	2	3	4	5
Not at all acceptable		Neutral		Very acceptable

3. The assessment/interview sessions using eGAS will be easy to do for me.

1	2	3	4	5
Not at all		Neutral		Very easy

4. The assessment/interview sessions using eGAS will be easy to complete for me.

1	2	3	4	5
Not at all		Neutral		Very easy

5. I believe that eGAS will be beneficial to my and my peers.

1	2	3	4	5
Not at all beneficial		Neutral		Very

6. To what extent do you think there might be disadvantages to using eGAS?

1	2	3	4	5
None likely		Neutral		Many likely

7. How much time will be needed for familiarizing yourself with eGAS before the next session?

1	2	3	4	5
Little time will be needed		Neutral		Much time will be needed

8. How confident are you that eGAS will provide an effective technique for engaging in patient-centered communication and goal-setting?

1	2	3	4	5
Not at all confident		Neutral		Very confident

9. How helpful do you think the eGAS will be?

1	2	3	4	5
Not at all helpful		Neutral		Very helpful

10. How disruptive will the eGAS be?

1	2	3	4	5
Not at all disruptive		Neutral		Very disruptive

11. How much do you like the eGAS ?

1	2	3	4	5
Do not like them at all		Neutral		Like them very much

12. How willing would you be to suggest the eGAS to others needing assistance?

1	2	3	4	5
Not at all willing		Neutral		Very willing

13. How much discomfort are you likely to experience while using eGAS?

1	2	3	4	5
No discomfort at all		Neutral		Very much discomfort

14. How well supported did you feel using the eGAS?

1	2	3	4	5
Not at all supported		Neutral		Very

15. How well will carrying out the eGAS fit into your existing routine?

1	2	3	4	5
Not at all well		Neutral		Very well

16. How effective will the eGAS be in teaching and other clinicians?

1	2	3	4	5
Not at all effective		Neutral		Very effective

17. How well does the eGAS fit to improve your use of research-based strategies to improve patient-centered interviewing and assessment?

1	2	3	4	5
Not at all		Neutral		Very much

REFERENCES CITED

Adamovich, B. B. (1998). Functional outcome assessment of adults with traumatic brain injury. *Seminars in speech and language, 19*(3), 281-290.

Adams, D., & Dahdah, M. (2016). Coping and adaptive strategies of traumatic brain injury survivors and primary caregivers. *NeuroRehabilitation*, *39*(2), 223–237. https://doi.org/10.3233/NRE-161353

Allen, J. D., Shelton, R. C., Emmons, K. M., & Linnan, L. A. (2017). Fidelity and its relationship to implementation effectiveness, adaptation, and dissemination. *Dissemination and Implementation Research in Health: Translating Science to Practice*, *2*, 267.

Aubree Shay, L., & Lafata, J. E. (2015). Where is the evidence? a systematic review of shared decision making and patient outcomes. *Medical Decision Making*, *35*(1), 114–131. https://doi.org/10.1177/0272989X14551638

Bach, L., & David, A. (2006). Self-awareness after acquired and traumatic brain injury. *Neuropsychological Rehabilitation*, *16*(4), 397–414. https://doi.org/10.1080/09602010500412830

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*(2), 248–287. https://doi.org/10.1016/0749-5978(91)90022-L

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC psychology, 3*(1), 32. doi:10.1186/s40359-015-0089-9

Beeson, P. M., & Robey, R. R. (2006). Evaluating single-subject treatment research: Lessons learned from the aphasia literature. *Neuropsychology review, 16*(4), 161-169.

Bell, K. R., Temkin, N. R., Esselman, P. C., Doctor, J. N., Bombardier, C. H., Fraser, R. T., Hoffman, J.M., Powell J.M., & Dikmen, S. (2005). The effect of a scheduled telephone intervention on outcome after moderate to severe traumatic brain injury: a randomized trial. *Archives of Physical Medicine and Rehabilitation*, *86*(5), 851-856.

Bellg, A. J., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., Ogedegbe G., Orwig D., Ernst D., & Czajkowski, S. (2004). Enhancing treatment fidelity in health behavior change studies: best practices and recommendations from the NIH Behavior Change Consortium. *Health Psychology*, *23*(5), 443.

Bergquist, T. F., Micklewright, J. L., Yutsis, M., Smigielski, J. S., Gehl, C., & Brown, A. W. (2012). Achievement of client-centred goals by persons with acquired brain injury in comprehensive day treatment is associated with improved functional outcomes. *Brain Injury*, *26*(11), 1307–1314. https://doi.org/10.3109/02699052.2012.706355

Bertakis, K. D., & Azari, R. (2011). Patient-centered care is associated with decreased health care utilization. *The Journal of the American Board of Family Medicine*, *24*(3), 229-239.

Black, S. J., Brock, K. A., Kennedy, G., & Mackenzie, M. (2010). Is achievement of short-term goals a valid measure of patient progress in inpatient neurological rehabilitation?. *Clinical rehabilitation*, *24*(4), 373-379.

Bombardier, C. H., Ehde, D., & Kilmer, J. (1997). Readiness to change alcohol drinking habits after traumatic brain injury. *Archives of physical medicine and rehabilitation*, *78*(6), 592-596.

