

A SINGLE CASE EXPERIMENTAL DESIGN INVESTIGATING COLLABORATIVE  
INTERPERSONAL STRATEGY BUILDING WITH AUDIO REFLECTION (CISBAR)  
FOR IMPROVING SOCIAL COMMUNICATION AFTER ACQUIRED BRAIN  
INJURY

by

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## DISSERTATION ABSTRACT

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Title: A Single Case Experimental Design Investigating Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR) for Improving Social Communication after Acquired Brain Injury

Four adults with a history of acquired brain injury (ABI) participated in an intervention study via Zoom with their everyday communication partners. This was the first trial of a new intervention, Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR). When developing CISBAR, I aimed to provide speech-language pathologists (SLPs) with an integrated package for goal-setting and treatment of social communication after ABI by combining motivational interviewing and goal attainment scaling with evidence-based treatment elements drawn from social cognitive and conversational coaching approaches. To elicit the targeted communication behaviors, CISBAR adds a new system of selecting equivalent conversation topics. To foster self-awareness and reflection, CISBAR incorporates the Conversational Rating System for ABI (CoRS-ABI). I used a single-case experimental, multiple-probe design across participants to evaluate CISBAR. All participants achieved personal communication goals. Raters scored behavior counts in 6-7 minute conversations in random order without knowing study phase. Behavior count results supported a treatment effect in the two working on interruption, but not the two working on verbosity. Participants' communication skills

improved as reported by both primary participants and partners. Improvements were maintained at one-month follow-up. Overall, results were encouraging. With further enhancements to increase treatment potency across a range of communication targets, CISBAR shows promise as a treatment package for social communication intervention post-ABI.

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## DEDICATION

This dissertation is dedicated in memory of my parents and grandmother.

My father, James Christopher (“Kit”) Hoeman (1950-1998), was a marine biologist who taught me to read at age three, whose 135-page typewritten master’s thesis on crangonid shrimp from 1982 I kept close while writing my own master’s thesis and doctoral dissertation as a lucky keepsake I hoped might help me finish. My mother, Laura Diane Hoeman (1952-2022), was a psychiatric nurse practitioner, counselor, and aspiring novelist who dedicated her first novel to me. From my earliest years I remember reading and providing feedback on her manuscripts, and so there is a sense of symmetry in remembering that I allowed her to read the Introduction of the present dissertation not long before she died, and she said she would be interested to read more. My grandmother, Gloria Ann Boysen (1929-2022), was an artist, seamstress, and great lover of the outdoors who initially expressed disbelief I would want to work with survivors of stroke or brain injury, not to mention older individuals like herself, but nonetheless warmly celebrated my success as she watched my career unfold.

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## CHAPTER I

### INTRODUCTION

Acquired brain injury (ABI), which encompasses both traumatic brain injury (TBI) caused by an external force (e.g. falls, assaults, motor vehicle accidents) and non-traumatic brain injury caused by internal factors (e.g. lack of oxygen, stroke, tumor), is a leading cause of disability worldwide (World Health Organization, 2006). According to the Centers for Disease Control (CDC), each year there are approximately 1.7 million cases of TBI in the United States alone, resulting in 52,000 deaths, 275,000 hospitalizations, and 1.365 million emergency room visits (Ma et al., 2014). At least one occurrence of TBI has been reported by approximately 12% of the general population (Stubbs et al., 2020), with greater incidence among men and individuals with lower income, mental illness, and/or housing instability (Stubbs et al., 2020). ABI ranges in severity from mild (80%) to severe (10%), with moderate to severe ABI accounting for most long-term disability (Ma et al., 2014). ABI has been associated with up to 5.3 million cases of long-term disability in the U.S., \$9.2 billion per year in direct costs, and an additional \$51.2 billion per year in indirect costs through missed work and lost productivity (Ma et al., 2014). Thus, ABI is associated with enormous direct and indirect costs, compounded by the relatively young age at which survivors may begin to experience lasting, severe disability (Ma et al., 2014).

Despite considerable heterogeneity of impairments resulting from moderate to severe ABI, common patterns of brain injury are associated with difficulties in executive function, attention, memory, and social cognition (Togher et al., 2014). Executive functions represent a range of abilities involved in initiating, planning, organizing, regulating, and self-monitoring (Bosco et al., 2017). Executive functions also include self-awareness, which is used to evaluate one's own abilities and performance (Lamberts et al., 2017). ABI survivors frequently report increased

difficulty with attention, leading to reduced ability to maintain focus on a topic without engaging in tangential or repetitive utterances (Hill et al., 2018). Both long-term memory and working memory are heavily utilized during social communication (Hill et al., 2018; Rowley et al., 2017). Social cognition, which has been defined as the ability to use social cues to infer the meaning and intentions behind the behavior of others, is also frequently disrupted by ABI (McDonald, 2013). These cognitive domains underlie social communication, which means that the cognitive sequelae of ABI frequently coexist with social communication impairment (Chia et al., 2019). Social communication challenges have been estimated to affect over half of individuals with moderate to severe ABI (Kelly, McDonald, & Frith, 2017; Sohlberg et al., 2019).

Social communication challenges following ABI have been shown to undermine family and peer relationships, community functioning, and educational and career attainment (MacDonald, 2017; Wzalek & Turkstra, 2019; Meulenbroek et al., 2016). Difficulties in social communication are also associated with decreased social participation and life satisfaction (Dahlberg et al., 2006; Finch et al., 2015). Breakdowns in social ties may increase the risk of negative health and social outcomes (MacDonald, 2017; Fisher et al., 2016). It is particularly concerning that individuals with a history of ABI, as well as their caregivers, are at increased risk of depression (Douglas & Spellacy, 2000; Juengst et al., 2015; Fisher et al., 2016). Depression is associated with negative health outcomes and increased risk of suicide (Fisher et al., 2016). In a large cohort study looking at rates of depression, suicidal ideation, and suicide attempts in patients with moderate to severe TBI across 20 years post-injury, at least 24.8% of this group experienced major depressive disorder, with rates of suicidal ideation 2-3 times higher than in the general population (Fisher et al., 2016). Social communication impairments also may lead to conflict within families and increased caregiver burden (MacDonald, 2017). Untreated social

communication deficits also contribute to greater frequency of arrests and legal difficulties as well as lower educational and career attainment in this population (Wzalek & Turkstra, 2019; Meulenbroek et al., 2016).

Despite the enormous impact of untreated social communication deficits following ABI on individuals, families, and society, treatment has been largely understudied and delivered (Kelly et al., 2017). Within the health care team serving adults with ABI, speech-language pathologists (SLPs) are uniquely qualified to address communication challenges. However, many SLPs report lacking confidence and knowledge in this practice area, highlighting a need for evidence-based treatment programs that are accessible to SLPs (Riedeman & Turkstra, 2018).

This dissertation describes a study evaluating a novel social communication intervention program, Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR). CISBAR was developed to provide SLPs with an integrated package for goal-setting and treatment of social communication after ABI, incorporating both social cognitive and conversational coaching methods within a collaborative, person-centered framework. CISBAR was developed by integrating existing evidence-based practices for improving social communication (e.g., MacDonald & Wiseman-Hakes, 2010; Togher et al., 2014, Meulenbroek et al., 2019), and incorporates collaborative, individualized goal-setting, metacognitive strategy training, audio feedback, reflection, and practice, integrated with the Conversational Rating System for ABI (CoRS-ABI) and adding a new method for selecting individualized and equivalently challenging conversation practice topics. The purpose of this dissertation is to evaluate CISBAR for its effectiveness in improving targeted social communication behaviors and perceptions of social communication as rated by clients and their everyday communication partners (ECPs).



Chapter II of the present dissertation contains a literature review. Literature relevant to the nature of common social communication deficits resulting from ABI is presented, followed by a summary of literature on social communication interventions for this population. Social communication interventions identified in the literature search that are relevant to the present research were further classified as following a social cognition approach or conversational coaching approach. These two approaches both informed the development of CISBAR.

Chapter III describes the methods of the study. This section includes a description of the research design, experimental protocol, and analysis used to answer the research questions. The first section describes the single-case design and rationale behind selecting this design to address the research questions. The second section describes the participants and setting. The third section describes the study procedures, including initial intake, baseline procedures, intervention procedures, post-intervention and follow-up procedures, measurement, and determination of interobserver agreement and treatment fidelity. The fourth section describes how the results were analyzed.

Chapter IV presents the results of the study pertaining to each research question and the social validity survey results. This chapter includes data plots and tables, effect size calculation, and descriptive statistics characterizing perceived improvements in communication as shown on pre-and post-intervention measures.

Chapter V provides a discussion that interprets the results in light of the theoretical framework of the CISBAR intervention and the research questions, highlighting conceptual and clinical implications. This section also discusses the limitations of the current study, along with directions for future research, and summarizes the main findings and implications of the study.

Appendices A-F provide researchers and clinicians with materials to implement the CISBAR intervention: the Conversation Topic Survey, the Conversational Rating System for ABI (CoRS-ABI), and other supplementary materials.

## CHAPTER II

### LITERATURE REVIEW

Social communication deficits following acquired brain injury (ABI) have been shown to have widespread deleterious effects. A study by Tran et al. (2018) evaluating 36 adults with severe TBI at twelve months post-injury showed that social communication ability was significantly related to a wide range of outcomes. The far-reaching effects of social communication deficits are multifaceted and are evident across key life domains such as employment, relationships, and community integration. Adults with a history of ABI are less likely to maintain satisfying employment (Wszalek & Turkstra, 2019), which is often due to communication breakdowns in the workplace (Meulenbroek et al., 2016). Douglas et al. (2016) found that the severity of perceived social communication deficits in this population predicted challenges in returning to work. As for relationships, social communication impairments contribute to increased conflict within families and perceived burden on caregivers, combined with greater difficulty in establishing new social connections and fulfilling family roles (MacDonald, 2017). Overall measures of community reintegration outcomes also show significant correlations with social communication skills (Struchen et al., 2011). With diminished ability to comprehend complex communication and effectively self-advocate, adults with a history of ABI are over-represented in incarcerated populations (Wszalek & Turkstra, 2019). Loss of life roles (e.g. worker, hobbies, friend, volunteer) is common after ABI, and contributes to isolation and depression (Juengst et al., 2015). Untreated social communication deficits after brain injury have a significant, long-lasting impact on ability to return to work and fulfill valued life roles (Meulenbroek & Turkstra, 2016; Douglas et al., 2016).

In a time-use diary study, Finch et al., (2016) found that compared to a control group, community-dwelling individuals with a history of TBI had significantly fewer communication

partners and engaged less often in conversation and communication activities in their communities. Social communication challenges may make engaging in communication activities more difficult, which may partially explain these results; other factors may be depression, anxiety, or decreased feelings of acceptance by others. In a cohort study with 60 participants at least one year post-TBI, Dahlberg et al. (2006) found that social communication deficits were significantly associated with decreased social participation and life satisfaction.

As a result of decreased social participation and loss of ability to fulfill valued roles, people recovering from ABI are at increased risk of depression. Juengst et al. (2015) performed a large-scale (n=3012) longitudinal analysis of data in the TBI Model Systems National Database in order to identify life satisfaction trajectories for five years post-injury. The authors defined life satisfaction trajectories over five years as “stable high”, “stable dissatisfaction”, “declining satisfaction” and “initial dissatisfaction improving”. Participants reporting high levels of participation in life roles were more likely to be in the “stable high” group, and also reported the fewest depressive symptoms of all groups. The “initial dissatisfaction improving” group had the second highest percentages in participation, showing that increasing participation contributed to increasing life satisfaction over time.

In another study investigating correlates of depression in adults with TBI and their caregivers, Douglas & Spellacy (2000) found that 57% of the individuals with TBI and 60% of their caregivers had significant symptoms of depression. A key protective factor identified in the study was strong-tie social support, which tends to be deeply impacted by deficits in social communication post-ABI. These studies have highlighted the need for treatment for social communication deficits in order to help prevent social isolation and associated negative outcomes.

Despite such grave social, personal, and economic consequences for untreated social communication deficits, this domain has been under-assessed and treated in most clinical practice settings worldwide (Kelly et al., 2017). In fact, social communication is one of the areas least assessed by SLPs in adults who have experienced ABI (Frith et al., 2014). Barriers to assessment and treatment have included time constraints (Maddy et al, 2015), preference given to other areas deemed more medically necessary, e.g. dysphagia (Kelly et al., 2017), and productivity expectations (Maddy et al., 2015). SLPs in medical settings are typically only allotted between 15-60 minutes for assessment, which does not always allow time to assess social communication (Maddy et al., 2015). Among SLPs, lack of availability and familiarity with social communication assessment and treatment tools further undercuts access to social communication treatment for this population (Kelly et al., 2017).

A survey of 260 clinicians who work with adults with ABI showed that social communication was under-assessed and treated, despite an incidence of over 50% self-reported social challenges in this population (Kelly et al., 2017). Barriers endorsed by survey respondents included lack of clarity in roles and responsibilities among rehabilitation professionals, a need for greater availability of well-validated standardized tools for assessment, lack of training in assessment tools, and lack of knowledge and access to rehabilitation programs that target multiple aspects of social communication (Kelly et al., 2017).

Based on the above-mentioned deficits and associated social, emotional, economic, and legal consequences, effective intervention for social communication deficits is needed in order to improve social functioning across multiple contexts, boosting educational and professional achievement while decreasing negative outcomes such as depression, unemployment, and incarceration. Therefore, there is currently a great need for evidence-based interventions for social

communication in adults after acquired brain injury (ABI) that are effective and feasible in today's clinical settings.

### **Nature of Social Communication Deficits Following ABI**

A systematic search of the literature was conducted to identify peer-reviewed articles published in the last five years evaluating the types and nature of social communication deficits resulting from ABI. Combinations of the search terms “social communication,” “discourse,” “conversation”, “deficit”, “impairment”, “brain injury”, “ABI”, and “TBI” were input into four electronic databases selected based on likelihood to contain articles on this topic: Academic Search Premier, PsycNET, PubMed, and Linguistics and Language Behavior Abstracts.

Ninety-three potential citations were found. A title and abstract review was conducted to exclude articles that: (1) did not focus on social communication of human adults after acquired brain injury; (2) were not written in English; or (3) focused on the results of an intervention or evaluation of an assessment tool. Twenty-one met final exclusion criteria and are summarized below. They included four systematic reviews and 17 individual studies.

Articles included in this review fell into two broad categories. The first category sought to investigate the relationships between cognitive domains and social communication deficits. This is important for understanding the cognitive underpinnings of problematic social behavior to be addressed in the current intervention. The second category described differences in communication competence between individuals with, and without, a history of ABI. The literature describes an array of social communication disorders resulting from ABI. Studies tended to compare the performance of individuals who had experienced ABI in comparison with matched controls on a range of communication tasks (Tran et al., 2018). Improving communication competence in conversational contexts was the focus of the present intervention; therefore, the present summary

of this large body of literature focuses primarily on conversation. Key findings of each of these three categories of articles are presented below.

### ***Cognitive Domains Underlying Social Communication Deficits***

In a recent systematic review, Hill et al. (2018) analyzed the relationships between discourse and cognition in speakers with ABI. The review supported the theorized connection between social communication challenges and cognitive impairments, particularly in executive function, working memory, and memory. Although the support in the literature was not as strong, the cognitive constructs of intelligence, processing speed, and attention were also implicated as important to discourse (Hill et al., 2018).

Several recent articles examined the relationships between executive functions and social communication. Executive functions represent a range of abilities involved in initiating, planning, organizing, regulating, and self-monitoring one's behavior, which are fundamental to effective communication (Bosco et al., 2017). Perhaps the executive function most associated with social communication deficits is inhibition, which is the ability to stop oneself from making a response according to a mental judgment made prior to responding (Pearce et al., 2016).

Studies have shown that individuals with a history of moderate to severe brain injury demonstrate significantly poorer inhibition than control participants in neuropsychological assessment tasks as well as during daily social interactions (Bosco et al., 2017). Pearce et al. (2016) found that reduced inhibitory speed was significantly correlated with social communication challenges in daily life as rated by a frequent communication partner. McDonald et al. (2014) compared the performance of adults with moderate to severe TBI with a group of non-injured controls on three sets of communication tasks: one with low demand on executive function, one set with high demand on flexibility, and one with high demand on inhibition. Results showed that

the TBI group showed specific difficulty inhibiting self-referential thoughts in order to consider thoughts and preferences of their communication partner. Therefore, difficulty inhibiting self-perspective may partially explain egocentric conversation patterns among some adults with moderate to severe TBI (McDonald et al, 2014). Such results highlight the intertwined nature of executive functioning and communication partner satisfaction.

Other executive functions strongly associated with social communication include self-awareness, defined as the ability to accurately evaluate one's own abilities and performance and show insight into one's own behavior (Lamberts et al, 2017); planning, defined as the ability to plan a series of actions or speech acts sequentially in a goal-directed fashion (Bosco et al., 2018); cognitive flexibility, defined as the ability to adapt one's thinking in response to situational demands (Bosco et al., 2017); and problem-solving, comprising skills necessary for identifying and generating effective solutions to problems encountered in daily life (Saint Jean et al., 2019).

Working memory, which has been variously categorized as a component of executive functioning, attention, and/or memory, refers to the ability to hold and manipulate information mentally (Hill et al., 2018). In studies of expressive communication after ABI, participants with impaired working memory demonstrated poorer ability to organize their utterances logically according to the general topic and were less informative. They also produced more redundant utterances than control participants, likely due to difficulty holding onto knowledge of what has already been said (Hill et al., 2018). It is important to consider that working memory difficulties also affect receptive social communication (Honan et al., 2015; Rowley et al., 2017). Working memory deficits secondary to ABI may make it difficult for individuals to see the conversation as a whole and generate appropriate inferences based on this larger context, instead being limited to processing smaller units of the conversation (Rowley et al., 2017).



Memory is another cognitive construct that plays a key role in social communication, which frequently requires the rapid retrieval of stored information. Memory has been consistently identified as one of the most impaired domains in neuropsychological assessments at both 6 and 12 months post-injury (Tran et al., 2018). In their systematic review of cognition and discourse, Hill et al. (2018) described the process of retrieving discourse schemata and relevant information from memory with reference to Gernsbacher's (1991) Structure Building Framework. The Structure Building Framework is a theoretical model of discourse comprehension based upon a construction analogy, i.e. one starts by laying a foundation, then builds upon that foundation with relevant incoming information, and continues by building new substructures as necessary to accommodate new information (Gernsbacher, 1991). Hill et al. (2018) suggested using the Structure Building Framework to describe the process of forming meaning in expressive communication by mapping information onto a discourse structure stored in memory. To complete goal-directed social interactions, a speaker must retrieve information from memory and continuously update this information in working memory, in order to map this information onto the schemata according to temporal, causal, and referential relationships (Hill et al., 2018). Participants in social interactions must continually shift between processing and storage demands while monitoring and updating information in memory (Hill et al., 2018).

A further cognitive domain with particular relevance to social communication is social cognition. Social cognition "refers to the ability to use social cues to infer the meaning and intentions behind the behavior of others in order to respond in a socially adaptive manner" (McDonald 2017). As a complex construct containing separate but interrelated components, social cognition is thought to include our human capacity to perceive the emotions of others, take the perspective of others (theory of mind, or ToM), and empathize with others (McDonald, 2017). All

of these abilities are served by complex neurological systems which may be disrupted by ABI (Arioli, 2018; Xiao et al., 2017).