Bombardier, C. H., & Rimmele, C. T. (1999). Motivational interviewing to prevent alcohol abuse after traumatic brain injury: A case series. *Rehabilitation Psychology*, *44*(1), 52.

Bouwens, S. F., van Heugten, C. M., & Verhey, F. R. (2009). The practical use of goal attainment scaling for people with acquired brain injury who receive cognitive rehabilitation. *Clinical Rehabilitation*, *23*(4), 310–320. https://doi.org/10.1177/0269215508101744

Braden, C. A., Cuthbert, J. P., Brenner, L., Hawley, L., Morey, C., Newman, J., Staniszewski, K., & Harrison-Felix, C. (2012). Health and wellness characteristics of persons with traumatic brain injury. *Brain Injury*, *26*(11), 1315–1327. https://doi.org/10.3109/02699052.2012.706351

Brands, I. M. H., Bouwens, S. F. M., Gregório, G. W., Stapert, S. Z., & Van Heugten, C. M. (2013). Effectiveness of a process-oriented patient-tailored outpatient neuropsychological rehabilitation programme for patients in the chronic phase after ABI. *Neuropsychological Rehabilitation*, *23*(2), 202–215. https://doi.org/10.1080/09602011.2012.734039

Brands, I., Stapert, S., Köhler, S., Wade, D., & Van Heugten, C. (2015). Life goal attainment in the adaptation process after acquired brain injury: The influence of self-efficacy and of flexibility and tenacity in goal pursuit. *Clinical Rehabilitation*, *29*(6), 611–622. https://doi.org/10.1177/0269215514549484

Boosman, H., Winkens, I., Van Heugten, C. M., Rasquin, S. M. C., Heijnen, V. A., & Visser-Meily, J. M. A. (2017). Predictors of health-related quality of life and participation after brain injury rehabilitation: the role of neuropsychological factors. *Neuropsychological rehabilitation*, *27*(4), 581-598.

Carlozzi, N. E., Tulsky, D. S., & Kisala, P. A. (2011). Traumatic brain injury patient-reported outcome measure: identification of health-related quality-of-life issues relevant to individuals with traumatic brain injury. *Archives of physical medicine and rehabilitation*, *92*(10), S52-S60.

Carlson, P. M., Boudreau, M. Lou, Davis, J., Johnston, J., Lemsky, C., McColl, M. A., Minnes P., & Smith, C. (2006). "Participate to learn": A promising practice for community ABI rehabilitation. *Brain Injury*, *20*(11), 1111–1117. https://doi.org/10.1080/02699050600955337

Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. *Implementation science*, *2*(1), 40.

Cicerone, K., Levin, H., Malec, J., Stuss, D., & Whyte, J. (2006). Cognitive rehabilitation interventions for executive function: moving from bench to bedside in patients with traumatic brain injury. *Journal of cognitive neuroscience*, *18*(7), 1212-1222.

Cicerone, K. D., Azulay, J., & Trott, C. (2009). Methodological quality of research on cognitive rehabilitation after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *90*(11), S52-S59.

Cicerone, K. D., Langenbahn, D. M., Braden, C., Malec, J. F., Kalmar, K., Fraas, M., Felicetti, T., Laatsch L., Harley, P., Bergquist T., Azulay, J., Cantor J., & Ashman T. (2011). Evidence-based cognitive rehabilitation: updated review of the literature from 2003 through 2008. *Archives of physical medicine and rehabilitation*, *92*(4), 519-530.

Charles, C., Gafni A., Whelan, T. (1997). Shared decision making in the medical encounter: What does is mean? (or it takes at least two to tango). *Social Science & Medicine*, *44*(5), 681–692. https://doi.org/S0277-9536(96)00221-3

Chaytor, N., & Schmitter-Edgecombe, M. (2003). The ecological validity of neuropsychological tests: A review of the literature on everyday cognitive skills. *Neuropsychology Review*, *13*(4), 181-197.

Cott, C. A. (2004). Client-centered rehabilitation: Client perspectives. *Disability and Rehabilitation*, *26*(24), 1411–1422. https://doi.org/10.1080/09638280400000237

Cox, W. M., Heinemann, A. W., Miranti, S. V., Schmidt, M., Klinger, E., & Blount, J. (2003). Outcomes of systematic motivational counseling for substance use following traumatic brain injury. *Journal of Addictive Diseases*, *22*(1), 93-110.

D'Arcy, L. P., & Rich, E. C. (2012). From comparative effectiveness research to patient-centered outcomes research: policy history and future directions. *Neurosurgical focus*, *33*(1), E7.

Danzl, M. M., Etter, N. M., Andreatta, R. O., & Kitzman, P. H. (2012). Facilitating neurorehabilitation through principles of engagement. *Journal of Allied Health*, *41*(1), 35–41.

D ’cruz, K., Howie, L., & Lentin, P. (2016). Client-centred practice: Perspectives of persons with a traumatic brain injury Client-centred practice: Perspectives of persons with a traumatic brain injury. *Scandinavian Journal of Occupational Therapy*, *23*(1), 30–38. https://doi.org/10.3109/11038128.2015.1057521doi.org/10.3109/11038128.2015.1057521

Dobber, J., van Meijel, B., Barkhof, E., Scholte op Reimer, W., Latour, C., Peters, R., & Linszen, D. (2015). Selecting an optimal instrument to identify active ingredients of the motivational interviewing-process. *Journal of Psychosomatic Research*, *78*(3), 268–276. https://doi.org/10.1016/j.jpsychores.2014.10.010

Doig, E., Fleming, J., Kuipers, P., Cornwell, P., & Khan, A. (2011). Goal-directed outpatient rehabilitation following TBI: A pilot study of programme effectiveness and comparison of outcomes in home and day hospital settings. *Brain Injury : [BI]*, *25*(11), 1114–1125. https://doi.org/10.3109/02699052.2011.607788

Doig, E., Prescott, S., Fleming, J., Cornwell, P., & Kuipers, P. (2015). Development and construct validation of the Client-Centredness of Goal Setting (C-COGS) scale. *Scandinavian Journal of Occupational Therapy*, *22*(4), 302–310. https://doi.org/10.3109/11038128.2015.1017530

Donaldson, N. E., Rutledge, D. N., & Ashley, J. (2004). Outcomes of adoption: measuring evidence uptake by individuals and organizations. *Worldviews on Evidence-Based Nursing*, *1*(s1).

Donnelly, C., & Carswell, A. (2002). Individualized outcome measures: a review of the literature. *Canadian Journal of Occupational Therapy. Revue Canadienne d'ergotherapie*, *69*(2), 84–94. https://doi.org/10.1177/000841740206900204

Duff, F., Proctor, A., & Haley, K. (2002). Mild traumatic brain injury (MTBI): assessment and treatment procedures used by speech-language pathologists (SLPs). *Brain Injury*, *16*(9), 773–787. https://doi.org/10.1080/02699050210128870

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American journal of community psychology*, *41*(3-4), 327.

Dy, S. M., & Purnell, T. S. (2012). Key concepts relevant to quality of complex and shared decision-making in health care: A literature review. *Social Science and Medicine*, *74*(4), 582–587. https://doi.org/10.1016/j.socscimed.2011.11.015

Eliacin, J., Salyers, M. P., Kukla, M., & Matthias, M. S. (2015). Factors influencing patients' preferences and perceived involvement in shared decision-making in mental health care. *Journal of Mental Health, 24*(1), 24-28.

Elwyn, G., Edwards, A., Mowle, S., Wensing, M., Wilkinson, C., Kinnersley, P., & Grol, R. (2001). Measuring the involvement of patients in shared decision-making: a systematic review of instruments. *Patient education and counseling*, *43*(1), 5-22.

Elwyn, G., Frosch, D., Thomson, R., Joseph-Williams, N., Lloyd, A., Kinnersley, P., Cording E., Tomson, D., Dodd C., Rollnick S., Edwards A., & Barry, M. (2012). Shared decision making: A model for clinical practice. *Journal of General Internal Medicine*, *27*(10), 1361–1367. https://doi.org/10.1007/s11606-012-2077-6

Fischer, S., Gauggel, S., & Trexler, L. E. (2004). Awareness of activity limitations, goal setting and rehabilitation outcome in patients with brain injuries. *Brain Injury*, *18*(6), 547–562. https://doi.org/10.1080/02699050310001645793

Frith, M., Togher, L., Ferguson, A., Levick, W., & Docking, K. (2014). Assessment practices of speech-language pathologists for cognitive communication disorders following traumatic brain injury in adults: An international survey. *Brain Injury*, *28*(13-14), 1657-1666.

Gauggel, S., Hoop, M., & Werner, K. (2002). Assigned versus self-set goals and their impact on the performance of brain-damaged patients. *Journal of Clinical and Experimental Neuropsychology*. https://doi.org/10.1076/jcen.24.8.1070.8377

Gearing, R. E., El-Bassel, N., Ghesquiere, A., Baldwin, S., Gillies, J., & Ngeow, E. (2011). Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. *Clinical psychology review*, *31*(1), 79-88.

Gerber, G. J., & Gargaro, J. (2015). Participation in a social and recreational day programme increases community integration and reduces family burden of persons with acquired brain injury. *Brain Injury*, *29*(6), 722–729. https://doi.org/10.3109/02699052.2015.1004745

Gilson, B. S., Gilson, J. S., Bergner, M., Bobbitt, R. A., Kressel, S., Pollard, W. E., & Vesselago, M. (1975). The Sickness Impact Profile Development of an Outcome Measure of Health Care. *American Journal of Public Health*, *65*(12), 1304–10. https://doi.org/10.2105/AJPH.65.12.1304

Grant, M., & Ponsford, J. (2014). Goal Attainment Scaling in brain injury rehabilitation: Strengths, limitations and recommendations for future applications. *Neuropsychological Rehabilitation*, *24*(5), 661–77. https://doi.org/10.1080/09602011.2014.901228