Moderate to severe ABI disrupts social cognition affecting the ability to recognize emotions in others in approximately 13-39% of cases (Babbage et al., 2011). This includes difficulty with facial affect recognition (Rigon et al., 2018) and prosodic processing (Ilie et al., 2017). Affect refers to the expression of emotion through outward displays including laughter, tears, facial expression, and prosody, all of which change rapidly throughout a conversation (Wauters & Marquardt, 2016). Multiple areas of the brain are involved in affect processing, including posterior regions of the right hemisphere, amygdala, insula, preorbital and ventral prefrontal cortex, and the anterior supramarginal gyrus (Mancuso et al., 2015; Wauters & Marquardt, 2019). Diffuse damage often involves these areas and is likely to result in difficulty in affect processing in adults after ABI (Wauters & Marquardt, 2019). These impairments may be less severe in women than in men (Rigon et al., 2016). ABI also disrupts the ability to communicate emotions successfully (Wauters & Marquardt, 2019).

Impaired social cognition has demonstrable consequences in functional outcomes in this population. Ubukata et al. (2014) found that ToM ability predicted functional outcomes over one year following TBI. Williams et al. (2019) found that alexythemia, the ability to recognize one's own emotions which is theorized to underlie emotion recognition and empathy, was linked to aggressive behavior post-TBI. Severe TBI may impact the ability to understand hints (McDonald et al., 2016), interpret non-verbal cues (Evans & Evans, 2019; Mutlu et al., 2019), and perceive whether another speaker is sincere (McDonald et al., 2017). In summary, numerous studies have demonstrated a distinct role played by social cognition processes in the complex set of skills necessary to flexibly navigate social interactions in real time (Byom & Turkstra, 2012).

Understanding the cognitive underpinnings of social communication is crucial due to the impact of subtle changes in executive functioning, memory, attention, and social cognition on demonstrated social competence in real-world settings. For example, cognitive difficulties with organization and reduced inhibition both contribute to the overproduction of tangential and redundant verbal output, which is off-putting to conversation partners and may impede the ability to participate meaningfully in social activities or therapy (Hill et al., 2018). Deficits in memory are thought to lead to reduced use of discourse schemata, which is seen in disorganized, tangential verbal output (Hill et al., 2018). Deficits in the executive function of inhibition as well as theory of mind have both been strongly implicated in socially inappropriate behavior of individuals who have had ABI (Bosco et al., 2018). Socially inappropriate behavior can cost a multitude of lost opportunities in the arenas of work, personal relationships, friendships, and leisure activities. In summary, executive functions (particularly inhibition, self-awareness, planning, cognitive flexibility, and problem solving), memory, attention, and social cognition have been shown across numerous studies to underlie social communication, and knowledge of these domains provides a cognitive context in which to plan and evaluate effective intervention.

### ***Communication Competence***

The second category of articles described differences in communication competence between individuals with, and without, a history of ABI. Communication competence is the ability to achieve social goals within interpersonal exchanges by effectively employing receptive and expressive communication skills (MacDonald, 2017). These interpersonal exchanges generally occur in the context of conversation, which has been the focus of numerous studies comparing the social communication performance of adults with a history of ABI to those without. Among types

of discourse, conversation is uniquely able to show social communication challenges in an ecologically valid context (Hill et al., 2018).

In the literature review, there were five studies that specifically evaluated social communication competence in the context of conversation. Two of the studies examined a specific aspect of conversational competence hypothesized to be commonly impaired in survivors of ABI, such as turn-taking (Murphy et al., 2015) and conversational synchrony (Gordon et al., 2015). Of the remaining studies, one study examined conversation participation and communication partner support (Chia et al., 2019), one evaluated the ability to comprehend and produce pragmatic aspects of everyday conversation exchanges (Bosco et al., 2015), and one evaluated the use of gesture (Kim et al., 2015). Overall, these studies showed subtle differences in each of the studied communication functions that negatively impacted communication partner satisfaction. The studies also highlighted a need for sensitive measures that can accurately capture social behaviors in conversation and changes in these behaviors across time.

Murphy et al., (2015) compared the performance of 19 adults with ABI with a group of matched peers in their accuracy of determining the timing for joining in a conversation when watching video recorded conversations. Statistical analysis revealed a significant between-group difference in the determination of turn timing, but no significant difference in the number of turns. The ABI group was not consistently earlier or later in determining an appropriate timing for taking turns, but instead showed a pattern of missed turns and mistimed turns. Results suggested that adults with ABI may miss or misinterpret verbal and non-verbal cues to conversational turn-taking, which likely impacts how their communication competence is perceived by others (Murphy et al., 2015).

Another factor thought to influence the perception of communication competence is conversational synchrony, which is the adjustment of one's own words and the number of words per turn to more closely align with those of one's conversation partner. Conversational synchrony is thought to aid in the development of rapport and promote more effective communication (Gordon et al., 2015). Gordon et al., 2015 compared the performance of eighteen participants with moderate to severe TBI with 19 comparison participants in the ability to demonstrate conversational synchrony during a 10-minute conversation with an unfamiliar partner. Conversational synchrony was measured by examining the degree to which the participants' productions of words and words per turn became more similar to one another over the course of the conversation. Results showed that conversational synchrony was lacking in the TBI group across significantly more conversations than in the comparison group. Also, there was a significant relationship between conversational synchrony and the subjective ratings of communication competence by raters who were blinded to participant status and study hypotheses. Results supported the authors' hypotheses that ABI can impair conversational synchrony, which negatively impacts social perceptions (Gordon et al., 2015).

Participation and communication partner support in conversation during the subacute phase of recovery has also been studied. Chia et al. (2019) videorecorded ten-minute casual conversation samples between seventeen pairs of participants with severe TBI and their conversation partners at both three and six months post-injury. These samples were rated by two trained raters using the adapted Kagan scales (Togher et al., 2010), global rating scales designed to assess participation and support in conversation. These rating scales did not detect any significant changes in participation or support between three and six months post-injury. Furthermore, some of the participants with severe TBI were able to demonstrate communication competence in these

conversations without noticeable impairment as rated on the global rating scale. In reviewing these results, the authors emphasized the complexity of measuring conversational competence post-ABI, and stressed the limitations of currently available global rating scales in capturing subtle impairments and changes in performance relevant to treatment outcome measurement. Therefore, rather than showing that there were no changes between three and six months post-injury and that some survivors of severe TBI have no social communication impairment, the significance of this study more likely lies in showing the risk of measurement error when we depend on unstructured casual conversation samples and broad, global rating measures that are not sufficiently sensitive to capture the complexity of social communication recovery in a conversational context.

Bosco et al. (2015) conducted a study comparing performance of a group of 30 participants with TBI and a matched control group in comprehending and expressing pragmatic indications that an utterance is either intended to be interpreted in a literal manner, or that the utterance is deceitful or ironic. Regression analyses showed that the TBI group performed significantly worse than the control group in both comprehension and production of these pragmatic indications. Considering the widespread nature of ironic or insincere use of language in conversation and the potential risks of misinterpreting such utterances literally, it is concerning that many adults following ABI may be missing extralinguistic cues to irony and deceit in everyday conversation.

Kim et al. (2015) examined the use of gestures in 30 participants with a history of ABI as compared to a group of 32 participants without a history of ABI. Adults with a history of ABI produced gestures approximately three times more frequently than control participants. Furthermore, the pattern of gestural use suggested inefficiency in selecting gestures that would support or supplement language use and enhance the effectiveness of communication. Implications

of these findings include the possibility of negative social perception of distracting and inefficient gestures in social communication following ABI.

As a whole, studies examining communication competence after ABI have shown that conversational discourse tends to be less efficient, more redundant, more tangential, and more egocentric in this population than in individuals who have not experienced a brain injury (Bond & Godfrey, 1997; Hill et al., 2018). Further research is needed to identify the specific cognitive and linguistic demands of conversation, and to examine the effects of contextual variables in facilitating or hindering ability to meet these demands for speakers with ABI (Hill et al., 2018). Furthermore, there is a need for more sensitive measures of communication competence after ABI that can capture subtle impairments and improvements in outcome following treatment (Chia et al., 2019).

Overall, the literature describes clear connections between cognition (particularly executive function, working memory, memory, and social cognition) and social communication in conversational contexts, which is important for social reintegration, maintenance of valued relationships and roles, and quality of life. These results highlight the need for intervention in social communication in order to mitigate severe negative social consequences and depression in this population. The next section describes the current intervention landscape for social communication following ABI. Some researchers have theorized that strategies and skill training directly targeting the above-mentioned cognitive domains, particularly social cognition, are the key ingredients for effective intervention in social communication after ABI (Bosco et al., 2018). Other researchers have argued for a more holistic and context-sensitive approach (Ylvisaker, 2003).

## **Social Communication Intervention Following ABI**

A second literature search was conducted to identify peer-reviewed articles published in the last five years describing social communication interventions following ABI. Combinations of the search terms “social communication,” “social cognition”, “intervention”, “treatment”, “brain injury,” “ABI”, and “TBI” were input into four electronic databases selected based on likelihood to contain articles on this topic: Academic Search Premier, PsycNET, PubMed, and Linguistics and Language Behavior Abstracts. The search was restricted to the time period between March 2010 and March 2020 in order to limit the search to studies published within the last ten years. An ancestral process was also used to identify studies referenced in other articles.

Seventy-five potential citations were found. A title and abstract review were conducted to exclude articles that: (1) did not focus on intervention for social communication of adults after acquired brain injury; (2) were not written in English; or (3) described indirect treatment methods such as communication partner training and peer mentoring. Twenty-eight articles met the final criteria and are summarized in this section. They included six systematic reviews and twenty-two individual studies.

Treatment approaches described within the literature are based on both behavioral and cognitive treatment theories (Meulenbroek et al., 2019). Behavioral elements of treatment include clinician modeling, opportunities for practice, and specific feedback on performance, while cognitive elements focus on modifying clients’ ways of thinking about the target through training strategies and/or increasing awareness (Meulenbroek et al., 2019). It is important to note that most recent interventions for social communication after ABI have incorporated both types of ingredients.



One category of intervention revealed in the literature search from the past decade, hereafter referred to as social cognition interventions, was built upon the social cognition literature (e.g. Gabbatore et al., 2015; Westerhof-Evers et al., 2019). These interventions used behavioral principles to train specific skills such as emotion recognition, while also providing education to increase clients' metacognitive understanding of the perspectives of others. Of the 22 selected individual studies, ten would be considered social cognition interventions. A second category of interventions revealed in the literature search from the past decade, hereafter referred to as conversational coaching interventions (e.g. Finch et al., 2017; Douglas et. al., 2014, 2019), was built upon the context-sensitive, dynamic coaching treatment principles pioneered by Ylvisaker (2003, 2006). Of the 22 selected individual studies, five would be considered conversational coaching interventions. These interventions utilize behavioral principles including modeling, positive reinforcement, and rehearsal, combined with metacognitive strategy training specifically designed to address client-generated, functional social communication goals. A third category is group interventions which make use of group interaction dynamics (e.g. Braden et al, 2010; McCarron et al., 2019). Seven individual studies were in this category. The following sections describe the models underlying these three categories of interventions followed by an analysis of the intervention components.

### ***Social Cognition Interventions***

Social cognitive approaches have been conceptualized as both cognitive and affective (Cassel et al., 2019). The cognitive component involves developing metacognitive abilities that allow a person to identify another's thoughts and beliefs, and the affective component involves fostering the emotional empathy and responsiveness expected in warm interpersonal relationships (Cassel et al., 2019). According to social cognition theory, awareness of the thoughts, beliefs, and

feelings of others is built upon a recognition of thoughts and feelings in oneself, and is constantly updated and informed by ongoing clues to the internal world of others perceived through external cues. Both cognitive and behavioral treatment ingredients have been used to enhance clients' awareness of the perspectives of others, which is thought to be the primary mechanism of change leading to improved social communication outcomes.

The majority of social cognition treatment approaches in the literature have targeted emotion perception, and even more narrowly, facial affect recognition, using behavioral techniques such as repetitive practice, positive reinforcement, and errorless learning techniques such as vanishing cues (Cassel et al., 2019; Vallat-Azouvi et al., 2019). These methods have generally shown positive results in improving the emotion perception abilities of participants (Cassel et al., 2019).

Both cognitive and behavioral treatment ingredients have been used to enhance clients' awareness of the perspectives of others, which is thought to be the primary mechanism of change leading to improved social communication outcomes.

Two intervention approaches for adults with ABI that have explicitly drawn upon social cognition theory are cognitive pragmatic treatment by Gabbatore et al., 2015, and T-ScEmo (Neumann et al., 2017; Westerhof-Evers et al., 2019). The components and preliminary findings of studies on these interventions are summarized below.

Cognitive pragmatic treatment (CPT; Gabbatore et al., 2015) is based upon cognitive pragmatic theory which examines the cognitive and inferential processes involved in communication and aims to remediate executive function, theory of mind, and inferential ability in adults with ABI. What distinguishes CPT from other interventions is the focus on the inferential processes involved in production and comprehension of speech, which are broken down into four

steps: expression act, actor's meaning, communicative effect, and reaction and response. Fifteen participants with a history of TBI were trained in these processes during 24 sessions. The participants improved significantly on both expressive and receptive communicative pragmatic tasks as measured by the Assessment Battery for Communication (ABaCo), and the improvements were maintained at three months follow up.

T-ScEmo is premised on the theory that the successful ability to perceive the emotions of others underlies the theory of mind and regulation of social behavior. Borrowing evidence-based treatment ingredients (e.g. involvement of partner, collaborative goal-setting) from other approaches, the T-ScEmo program begins with a psychoeducation session for the client and their partner with individualized goal-setting, followed by a module on emotion perception, a second module on theory of mind, and a third module on emotional self-regulation (Westerhof-Evers et al., 2019). The 20-hour T-ScEmo program was found to have significant benefits in facial affect recognition, theory of mind, informant-rated empathic behavior, community participation, and goal attainment, which were maintained five months after treatment (Westerhof-Evers et al., 2017).

### ***Conversational Coaching Interventions***

In 2006, Ylvisaker proposed a context-sensitive, person-centered approach to social communication intervention called the self-coaching approach. This approach is built upon a theoretical model that privileges the autonomy and individual goals of the client, leveraging person-centered collaborative goalsetting and strategy selection to enhance client motivation and engagement with therapy. Mechanisms for change identified in this approach are collaborative, person-centered goal-setting, building autonomy in the client by encouragement rather than direction, collaborative development of personally relevant strategies, repeated rehearsal, use of

video learning trials, supported use in the real-world environment, and self-evaluation of performance (Ylvisaker, 2006). The progression of treatment ingredients comprise a holistic program with strong roots in metacognitive strategy instruction and grounding in theoretical literature.

Metacognition, the ability to think about one's own thinking, may be particularly susceptible to disruption by ABI, but can be improved with treatment (Finch et al., 2017). Metacognition requires awareness of one's own cognitive abilities and the ability to monitor one's own performance during a particular task (Finch et al., 2017). On-line awareness consists of both appraisal of current task demands (anticipatory awareness) and recognition of one's own errors in real-time (emergent awareness) (Toglia & Kirk, 2000). Metacognitive strategies are internal strategies used for regulating one's own thinking and behavior (Sohlberg & Turkstra, 2011). Metacognitive strategy instruction (MSI) involves direct instruction to train clients to break complex tasks into simpler steps and self-regulate their own behavior (Kennedy et al., 2008; Sohlberg & Turkstra, 2011). MSI is designed to equip clients with the skills to predict their own performance on a future task, set a specific performance goal, select a strategy to help them achieve that goal, and reflect upon their performance on the task (Kennedy et al, 2008). Evidence has supported the use of metacognitive strategy instruction for treating diverse treatment targets including executive function, attention, visual neglect, and reading comprehension (Cicerone et al., 2019).

The literature search revealed five articles publishing results of conversational coaching interventions for expressive social communication after ABI (see Table 1). The participants were survivors of moderate to severe brain injury with an age range between 17-58. With the exceptions of Helffenstein & Wechsler (1982) and Finch et al. (2017), the remaining three articles reported

recruiting participants at least two years post-injury in order to avoid confounding results with spontaneous recovery.

The studies were all limited by a low number of participants. Each study only included between one and sixteen total participants. Only one study (Douglas et al., 2014) was designed as single-case research, and this one only had two participants, which fell short of the recommended number of participants in order to demonstrate adequate replications of treatment effect across multiple participants in single-case research methodology. The designs of the remaining studies included one randomized and controlled study (Helffenstein & Wechsler 1982), one cohort study (Finch et al., 2017), one pre- vs. post-intervention repeated measures study (Douglas et al., 2019), and one mixed-methods study (Hoepner & Olson, 2018).

The five articles described four distinct interventions: Interpersonal Process Recall (IPR) (Helffenstein & Wechsler, 1982), metacognitive strategy intervention (MSI) (Finch et al., 2017), joint video self-modeling (Hoepner, & Olson, 2018), and the Communication-specific Coping Intervention (CommCope-I) (Douglas et al., 2014, 2019). The dosage of the intervention ranged from 12-20 hours in total intervention time, with sessions occurring either once or twice a week.

All five articles reported successful results. While there were common active ingredients across studies, no single treatment ingredient was shared across all the interventions. The most common treatment component was video feedback on social interactions incorporating joint reflection and processing from multiple perspectives (clinician, client, and communication partner), which was a key element in three out of four of the intervention approaches used (Helffenstein & Wechsler, 1982; Hoepner, & Olson, 2018; and Douglas et al., 2014, 2019). Two of the four interventions included collaborative, individualized goal-setting based on the client's stated priorities (Finch et al., 2017; Hoepner, & Olson, 2018). Two of the four interventions

included a process of modifying strategies and providing opportunities to practice more adaptive strategies (Helffenstein & Wechsler, 1982; Finch et al., 2017) with one study specifying that the more adaptive strategy should be modeled first by the clinician (Helffenstein & Wechsler, 1982).

Trends in post-intervention outcomes included a greater frequency of desirable communication behaviors (Helffenstein & Wechsler, 1982; Douglas et al., 2014; Douglas et al., 2019); improvement in other-rated communication skills (Helffenstein & Wechsler, 1982; Hoepner, & Olson, 2018); and improvements in anxiety (Helffenstein & Wechsler, 1982) and stress (Douglas et al., 2014). Goal attainment was noted in the studies that included collaborative goal-setting (Finch et al., 2017; Hoepner, & Olson, 2018), and improvements in self-awareness and self-regulation were noted in Hoepner, & Olson, (2018). However, partner-rated communication did not significantly improve in Hoepner & Olson (2018) as measured by the LCQ. This may be because the LCQ is not as sensitive to treatment effects as other measures such as increases in frequency of behaviors and attainment of specific functional goals (Finch et al., 2019).

Although these were all preliminary findings with small numbers of participants, they offer some empirical support for the context-sensitive and self-coaching theories espoused by Ylvisaker (2003, 2006) and others. It is encouraging that these interventions achieved changes in core communication behaviors that were stable even at follow up, which provides preliminary evidence for the effectiveness of these ingredients.

Social cognition interventions and conversational coaching interventions are similar in that they both incorporate metacognitive and behavioral elements, and they both aim to build skills that can be generalized to everyday social interactions. However, they are different in that social cognition interventions focus primarily on teaching the client to be more aware of the emotions and thoughts of others (Cassel et al., 2019), and conversational coaching interventions teach the

client to improve their own self-regulation through the application of strategies (Finch et al., 2017).

Of primary relevance to this study is the conversational coaching interventions. They have the potential to directly impact communication competence in everyday conversations, which has particular relevance to psychosocial outcomes. The metacognitive strategy training incorporated into conversational coaching interventions fosters development of self-regulation (Finch et al., 2017), and the elements of self-assessment, reflection, and rehearsal in conversational coaching interventions empowers the client to learn to be their own coach (Ylvisaker, 2003). Adults with self-awareness deficits secondary to ABI benefit from video/audio feedback to increase online awareness during targeted functional tasks (Schmidt et al., 2012). Taken as a whole, the literature suggests that combining these conversational coaching elements with the perspective taking element from social cognition interventions has the potential to be an effective social communication intervention.