Holliday, R. C. (2005). A Survey of Goal-Setting Methods Used in Rehabilitation. *Neurorehabilitation and Neural Repair*, *19*(3), 227–231. https://doi.org/10.1177/1545968305279206

Holliday, R. C., Cano, S., Freeman, J. a, & Playford, E. D. (2007). Should patients participate in clinical decision making? An optimised balance block design controlled study of goal setting in a rehabilitation unit. *Journal of Neurology, Neurosurgery, and Psychiatry*, *78*(6), 576–80. https://doi.org/10.1136/jnnp.2006.102509

Holloway, M. (2012). Motivational interviewing and acquired brain injury. *Social Care and Neurodisability*, *3*(3), 122–130. https://doi.org/10.1108/20420911211268740

Hunt, A. W., Turner, G. R., Polatajko, H., Bottari, C., & Dawson, D. R. (2013). Neuropsychological Rehabilitation : An International Executive function , self-regulation and attribution in acquired brain injury : A scoping review, *23*(November), 914–932. https://doi.org/10.1080/09602011.2013.835739

Hurn, J., Kneebone, I., & Cropley, M. (2006). Goal setting as an outcome measure: A systematic review. *Clinical Rehabilitation*, *20*(9), 756–772. https://doi.org/10.1177/0269215506070793

Jelsma, J. G. M., Mertens, V. C., Forsberg, L., & Forsberg, L. (2015). How to Measure Motivational Interviewing Fidelity in Randomized Controlled Trials: Practical Recommendations. *Contemporary Clinical Trials*, *43*, 93–99. https://doi.org/10.1016/j.cct.2015.05.001

Jeyaraj, J. A., Clendenning, A., Bellemare-Lapierre, V., Iqbal, S., Lemoine, M. C., Edwards, D., & Korner-Bitensky, N. (2013). Clinicians' perceptions of factors contributing to complexity and intensity of care of outpatients with traumatic brain injury. *Brain Injury*, *27*(12), 1338–1347. https://doi.org/10.3109/02699052.2013.823650

Johnston, M. V., Findley, T. W., DeLuca, J., & Katz, R. T. (1991). Research in physical medicine and rehabilitation. XII. Measurement tools with application to brain injury. *American Journal of Physical Medicine & Rehabilitation*, *70*(1), S114. Retrieved from http://journals.lww.com/ajpmr/Abstract/1991/02001/Research_in_Physical_Medicine_and_Rehabilitation_.18.aspx

Johnston, M. V., & Miklos, C. S. (2002). Activity-related quality of life in rehabilitation and traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *83*(12 SUPPL. 2), 26–38. https://doi.org/10.1053/apmr.2002.37100

Joseph-Williams, N., Elwyn, G., & Edwards, A. (2014). Knowledge is not power for patients: A systematic review and thematic synthesis of patient-reported barriers and facilitators to shared decision making. *Patient Education and Counseling*, *94*(3), 291–309. https://doi.org/10.1016/j.pec.2013.10.031

Joyce, B., Rockwood, K., & Mate-Kole, C. (1994). Use of Goal Attainment Scaling in Brain Injury in a Rehabilitation Hospital. *American Journal of Physical Medicine & Rehabilitation*, *73*(1), 10–14.

Kasper, J., Heesen, C., Köpke, S., Fulcher, G., & Geiger, F. (2011). Patients' and observers' perceptions of involvement differ. Validation study on inter-relating measures for shared decision making. *PloS one*, *6*(10), e26255.

Kervick, R., & Kaemingk, K. (2005). Cognitive appraisal accuracy moderates the relationship between injury severity and psychosocial outcomes in traumatic brain injury. *Brain Injury*, *19*(11), 881–889. https://doi.org/10.1080/02699050400025273

Kiresuk, T., & Sherman, R. (1968). Goal Attainment Scaling: A Gernal Method for Evaluating Comprehensive Community Mental Health Programs. *Community Mental Health Journal*, *4*(6), 443–453.

Krasny-Pacini, A., Chevignard, M., & Evans, J. (2014). Goal Management Training for rehabilitation of executive functions: A systematic review of effectivness in patients with acquired brain injury. *Disability and Rehabilitation*, *36*(2), 105–116. https://doi.org/10.3109/09638288.2013.777807

Krasny-Pacini, A., Evans, J., Sohlberg, M., Chevignard, M., Hospitals, M., & Maurice, S. (2016). Proposed Criteria for Appraising Goal Attainment Scales Used as Outcome Measures in Rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *97*(1), 157–170. https://doi.org/10.1016/j.apmr.2015.08.424

Lawrence, M., & Kinn, S. (2012). Defining and measuring patient-centred care: An example from a mixed-methods systematic review of the stroke literature. *Health Expectations*, *15*(3), 295–326. https://doi.org/10.1111/j.1369-7625.2011.00683.x

Leach, E., Cornwell, P., Fleming, J., & Haines, T. (2010). Patient centered goal-setting in a subacute rehabilitation setting. *Disability and Rehabilitation*, *32*(2), 159–172. https://doi.org/10.3109/09638280903036605

Levack, W., Dean, S., Mcpherson, K., & Siegert, R. (2006). How clinicians talk about the application of goal planning to rehabilitation for people with brain injury-variable interpretations of value and purpose. *Brain Injury*, *20*(13–14), 1439–1449. https://doi.org/10.1080/02699050601118422

Levack, W., Mark, W., Hay Smith, J., Dean, S., McPherson, K., & Siegert, R. (2015). Goal setting and strategies to enhance goal pursuit for adults with acquired diasability participating in rehabilitation, (7), 1. https://doi.org/10.1002/14651858.CD009727.pub2.www.cochranelibrary.com

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, *57*(9), 705–717. https://doi.org/10.1037//0003-066X.57.9.705

Locklear, T. (2015). Reaching consensus on patient-centered definitions: a report from the Patient-Reported Outcomes PCORnet Task Force. *NIH Collaboratory*.

Madson, M. B., & Campbell, T. C. (2006). Measures of fidelity in motivational enhancement: A systematic review. *Journal of Substance Abuse Treatment*, *31*(1), 67–73. https://doi.org/10.1016/j.jsat.2006.03.010

Madson, M. B., Loignon, A. C., & Lane, C. (2009). Training in motivational interviewing: A systematic review. *Journal of substance abuse treatment*, *36*(1), 101-109.

Malec, J. F. (2001). Impact of comprehensive day treatment on societal participation for persons with acquired brain injury. *Archives of Physical Medicine and Rehabilitation*, *82*(7), 885–895. https://doi.org/10.1053/apmr.2001.23895

Malec, J. F., Smigielski, J. S., & DePompolo, R. W. (1991). Goal attainment scaling and outcome measurement in postacute brain injury rehabilitation. *Archives of Physical Medicine & Rehabilitation*, *72*(February), 138–143. Retrieved from https://login.proxy.bib.uottawa.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=1991126027&site=ehost-live

McPherson, K. M., Kayes, N., Weatherall, M., & Members of the Goals-SR Research Group. (2009). A pilot study of self-regulation informed goal setting in people with traumatic brain injury. *Clinical Rehabilitation*, *23*(4), 296–309. https://doi.org/10.1177/0269215509102980

McPherson, K. M., & Pentland, B. (1997). Disability in Patients Following Traumatic Brain Injury -- Which Measure? *International Journal of Rehabilitation Research*, *20*(1), 1–10.

Mead, N., & Bower, P. (2000). Patient-centredness: a conceptual framework and review of the empirical literature. *Social Science & Medicine*, *51*(7), 1087–1110. https://doi.org/http://dx.doi.org/10.1016/S0277-9536(00)00098-8

Medley, A. R., & Powell, T. (2010a). Motivational Interviewing to promote self-awareness and engagement in rehabilitation following acquired brain injury : A conceptual review, *20*(4), 481–508. https://doi.org/10.1080/09602010903529610

Medley, A. R., & Powell, T. (2010b). Motivational Interviewing to promote self-awareness and engagement in rehabilitation following acquired brain injury: A conceptual review. *Neuropsychological Rehabilitation*, *20*(4), 481–508. https://doi.org/10.1080/09602010903529610

Moyers, T. B., Martin, T., Manuel, J. K., Hendrickson, S. M., & Miller, W. R. (2005). Assessing competence in the use of motivational interviewing. *Journal of substance abuse treatment*, *28*(1), 19-26.

Moyers, T. B., Rowell, L. N., Manuel, J. K., Ernst, D., & Houck, J. M. (2016). The motivational interviewing treatment integrity code (MITI 4): rationale, preliminary reliability and validity. *Journal of Substance Abuse Treatment*, *65*, 36-42.

Nichol, a. D., Higgins, a. M., Gabbe, B. J., Murray, L. J., Cooper, D. J., & Cameron, P. a. (2011). Measuring functional and quality of life outcomes following major head injury: Common scales and checklists. *Injury*, *42*(3), 281–287. https://doi.org/10.1016/j.injury.2010.11.047

Novakovic-Agopian, T., Chen, A. J. W., Rome, S., Abrams, G., Castelli, H., Rossi, A., McKim R., Hills, N., & D'Esposito, M. (2011). Rehabilitation of executive functioning with training in attention regulation applied to individually defined goals: A pilot study bridging theory, assessment, and treatment. *Journal of Head Trauma Rehabilitation*, *26*(5), 325–338. https://doi.org/10.1097/HTR.0b013e3181f1ead2

Noe, E., Ferri, J., Caballero, M. C., Villodre, R., Sanchez, A., & Chirivella, J. (2005). Self-awareness after acquired brain injury. *Journal of Neurology*, *252*(2), 168-175.

O'Callaghan, A., McAllister, L., & Wilson, L. (2012). Insight vs readiness: Factors affecting engagement in therapy from the perspectives of adults with TBI and their significant others. *Brain Injury*, *26*(13–14), 1599–1610. https://doi.org/10.3109/02699052.2012.698788

Ownsworth, T., & Clare, L. (2006). The association between awareness deficits and rehabilitation outcome following acquired brain injury. *Clinical Psychology Review*, *26*(6), 783–795. https://doi.org/10.1016/j.cpr.2006.05.003

Parente, R., & Stapleton, M. (1997). History and systems of cognitive rehabilitation. *NeuroRehabilitation*, *8*(1), 3–11. https://doi.org/10.1016/S1053-8135(96)00203-X

Phillips, N. M., Street, M., & Haesler, E. (2016). A systematic review of reliable and valid tools for the measurement of patient participation in healthcare. *BMJ Quality & Safety*, *25*(2), 110-117.