**Table 1***Conversational Coaching Interventions*

Article	Theory	Dosage/Ingredients	Participants	Measurement	Results
The use of interpersonal process recall (IPR) in the remediation of interpersonal and communication skill deficits in the newly brain-injured. (Helffenstein & Wechsler, 1982)	Cognitive retraining with active participation by participant, who must desire change; progression from simple to complex	20 hours of IPR treatment, including: video feedback, reflection, and processing from multiple perspectives, direct feedback, collaborative development of more adaptive strategy/script, modeling, opportunity to practice	16 adults, 17-35 years old (M=13, F=3), randomly assigned to treatment group or control group; most less than 2 years post-injury	STAS, TSCS, ICI, IRRS, independent observer rating scale, videotape analysis	Increased effective communication behaviors, reduced trait anxiety, increased overall self-concept, greater positive social self-concept
Remediation of social communication impairments following traumatic brain injury using metacognitive strategy intervention: a pilot study. (Finch et al., 2017)	Context-specific intervention that is goal-driven, manualized, includes group sessions, opportunities to practice, feedback, and reflection	16 hours of MSI intervention (1 individual and one group session per week) including: collaborative goal-setting, structured manual, MSI training. Each session involved review of the week, discussing goals and strategies, and modifying strategies as necessary	8 adults (18+) with TBI (M=4, F=4); seven severe, one moderate; ranging from 4 months post-TBI to four years, eight months post-TBI.	PPIC, LCQ, GAS	Significant increase in GAS goal T-scores.  PPIC variable, LCQ nonsignificant improvement.



**Table 1, Continued**

Article	Theory	Dosage/Ingredients	Participants	Measurement	Results
Joint video self-modeling as a conversational intervention for an individual with traumatic brain injury and his everyday partner: A pilot investigation (Hoepner, & Olson, 2018)	Context-specific intervention principles identified in systematic review by Finch et al., 2015	16 weeks (50 min once a week) tx including: collaborative goalsetting, video feedback, reflection, and processing from multiple perspectives, direct feedback, self-reflection using hierarchy of prompts	1 person (53-year-old male) 27 months post-TBI and his ECP	CommSpeCS (self and other ratings), DCS-CR, LCQ, DASS-21, CHART-SF, percentage of non-overlapping corrected data (PNCD)	Greater self-awareness, self-regulation, participation, and ECP support
Improving communication-specific coping after traumatic brain injury: Evaluation of a new treatment using single-case experimental design (Douglas et al., 2014)	Cognitive Behavioral Therapy (CBT), self-coaching, and context-sensitive social communication therapy	6-week treatment (1 hour sessions twice a week, =12 total hours) using “CommCope-I” intervention, comprising facilitating awareness, developing skill, and evaluating performance	2 adults (M=1 aged 34, F=1, aged 30) with severe TBI 5 or more years prior	CommSpeCS (self and other ratings), DCS-CR, LCQ, DASS-21, CHART-SF	Large treatment effect in increase of more adaptive behaviors in both participants at end of treatment and 3-month follow-up
Effectiveness of Communication-specific Coping Intervention for adults with traumatic brain injury: preliminary results (Douglas et al., 2019)	Cognitive Behavioral Therapy (CBT), self-coaching, and context-sensitive social communication therapy	6-week treatment (1 hour sessions twice a week, =12 total hours) using “CommCope-I” intervention, comprising facilitating awareness, developing skill, and evaluating performance	13 adults with severe TBI (M=8, F=5), aged 25-58, at least 2 years post-injury, and ongoing social communication difficulties	CommSpeCS (self and other ratings), DCS-CR, LCQ, DASS-21, CHART-SF	Significant improvements in communication-specific coping, functional communication and reduction in stress, maintained 3 months.

## ***Group Interventions***

Key group-based interventions from the literature are described briefly below, with an emphasis on interventions that share features with the experimental intervention Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR). CISBAR, the intervention to be used in the present study, is composed of features with support in both group and individual treatment literature, e.g. individualized goal-setting and contextualized treatment. There has been strong research support in the literature for the effectiveness of manualized group interventions for social communication after ABI. Two such interventions are Group Interactive Structured Treatment (GIST) (Braden et al, 2010; Dahlberg et al., 2007; Hawley & Newman, 2010, Harrison-Felix et al., 2018), and a social skills program called Improving First Impressions (McDonald et al., 2008b).

GIST utilizes a comprehensive, holistic approach including individualized goal-setting, involvement of family and friends, and weekly homework assignments, with the added benefit of a support system among members (Dahlberg et al., 2007). Braden et al. (2010) investigated GIST in a cohort study involving thirty participants at least 1 year post-TBI. Results suggested efficacy of the intervention in improving perceived communication abilities from both the perspective of the person with TBI and their conversation partners. Harrison-Felix et al. (2018) conducted a multicenter randomized controlled trial comparing GIST in interactive group format versus a classroom lecture format without structured group interaction. Results showed that social competence skills improved in both treatment conditions, suggesting that the group interactive element of GIST was not necessary to achieving treatment results.

A second group intervention program for social communication after ABI is the *Improving First Impressions* social skills program (McDonald et al., 2008b). This manualized group program

was developed to reduce the cognitive load required to learn and practice social skills for individuals with severe, chronic TBI by utilizing direct feedback and reinforcement (McDonald et al., 2008a; Appleton et al., 2011). Before starting the program, each participant sets individual goals and selects specific behaviors to target. Desirable social behaviors are practiced using behavioral techniques including role-play, video feedback, and cues for self-monitoring. Weekly homework assignments facilitate practice and generalization of social skills to other settings (McDonald et al., 2008) Using a version of the program adapted for an inpatient population, Appleton et al. (2011) found that a majority of participants improved efficiency and informativeness of speech, with reduced reported anxiety.

In summary, there was consistency in many of the active ingredients used in both the conversational coaching interventions and the group-based interventions. Successful interventions frequently incorporated individualized, collaborative goal-setting, psychoeducation aimed at building greater awareness of self and the perspective of others, self-assessment, video feedback, involvement of family and friends, opportunities to practice, and homework to complete between sessions. Conversational coaching interventions, which share several key elements of the successful group interventions yet can be offered on an individual basis, offer a promising alternative that can be implemented feasibly by SLPs.

### ***Teletherapy***

Not only is it difficult to implement group therapy when clients have different needs and schedules, it is also difficult for SLPs to deliver individual therapy when there is significant geographic distance between SLP and client, when the client does not have a reliable means of transportation, or when health and safety guidelines discourage in-person therapy. Therefore, there has been an increased interest in teletherapy as a way to deliver cognitive rehabilitation, including

social communication intervention. Teletherapy allows removal of barriers to access to therapy, and in many cases, offers greater convenience and efficiency for both SLP and client. In the case of social communication interventions following ABI, teletherapy is better poised to deliver treatment within natural communication environments and contexts, i.e. within the client's own home, than traditional outpatient therapy.

Teletherapy for rehabilitation after ABI has a robust history in the literature, perhaps due to geographical convenience and willingness of this population to engage in teletherapy (Ownsworth et al., 2018). A number of studies have provided support for the potential of teletherapy to deliver equivalent services to in-person sessions for clients who meet candidacy criteria (Ownsworth et al., 2018). Remaining questions to be addressed by further research in this area include refining the candidacy criteria and examining the relationships between treatment modality and therapeutic alliance and client buy-in, motivation, and resilience (Ownsworth et al., 2018).

In a qualitative study utilizing semi-structured interviews with 30 participants (including both clients and clinicians) from a community-based ABI rehabilitation clinic, Ownsworth et al. (2020) identified a multitude of benefits to teletherapy including: time and cost efficiency, accessibility and convenience, user autonomy, and sense of connection in the home. Participants identified particular benefits of teletherapy for users living in remote areas, who could gain access to specialists for in-home rehabilitation. Some participants with ABI expressed hope that teletherapy would hasten recovery due to increased access to specialized rehabilitation services. User autonomy was perceived as greater for teletherapy in comparison to traditional in-person therapy. Teletherapy potentially gives clients more control of how, when, and where to access therapy; the user has control over the type of device used, positioning of the device, physical

environment and comfort during therapy, being able to mute audio and switch off the camera as needed, and greater flexibility in duration and frequency of therapy. From the clients' perspective, teletherapy was perceived as less inconvenient and intrusive on daily routines than traditional therapy. Clinicians valued the way teletherapy offers opportunities to observe the client in natural surroundings, and to gain information from the client's home environment and interactions within the household.

Potential challenges and limitations associated with teletherapy cited by participants in the study by Ownsworth et al. (2020) were grouped into the categories of (a) technical and connectivity issues, (b) client capability and compatibility, and (c) lack of physical presence. Unreliable internet connections and technical glitches raised concerns that therapy time would be lost dealing with technical issues. Client capability and compatibility referred to the receptiveness and ability of clients to utilize teletherapy, with potential disadvantages seen for clients with more severe functional impairments and those without support, as well as for clients who lack experience with computers. Clients with low frustration tolerance and/or high anxiety were also seen as disadvantaged as candidates for teletherapy. These traits may cause clients to experience stress and fear related to computer use, and especially when experiencing unexpected technical or connectivity problems. Lastly, clients who are less receptive to learning new skills were identified as less likely to embrace teletherapy. Regarding the lack of physical presence represented by teletherapy, some participants expressed that in-person meetings are important for developing rapport and gaining insight into client's functioning. In particular, it was noted that the user's viewpoint is limited by camera angle, which may hinder assessment. Participants also noted that some therapy tasks are not well suited to remote therapy. Specifically, during teletherapy, the

clinician is not able to offer physical, hands-on support for performing tasks or manipulating objects as would be possible in person (Ownsworth et al., 2020).

In the literature pertaining to social communication after ABI, Rietdijk et al. (2020) found that when the same social communication intervention was delivered in different modalities to different treatment groups in a partially randomized controlled trial, the telehealth group demonstrated improvements compared to the control group and even compared to the in-person group, with medium to large effect sizes. Rietdijk et al. (2019) also conducted a single-case study using a modified version of TBI Express for telehealth, TBIconneCT, with two dyads each consisting of a participant with a history of TBI and their communication partner. Results supported their hypothesis that the telehealth intervention showed preliminary effectiveness as measured by global ratings of conversation samples by blinded raters and feasibility as measured by participant satisfaction data.

### **Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR)**

The literature establishes the potential to improve conversational competence in people with ABI given the incorporation of particular treatment ingredients such as personalized communication goals, structured reflection, coaching and practice. Clinical adoption of social communication interventions requires that they can be implemented within the constraints of SLPs' practice. With the goal of building on the existing intervention literature and addressing clinical feasibility, I developed the Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR), a novel intervention for social communication after ABI that activates the key treatment elements identified in the above literature review and can be delivered face-to-face or via teletherapy. CISBAR aims to integrate metacognitive training to increase awareness of the emotions and perspective of self and others, which have been identified in the social cognition

literature as foundational skills underlying successful, flexible social communication, with the treatment ingredients identified in the conversational coaching interventions as effective for increasing communication competence: collaborative, individualized goal-setting (Finch et al., 2017; Hoepner, & Olson, 2018), audio or video feedback on social interactions followed by joint reflection and processing (Helffenstein & Wechsler, 1982; Hoepner, & Olson, 2018; and Douglas et al., 2014, 2019), and opportunities to modify strategies and practice more adaptive strategies based on reflection and feedback (Helffenstein & Wechsler, 1982; Finch et al., 2017). See Table 2 for a step-by-step description of the intervention components and evidence base for each component of CISBAR.

CISBAR combines several interrelated treatment ingredients which are hypothesized to result in measurable improvements in social communication. Firstly, to ensure carryover of learned strategies to everyday communication, an everyday communication partner (ECP) selected by the participant was involved in every session (Togher et al., 2014; Finch et al., 2015). The ECP and the client were both active participants in collaborative, individualized goal-setting to ensure that specific goals are functional and meaningful for the individual (Togher et al., 2014; Finch et al., 2016). Metacognitive strategy training was provided (Kennedy et al., 2008). In each session, the participant was given opportunities to practice, and joint reflection was utilized in order to foster self-awareness (Hoepner & Olsen, 2018). The afore-mentioned components and associated evidence base are shown in the table below.

**Table 2**

*CISBAR Components and Evidence Base*

Treatment Component	Description of Procedures	Evidence Base
<b>Involve the everyday communication partner (ECP) in therapy</b>	<ol style="list-style-type: none"> <li>1) Identify an everyday communication partner (ECP) who can participate in each therapy session</li> <li>2) Provide training to the ECP in guidelines for effective conversation support</li> </ol>	INCOG guideline recommendation #5 (Grade A) (MacDonald & Wiseman-Hakes, 2010; Togher et al., 2014). Also identified in the mapping review by Meulenbroek et al., 2019 and the systematic review by Finch et al., 2015.
<b>Identify a functional communication goal that is meaningful to the client and ECP</b>  (Intake Session)	<ol style="list-style-type: none"> <li>1) Conduct clinical interview/ motivational interviewing</li> <li>2) Provide guidance to client and ECP in filling out the CoRS-ABI Self and Partner Rating Form</li> <li>3) Collaboratively identify areas of concern to participant and/or ECP, and set goals and targets with use of the CoRS-ABI Self and Partner Rating Form</li> <li>4) Complete Goal Attainment Scaling for functional goal</li> </ol>	Finch et al., 2016; Finch et al. 2017; INCOG guideline recommendation #7 by Togher et al., 2014 (Grade A).

**Target:** Measurable behavior to be affected by the intervention.

**Goal:** Desired functional outcome associated with the area of concern.

**Examples of Functional Communication Goals:**  
 improve spouse’s level of conversation satisfaction with participant; decrease frequency of verbal arguments with care provider; increase client participation in group meetings.



**Table 2, Continued**

Treatment Component	Description of Procedures	Evidence Base
<b>Collaboratively select a metacognitive strategy to address the social communication target</b>	<ol style="list-style-type: none"> <li>1) Elicit input from participant on any strategies they have previously used successfully to address the targets. When possible, build off of a strategy the participant has been successful with in the past. Modify and customize with the participant as necessary.</li> <li>2) Ask participant to rate how likely they are to use the strategy from 1-5. If they do not seem likely to use the strategy (3 or less), either identify method to overcome barrier to using the strategy or identify a more usable strategy.</li> <li>3) If participant cannot identify a suitable strategy, present participant with a short menu of 3-4 possible strategies that may address the target, and help participant to pick the best match.</li> <li>4) Clinician and participant will jointly customize strategy to the needs and preferences of the participant based on Ylvisaker’s self-coaching “plays” or scripts (Ylvisaker, 2006).</li> </ol>	Finch et al. 2017, Kennedy et al., 2008
<b>Clinician delivers metacognitive strategy instruction</b>	<ol style="list-style-type: none"> <li>1) Clinician provides strategy instruction using modeling, cueing, and coaching.</li> <li>2) The clinician confirms that the client understands and can demonstrate the strategy.</li> <li>3) Develop ECP prompt and reminder system.</li> <li>4) Train ECP to provide appropriate cueing.</li> </ol>	Finch et al. 2017, Kennedy et al., 2008

**Table 2, Continued**

Treatment Component	Description of Procedures	Evidence Base
<b>Clinician conducts treatment sessions with participant and ECP</b>	<ol style="list-style-type: none"> <li>1) Conduct structured conversational practice between participant and ECP using randomly drawn topic</li> <li>2) Clinician stops conversation after 7 minutes.</li> <li>3) Clinician guides a joint reflection (see below) based on first conversation</li> <li>4) Participant and ECP practice conversation again using same topic</li> <li>5) Joint reflection on second sample; reflect on successes</li> </ol>	Increased awareness and improvement in skills (Hoepner & Olsen, 2018; Helffenstein and Wechsler, 1982).
<b>Clinician guides a joint reflection on the conversations between the participant and ECP with rating comparison between the participant and ECP</b>	<ol style="list-style-type: none"> <li>1) Clinician asks participant, and then the ECP to share ratings for each social communication target using the CoRS-ABI Conversation Practice Form. During the rating process, the clinician also asks the participant and ECP to share examples of when the social communication target was and was not implemented.</li> <li>2) Clinician guides a reflection session using the suggested questions on the CoRS-ABI Conversation Practice Form as a guide.</li> <li>3) During reflection session, the clinician plays back the audio recording of the conversation for the participant and ECP with relevant exemplars as appropriate to facilitate awareness and understanding</li> </ol>	Increased awareness and improvement in skills (Hoepner & Olsen, 2018; Helffenstein and Wechsler, 1982).

## **Identification of Treatment Targets**

In this study, identification of treatment targets was accomplished with use of the Conversational Rating System for Acquired Brain Injury (CoRS-ABI) (Iwashita, 2019). The CoRS-ABI was built upon the framework established by the Pragmatics Rating Scale (PRS) (MacLennan et al., 2002). The PRS framework was selected because a comparison with the more commonly cited Profile of Pragmatic Impairment in Communication (PPIC), showed that the PRS was less time consuming to administer, had good discriminative validity, and was sensitive to aspects of social communication often impaired by ABI, without the feasibility drawbacks of a more complex rating scale (Iwashita & Sohlberg, 2019). The CoRS-ABI incorporated several additional elements identified in the literature as useful for guiding a clinical interview, identifying perceived communication challenges, setting meaningful goals, goal attainment scaling, and reflecting on structured conversation practice.

Development of the CoRS-ABI began with the items and categories from the PRS. The following additional aspects were identified through a literature search and iterative process of soliciting expert feedback from clinicians and researchers with experience with this population: listening, perspective taking, emotional regulation, and limited speech. In contrast to the PRS which is a single rating scale to be filled out by the clinician, the CoRS-ABI is designed to show multiple perspectives (client, clinician, and communication partner). Furthermore, the conversation sample protocol to accompany the CoRS-ABI was developed to incorporate sufficient conversational challenges in order to reveal subtle communication difficulties in a short period of time.

Following development, pilot versions of the CoRS-ABI were utilized by clients with social communication challenges in the Brain Injury and Concussion Clinic at the University of

Oregon. Feedback from five clients was solicited via phone with clear endorsement of the acceptability, usefulness, and thoroughness of the CoRS-ABI Self and Partner Rating Form. Using an online anonymous survey, four student clinicians and one practicing clinician who had used CoRS-ABI endorsed features helpful to the clinician, particularly the ability to compare ratings across samples and summarize client, partner, and clinician perspectives.

In the present study, before the intervention, the CoRS-ABI Self and Partner Rating Form was used to guide selection of treatment targets. The Self and Partner Rating Form of the CoRS-ABI guide the clinician, client, and ECP in rating clinically relevant parameters of social communication in order to collaboratively identify personally meaningful treatment targets. The Conversation Practice form of the CoRS-ABI is an aid for promoting reflection and awareness in the person with ABI with respect to these identified targets, which is expected to contribute to the success of the CISBAR intervention.

### **Assessment of Treatment Impact**

For a domain as complex as social communication, assessment is multifaceted and necessitates a comprehensive approach. Researchers aiming to measure social communication outcomes objectively have been challenged by the need to consider contextual factors and communication partner support (Togher, 2001; Steel & Togher, 2018). Because social communication competence is dependent on subtle contextual factors which underlie speaker and listener perception of communicative success, our methodology must include both objective and perceptual indices. Furthermore, our multiple baseline study design requires repeated measures over time to show demonstration of treatment effect. To ensure sensitivity to all of these aspects, the present study utilized objective, repeated measures (Communication Target Counts), goal attainment scaling, and questionnaires (the La Trobe Communication Questionnaire (LCQ;

Douglas, O'Flaherty, & Snow, 2000) and the CoRS-ABI Self and Partner Rating Form (Iwashita & Sohlberg, 2019) completed by both the participant and the ECP. Each of these methods of assessing treatment impact is described in more detail in the Measurement section of the Methods chapter.