Plant, S. E., Tyson, S. F., Kirk, S., & Parsons, J. (2016). What are the barriers and facilitators to goal-setting during rehabilitation for stroke and other acquired brain injuries? A systematic review and meta-synthesis. *Clinical Rehabilitation*, *30*(9), 921–930. https://doi.org/10.1177/0269215516655856

Playford, E. D., Siegert, R., Levack, W., & Freeman, J. (2009). Areas of consensus and controversy about goal setting in rehabilitation: a conference report. *Clinical rehabilitation*, *23*(4), 334-344.

Plewnia, A., Bengel, J., & Körner, M. (2016). Patient-centeredness and its impact on patient satisfaction and treatment outcomes in medical rehabilitation. *Patient Education and Counseling*, *99*(12), 2063–2070. https://doi.org/10.1016/j.pec.2016.07.018

Prescott, S., Fleming, J., & Doig, E. (2015). Goal setting approaches and principles used in rehabilitation for people with acquired brain injury: A systematic scoping review. *Brain Injury*, *29*(13–14), 1515–1529. https://doi.org/10.3109/02699052.2015.1075152

Prigatano, G. P. (2005). Distrubances of Self-awareness and Rehabilitation of Patients With Traumatic Brain Injury: A 20-Year Perspective. *Journal of Head Trauma Rehabilitation*, *20*(1), 19–29.

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey R., & Hensley, M. (2011). Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, *38*(2), 65-76.

Pustejovsky, J. E. & Swan, D. M. (2018). Single-case effect size calculator (Version 0.4) Web application. Retrieved from https://jepusto.shinyapps.io/SCD-effect-sizes/

Quatrano, L. a, & Cruz, T. H. (2011). Future of outcomes measurement: impact on research in medical rehabilitation and neurologic populations. *Archives of Physical Medicine and Rehabilitation*, *92*(10 Suppl), S7-11. https://doi.org/10.1016/j.apmr.2010.08.032

Rasquin, S. M. C., Bouwens, S. F. M., Dijcks, B., Winkens, I., Bakx, W. G. M., & Van Heugten, C. M. (2010). Effectiveness of a low intensity outpatient cognitive rehabilitation programme for patients in the chronic phase after acquired brain injury. *Neuropsychological Rehabilitation*, *20*(5), 760–777. https://doi.org/10.1080/09602011.2010.484645

Reeve, B. B., Wyrwich, K. W., Wu, A. W., Velikova, G., Terwee, C. B., Snyder, C. F., Schwartz, C., Revicki D.A., Moinpour C.M., McLeod L.D., Lyons, J. C., Lenderking W.R., Hinds P.S., Hays R.D., Greenhalgh J., Gershon R., Feeny, D., Fayers, P.M., Cella D., Brundage M., Ahmed S., Aaronson N.K.,& Butt Z. (2013). ISOQOL recommends minimum standards for patient-reported outcome measures used in patient-centered outcomes and comparative effectiveness research. *Quality of Life Research*, *22*(8), 1889-1905.

Ree, E., Wiig, S., Manser, T., & Storm, M. (2019). How is patient involvement measured in patient centeredness scales for health professionals? A systematic review of their measurement properties and content. *BMC health services research*, *19*(1), 12.

Rockwood, K., Howlett, S., Stadnyk, K., Carver, D., Powell, C., & Stolee, P. (2003). Responsiveness of goal attainment scaling in a randomized controlled trial of comprehensive geriatric assessment. *Journal of Clinical Epidemiology*, *56*(8), 736–743. https://doi.org/10.1016/S0895-4356(03)00132-X

Rockwood, K., Joyce, B., & Stolee, P. (1997). Use of goal attainment scaling in measuring clinically important change in cognitive rehabilitation patients. *Journal of Clinical Epidemiology*, *50*(5), 581–588. https://doi.org/10.1016/S0895-4356(97)00014-0

Rose, A., Rosewilliam, S., & Soundy, A. (2017). Shared decision making within goal setting in rehabilitation settings: A systematic review. *Patient Education and Counseling*, *100*(1), 65–75. https://doi.org/10.1016/j.pec.2016.07.030

Rosenbaum, S. B., & Lipton, M. L. (2012). Embracing chaos: the scope and importance of clinical and pathological heterogeneity in mTBI. *Brain imaging and behavior*, *6*(2), 255-282.