### **Why Develop A New Intervention?**

The social communication interventions described above have generally shown promising results, with each bringing unique contributions to the field. The potential question: “Why develop a new intervention now, when existing interventions may be beneficial?” may arise after reviewing this literature. To address this question, it is important to first review the theoretical grounding of CISBAR, which has been informed by the current body of work on social cognition and seeks to address difficulties that could not be remedied by conversational coaching alone. Ongoing research is illuminating a growing network of neural correlates underlying social cognitive processes that are frequently disrupted by ABI (Arioli et al., 2018). A critical review of the small number of existing social cognitive interventions for adults with TBI by Vallat-Azouvi et al. (2019) described encouraging results from preliminary studies, particularly when training different aspects of social cognition together. The review recommended future interventions build a comprehensive, individualized program addressing all aspects of social cognition, and strive to increase generalization to everyday communication. Existing interventions have not yet achieved these aims.

CISBAR also builds upon the growing literature supporting the value of collaborative, personalized goal attainment scaling (GAS) as a treatment ingredient in its own right, not only as a tool for setting functional therapy goals and measuring outcomes (Hart & Evans, 2012). Individuals affected by brain injury are at risk for reduced engagement in therapy due to

impairments in the cognitive domains involved in setting and achieving goals, which may be compounded by gaps in self-awareness. (Borgen et al., 2022). Hart et al. (2006) described a two-part approach to counteract these effects, beginning with the “goal” level and then expanding to the “self-regulation” level. Clients who participate in setting up individualized GAS are thought to have better rehabilitation outcomes due to increased motivation, ability to target personally relevant goals, and increased understanding of their own agency in achieving the goals (Grant & Ponsford, 2014; Borgen et al., 2022). More than just an outcome measure, effective implementation of person-centered GAS can facilitate realistic goal conceptualization and planning, support team communication, and encourage self-monitoring and reflection on goal attainment (Turner-Stokes et al., 2015). CISBAR takes advantage of these benefits of person-centered GAS, and takes the emphasis on self-monitoring and self-reflection based on personalized goal planning even further by incorporating the CoRS-ABI.

One key feature of the CoRS-ABI Self and Partner Rating Form is the clear definitions of each aspect of social communication that may be impacted by ABI. Study participants commented that engaging with the CoRS-ABI provided a “common vocabulary” for discussing communication strengths and challenges. Successful goal-setting requires that clients share a foundation of understanding of the purpose and process of goal-setting that is consistent with therapeutic goal-setting in healthcare (Siegert & Taylor, 2004). The CoRS-ABI is set up to facilitate this understanding and negotiation of agreed goals and realistic expectations. To guide the selection of realistic goals targeting areas that were impacted by brain injury rather than stemming from unrelated causes such as individual, family, or cultural variations, the CoRS-ABI Self and Partner Rating Form includes a section for noting any cultural differences in communication and also provides a column for noting whether each communication aspect has

changed following brain injury. The in-depth self- and partner evaluation process facilitated by the CoRS-ABI allows clinicians to easily measure perceptions of improvement across time.

Unlike some other interventions, CISBAR is designed to target personally-meaningful, functional communication goals in collaboration with the client and communication partner in a short number of treatment sessions, via teletherapy or in person, without the necessity of gathering together a group of similar clients for group therapy. These advantageous features make CISBAR clinically feasible for clinicians across various practice settings. Although many existing interventions are also promising, it is important to recognize that those interventions are also new and still under development. There is not yet robust literature showing evidence of effectiveness, candidacy, and generalization for treatment using conversational coaching approaches. The literature on social communication and discourse interventions for adults following brain injury is promising but still in an early stage of development (Lê et al., 2022). The recent review of existing interventions by Lê et al., 2022 found that the following treatment ingredients as “building blocks” of a social communication intervention program were associated with durable improvements in communication: feedback, simulated/actual social context, functional practice of learned skills, metalinguistic/metacognitive strategy training, and hierarchical training. With the possible exception of hierarchical training, which could be built into future iterations of CISBAR, the preliminary version of CISBAR evaluated in the present study contained all of these effective treatment ingredients. Therefore, it is worthwhile to contribute to this ongoing research by packaging effective treatment elements together in a novel way that aims to optimize existing treatment.

One further consideration in developing CISBAR was the accessibility of existing interventions and assessment tools. Sohlberg et al. (2019) found that only 55% of assessment tools

for social communication in the reviewed literature were available to clinicians to access online or purchase. It is also difficult for practicing clinicians to gain access to current, evidence-based treatment packages or manuals for this population. Therefore, it is hoped that further development and evaluation of CISBAR will lead to a person-centered, evidence-based assessment, goal-setting, and treatment package that can be freely available and accessible to practicing SLPs and SLP students.

### **Research Aims and Questions**

This dissertation evaluates the effectiveness of the social communication intervention, CISBAR, in improving targeted social communication behaviors as measured by Communication Target Counts, self-rating, and rating by an everyday communication partner (ECP). Research questions and hypotheses are listed below.

1. For adults with social communication challenges following acquired brain injury (ABI), is there a functional relation between Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR) and an improvement in targeted social communication behaviors within a 6-7-minute conversation with a familiar conversation partner?
  - a. It is hypothesized that there will be a functional relationship between the administration of CISBAR and the personalized social communication goal behaviors of participants.
2. Is there an improvement in self-ratings of social communication skills by adults who have experienced social communication challenges following ABI after participating in CISBAR?



- a. It is hypothesized that participant pre- and post-ratings on the La Trobe Communication Questionnaire and the CoRS-ABI Self-Rating Form will show improvement.
3. Is there an improvement in ratings of social communication skills by an everyday communication partner (ECP) for adults who have experienced social communication challenges following ABI after participating in CISBAR?
  - a. It is hypothesized that ECP pre- and post-ratings on the La Trobe Communication Questionnaire and the CoRS-ABI Partner-Rating Form will show improvement.

## CHAPTER III

### METHODS

This chapter provides a detailed description of the experimental design, participants, procedures, measurement, and analysis methods used in the present study. The first section describes the single-case experimental design and rationale behind selecting this design to address the research questions. The second section describes the participants and setting. The third section describes the study procedures, including initial intake, baseline procedures, intervention procedures, post-intervention and follow-up procedures, and measurement. The fourth section describes how the results were analyzed.

#### **Experimental Design and Rationale**

The study was conducted using a single-case multiple-probe design across behaviors and participants. This design was selected in order to address the research questions using a rigorous methodology that is well established in behavioral research, while allowing flexibility in participant recruitment with non-concurrent implementation if necessary (Coon & Rapp, 2018).

Each participant participated in three phases (baseline, intervention, and follow-up) during which the dependent variables were measured. Before the baseline phase, an initial intake session was conducted for informed consent, initial screening, social communication questionnaires (including a “Conversation Topic Survey” to determine equivalency of prompt topics) and rating scales, ECP training, and goal attainment scaling. Each participant progressed through the following sequence: (1) intake, (2) baseline, (3) intervention, and (4) follow-up. Each step of this sequence is further detailed in the Procedures section.

The non-concurrent multiple baseline design is a variation of multiple baseline methodology that allows researchers to run single participants through the study asynchronously,

which is often more practical in clinical settings (Smith, 2012; Gast & Ledford, 2014; Coon & Rapp, 2018). In the present study, three dyads were able to start synchronously, while the fourth dyad had an asynchronous start. This way I was able to preserve, as much as possible, chronological overlap in the baseline phases between participants. Non-concurrent multiple probe design, when necessary, allows greater flexibility in recruitment and scheduling, which is often needed due to challenges in recruiting participants with similar social communication profiles for an intervention study at the same time.

The multiple-probe design, a variation of multiple baseline design that selectively probes performance at critical points during the pre-intervention baseline phase rather than continuously, reduces the instrumentation threat to validity by limiting the impact of repeated testing on the results of the study (Tate & Perdices, 2019). In the present study, multiple probe design was implemented on a limited basis for the third dyad. Justification for multiple probe design was strengthened because three of the dyads were able to start concurrently.

In accordance with What Works Clearinghouse standards (Institute of Education Sciences, 2020), the current study included at least five data points in baseline for each participant, and at least one probe data point (baseline session) at the point at which intervention is introduced for another participant (Ganz & Ayres, 2018; Tate & Perdices, 2019).

Randomization was not used to determine the length of baseline. Only two study elements were suitable for randomization: the order of conversation topic prompts (randomly selected from a pre-determined pool before each session), and the order in which the conversation samples were scored by blinded raters. Randomization of these two elements strengthened the study design without compromising study results.

After determining a suitable pool of conversation topics using the “Conversation Topic Survey” (described below under “Initial Intake”), one topic was drawn at random for each session during the baseline, intervention, and follow-up phases. During intervention sessions, the same topic was used twice in the same session to provide additional opportunity for practice. After being used during that session, the topic was removed from rotation and not used again.

To minimize the potential for bias in observer scoring of the conversation samples, the order of the conversation samples was also randomized before being viewed by the research assistants who scored each sample. Therefore, the scorers did not know whether the sample was collected during the baseline or intervention phase. There were two trained scorers, one who was an experienced speech-language pathologist (SLP), and one who was a student near graduation from a master’s program in speech-language pathology. The two scorers were not told whether the other scorer may have already scored samples for a given participant, which preserved phase blinding even when the initial baseline data was scored.

### **Participants and Setting**

Four participant dyads meeting the inclusion criteria completed the present study via Zoom in the summer of 2021. Participants were recruited in accordance with my research protocol which received prior approval from the Institutional Review Board (IRB). I posted the IRB-approved recruitment script with my contact information on online brain injury communities, local craigslist sites, and social media. Each of the primary participants in the present study called or emailed me in response to the recruitment script. All participants were community-dwelling adults in the state of Oregon, at least one-year post-ABI. Three were female, one male. Two were employed (one in education, one in business). I asked each primary participant to nominate an everyday communication partner (ECP) whom they endorsed as being supportive and would be available to

join in each study session. Of the four ECPs, two were spouses, one was a housemate, and one was a paid caregiver. This resulted in a total of eight participants (four primary participants and four ECPs), forming four dyads. I conducted informed consent with each dyad via Zoom prior to beginning study procedures.

One additional dyad was screened out of the study during the initial intake session because they did not indicate concern with changes in interruption, wordiness, limited speech, or perspective-taking, and could not identify a goal related to these areas. The remaining four dyads met all inclusion criteria (listed below) and were able to identify relevant social communication goals.

### ***Inclusion Criteria***

Separate sets of inclusion criteria were used for the primary participants and the ECPs.

#### **Primary Participant Inclusion Criteria:**

1. Adults aged 18-80 with reported ABI after age 16.
2. Access to a computer, mobile phone, or tablet with Internet connectivity and a camera in order to allow participation in Zoom sessions; participation may require assistance of everyday communication partner (ECP)
3. Memory ability sufficient to allow meaningful participation in therapy and retention of skills with practice, as determined by the clinician in the initial screening interview with participant and everyday communication partner.
4. Reported ABI greater than eight months prior with hospitalization of at least one day resulting in changes in cognitive communication

5. Able to identify an ECP (i.e., a close friend or family member with whom the participant talks at least once per week), who is willing to participate in each session and whom the primary participant endorses as supportive.
6. Participant and ECP report current challenges in social communication characterized by verbosity (or limited speech), tangentiality and/or difficulty taking the perspective of others which were not apparent before the ABI
7. Participant and the ECP both indicate willingness to work on measurable social communication behaviors (specifically interruption, wordiness, limited speech, or perspective taking) using the present intervention. Specifically, both the participant and ECP must score midway or above on the Motivational Interviewing (MI) rulers of confidence in change and importance of change (Miller & Rollnick, 2013; described below in the Initial Intake section).
8. Participants must be able to participate in therapy without significant barriers to treatment posed by severe depression or other mental health issues, as determined by the screening interview with the ECP and primary participant, and results of *The Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995)*.

**ECP Inclusion Criteria:**

1. Nominated by the primary participant as a person who talks with the primary participant regularly (at least once per week).
2. Endorsed by the primary participant as being supportive.
3. Willing to participate in each session with the primary participant.
4. Indicates readiness to support the participant in working on a communication goal by scoring at least midway on the Motivational Interviewing (MI) rulers of

confidence in change and importance of change (Miller & Rollnick, 2013; described below in the Initial Intake section).

5. Demonstrated satisfactory supportiveness in communication as indicated by scores of at least 2 out of 4 on the Measure of Skill in Supported Conversation (MSC) scales of the adapted Kagan Scales (Togher et al., 2010), indicating a basic level of skill in acknowledging competence and revealing competence in the person with ABI, after a short training in supportive communication.

### *Introduction to Participants*

All participant dyads meeting inclusion criteria participated on Zoom in four phases: intake, baseline, intervention, and a one-month follow-up session. Three participant dyads began the baseline phase concurrently, with a delayed start for the fourth dyad. Participants selected their own pseudonyms. Participant dyads, characteristics, and pseudonyms are briefly introduced below.

**Table 3**

### *Participant Characteristics*

Dyad	Sex	Age	Etiology	Time Post-Onset
Michelle with spouse, Kaladin	F	43	AVM rupture and brain surgery	11 years
Joy with roommate, Diana	F	52	TBI, pituitary brain tumor	20 years, uncertain/ongoing
Sante with part-time caregiver, Stephanie	F	61	Multiple TBI	Approximately 40 years prior
Benny with spouse, Marge	M	52	TBI due to fall from roof; subdural hematoma on right temporal lobe	1 year

**“Michelle” (participant with history of ABI) and “Kaladin” (ECP/spouse).** Michelle was a 43-year-old woman who spoke English as a first language and also spoke Spanish. She reported Hispanic, Catholic, German, and Irish cultural influences on communication. Eleven years prior, she experienced an arteriovenous malformation (AVM) rupture and subsequent corrective brain surgery, which impacted her communication and confidence. Self- and partner-identified communication strengths included empathy and the ability to be attentive and helpful at work. Michelle prioritized the following treatment concerns at intake: (1) “speaking too fast”, (2) “pausing and looking off into the distance while speaking”, (3) “not organizing thoughts well”, (4) “focus on listening better”, and (5) “not speaking up more”.

Michelle’s husband Kaladin acted as the ECP during the present study. Supportive and reassuring, he rated Michelle’s communication as less impaired (although still compromised) on the pre-treatment questionnaires than she rated herself. He expressed the view that Michelle was “being too hard on herself” and should “just relax”.

**Participant Dyad 2: “Joy” (participant with ABI) and “Diana” (ECP/roommate).** Joy was a 52-year-old woman who spoke English as a first language and had also learned Hebrew, French, Spanish, and ASL. She reported Native American cultural influences and practiced Judaism. Joy recalled that while growing up she was gifted in some areas and struggled with others. She identified as neurodiverse but reported no specific developmental diagnosis. After a TBI twenty years prior, she reported experiencing greater difficulty with communication, particularly listening to her partner with comprehension and without interrupting, especially during episodes when she was tired, sick, or upset. Pre-treatment questionnaires listed communication strengths in verbal skills, small talk, teaching, public speaking, and initiating conversations. Joy ranked her top treatment priorities as (1) listening, (2) comprehension, and (3) perspective-taking.



Diana was Joy's roommate and long-time friend, who worked in a healthcare-related field. They seemed to have a close friendship characterized by mutual respect, with Diana often providing additional insights on Joy's communication and how it was perceived by others. Diana ranked the following priorities based on her perspective of Joy's communication: (1) interrupting, (2) knowing what not to say, (3) not understanding reactions, (4) overreacting, (5) volume, (6) wrong details, and (7) eye contact.

**Participant Dyad 3: "Sante" (participant with ABI) and "Stephanie" (ECP/paid caregiver).** Sante was a 61-year-old woman who reported a history of TBI and trauma that had affected her communication. She was born in a large city in the United States and had traveled extensively. Her first language was English, and she also spoke French, Italian, Greek, and Korean. She described her areas of strength in communication as "self-expression, connecting ideas and interests, great communication with all cultures." Sante did not list specific treatment priorities at intake but instead described communication breakdowns with partners who were not able to follow her train of thought. Both Sante and her ECP, Stephanie, endorsed interruption ("major problem"), wordiness ("major problem"), and listening ("larger problem") as concerns when each independently filled out the CoRS-ABI Self and Partner Rating Form at intake.

Stephanie was a paid caregiver who came to Sante's house a few times a week. On intake questionnaires, Stephanie rated Sante's communication as more impaired than Sante did. Key differences were that Stephanie rated Sante's perspective-taking as a medium problem, and cohesion and emotional regulation as larger problems. In comparison, Sante rated her own perspective-taking as not a problem, and cohesion and emotional regulation as minor problems. Therefore, there was a pattern of the same issues appearing more problematic to Stephanie. Although the two frequently showed warmth and mutual respect to each other, they also

occasionally mentioned having differences of opinion when discussing current events. Stephanie listed the following treatment priorities in order: “1. interrupting”, “2. talking too fast”, “3. talking too much”, and “4. switching to other topics without warning”.

**Participant Dyad 4: “Benny” (participant with ABI) and “Marge” (ECP/spouse).**

Benny was a 52-year-old man who grew up in Oregon and had also lived in Germany. He spoke English as a first language and also spoke German. One year prior, he was hospitalized for several weeks following a fall from his roof that caused a TBI with a subdural hematoma on his right temporal lobe. He recalled that while he was in the hospital, he was “hypervocal” and that the therapists “had to tell me to shut up”. At intake, Benny said that he had recovered well and had returned to work. When asked to describe his strengths in communication, he responded: “I had a good starting point, and was regarded as a good conversationalist prior to my injury. I’m still able to absorb information and meaningfully participate in communication. I can still be an engaging person to talk with.” He described his current communication concern as follows: “I sometimes ramble or feel that I sound less informed or competent at work. I’d like to work on that.”

Benny identified his wife, Marge, as a supportive communication partner. Marge reported that Benny’s current degree of verbosity was situational. When asked to demonstrate a typical conversation, Benny showed difficulty wrapping up a speaking turn on his own. Marge compensated by cutting in when she had a point to make, which seemed to be a comfortable communication style for her. The couple had noticed Benny’s verbosity being an issue when Benny was talking with less familiar communication partners, who would wait politely for him to finish talking.

*Study Setting*

The study was conducted online via Zoom, with all sessions video-recorded to allow for later analysis. All dyads participated from their homes using a personal computer, tablet, or mobile phone. In the case of technology or scheduling issues that interfered with session activities, as well as instances in which the session time ran over an hour, and the participants needed to cut the time short, the continuation of the session was rescheduled for the next mutually available time. Therefore, intake procedures and some sessions, especially the first treatment session which contained the bulk of the metacognitive strategy selection and training, sometimes needed to be continued on a different day, due to the time required to get through all of the planned procedures. Questionnaires and surveys were completed via Qualtrics.

### **Study Procedures**

The study design consisted of an initial intake session followed by three phases: baseline, intervention, and follow-up. The intake session and three phases are described below. After the description of study procedures, a visual summary of the order of procedures is provided in Table 7.