Sander, a M., Roebuck, T. M., Struchen, M. a, Sherer, M., & High, W. M. (2001). Long-term maintenance of gains obtained in postacute rehabilitation by persons with traumatic brain injury. *The Journal of Head Trauma Rehabilitation*, *16*(4), 356–73. https://doi.org/10.1097/00001199-200108000-00006

Scheenen, M. E., van der Horn, H. J., de Koning, M. E., van der Naalt, J., & Spikman, J. M. (2017). Stability of coping and the role of self-efficacy in the first year following mild traumatic brain injury. *Social Science and Medicine*, *181*, 184–190. https://doi.org/10.1016/j.socscimed.2017.03.025

Schlosser, R. W. (2004). Goal attainment scaling as a clinical measurement technique in communication disorders: a critical review. *Journal of Communication Disorders*, *37*(3), 217–39. https://doi.org/10.1016/j.jcomdis.2003.09.003

Schmitz, T. W., Rowley, H. A., Kawahara, T. N., & Johnson, S. C. (2006). Neural correlates of self-evaluative accuracy after traumatic brain injury. *Neuropsychologia*, *44*(5), 762-773.

Schutz, L. E., & Trainor, K. (2007). Evaluation of cognitive rehabilitation as a treatment paradigm. *Brain Injury*, *21*(6), 545-557.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology*, *57*(1), 1–29. https://doi.org/10.1111/j.1464-0597.2007.00325.x

Scobbie, L., Dixon, D., & Wyke, S. (2011). Goal setting and action planning in the rehabilitation setting: Development of a theoretically informed practice framework. *Clinical Rehabilitation*, *25*(5), 468–482. https://doi.org/10.1177/0269215510389198

Scobbie, L., Wyke, S., & Dixon, D. (2009). Identifying and applying psychological theory to setting and achieving rehabilitation goals. *Clinical Rehabilitation*, *23*(4), 321–333. https://doi.org/10.1177/0269215509102981

Sherer, M., Davis, L. C., Sander, A. M., Caroselli, J. S., Clark, A. N., & Pastorek, N. J. (2014). Prognostic importance of self-reported traits/problems/strengths and environmental barriers/facilitators for predicting participation outcomes in persons with traumatic brain injury: A systematic review. *Archives of Physical Medicine and Rehabilitation*, *95*(6), 1162–1173. https://doi.org/10.1016/j.apmr.2014.02.006

Sherer, M., Evans, C. C., Leverenz, J., Stouter, J., Irby, J. W., Lee, J. E., & Yablon, S. A. (2007). Therapeutic alliance in post-acute brain injury rehabilitation: Predictors of strength of alliance and impact of alliance on outcome. *Brain Injury*, *21*(7), 663–672. https://doi.org/10.1080/02699050701481589

Siegert, R. J., & Levack, W. M. M. (2010). *Rehabilitation Goal Setting Theory, Practice and Evidence*. CRC Press. Retrieved from https://books.google.co.nz/books?hl=en&lr=&id=HaThAwAAQBAJ&oi=fnd&pg=PP1&dq=inlevack+rehabilitation+palliative+OR+terminal+OR+stroke&ots=MaOOuDZ9iz&sig=zin9VE5BmlH8vXXpwr521TPU888

Siegert, R. J., O´Connell, C., & Levack, W. M. M. (2015). Psychology, goals and rehabilitation: providing a theoretical foundation. In *Rehabilitation goal setting : theory, practice, and evidence* (pp. 45–65).

Sohlberg, M. M., Harn, B., MacPherson, H., & Wade, S. L. (2014). A Pilot Study Evaluating Attention and Strategy Training Following Pediatric Traumatic Brain Injury. *Clinical Practice in Pediatric Psychology*, *2*(3), 263–280.

Stagg, K., Douglas, J., & Iacono, T. (2017). A scoping review of the working alliance in acquired brain injury rehabilitation. *Disability and Rehabilitation*, 1–9. https://doi.org/10.1080/09638288.2017.1396366

Stevens, A., Beurskens, A., Köke, A., & Van Der Weijden, T. (2013). The use of patient-specific measurement instruments in the process of goal-setting: A systematic review of available instruments and their feasibility. *Clinical Rehabilitation*, *27*(11), 1005–1019. https://doi.org/10.1177/0269215513490178

Stiggelbout, A. M., Pieterse, A. H., & De Haes, J. C. J. M. (2015). Shared decision making: Concepts, evidence, and practice. *Patient Education and Counseling*, *98*(10), 1172–1179. https://doi.org/10.1016/j.pec.2015.06.022

Stolee, P., Awad, M., Byrne, K., DeForge, R., Clements, S., & Glenny, C. (2012). A multi-site study of the feasibility and clinical utility of Goal Attainment Scaling in geriatric day hospitals. *Disability and Rehabilitation*, *34*(20), 1716–1726. https://doi.org/10.3109/09638288.2012.660600

Stuss, D. T. (2011). Traumatic brain injury: relation to executive dysfunction and the frontal lobes. *Current opinion in neurology*, *24*(6), 584-589.

Tellier, A., Marshall, S. C., Wilson, K. G., Smith, A., Perugini, M., & Stiell, I. G. (2009). The heterogeneity of mild traumatic brain injury: Where do we stand?. *Brain Injury*, *23*(11), 879-887.