#### ***Initial Intake***

The initial intake session began with informed consent, followed by a screening interview and the DASS-21. Dyads who passed those stages completed the CoRS-ABI Self and Partner Rating Form and La Trobe Communication Questionnaire, the Conversation Topic Survey, and the Motivational Interviewing (MI) Rulers for confidence in change and importance of change (Miller & Rollnick, 2013). Subsequently I provided the ECP with communication partner training, and measured their supportiveness in communication with the MSC scales of the adapted Kagan Scales (Togher et al., 2010) during a practice conversation between the ECP and primary participant. Each element of the intake is described further below.

The Conversation Topic Survey is a 4-page list of opinion topics based on a list of prompts for argumentative writing published in the New York Times (Gonchar, 2017), with a column for the participants to indicate degree of interest and strength of feeling on each topic on a scale from 1-5 (See Appendix A). Topics the participants wanted to exclude from discussion were eliminated. Each primary participant completed the Conversation Topic Survey once. The ECPs completed the Conversation Topic Survey twice: once for themselves, and once based on their perceptions of the primary participant.

I identified a pool of topics for each dyad which were scored within a common range to ensure reasonable equivalency. Specifically, I included topics that the primary participant rated between 2-5 in interest and between 3-5 in “strong feelings”, adding in any topics that the ECP rated for the primary participant as between 2-5 in interest and between 3-5 in “strong feelings”, and eliminated any topics for which the ECP rated their own strength of feeling as either “5”, or two or more points higher than the primary participant. For example, if the primary participant rated their feelings as “2” about a topic but the ECP rated their feelings as “4”, that topic would be eliminated in order to avoid situations in which the ECP felt significantly more strongly about the topic than the primary participant. When the pool of topics was not sufficient in number or satisfactory to the participants, I allowed them to generate their own customized prompts that they felt were equivalent in interest and emotional valence.

Next, I explained the three observable communication targets thought to be most measurable and likely to be improved using CISBAR: interruption, wordiness, and perspective taking. As described in the literature review, the cognitive processes most disrupted in moderate to severe ABI often present in conversational discourse as interruption, wordiness, tangentiality, and more ego-centric conversation. Since it was expected that the same individual may show

difficulty in all of these areas, data were taken on all of these for each participant. However, perspective-taking was not targeted by any of the dyads, and there was difficulty establishing interrater reliability for this outcome measure. Therefore, the data plots of results show only interruption and wordiness, which were targeted by two dyads each.

I used collaborative, person-centered goal-setting techniques, as well as the results of the CoRS-ABI Self and Partner Rating Form, to support each primary participant in setting an individual, personally relevant communication goal, and to generate a five-level goal hierarchy according to the principles of goal attainment scaling (GAS; Krasny-Pacini et al, 2016).

After collaborative goal-setting, I administered the MI rulers of importance of change and confidence in change (Miller & Rollnick, 2013) for the participant's goal. These rulers were designed to show a person's readiness to begin making a behavioral change, while evoking positive "change talk" that fosters motivation to change. According to the process described in Miller & Rollnick (2013), I asked, "On a scale from 0 to 10, how important is it to you to make a change?" (importance ruler). Then I asked the follow-up questions: "Why are you at a \_\_ and not a 0?", "What would it take for you to go from \_\_ to [a higher number]?". To administer the confidence ruler, I asked, "how confident are you that you could do this if you decided to? On a scale from 0 to 10, where 0 is not at all confident and 10 is extremely confident, where would you say you are?" Then I asked the same follow-up questions: "Why are you at a \_\_ and not a 0?" and "What would it take for you to go from \_\_ to [a higher number]?" Using these procedures, all dyads were able to demonstrate sufficient belief in importance and confidence to proceed with the study.

In order to promote successful communication and minimize risk of conflict, I provided a one-page handout of "Communication Partner Guidelines" and gave training to each ECP in supportive communication in the intake session, with reference to this handout. The

communication strategies listed were drawn from communication partner training materials in the TBI Express program (Togher et al., 2010) and the Calgary Brain Injury Program (2018). To ensure that the ECP understood the guidelines and was able to implement them during conversations with the participants, I required the ECP to demonstrate satisfactory adherence to the Communication Partner Guidelines during a role-play conversation with the primary participant in order to continue in the study.

I continued to monitor the ECP's supportiveness in conversation throughout the study, and in the event their supportiveness dropped below 2 out of 4 on the MSC scales, I provided additional training as needed.

### ***Baseline Procedures***

Baseline sessions were scheduled 2-3 times a week. These were the shortest sessions, only consisting of one videorecorded conversation sample. I instructed the primary participant and ECP to have a conversation for 6-7 minutes on a topic which was drawn randomly from their conversation topic pool. I stopped the conversation at 7 minutes. Each topic that was used once for baseline was removed from the pool and not re-used with that dyad.

### ***Intervention Procedures***

**Treatment Dosage.** I attempted to schedule intervention sessions 2-3 times per week in order to maximize intensity of treatment, but since most intervention sessions turned out to be at least an hour in length, participants could not always keep up with this pace, so sessions were scheduled as frequently as the participants' schedules allowed.

**Treatment Duration.** The study protocol allowed at least five but no more than eight intervention sessions. This was sufficient for achieving treatment effect in the participants with high awareness who targeted interruption, but not for the participants with lower awareness who

targeted wordiness. All dyads completed the study after 5-6 treatment sessions, after achieving their GAS goals and personally feeling they had gotten what they needed from treatment.

**Treatment Intervention.** The experimental intervention, Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR), combines elements of collaborative goal-setting with GAS (Krasny-Pacini et al, 2016), metacognitive strategy instruction (Sohlberg & Turkstra, 2011, Ylvisaker, 2006; Douglas et al., 2014; 2019, Finch et al., 2017), and joint reflection (Helffenstein & Wechsler, 1982; Hoepner & Olson, 2018). Chapter II detailed the theoretical underpinnings and existing experimental support for each of these treatment ingredients. Below I describe how the treatment ingredients were implemented in the present study.

*Collaborative Goal-setting and Goal Attainment Scaling (GAS).* In the initial intake, all participants expressed hopes for rehabilitating aspects of communication made more difficult since the brain injury. Individualized GASs were developed collaboratively based on stated communication goals, ECP input, and observed patterns in their communication with their ECPs. Since the goal-setting process was highly individualized and person centered, the GAS goals developed collaboratively with participants did not always map directly onto the measurable Communication Target Counts (CTCs) which blinded research assistants were trained to score for the conversation samples. CISBAR targeted specific communication behaviors selected by each dyad using conversational practice and reflection. It was hypothesized that the GAS goals were sufficiently related to the CTCs and would be amenable to change given the intervention ingredients. The final GAS developed with each dyad are presented in Table 4. Further explanation of the collaborative goal-setting process with each dyad is provided thereafter.

**Table 4***Participant GAS Hierarchies*

Level Description	Participant			
	“Michelle”	“Joy”	“Sante”	“Benny”
<b>+2</b> At this level, I would consider this problem solved	I get my thoughts across 100% of the time without getting sidetracked	I know when to talk and when to listen 100% of the time	When I take a longer speaking turn, my partner and I feel I’m at about a “5” on the Scale of Partner Understanding (SPU)	I talk for about 50% of the conversation, and my partner talks about 50%
<b>+1</b> Where I hope to be after a month or two of working on this	I get my thoughts across 80% of the time without getting sidetracked	I know when to talk and when to listen 75% of the time	When I take a longer speaking turn, my partner and I feel I’m at about a “4.5” on the SPU	I talk for about 58% of the conversation, and my partner talks about 42%
<b>0</b> Where I hope to be after a few weeks of working on this	I get my thoughts across 60% of the time without getting sidetracked	I know when to talk and when to listen 50% of the time	When I take a longer speaking turn, my partner and I feel I’m at about a “4” on the SPU	I talk for about 66% of the conversation, and my partner talks about 34%
<b>-1</b> Where I am now	I get my thoughts across 40% of the time without getting sidetracked	I know when to talk and when to listen 25% of the time.	When I take a longer speaking turn, my partner and I feel I’m at about a “3.5” on the SPU	I talk for about 75% of the conversation, and my partner talks about 25%
<b>-2</b> Worse than before	I get my thoughts across 20% of the time without getting sidetracked	I know when to talk and when to listen 0% of the time.	When I take a longer speaking turn, my partner and I feel I’m at about a “3” on the SPU	I talk for about 83% of the conversation, and my partner talks about 17%



**“Michelle” (participant with history of ABI) and “Kaladin” (ECP/spouse).** Although baseline conversations showed interruption as the most frequent of the observable communication target behaviors, Michelle herself expressed more concern with the internal features of her difficulty with communication. She expressed worry that others would be bothered by her difficulties with word-finding and attention during conversation, e.g. by looking into the distance to find a word, or becoming distracted and tangential. Therefore, she expressed her highest priority goal as “getting across my thoughts without becoming side-tracked”.

**Participant Dyad 2: “Joy” (participant with ABI) and “Diana” (ECP/roommate).** During the collaborative goal-setting discussion, Joy and Diana both identified turn-taking, or interruption, as an area of particular challenge. Joy said, “I don’t know how to tell when it’s my turn to talk, no way to control it, no filter.” She estimated her current level of knowing when to talk and when to listen at 25%, and desired to ultimately be at 100%. When asked what it would be like to be at her highest GAS level, she said, “I would be a more effective communicator. People would not get agitated and upset with me.”

**Participant Dyad 3: “Sante” (participant with ABI) and “Stephanie” (ECP/paid caregiver).** Though Sante and Stephanie initially also endorsed “interruption” as a major concern, baseline conversation sampling revealed that Sante did not often interrupt Stephanie during structured recorded conversations. Wordiness continued to be an issue, but rather than simply shortening her speaking turns, it was important to Sante to learn to convey her meaning more clearly. I anticipated that by teaching Sante to produce more clearly organized and partner-centered speaking turns, the resulting output would also be less verbose. This focus on clarity of the message

over duration ensured that the resulting exchange was more satisfying for Sante and her conversation partner.

During our collaborative goal-setting discussion, Sante expressed frustration with trying to get across her meaning to others. According to Stephanie, Sante often changed topics suddenly, making connections that her partners could not easily follow. Sante shared that when she talked with friends from all over the world online, she often found that they didn't understand her due to her use of specialized vocabulary or expressions not familiar to them. Therefore, we developed the following Scale of Partner Understanding to be used with Sante's goal attainment scale:

**Figure 1**

*Scale of Partner Understanding*

0	Did not understand message at all
1	Understood a little of the message
2	Understood some of the message
3	Understood about half of the message
4	Understood most of the message
5	Understood all of the message

**Participant Dyad 4: “Benny” (participant with ABI) and “Marge” (ECP/spouse).**

During the intake, I offered the observation that Marge seemed to be interrupting proactively so that she would get enough speaking time. While this had allowed speaking turns for both parties, it did not give Benny practice ending his speaking turns on his own. This seemed to resonate, so I suggested that during the structured 6-7 minute study conversations for both baseline and treatment, Marge would try not to interrupt Benny. This would allow us to objectively measure the actual duration of his speaking turns when they were not cut short. Marge agreed, and

endeavored to avoid interrupting Benny during both the baseline and intervention phase conversation samples for this study.

Baseline conversation sampling showed that Benny continued to have difficulty ending his speaking turn when not interrupted. At this point, we were ready to develop a functional goal. Rather than setting an arbitrary target for length of speaking turn, it was more important to Benny and Marge that they both have equal chances to participate in the conversation. When Marge interrupted Benny frequently, as she had become accustomed to doing, Benny was not getting adequate chances to finish speaking. This made it more likely that Benny's views would not be fully heard and understood. On the other hand, when Marge stopped interrupting, Benny was not consistently able to end his turn so she could speak. I asked where they would like to see themselves, and they set the goal of each contributing 50% to the conversation. Benny said, "if I can make myself a little more concise that would probably be a good thing. Just in terms of, you know, maybe just deciding what I'm going to say before I open my mouth. And if there's an internal leash I can pull just to make myself be quiet that would probably be a good thing too."

***Metacognitive Strategy Selection and Training.*** At the beginning of the intervention phase, after reviewing each participant's communication concerns and profile based on the interview, intake, and baseline data, I presented each participant with a short "menu" of pre-selected metacognitive strategies based on their treatment needs. I introduced each strategy and invited participants to provide input on which one(s) they felt would most help them. Participants endorsed multiple strategies, and at times proposed their own.

**Table 5***Participant Metacognitive Strategies*

Participant	Strategy Nickname	Strategy Description
Michelle	“Meditation”	Take a few deep breaths and clear your mind before the conversation, and at any time during the conversation when you want to bring yourself back to a focused state.
	“Summarizing”	After listening to your partner, try summarizing or reflecting back in your own words what you think they meant. Allow them to clarify.
Joy	“Body language”	Watch for nonverbal cues to judge when to talk, when to listen.
	“Vine vs. bubble”	Thinking of conversation as a vine you are growing between both of you, rather than creating separate bubbles.
Sante	“Preparation”	Before speaking, take a minute to outline in your head the main points of what you will say. Organize the information so that your most important point is first.
	“Personalize content”	Remember whom you are talking to. Tailor your content and language to your partner, and ask them questions based on their interests and experience.
Benny	“Preparation”	Before speaking, take a minute to outline in your head the main points of what you will say. Organize the information so that your most important point is first.
	“Transition phrase”	Adopt a short transition phrase such as “And you?” or “And what do you think?” to keep the conversation flowing smoothly.

The final list of strategies trained for each participant is presented in Table 5. Joy’s analogy of “vine vs bubble” and Sante’s strategy of “personalize content” were generated by the participants themselves. Other strategies were selected from the pre-selected short menu I proposed for each client, which were drawn from communication strategies found in the literature.

After collaborative selection of strategies, I provided training, modeling, and practice opportunities using the selected strategies. Two-minute structured practice conversations on lighthearted topics (e.g. favorite grade school memory, favorite comfort food) were provided during training to give primary participants and ECPs opportunities to learn and practice strategies before the longer 6-7 minute conversations for data analysis. Metacognitive strategy instruction was infused throughout subsequent treatment sessions. The process of selecting and training metacognitive strategies is described below for each dyad.

**“Michelle” (participant with history of ABI) and “Kaladin” (ECP/spouse).** To select a primary metacognitive strategy for Michelle, it was necessary to consider the underlying cognitive processes involved in her challenges. Her brain surgery had impacted attention and memory. She worried that if she did not speak quickly, she would forget what she was going to say. I expected that selecting a reassuring strategy to establish internal calm and allow her to collect her thoughts would allow her to focus on the conversation without becoming sidetracked. Therefore, she selected the strategy “Meditation”.

To address her desire to “focus on listening better,” Michelle endorsed the secondary strategy of “Summarizing”. After training and practice in this strategy, she reported that it helped her maintain attention during conversation, contributing to her goal of communicating without getting sidetracked.

**Participant Dyad 2: “Joy” (participant with ABI) and “Diana” (ECP/roommate).**

Consideration of the social cognitive underpinnings of Joy’s primary issue with communication led to selection of the metacognitive strategy, “Body language”. Since Joy professed to not understand when it was her turn to talk, I provided training in how to attend to nonverbal cues during a conversation in order to determine whose turn it is to speak.

Diana was actively involved in this training, so I took the opportunity to ask Diana to demonstrate how she indicated with body language to Joy that she was either (1) interested in what Joy had to say and wanted her to continue, or (2) wanted Joy to wrap up her speaking turn so that she could have a turn to speak. Diana demonstrated her body language in each of these scenarios to Joy, and the three of us collaboratively developed a customized strategy guide for Joy analyzing the meaning of various cues related to conversational turn-taking. Cues indicating “Go” ahead and talk were coded green for “go”, and cues to stop talking/not talk were coded red for “Stop”.

With Diana acting as a conversation partner with whom Joy could practice, I provided in-session training on strengthening awareness of partner’s body language to improve turn-taking skills. To support generalization of these skills, I also asked Diana to develop cues she could give Joy during conversations at home and across various everyday contexts. Joy was receptive to online feedback on her communication from Diana, and quickly reported an improvement in her own awareness of turn-taking. Both sets of cues were incorporated into a customized strategy guide I developed with Joy and Diana, which was used for training and provided to them by email.

**Figure 2**

*Customized Strategy Guide Developed with Joy and Diana*

**Watch for Nonverbal Cues of When to Talk, When to Listen**

When to talk		When to listen	
Cue	Meaning	Cue	Meaning
Settling back a bit; putting hands in lap; pausing after completing a sentence	Done with their turn; you may start talking	Leaning forward	Interest in the conversation  Desire to say something
Looking at you with an expectant look, asking a question; tilting head to side	Curious what you will say next	Gesturing forward with finger/hand	Desire to say something  Eager for chance to speak
Nodding	Encouraging you to continue talking	Continuing to talk with no pause	Still have more to say; wait until done

**Ask for Cues and Feedback from Partner**

Nonverbal Cue		Verbal Feedback	
Cue	Meaning	Partner Says	Meaning
Touching cheek	Conversation is getting derailed  Return to original topic or question, and wrap up speaking turn	“Wait”, “Stop”, “Hold on a minute”	Take a minute to get back on topic and wait for cues from the other person, before conversation gets derailed
		“What triggered that?”	Reflect on cause of deregulation so that you can recognize the trigger and choose a different response.

After working on these strategies, Joy reported an overall shift in her thinking about communication. She conceptualized this with her own novel metaphor, “bubbles vs. vine”. As Joy explained, she had felt like she had “bubbles” of messages in her that she was trying to get out, and during conversation these bubbles would collide with her partner’s bubbles. After experiencing CISBAR, Joy stated that “there was a growing together of something between us, that made it stronger between us.” Instead of being afraid that she would lose something in conversation if her partner’s words “popped her bubbles”, she described the new feeling as being like a “vine that we grow together” so that “somebody else’s words and communication become part of my experience”. Through discussion of this metaphor across multiple sessions and relating it to her conversations with Diana and others in her life, Joy reported enhanced everyday communication and achievement of her communication goal.

**Participant Dyad 3: “Sante” (participant with ABI) and “Stephanie” (ECP/paid caregiver).** To select a primary metacognitive strategy for Sante, it was necessary to consider the underlying cognitive processes involved in her challenges. Executive function impairments in organization and inhibition secondary to TBI often present in conversation as poor discourse organization and overproduction of tangential and redundant verbal output (Hill et al., 2018). These seemed to be the features characterizing Sante’s discourse which gave her the greatest concern in everyday communication attempts. Her communication goal involved being able to structure the content of her message in an organized way according to the needs of her partner, so that her partner would have a better understanding of the key points she wished to communicate.

With this understanding, Sante endorsed the metacognitive strategy of “Preparation”. Sante reported that she had tried this strategy successfully before, so training focused on further practice and expanded use of the strategy. The “Preparation” strategy involves taking a minute to mentally



outline your main points before speaking. It is further recommended to state the main point clearly first, so that supporting details can follow later.

Sante demonstrated success with this strategy, but still struggled with wordiness, which was the conversational target most closely aligned with her goal. Sante then generated her own secondary strategy, “Personalize content,” which we discussed and defined as “Remember whom you are talking to. Tailor your content and language to your partner, and ask them questions based on their interests and experience.” This strategy helped Sante focus her content more closely on the interests and background knowledge of her partner, resulting in more satisfying conversations for both parties.

**Participant Dyad 4: “Benny” (participant with ABI) and “Marge” (ECP/spouse).**

Similarly to Sante, Benny’s TBI had resulted in executive function challenges impacting his ability to produce concise, well-organized discourse. Of all participants, he demonstrated the lowest level of self-awareness, and seemed unaware of nonverbal partner cues that his speaking turns were too lengthy. Initially, I tried training the “body language” strategy to improve awareness of nonverbal signals which I expected would improve his turn-taking. Though this seemed to have some benefit, it did not address what Benny himself hoped to get out of the intervention, which was being able to “sound smart”. Instead he endorsed the primary strategy of “Preparation”, which addressed being able to organize the content of what his message more clearly for work and personal communication. I hoped that training this strategy would indirectly impact wordiness by allowing him to get his central message across in fewer words. Although Benny preferred this strategy from among the presented options, it did not seem to have a measurable impact on his wordiness.

After working on “Preparation” and noting that Benny still had difficulty turning over his speaking turn to his partner after stating his main point, I introduced the strategy “transition phase”,

training him to adopt a short phrase like “And you?” or “And what do you think?” to wrap up his lengthy and at times, monologic speaking turns and show interest in his partner’s views. Although this seemed helpful, a further difficulty that arose between Benny and Marge during structured conversations in treatment sessions was that Benny would return to the given topic in a way that Marge felt was “too rigid”, when she wanted to continue “branching off” the original topic in different ways. During the joint reflection sessions after each conversation, we explored how Benny could remain open to new directions that Marge wanted to take each conversation topic, while still working on improving the organization of his own discourse.

**Structured Conversation Practice, Feedback, and Reflection.** A key component of CISBAR is providing opportunities for conversation practice and reflection. First, I randomly selected a previously-unused conversation topic from the available pool. Next, I instructed the participant and ECP to have a conversation according to this specific conversation prompt for 6-7 minutes. While the conversation was taking place, I turned off my own video on Zoom so that the participants would only be talking to each other without checking with me. If their conversation concluded naturally between 6 and 7 minutes, I turned my video back on to rejoin them and let them know the conversation was done. If it did not conclude naturally first, I turned my video back on to stop the conversation at 7 minutes. I instructed the participant or ECP to video- or audio-record these conversations for later playback during the reflection discussion. However, because both primary participants and ECPs often made technical errors when attempting to record their own conversations or lacked appropriate technology to do so, it was often necessary for me to use the video of the conversation that was recorded as part of the Zoom session recording, which added extra time to the session since it required all parties to leave the Zoom call and rejoin again approximately 10 minutes later once the video was ready to view.

Immediate feedback on performance is a key ingredient in successful treatment approaches for social communication after ABI (Meulenbroek et al., 2019). After each conversation, I asked both the participant and ECP to rate each behavior target they had identified using the CoRS-ABI Conversation Practice Form. Then I guided the participants in a reflection discussion using the suggested discussion questions of the CoRS-ABI Conversation Practice Form.

During this discussion, I provided positive verbal reinforcement for strengths demonstrated during the conversation, and highlighted areas of the recording to prompt reflection. After the participant identified areas to improve and strategies to address such improvements, the participant and ECP engaged in a second conversation using the same prompt. This provided the primary participant with additional opportunities to rehearse strategies and experience success.

**Measuring Treatment Fidelity.** A fidelity checklist was developed listing key components of the intervention (see Appendix F). The last portion of the fidelity checklist allowed evaluation of the session according to a 5-point scale with respect to five areas: “level of collaboration,” “clarity of feedback,” “incorporation of client and ECP input,” “client level of engagement,” and “ECP level of engagement”.

Twenty-five percent of randomly selected intervention sessions were scored according to the fidelity checklist by a research assistant, who had also previously scored some of the conversation samples. A brief explanation of each of the components and five global evaluation areas was provided scoring. To preserve phase blinding, the research assistant completed the fidelity checklists after all of the data to be used for analysis had been collected.

Descriptive statistics summarizing these results are presented in Table 6.

**Table 6***Treatment Fidelity Results*

	Mean	Range	Standard Deviation
Percent Fidelity	97.38%	92.86%-100%	3.62
Collaboration	2.44	2.00-3.00	1.01
Clarity of feedback	5.00	5.00-5.00	0.00
Incorporation of client and ECP feedback	5.00	5.00-5.00	0.00
Client level of engagement	4.88	4.00-5.00	0.35
ECP level of engagement	5.00	5.00-5.00	0.00

**Note:** Scoring key: *collaboration* (1 = “very directive,” 2 = “mostly directive with some collaboration,” 3 = “good balance between providing structure and collaborating,” 4 = “very collaborative with some direction”, and 5 = “open-ended with limited feedback and structure”); *clarity of feedback* (1 = “unclear,” 5= “very clear and understandable”); *incorporation of client and ECP input* (1= “did not incorporate client input”; 5= “fully acknowledged and incorporated client input”); *perception of client’s level of engagement*; 1= “did not appear engaged;” 5 = “highly engaged and interactive;” and *perception of the ECP’s level of engagement* (1= “did not appear engaged;” 5= “highly engaged and interactive”).

***Post-Intervention Session***

At the conclusion of treatment, all dyads completed a post-intervention session. Post-intervention procedures included GAS, post-intervention questionnaires, and the social validity questionnaire. The social validity questionnaire was adapted from the Treatment Acceptability Rating Form – Revised (TARF-R; Reimers & Wacker, 1988) with the addition of open-ended questions to elicit feedback on the study and what could be improved upon in the intervention procedures or materials.

***Follow Up Session***

All dyads completed a follow up session at least one month after the post-intervention session. Procedures of the one-month follow up session included completion of the CoRS-ABI Self and Partner Rating Form and LCQ by both primary participant and ECP, GAS, and a final conversation sample using a randomly selected topic that had not yet been used.

**Table 7***Sequence of Procedures*

Phase	Procedures
Intake	Informed consent Screening interview MI Rulers for confidence in change and importance of change Communication partner training MSC scales of the adapted Kagan Scales during a practice conversation between the ECP and primary participant. Preliminary discussion of potential target and functional goal Pre-treatment questionnaires (DASS-21, CoRS-ABI Self and Partner Rating Form, LCQ, Conversation Topic Survey, via Qualtrics)
Baseline	One scored conversation sample
Intervention	Complete GAS, setting functional goal and target Metacognitive strategy selection, metacognitive strategy training Social cognitive training First recorded conversation sample Playback of conversation sample Second opportunity for joint reflection
Post-Intervention	Post-treatment questionnaires (CoRS-ABI Self and Partner Rating Form, LCQ, via Qualtrics) GAS data collected via Qualtrics Social validity questionnaire
Follow-Up	Post-treatment questionnaires (CoRS-ABI Self and Partner Rating Form, LCQ, via Qualtrics) GAS data collected via Qualtrics One scored conversation sample

**Measurement**

The table below provides an overview of the measurement methods used in the present study in the order in which they were employed. The table is followed by a description of the rationale and procedures for each method of measurement.

**Table 8***Overview of Measurement*

Phase	Measurement
Intake	DASS-21 CoRS-ABI Self and Partner Rating Form by participant and ECP LCQ by participant and ECP GAS
Baseline	Communication Target Counts (CTCs)
Intervention	CTCs
Post-Intervention	GAS CoRS-ABI Self and Partner Rating Form by participant and ECP LCQ by participant and ECP Social Validity Questionnaire
Follow-Up	GAS CoRS-ABI Self and Partner Rating Form by participant and ECP LCQ by participant and ECP CTCs

***Screening*****The Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995).**

The DASS-21 is a valid and reliable screening tool for mental health factors that may be barriers to improvement in intervention. Strong support for using the DASS-21 as a screening tool for brain injury rehabilitation was found by Randall et al. (2017) when examining the fit of records from 504 patients of a brain injury rehabilitation program with the factor structure of the DASS-21. The DASS-21 has been widely used to screen for mental health conditions for intervention studies for social communication after ABI (McDonald et al., 2016; Honan et al., 2019).

In the present study, the DASS-21 was given before the start of the study to contribute to screening for severe mental health issues that could be a barrier to therapy. No participants were identified as having severe mental health issues.

## *Dependent Variables*

**Communication Target Counts.** The primary measure of intervention effect was the Communication Target Counts (CTC) representing the frequency or duration of a targeted communication behavior for each participant. See Table 9 for methods of measuring each identified target.

**Table 9**

### *Measurement Methods for Social Communication Targets*

<b>Target Aspect of Social Communication</b>	<b>Measurement Method</b>
<b>Interruption</b> Speaking over someone else or starting to speak before they are finished	Number of times in conversation sample when primary participant started talking at same time as ECP
<b>Wordiness</b> Talking too much	Average duration of speaking turn in conversation sample, in seconds

CTCs were obtained via Qualtrics from ratings by trained research assistants who viewed the video-recorded conversation samples in random order. The two research assistants who scored the conversation samples were a doctoral student and a master's student, each of whom had education and clinical experience in speech-language pathology. Both first and second conversation samples of each intervention session were scored, but only results of the first conversation sample of each session were used for data analysis.

Before training the research assistants, I prepared a series of video-recorded conversations of similar length and topic as the real ones in the present study. Non-participant actors demonstrated natural conversation in some videos and deliberate wordiness, interruption, and/or poor perspective-taking in others. I conducted two training sessions via Zoom and gave instructions via email to the research assistants, who then practiced scoring the training

conversation videos separately until they reached 80% agreement. At that point I allowed each research assistant to start scoring randomized sets of conversation samples collected from the actual participants, without letting them know which phases the samples were from and whether the other research assistant had scored any of them already, to preserve phase blinding. The scores included number of interruptions, average duration of speaking turns, and number and categories of perspective-taking behaviors, though these proved more difficult to measure reliably and were not targeted by participants in the current study.

***Interobserver Agreement (IOA).*** To allow IOA analysis, 25% of all conversation samples in baseline, intervention, and follow-up phases were scored by both raters. Of the twenty-nine total baseline samples, eight were double scored (27.59%); of the 40 conversation samples taken during the intervention phase, ten were double scored (25%); and of the four follow-up conversation samples, one was double-scored (25%). When raters disagreed, the data submitted by the first rater to score the sample was used for data plotting and analysis.

Inter-observer agreement (IOA) was calculated using percent agreement, according to the formula: [(frequency of observations with agreement/ total number of observations) x 100%]. The randomly selected baseline samples that were scored by both raters included three samples from Michelle, two samples from Joy, one sample from Sante, and two samples from Benny. In the baseline phase across participants, IOA was 87.5% (7/8) for interruption, and 75% (6/8) for average duration of speaking turn, within 5 seconds. The randomly selected intervention samples that were scored by both raters included two samples from Michelle, four samples from Joy, two samples from Sante, and two samples from Benny. In the intervention phase, there was agreement of 50% (5/10) for interruption, and 80% (8/10) for average duration of speaking turn, within 5 seconds. The randomly selected session for the follow-up phase was from Sante. There was 100%



agreement between raters on this sample for both interruption and average duration of speaking turn.

Data for Michelle across both CTCs had 80% agreement in baseline (4 out of 5 scores agreed) and 50% in intervention (1 out of 2 scores agreed). Data for Joy in baseline for both CTCs had 100% agreement (4/4). In the intervention phase, data for Joy showed 25% agreement (1/4) for interruption and 100% (4/4) for average duration of speaking turn. Data for Sante in baseline showed 100% agreement (1/1) for interruption and 0% (0/1) for average duration of speaking turn. Data for Sante in intervention showed 100% agreement for interruption (2/2) and 50% agreement for average duration of speaking turn (1/2). Data for Benny in baseline for both CTCs showed 50% agreement in baseline (1/2). Data for Benny in the intervention phase for interruption was 50% (1/2) and for average duration of speaking turn was 100% (2/2).

Across participants and phases, the total IOA was 68.42% for interruption and 78.95% for average duration of speaking turn, showing a moderate degree of reliability.

### ***Pre-Post Dependent Variables***

**Goal Attainment Scaling (GAS).** GAS is a criterion-based, person-centered measurement methodology that establishes five levels for a desired behavior with values ranging from -2 (worst possible outcome) to +2 (best possible outcome) (Krasny-Pacini et al, 2016). Key advantages of using GAS for brain injury rehabilitation include the ability to facilitate collaborative goal-setting, increase client motivation, and capture improvements in meaningful daily activities more effectively than broader measures of impairment (Grant & Ponsford, 2014). In a pilot pre-post, cohort design, Finch et al. (2019) found that participants with a history of ABI showed a statistically significant improvement on 25 of 27 social communication GAS goals after treatment, which was not reflected on other outcome measures, such as the LCQ or Profile of Pragmatic

Impairments in Communication (PPIC). These results suggest that GAS may be a more sensitive measure of intervention effects than other commonly used clinical measures of social communication for adults with ABI (Finch et al., 2019).

**La Trobe Communication Questionnaire (LCQ).** In order to capture overall perceptions of social communication strengths and challenges from the perspectives of both the client and their everyday communication partner (ECP), the LCQ (Douglas, O’Flaherty, & Snow, 2000) was used a pretest/post-test measure. Due to the prevalence of awareness deficits in individuals with a history of brain injury, questionnaires that can also be completed by an ECP are particularly useful for examining gaps in perception between the individual and others with regards to their challenges. Developed for this population, the LCQ is in widespread use by SLPs in clinical assessment and research (Kelly et al., 2017). When evaluating reliability and validity of this measure with 88 adults post-severe TBI and their communication partners, Douglas et al., 2007 found test-retest reliability above 0.80, internal consistency coefficients above 0.9, and sensitivity to the effect of severity of injury.

**The Conversational Rating System for ABI (CoRS-ABI) Self and Partner Rating Form (Iwashita, 2019).** The CoRS-ABI Self and Partner Rating Form (provided in Appendix B) was administered to the participant and the ECP at the beginning and end of the study. This rating scale allows individuals and their partners to rate perceived social communication abilities across 20 aspects of social communication commonly reported as problematic among adults with ABI. The checkboxes corresponding to each of the 20 areas allow individuals and their partners to indicate perceived change in each ability since the ABI. Furthermore, space is provided for the participant and ECP to identify and rank top treatment priorities.

## **Analysis of Repeated Measures**

Trained raters scored the conversation samples and entered scores for the CTC data into Qualtrics. For each sample, they entered scores for interruption, average duration of speaking turn, and perspective taking behaviors. CTC data were analyzed by plotting each data point in Excel in order to prepare graphs for visual analysis, and was also input into SPSS for effect size estimation.

The data on perspective-taking behaviors had poor inter-rater reliability and a ceiling effect, since only a few opportunities for perspective-taking behaviors could be observed per sample. Therefore, these data were not included in the visual analysis.

CTC data were then analyzed according to the six features of visual analysis: (1) level, (2) trend, (3) variability, (4) immediacy of the effect, (5) overlap, and (6) consistency across similar phases (Kratochwill et al., 2010). Assessing these features allows a determination as to whether three or more treatment effects have been replicated across three or more different points in time, which would indicate a causal relationship between the intervention and a change in behavior (Horner et al., 2005; Kratochwill et al., 2010). Although the current version of the What Works Clearinghouse standards no longer uses visual analysis to characterize studies (Institute of Education Sciences, 2020), an update and proposed upgrade to these standards by Kratochwill et al. (2021) emphasized the continued value of visual analysis in single case experimental research. Specifically, visual analysis allows determination of a functional relation through examining the full set of study data, and also allows evaluation of threats to internal validity (Kratochwill et al., 2021).

According to technical documentation (Kratochwill et al., 2010), the first step in visual analysis is to determine whether the data in baseline indicate the presence of a problem, and that the data show a clear, stable pattern that can be used to contrast with any subsequent intervention effect. The second step is to assess the level, trend, and variability of data within each phase, comparing the pattern of data in each phase with data in adjacent phases. The third step is to examine the overlap, immediacy of effect, and consistency of patterns in similar phases. To determine functional relation in a multiple baseline design, effects must be analyzed both horizontally (intra-participant) and vertically (inter-participant). The fourth and final step is to integrate all information from preceding steps in order to determine whether the data, as a whole, meet the standard for documenting three demonstrations of effect at three different points in time (Kratochwill et al., 2010). These analyses were completed on the CTC for all dyads.

Following visual analysis, calculation of effect size was performed with the design-comparable effect size (D-CES) described by Pustejovsky et al. (2014), using the “scdhlms” web application (Pustejovsky, 2021). D-CES can be calculated for any study using multiple baseline or treatment reversal design that includes data from three or more individuals. Furthermore, D-CES is currently the recommended effect size for multiple baseline and multiple probe design (Institute of Education Sciences, 2020).

Following the steps in the What Works Clearinghouse Procedures Manual 4.1, (Institute of Education Sciences, 2020), D-CES analysis was run using the default estimator of restricted maximum likelihood, fixed effect, and the assumption of no trend at baseline. Interruption data was input for all four participants. Interruption data was used because D-CES requires measuring outcomes according the same variable, and according to the prior visual analysis of data, treatment effects were supported only for the CTC of interruption.

### **Analysis of Pre Post Data**

**Goal Attainment Scaling (GAS).** Goal attainment data was collected from primary participants and ECPs via Qualtrics and is presented in table form in Chapter IV. GAS was also conducted to evaluate potential treatment effect, and treatment effects were calculated using the method Percentage of Goal Obtained (PoGO; Ferron et al., 2020). PoGO was developed to allow behavioral intervention researchers to measure effect sizes consistently across groups of participants who are working towards different individualized goals. As such, it is uniquely well suited to cognitive rehabilitation research given the need to align goals with functional outcomes desired by the patients themselves.

Calculation of PoGO uses one of two simple formulas depending on whether the desired direction of change is increasing or decreasing the target behavior. In the present study, because an increase in GAS scores was desired, the ascending PoGO formula was used. Where  $Y$  = goal level of behavior,  $\beta$  = obtained level of behavior, and  $\alpha$  = expected level of behavior in the absence of the intervention,

$$\text{PoGO}\hat{=} = \frac{\beta - \alpha}{\gamma - \alpha} \times 100$$

PoGO is expressed as a percentage, with the maximum being 100%. As an example, a PoGO value of 50% would indicate that the person was halfway towards achieving the highest level of their goal, according to their predetermined goal criteria. In the current study, goal attainment scaling (GAS) was used to determine levels for each participant's individualized goal (see Table 4). The most favorable outcome level of GAS is +2, which was described to the participants in this study as "at this level, I would consider the problem solved." This was used for  $\gamma$  in the PoGO formula. The baseline level, which was expressed to participants as "where I am now," was used as the  $\alpha$  value in the PoGO formula. The value  $\beta$ , representing the obtained level of behavior, indicated the GAS outcome at the end of the intervention and at the one-month follow-up, respectively. Therefore, a participant who reached the highest (+2) GAS level at the indicated time point would have a PoGO of 100%, a participant who reached the second-highest (+1) GAS level would have a PoGO of 66.7%, and so on.

An example of how  $\text{PoGO}\hat{=}$  was calculated for Michelle (self, post-intervention) is shown below.

$$\text{PoGO}\hat{=} \text{ for Michelle} = \frac{100 - 40}{100 - 40} \times 100 = 100\%$$

**LCQ.** Self and partner versions of the LCQ were used to answer research questions 2 and 3, respectively. The self and partner versions were each scored and analyzed according to the procedures described below.

To demonstrate how the LCQ results compared to researcher hypotheses regarding how the CISBAR intervention would affect social communication, I made *a priori* predictions for the study as a whole and individual participants. These predictions were based on knowledge of the study participants' communication profiles, goals, and areas targeted by the intervention. Since

CISBAR is a novel intervention, there was no prior LCQ data associated with this intervention from which to draw the hypotheses. The theoretical underpinnings of the hypotheses were the areas of social communication represented by the LCQ Indices described by Struchen et al. (2008): “Initiation/Conversation Flow”, “Disinhibition/Impulsivity”, “Conversational Effectiveness”, and “Partner Sensitivity”.

Results of the LCQ were collected via Qualtrics and scored according to the indices developed by Struchen et. al. (2008). Because the number of items comprising each index was unequal, I used the total number of items in each index and the raw score for each index to calculate a percentage score for each participant for each index, using an Excel spreadsheet. This allowed me to compare the percentages of improvement across indices and across participants. Then I compared the results of this analysis to my hypotheses.