Tennant, A. (2007). Goal attainment scaling: current methodological challenges. *Disability and Rehabilitation*, *29*(20–21), 1583–1588. https://doi.org/10.1080/09638280701618828

Trahan, E., Pépin, M., & Hopps, S. (2006). Impaired awareness of deficits and treatment adherence among people with traumatic brain injury or spinal cord injury. *Journal of Head Trauma Rehabilitation*, *21*(3), 226–235. https://doi.org/10.1097/00001199-200605000-00003

Tornås, S., Stubberud, J., Solbakk, A. K., Evans, J., Schanke, A. K., & Løvstad, M. (2017). Moderators, mediators and nonspecific predictors of outcome after cognitive rehabilitation of executive functions in a randomised controlled trial. *Neuropsychological rehabilitation*, 1-22.

Turner-Stokes, L. (1999). Outcome measurement in brain injury rehabilitation--towards a common language. *Clinical Rehabilitation*, *13*, 273–275.

van den Broek, M. D. (2005). Why does neurorehabilitation fail? *The Journal of Head Trauma Rehabilitation*, *20*, 464–473. https://doi.org/10.1097/00001199-200509000-00007

van der Naalt, J., Timmerman, M. E., de Koning, M. E., van der Horn, H. J., Scheenen, M. E., Jacobs, B., Hageman, G., Yilmaz T., Roks G., & Spikman, J. M. (2017). Early predictors of outcome after mild traumatic brain injury (UPFRONT): an observational cohort study. *The Lancet Neurology*, *16*(7), 532-540.

Waldersen, B. W., Wolff, J. L., Roberts, L., Bridges, A. E., Gitlin, L. N., & Szanton, S. L. (2017). Functional Goals and Predictors of Their Attainment in Low-Income Community-Dwelling Older Adults. *Archives of Physical Medicine and Rehabilitation*, *98*(5), 896–903. https://doi.org/10.1016/j.apmr.2016.11.017

Watermeyer, T. J., Hindle, J. V., Roberts, J., Lawrence, C. L., Martyr, A., Lloyd-Williams, H., Brand A., Gutting P., Hoare Z., Edwards R.T., & Clare, L. (2016). Goal Setting for Cognitive Rehabilitation in Mild to Moderate Parkinson's Disease Dementia and Dementia with Lewy Bodies. *Parkinson's Disease*, *2016*. https://doi.org/10.1155/2016/8285041

Watkins, C. L., Auton, M. F., Deans, C. F., Dickinson, H. A., Jack, C. I., Lightbody, C. E., Sutton C.J., van den Broek M.D., & Leathley, M. J. (2007). Motivational interviewing early after acute stroke: a randomized, controlled trial. *Stroke*, *38*(3), 1004-1009.

Wilde, E. a., Whiteneck, G. G., Bogner, J., Bushnik, T., Cifu, D. X., Dikmen, S., French L., Giacino J.T., Hart T., Malec J.F., Millis S.R., Novack T.A., Sherer M., Tulsky D.S., Vanderploeg R.D., & von Steinbuechel, N. (2010). Recommendations for the use of common outcome measures in traumatic brain injury research. *Archives of Physical Medicine and Rehabilitation*, *91*(11), 1650–1660.e17. https://doi.org/10.1016/j.apmr.2010.06.033

Willer, B., & Miller, G. H. (1976). Client involvement in goal setting and its relationship to therapeutic outcome. *Journal of Clinical Psychology*, *32*(3), 687–690. https://doi.org/10.1002/1097-4679(197607)32:3<687::AID-JCLP2270320343>3.0.CO;2-V

Wolters, G., Stapert, S., Brands, I., & Van Heugten, C. (2010). Coping styles in relation to cognitive rehabilitation and quality of life after brain injury. *Neuropsychological rehabilitation*, *20*(4), 587-600.

Worrall, L., McCooey, R., Davidson, B., Larkins, B., & Hickson, L. (2002a). The validity of functional assessments of communication and the Activity/Participation components of the ICIDH-2: Do they reflect what really happens in real-life? *Journal of Communication Disorders*, *35*(2), 107–137. https://doi.org/10.1016/S0021-9924(02)00060-6

Worrall, L., McCooey, R., Davidson, B., Larkins, B., & Hickson, L. (2002b). The validity of functional assessments of communication and the Activity/Participation components of the ICIDH-2: Do they reflect what really happens in real-life? *Journal of Communication Disorders*, *35*(2), 107–137. https://doi.org/10.1016/S0021-9924(02)00060-6

Wressle, E., Eeg-Olofsson, A. M., Marcusson, J., & Henriksson, C. (2002). Improved client participation in the rehabilitation process using a client-centred goal formulation structure. *Journal of rehabilitation medicine*, *34*(1), 5-11.

Ylvisaker, M., Hanks, R., & Johnson-Greene, D. (2002). Perspectives on rehabilitation of individuals with cognitive impairment after brain injury: rationale for reconsideration of theoretical paradigms. *The Journal of head trauma rehabilitation*, *17*(3), 191-209

Ylvisaker, M., McPherson, K., Kayes, N., & Pellett, E. (2008). Metaphoric identity mapping: Facilitating goal setting and engagement in rehabilitation after traumatic brain injury. *Neuropsychological Rehabilitation*, *18*(5–6), 713–741. https://doi.org/10.1080/09602010802201832