**CoRS-ABI Self and Partner Rating Form.** Results from both the primary participant and ECP were used to answer research questions 2 and 3, respectively. Primary participant and ECP responses were each scored and analyzed separately according to the procedures described below.

I made *a priori* predictions for the greatest areas of improvement expected on the CoRS-ABI Self and Partner Rating Form based on the conceptual distinctions on the CoRS-ABI represented by the three sections, “Non-Verbal Aspects of Communication,” “Speech Quality in Verbal Communication,” and “Interactional Aspects of Communication”. These predictions were based on knowledge of the study participants’ communication profiles, goals, and areas targeted by the intervention.

Results of the CoRS-ABI Self and Partner Rating Form were collected via Qualtrics and input into an Excel spreadsheet. Because the number of items comprising each index was unequal, I used the total number of items in each section and the raw score for each section to calculate a

percentage score. This allowed me to compare percentage of improvement across sections and across participants. Then I compared the results of this analysis to my hypotheses.

Further analyses to answer research questions 2 and 3 were performed by calculating descriptive statistics (mean, median, and standard deviation) using the online statistical calculator at <https://statscalculator.com> for scores from all participants for the LCQ and the CoRS-ABI Self and Partner Rating form.



## CHAPTER IV

### RESULTS

This chapter presents the results of the study pertaining to each research question and the social validity survey results.

#### **Results of the Study Pertaining to Each Research Question**

##### ***Research Question 1***

*For adults who have experienced social communication challenges following acquired brain injury (ABI), is there a functional relation between Collaborative Interpersonal Strategy Building with Audio Reflection (CISBAR) and an improvement in targeted social communication behaviors within a 6-7-minute conversation with a familiar conversation partner?*

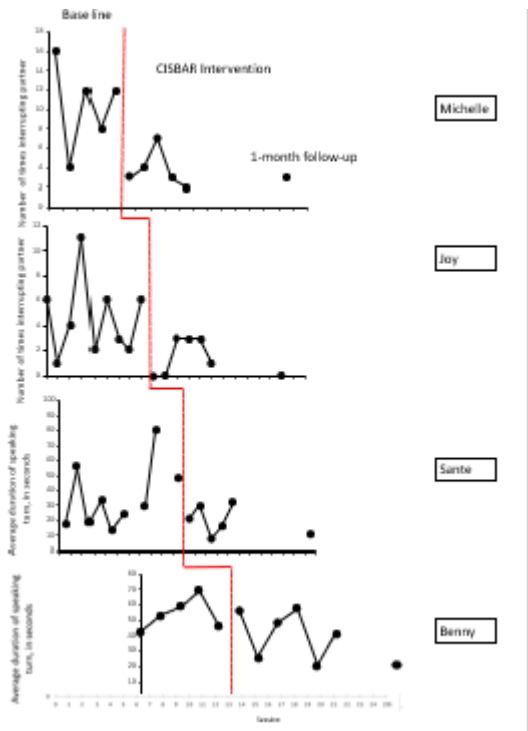
This research question was primarily addressed via analysis of the repeated measures, using both visual analysis and the effect size D-CES. Although a functional relation was not demonstrated in the present study, visual analysis suggested treatment effects in Michelle and Joy. Furthermore, effect size estimation using D-CES suggest a medium effect size for interruption in the present study.

**Results from Repeated Measures.** The CTCs were graphed and analyzed using visual analysis. Figure 3 shows the visual display of the data.

Analyzing the effects horizontally shows that Michelle and Joy met the criteria of “change in level”, “change in trend,” and “immediacy of effect”, suggestive of a treatment effect for these two participants. Though there was overlap between baseline and intervention phases, in general the median level of the data in the intervention phase was lower than baseline, and showed a trend downward.

**Figure 3**

*Relation Between CISBAR and Targeted Social Communication Behaviors*



For both Michelle and Joy, there was an immediate change in the desired direction following introduction of the intervention. In contrast, Sante and Benny showed no immediacy of effect after introduction of the intervention. The last data point in baseline for Sante trended in the direction of expected intervention effect, making it unclear whether further change in the desired direction would have occurred without the intervention (Kratochwill et al., 2021). The data plot for Benny also did not show immediacy of effect. In fact, Benny’s average duration of speaking turn increased immediately after introducing the intervention. However, the next observation showed a change in the desired direction, falling lower than any observations in the baseline phase. The remaining data points from Benny’s treatment sessions continued to show high variability and high degree of overlap with baseline data. Therefore, results of the visual analysis of immediacy

effect, trend, and level suggest that treatment effects were demonstrated for Michelle and Joy, but not for Sante or Benny.

Comparing consistency of patterns across phases revealed substantial variability in baseline for Michelle, Joy, and Sante. This degree of variability in baseline made it difficult to compare baseline and treatment data. Variability decreased in the intervention phase for Michelle, Joy, and Sante, while increasing slightly for Benny. Across all participants, the level of the follow-up data point suggested a maintenance of improvement at the one-month follow-up.

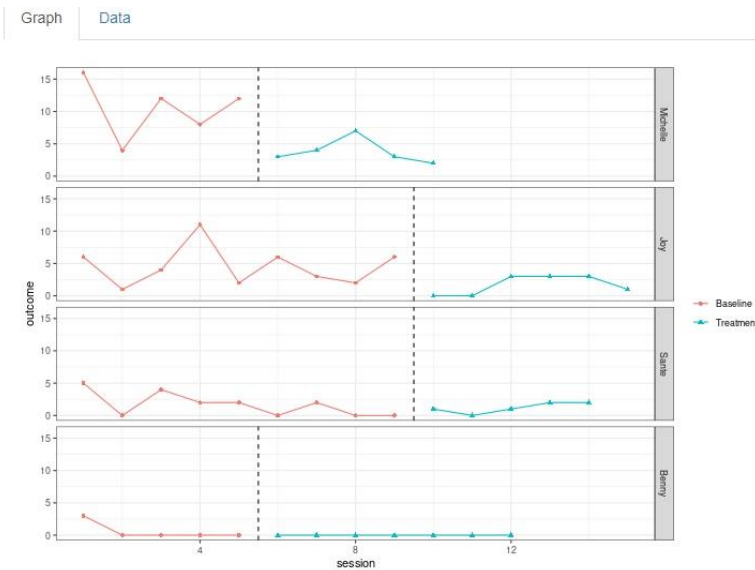
Vertical analysis of data ensures that changes in the data coincide with the time-staggered introduction of the intervention, rather than with an unrelated factor influencing multiple participants at a certain point of time (Kratochwill et al., 2021). In the present study, results of the vertical analysis suggested that there was not a threat to internal validity based on a confounding variable affecting multiple participants at the same point in time.

Using the “scdhlm” web application (Pustejovsky, 2016) to estimate D-CES for the CTC data on “interruption” for all four participants of the present study resulted in a D-CES estimate of -0.54, representing a medium effect size in the direction of decreasing the behavior (interruption). There was a standard error of 0.23 and an autocorrelation estimate of -0.23.

Note that Sante and Benny, whose goals corresponded to a different treatment target, had a consistently low level of interruption throughout both baseline and treatment phases. To illustrate this, Figure 4 below shows the data plots for “interruption” for all participants after being input in the “scdhlm” web application. This difference in targets may have contributed to a less sizable effect size than would have been obtained had all of the four participants been targeting interruption.

**Figure 4**

*Data Plots for Interruption for All Participants*



**Results from GAS.** Each participant had collaboratively developed an individualized GAS that reflected their desired change in communication following the treatment. The GAS represented a functional goal related to the CTC. Analysis of GAS thus provided an important indicator of the effect of CISBAR. All participants and ECPs reported improved communication across settings following CISBAR intervention. The GAS outcome results are presented in Table 8. Note that “Self” refers to self-reported GAS levels across phases, while “ECP” indicates how the ECP of each dyad reported the GAS level of the primary participant; the maximum possible goal attainment level is +2 (explained to participants using the wording, “At this level, I would consider the problem solved.”) and the second highest level is +1, (“where I hope to be after a month or two of working on this.”) Following the delivery of the CISBAR intervention, all primary participants and ECPs reported change at one of these two highest levels, compared to the baseline level of -1 (“where I am now”) reported at intake.

**Table 8***GAS Outcome Results*

Name	Intake		Post-intervention		Follow-up	
	Self	ECP	Self	ECP	Self	ECP
Michelle	-1	-1	+2	+2	+2	+2
Joy	-1	-1	+1	+2	+2	+1
Sante	-1	-1	+2	+1	+2	+2
Benny	-1	-1	+2	+2	+2	+2

Findings indicated that both self and ECP estimates of goal attainment averaged approximately 92% post-intervention. At the one-month follow-up, the average across all primary participants was 100% goal attainment, with 92% by ECPs. Results suggest a high level of goal attainment which was maintained at one-month follow-up. Table 9 shows the effect sizes for the current study using PoGO.

**Table 9***Treatment Effect Sizes Using Percentage of Goal Obtained*

Name	Post-intervention		Follow-up	
	Self	ECP	Self	ECP
Michelle	100%	100%	100%	100%
Joy	66.7%	100%	100%	66.7%
Sante	100%	66.7%	100%	100%
Benny	100%	100%	100%	100%

**Research Question 2: Self-Ratings.** *Is there an improvement in self-ratings of social communication skills by adults who have experienced social communication challenges following ABI after participating in CISBAR?*

The perceptions of the participants on whether there were differences in their communication pre and post-treatment were measured by comparing changes on the self-report questionnaires of the La Trobe Communication Questionnaire (LCQ) and the CoRS-ABI Self Rating Form.

**La Trobe Communication Questionnaire (LCQ) Results.** Results of the LCQ were analyzed according to the updated scoring system developed by Struchen et. al. (2008), which groups most of the thirty questionnaire items into indexes measuring “Initiation/Conversation Flow”, “Disinhibition/Impulsivity”, “Conversational Effectiveness”, and “Partner Sensitivity”. The number of items comprising each index is unequal, so it was necessary to first convert the raw score of each index into a percentage before comparing amount of relative improvement across indices. Overall, the “Disinhibition/Impulsivity” and “Partner Sensitivity” indices were predicted to be most improved across participants as a result of the present intervention. Table 10 shows the perceived improvements in communication as shown by raw score results for each index, and Table 11 shows the difference between pre- and post- scores for each index converted to percentages for ease of comparison of amount of improvement across indices.

**Table 10**

*Perceived Improvements in Communication as Measured by LCQ Raw Scores*

	Michelle			Joy			Sante			Benny		
	Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up
Initiation/ Conversational Flow	29	15	15	18	14	15	17	12	11	11	15	13
Disinhibition/ Impulsivity	18	13	8	15	11	11	9	9	10	9	9	9
Conversational Effectiveness	16	11	13	16	12	10	10	10	8	6	6	6
Partner Sensitivity	10	5	5	14	8	9	6	6	6	4	5	4
Other	8	5	5	10	6	7	5	4	5	3	4	4
<b>Total</b>	<b>81</b>	<b>49</b>	<b>46</b>	<b>71</b>	<b>51</b>	<b>52</b>	<b>47</b>	<b>41</b>	<b>40</b>	<b>33</b>	<b>35</b>	<b>32</b>

Note that higher scores indicate perceived higher degrees of impairment in these areas.

**Table 11**

*Percentages of LCQ Improvement by Index*

	Initiation/ Conversational Flow	Disinhibition/ Impulsivity	Conversational effectiveness	Partner sensitivity	Other	Total LCQ score
Michelle	35.0%	17.9%	20.9%	31.2%	10%	26.7%
Joy	10%	14.3%	16.7%	37.5%	13.3%	16.70%
Sante	12.5%	0	0	0	3.4%	5%
Benny	-10%*	0	0	0	0	-1.7%*
Index total	11.9%	8.05%	9.4%	17.2%	6.7%	11.7%

*Note: Rounded to nearest tenth of a percentage point.*

*\*Negative sign and asterisk indicate the direction of change was reversed (self-reported greater frequency of behaviors post-intervention).*

To calculate percentage improvement for each index and for the total LCQ score, I divided each raw score by the total number of items in each index or total and converted to a percent corresponding to each participant’s pre-intervention and post-intervention score for each index and for the LCQ total score. Then I subtracted the post-intervention percentage from the pre-intervention percentage resulting in positive numbers (showing improvement) for Michele, Joy and Sante. For Benny, self-report scores actually increased following intervention, possibly indicating greater awareness of deficits. By calculating a mean of all four participants’ percentage improvement for each index, I could compare percentage improvement across indices to evaluate whether my prediction was correct. As I predicted, the “Partner Sensitivity” index was one of the two indexes showing most improvement following the CISBAR intervention. However, contrary to my prediction, the second most improved index on the LCQ per self-report was not “Disinhibition/Impulsivity” but rather “Initiation/Conversational Flow”, as shown in Table 11.

I also made individual predictions based on the communication aspects targeted by each participant. These specific predictions and results for each participant are summarized below.

Michelle's primary area of concern was getting her thoughts across without getting sidetracked, and the treatment focused on mindful communication. Therefore, I expected her to improve most on the LCQ item on becoming "side-tracked by irrelevant parts of conversation". To compare change for individual LCQ items, I input each LCQ item with the participants' pre-, post-, and follow-up responses into an Excel spreadsheet. Then I calculated the difference between the pre-, post-, and follow-up scores for each item. Since each item was rated on a 4-point frequency scale, the greatest possible difference in scores would be 3 points.

Michelle's score for the predicted item on becoming "side-tracked on irrelevant parts of conversation" did improve by one point between pre- and post-intervention, and continued improving an additional point at the one-month follow-up, for a total improvement of two points. However, she showed greater immediate improvement (two points) between pre- and post-intervention on the following items: "use a lot of vague or empty words such as 'you know what I mean' instead of the right word"; "need a long time to think before answering the other person"; "hesitate, pause, and/or repeat yourself"; and "difficulty thinking of things to say". These two-point improvements were all maintained at the one-month follow up.

Comparing pre-intervention to follow-up scores for Michelle also showed one 3-point item difference, "lose track of conversations in noisy places", however this only had one point of difference between pre- and post-intervention, and was not targeted by the present study, so is unlikely to be a study-related change.

Joy's primary area of concern was knowing when to talk and when to listen, and the treatment focused on nonverbal cues and collaborative conversation. Therefore, I expected Joy to



improve most on the LCQ item on “knowing when to talk and when to listen”, and this hypothesis was supported by the results. Joy’s pre-intervention score for this item was 4, “never or rarely” (this item was reverse scored), her post-intervention score was 2, “often”, and her 1-month follow-up score was 1, “usually or always”. Including the follow-up score, this was the largest difference for her. The only other item that showed a 2-point perceived improvement in pre- and post-intervention and was also maintained at the 1-month follow up for Joy was: “switch to a different topic of conversation too quickly”(pre: 4 “usually or always”, post-2 “sometimes”, and follow-up 2, “sometimes”).

Sante’s primary area of concern was efficiency in getting across her message and being understood by a partner, and the treatment focused on preparation before speaking and personalizing content to her partner. Therefore, I expected her to improve most on the “Conversational Effectiveness” index of the LCQ. There were no individual items of the LCQ related to this directly, so it was necessary to compare her improvement on scores for that index. Contrary to my prediction, Sante improved most on the “Initiation/Conversation Flow” index (12.5% improvement) and did not show perceived change in “Conversation Effectiveness” following the present CISBAR intervention.

Benny’s primary area of concern was achieving more equitably divided speaking turns with his partner, and treatment focused on improving discourse organization and turning over the speaking turn with use of a transition phrase. I expected him to improve most on the “Conversational Effectiveness” index of the LCQ. Like Sante, Benny did not show perceived improvement in “Conversation Effectiveness” following the present CISBAR intervention.

Overall, LCQ results support the findings of the visual analysis, showing that participants Michelle and Joy benefited the most from the CISBAR intervention. These two participants differed from Sante and Benny both in target behavior (interruption vs. wordiness) and in self-awareness as shown by pre-intervention self-report LCQ scores. Note that Struchen et al. (2008) found that matched control participants without a history of TBI had total LCQ scores with a mean of 48.51, and the lowest possible (non-impaired) score of the LCQ is 30. Therefore, Sante's pre-intervention LCQ score of 47 and Benny's pre-intervention score of 33 do not indicate perceived communication impairment above that which would typically be felt by a person without brain injury.

#### **CoRS-ABI Self Rating Form Results**

Results of the CoRS-ABI Self Rating Form (0-80, with lower scores indicating less impairment) were analyzed by comparing both total scores and scores for each of the three subsections pre- and post-intervention. My prediction was that overall, participants would show the greatest improvement in the subsection "Interactional Aspects of Communication" following intervention. As in the LCQ, the number of items comprising each subsection is unequal, so it was necessary to first convert the raw score of each index into a percentage before comparing amount of relative improvement across subsections. Table 12 shows the raw score results for each subsection for each participant across pre-, post, and follow up (F), and Table 13 shows the difference between pre- and post- scores for each index converted to percentages for ease of comparison of amount of improvement across indices. Table 14 shows descriptive statistics for scores of all participants for the self-report versions of both the LCQ and the CoRS-ABI Self Rating Form.

**Table 12***CoRS-ABI Self Rating Form Raw Scores*

	Michelle			Joy			Sante			Benny		
	Pre	Post	F	Pre	Post	F	Pre	Post	F	Pre	Post	F
Facial												
Expression	2	0	0	*	0	0	0	0	0	0	0	0
Eye Contact	1	0	0	3	1	1	0	0	0	0	0	0
Body Language	1	0	0	*	0	1	0	0	0	1	0	0
Listening	3	0	0	4	1	1	3	0	1	1	1	1
<b>Non-Verbal Total</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>
Intelligibility	3	0	1	*	0	0	0	0	0	1	1	0
Fluency	3	0	0	2	1	1	1	0	0	1	1	1
Prosody	3	0	0	4	1	0	0	0	0	0	0	0
Voice Quality	2	0	0	*	0	1	0	0	0	0	0	0
<b>Speech Quality Total</b>	<b>11</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>1</b>
Cohesion	3	0	1	3	1	1	1	0	0	0	1	1
Appropriateness	2	1	0	4	1	2	0	0	0	1	0	0
Responsiveness	2	0	0	3	0	1	0	0	0	0	1	0
Interruption	2	1	0	4	1	0	4	0	0	1	0	0
Repair	2	0	0	3	0	1	1	0	0	0	0	0
Emotional												
Regulation	3	0	0	4	2	1	1	0	0	1	0	0
Relevance	2	0	0	3	1	0	0	0	0	0	0	0
Elaboration	3	0	0	4	1	0	0	0	0	1	0	1
Initiation	2	0	0	1	0	0	0	0	0	1	0	0
Wordiness	1	0	0	4	0	0	4	0	1	0	0	1
Limited Speech	3	0	1	0	0	0	0	0	0	0	0	0
Perspective												
Taking	1	0	0	4	1	0	0	0	0	0	0	0
<b>Interactional Total</b>	<b>26</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>11</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>3</b>
<b>Grand Total</b>	<b>44</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>12</b>	<b>11</b>	<b>15</b>	<b>0</b>	<b>2</b>	<b>9</b>	<b>5</b>	<b>5</b>

\*Participant marked as unsure.

**Table 13***Perceived Improvements in Communication Measured by CoRS-ABI*

	Non-Verbal	Speech Quality	Interactional	Total CoRS-ABI score
Michelle	12.50%	68.75%	50.00%	52.50%
Joy	31.25%	25.00%	0.00%	47.50%
Sante	18.75%	18.75%	22.91%	13.75%
Benny	11.90%	0.00%	10.00%	5.00%
Subsection Mean	18.60%	28.13%	20.73%	29.69%

*Note: Rounded to nearest tenth of a percentage point.*

*\*Negative sign and asterisk indicate the direction of change was reversed (self-reported greater frequency of behaviors post-intervention).*

To calculate percentage improvement for each subsection and for the total CoRS-ABI self-report score, I divided each raw score by the total number of items in each index or total and converted to a percent corresponding to each participant’s pre-intervention and post-intervention score for each subsection and for the total score. Then I subtracted the post-intervention percentage from the pre-intervention percentage. The results were all a positive numbers (showing improvement) except for the Interactional subsection for Joy and the Speech Quality subsection for Benny, which showed no pre/post change. By calculating a mean of all four participants’ percentage improvement for each index, I could compare percentage improvement across indices to evaluate whether my prediction was correct. Contrary to expectation, the participants’ self-reported scores showed the greatest percentage of change in the “Speech Quality” subsection which was not a target related to CISBAR.

Descriptive statistics representing the self-reported changes as shown by both the LCQ and the CoRS-ABI Self Rating Form are presented in Table 14 below.

**Table 14***Descriptive Statistics for Perceived Changes in Communication*

All Participants' Self-Report Scores	Mean	Median	SD
LCQ total, pre	58	59	21.94
LCQ total, post	44	45	7.39
Initiation/Conversation Flow, pre	18.75	17.5	56.25
Initiation/Conversation Flow, post	14	14.5	2.0
Disinhibition/Impulsivity, pre	12.75	12	20.25
Disinhibition/Impulsivity, post	10.5	10	3.67
Conversational Effectiveness, pre	11.75	12.5	21.58
Conversational Effectiveness, post	9.5	10.5	5.67
Partner Sensitivity, pre	10.75	10	5.5
Partner Sensitivity, post	6	5.5	2.0
CoRS-ABI total, pre	29.5	29.5	20.50
CoRS-ABI total, post	4.75	3.5	5.25
Non-verbal, pre	4.75	5	2.63
Non-verbal, post	0.75	0.5	0.96
Speech Quality, pre	5.25	4	4.27
Speech Quality, post	1.25	1.5	0.96
Interactional, pre	12.5	9.5	9.33
Interactional, post	3	2	3.46

*Research Question 3: Is there an improvement in ratings of social communication skills by an everyday communication partner (ECP) for adults who have experienced social communication challenges following ABI after participating in CISBAR?*

My hypothesis that ECP ratings on the CoRS-ABI and LCQ questionnaires would show improvement after the CISBAR intervention was supported by the results. ECP perceptions of differences in communication pre- and post-treatment were measured by comparing changes on the partner-report questionnaires of the La Trobe Communication Questionnaire (LCQ) and the CoRS-ABI Partner Rating Form.

**La Trobe Communication Questionnaire (LCQ) Results.** I analyzed the results of the partner report form of the LCQ in the same way as for the self-report form, as described above. Overall, I predicted that ECP ratings would show the “Disinhibition/Impulsivity” and “Partner

Sensitivity” indices most improved as a result of the present intervention. This hypothesis was supported by the results of the partner report form of the LCQ; “Partner Sensitivity” showed the most improvement, followed by “Disinhibition/Impulsivity”. Table 15 shows the raw score results for each index for each participant across pre-, post, and follow up, and Table 16 shows the difference between pre- and post- scores for each index converted to percentages for ease of comparison of amount of improvement across indices.

**Table 15**

*Partner-Reported Improvements in Communication as Measured by LCQ*

	Michelle			Joy			Sante			Benny		
	Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up
Initiation/ Conversational Flow	20	13	13	17	14	21	10	10	10	17	14	14
Disinhibition/ Impulsivity	14	10	8	15	13	14	14	8	7	12	9	8
Conversational Effectiveness	11	5	5	12	10	12	10	8	6	8	6	5
Partner Sensitivity	6	4	4	10	7	10	12	8	6	6	4	4
Other	5	3	3	5	5	7	5	4	4	7	5	4
Total	56	35	33	59	49	64	51	38	33	50	38	35

**Table 16**

*Percentages of Partner-Reported Improvements by LCQ Index*

	Initiation/ Conversational Flow	Disinhibition/ Impulsivity	Conversational effectiveness	Partner sensitivity	Other	Total LCQ score
Michelle	17.50%	14.29%	25.00%	12.50%	6.67%	17.5%
Joy	7.50%	7.14%	6.00%	18.50%	0.00%	8.34%
Sante	0.00%	21.43%	13.10%	25.00%	3.37%	10.84%
Benny	9.56%	10.72%	8.00%	12.50%	6.66%	10.00%
Index mean	8.64%	13.40%	13.03%	17.13%	4.18%	11.67%

*Note: Rounded to nearest tenth of a percentage point.*

*\*Negative sign and asterisk indicate the direction of change was reversed (self-reported greater frequency of behaviors post-intervention).*

I also made the same individual predictions of specific areas of improvement for each participant as described in the results of the previous research question.

Becoming “side-tracked by irrelevant parts of conversation” was predicted to be most improved for Michelle, but this was not supported by the ECP LCQ results. The most improved items instead were “hesitate, pause, and/or repeat yourself”, “make a few false starts,” and “have difficulty thinking of things to say”. Each of these items improved two points from 3, “often” to 1 “never or rarely”, and this 2-point improvement was maintained at follow-up. Interestingly, the ECP perception of the item “side-tracked by irrelevant parts of conversation” followed the same course as Michelle’s perceived improvements in communication; it did improve by one point between pre- and post-intervention, and continued improving an additional point at the one-month follow-up, for a total improvement of two points.

Joy’s primary area of concern was knowing when to talk and when to listen, and the treatment focused on nonverbal cues and collaborative conversation. Therefore, I expected Joy to improve most on the LCQ item on “knowing when to talk and when to listen”. The partner report results indicated that this item was tied for “most improved” with twelve other items, each of which showed one point improvement between pre- and post-intervention.

Sante’s primary area of concern was efficiency in getting across her message and being understood by a partner, and the treatment focused on preparation before speaking and personalizing content to her partner. Therefore, I expected her to improve most on the “Conversational Effectiveness” index of the LCQ. As shown by Table 16, her most improved partner-rated LCQ index was actually “Partner Sensitivity,” followed by “Disinhibition/Impulsivity”.

Benny's primary area of concern was achieving more equitably divided speaking turns with his partner, and treatment focused on improving discourse organization and turning over the speaking turn with use of a transition phrase. I expected him to improve most on the "Conversational Effectiveness" index of the LCQ. As shown by Table 16, his most improved index was actually "Partner Sensitivity," followed by "Disinhibition/Impulsivity," similarly to Sante and the overall improvement patterns of participants.

It is interesting to note that while self-report LCQ results corroborated the findings of the visual analysis that participants Michelle and Joy benefited the most from the CISBAR intervention, the ECP LCQ results tell a more nuanced story. Although Michelle remained the participant with the most percentage of improvement according to ECP perception, the ratings of both Sante's and Benny's ECPs show that they perceived improvements post-intervention even greater than Joy. These results highlight the importance of gaining multiple perspectives on communication outcomes.

### **CoRS-ABI Partner Rating Form Results**

As described above in the results of research question 2, my prediction was that overall, participants would show the greatest improvement in the subsection "Interactional Aspects of Communication" following intervention. Table 17 shows the raw score results for each subsection for each participant across pre-, post, and follow up, and Table 18 shows the difference between pre- and post- scores for each index converted to percentages for ease of comparison of amount of improvement across indices. Table 19 shows descriptive statistics for scores of all participants for the partner-report versions of both the LCQ and the CoRS-ABI.



**Table 17***CoRS-ABI Partner Rating Form Raw Scores*

	Michelle			Joy			Sante			Benny		
	Pre	Post	F	Pre	Post	F	Pre	Post	F	Pre	Post	F
Facial												
Expression	2	0	0	1	0	0	0	0	0	0	0	0
Eye Contact	0	0	0	0	1	1	0	0	0	0	0	0
Body Language	0	0	0	2	0	1	1	1	0	0	0	0
Listening	1	0	0	3	0	0	3	0	0	2	1	0
<b>Non-Verbal Total</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0</b>
Intelligibility	0	0	0	4	0	0	0	0	0	0	0	0
Fluency	3	0	0	3	0	0	0	0	0	2	0	0
Prosody	2	0	0	4	0	1	1	0	0	1	0	0
Voice Quality	1	0	0	3	0	1	0	0	0	0	0	0
<b>Total Speech Quality</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>
Cohesion	1	0	0	3	0	1	3	1	0	1	1	1
Appropriateness	0	0	0	2	0	1	1	0	0	0	0	0
Responsiveness	1	0	0	1	0	0	0	0	0	1	1	0
Interruption	0	0	0	4	0	1	4	0	1	1	0	0
Repair	2	0	0	3	0	1	1	0	0	1	1	0
Emotional Regulation	2	0	0	4	0	1	3	0	0	1	0	0
Relevance	1	0	0	3	0	1	1	1	1	1	0	0
Elaboration	2	0	1	3	0	1	1	1	1	0	0	0
Initiation	0	0	0	0	0	0	0	0	0	0	0	1
Wordiness	0	0	0	3	0	1	4	0	0	2	1	0
Limited Speech Perspective	1	0	0	0	0	0	0	0	0	1	0	0
Taking	0	0	0	4	0	1	2	0	0	1	0	0
<b>Interactional Total</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>0</b>	<b>9</b>	<b>20</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>4</b>	<b>2</b>
<b>Grand Total</b>	<b>19</b>	<b>0</b>	<b>1</b>	<b>50</b>	<b>1</b>	<b>13</b>	<b>25</b>	<b>4</b>	<b>3</b>	<b>15</b>	<b>5</b>	<b>2</b>

**Table 18***Partner-Reported Improvements as Measured by CoRS-ABI*

	Non-Verbal	Speech Quality	Interactional	Total CoRS-ABI score
Michelle	18.75%	37.50%	20.83%	23.75%
Joy	25.75%	87.5%	62.50%	61.25%
Sante	18.75%	6.25%	33.34%	25.00%
Benny	6.25%	18.75%	12.50%	12.50%
Subsection Mean	17.38%	37.50%	32.29%	30.63%

*Note: Rounded to nearest tenth of a percentage point.*

Percentage improvement was calculated in the same way as described in the previous section for research question 1. Results were all positive numbers (showing improvement) for the ECP-reported CoRS-ABI results, and in most cases the ECPs reported a greater degree of improvement post-intervention than the participants, with the exception of Michelle’s ECP, Kaladin. Although his scores did indicate a perceived improvement in Michelle’s communication, it was not as great as the perception of improvement by Michelle herself, as indicated by comparing Tables 12 and 17. Contrary to expectation, the ECP-reported scores showed the greatest percentage of change in the “Speech Quality” subsection, which was consistent with the self-report results.

Descriptive statistics representing the partner-reported changes as shown by both the LCQ and the CoRS-ABI Partner Rating Form are presented in Table 19 below.

**Table 19***Descriptive Statistics for Partner-Reported Improvements*

	Mean	Median	SD
LCQ total, pre	54	53.5	4.24
LCQ total, post	40	38	6.16
Initiation/Conversation Flow, pre	16	17	4.24
Initiation/Conversation Flow, post	12.75	13.5	1.89
Disinhibition/Impulsivity, pre	13.75	14	1.26
Disinhibition/Impulsivity, post	10	9.5	2.16
Conversational Effectiveness, pre	9.75	9.5	2.16
Conversational Effectiveness, post	6.75	6	2.22
Partner Sensitivity, pre	8.5	8	3
Partner Sensitivity, post	5.75	5.5	2.06
CoRS-ABI total, pre	27.25	22	15.71
CoRS-ABI total, post	2.5	2.5	2.38
Non-verbal, pre	3.5	3.5	2.08
Non-verbal, post	0.5	0.5	0.58
Speech quality, pre	5.25	3.5	6.4
Speech quality, post	0	0	0
Interactional, pre	16	15	11.43
Interactional, post	1.25	1	1.5

**Social Validity Questionnaire Results**

Social validity questionnaire results were extremely positive overall across primary participants, and across ECPs with the exception of Benny's ECP, whose ratings tended to be more neutral. Participant responses to each item on the Social Validity Questionnaire are presented below in Table 21. To conserve space and improve readability for the text-heavy portions of the table, the items calling for a numerical response are presented first, followed by the items allowing free response.

**Table 20***Participant Responses to Social Validity Questionnaire*

	Michelle		Joy		Sante		Benny	
	Self	ECP	Self	ECP	Self	ECP	Self	ECP
How acceptable do you find the treatment to be for your concerns about social communication? (1= “not at all acceptable,” 5= “very acceptable”)	5	5	5	5	5	5	5	4
To what extent do you think there might be disadvantages in following this treatment? (1= “none are likely,” 5= “very likely”)	1	1	1	1	2	2	1	1
How likely is this treatment to make permanent improvements in your [this individual’s] behavior? (1= “not at all likely,” 5= “very likely”)	5	5	5	5	5	4	5	2
How confident are you that this treatment will be effective? (1= “not at all,” 5= “very confident”)	5	4	5	5	4	4	5	3
How effective is this treatment likely to be? (1= “not at all,” 5= “very effective”)	5	4	5	5	4	4	5	3

**Table 20, Continued**

	Michelle		Joy		Sante		Benny	
	Self	ECP	Self	ECP	Self	ECP	Self	ECP
How much do you like the procedures used in the proposed treatment? (1= “do not like them at all,” 5= “like them very much”)	5	5	4	5	4	5	5	3
To what extent are undesirable side effects likely to result from this treatment? (1= “no side effects are likely,” 5= “many side effects are likely”)	1	1	1	1	1	1	1	1
How much discomfort did you experience during the course of this treatment? (1= “no discomfort at all,” 5= “very much discomfort”)	1	2	2	1	3	1	1	1
How likely are you to continue using aspects of this approach after the study is over? (1= “very unlikely,” 5= “very likely”)	5	5	5	5	5	5	5	2
Would you be willing to change your routines to carry out this treatment? (1= “not at all willing,” 5= “very willing”)	5	5	5	5	5	4	5	2
How well did carrying out this treatment fit into your existing routine? (1= “not at all,” 5= “very well”)	5	5	5	5	3	4	5	5

**Table 20, Continued**

**“Please list any potential disadvantages below.”**

<p><b>Michelle:</b> “Not many, I feel like maybe potentially there could be issues in a professional setting if people are uncomfortable with a person doing some deep breathing exercises before a big work presentation?” <b>Kaladin:</b> <i>no answer</i></p>	<p><b>Joy &amp; Diana:</b> <i>no answer</i></p>	<p><b>Sante:</b> “Many people with TBI's also suffer from PTSD. It would be nice to incorporate some of that treatment and awareness into the treatment so participants can seek further care for this affliction. They are both very closely connected according to reknowned [sic] physician, Dr. Bessel Van Der Kolk, in his book, PTSD: The Body Keeps the Score.” <b>Stephanie:</b> “Just the time it takes to practice. I view this as a very minor disadvantage, well worth the effort!”</p>	<p><b>Benny:</b> “It's hard to imagine a valid disadvantage, so maybe my participation in the treatment might result in my being overly self-conscious of my communication, which could possibly be an impediment. I haven't experienced this, so this answer is just an exercise in imagination.” <b>Marge:</b> <i>no answer</i></p>
<p><b>“Which aspects do you see yourself using?”</b></p>			
<p><b>Michelle:</b> “I will be using the deep breathing exercises to center myself, this seems very doable in any situation I find myself in, especially surprise situations.” <b>Kaladin:</b> “I will use body language so she will use it more, I will use the strategies such as repeating what she has said to me and waiting for her to finish so this will help her remember the strategies.”</p>	<p><b>Joy:</b> “All of the strategies helped.” <b>Diana:</b> “Body language.”</p>	<p><b>Sante:</b> “Changing my verbiage, being more aware of my issues and the other speaker to allow them time to clear their mind and speak.” <b>Stephanie:</b> “Planning what I want to say before I start talking, asking my talking partner (What do you think about that? or What is your take away?)”</p>	<p><b>Benny:</b> “Planning what I say before I speak, listening for key concepts from my partner and incorporating them, actively keeping my turns in a conversation short, and encouraging the other to contribute.” <b>Marge:</b> <i>(no answer)</i></p>

**Table 20, Continued**

**“Any comments on the study or intervention?”**

<p><b>Michelle:</b> “I am glad there was more than 1 option to try out, the intervention felt personally chosen for me and I was glad I felt I could be open with Heidi about things that didn't work. I didn't feel pressured to try something that didn't work.”</p>	<p><b>Joy:</b> “It's triggered so much more learning than these questionnaires capture. Even just being able to talk to people in my world about this was valuable because I didn't have the words before.”</p>	<p><b>Sante:</b> “Heidi Iwashita should be head of your communications dept. This was an amazing [sic] and insightful study. I learned a lot and it also made me feel as if I was not the only one with issues following [sic] a TBI, despite what MD's claim.”</p>	<p><b>Benny:</b> “I found this intervention to be very valuable as I navigate my recovery, and the work has led to increased conversational success and confidence for me. I'm grateful for the opportunity to improve.”</p>
<p><b>Kaladin:</b> “I think it went very well and can be very beneficial for all tbi persons.”</p>	<p><b>Diana:</b> “Easy to do.”</p>	<p><b>Stephanie:</b> “[Sante] and I did not need so much review at each intervention. We would have been able to save about 10 minutes per session by not reviewing the scales, for example.”</p>	<p><b>Marge:</b> “It was more of a time commitment than initially expected - so it was difficult at times to stay focused.”</p>

**“Any feedback or suggestions for future studies using similar aims and procedures?”**

<p><b>Michelle:</b> <i>(No answer)</i></p>	<p><b>Joy:</b> “Worst part was discomfort facing my shame triggers and ego.”</p>	<p><b>Sante:</b> “I liked it. Very concise and clear.”</p>	<p><b>Benny:</b> “I think this was a useful and valuable way to improve conversational skills. While I needed help after I had a TBI, I have encountered many people over my life who would benefit from a similar approach.”</p>
<p><b>Kaladin:</b> “Immediate feedback very helpful.”</p>	<p><b>Diana:</b> <i>(No answer)</i>.</p>	<p><b>Stephanie:</b> “Doing it by Zoom really made it accessible. I appreciated your flexibility in scheduling the time!”</p>	<p><b>Marge:</b> “If subjects/partners are in a working environment, I suggest using calendar tools to help with scheduling meetings and communicating zoom details. This makes it easier to keep track of the meetings.”</p>

**Table 20, Continued**

**“Thinking back to the "CoRS-ABI Self and Partner Rating Form" (questionnaire you completed at the beginning and end of the study), how did you feel about filling this out? Do you have any feedback or suggestions?”**

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<p><b>Michelle:</b> “Please break up the questionnaire into smaller chunks on multiple pages, both my partner and I had issues with the form resetting itself and erasing all our answers. This was very frustrating.” <i>(Note: this refers to the Qualtrics version)</i></p> <p><b>Kaladin:</b> “I felt like it was useful. I did not know [Michelle] before her brain injury so I don't know exactly how much she has changed but I love her exactly how she is now.”</p>	<p><b>Joy:</b> “Each time I think It is astounding how many ways my life has been affected but at the end it became look how far I have come”</p> <p><b>Diana:</b> <i>(No answer).</i></p>	<p><b>Sante:</b> “Yes, very helpful.”</p> <p><b>Stephanie:</b> “I felt embarrassed when points of my initial assessment were shared with [Sante]. She hates it when people describe her as believing in "conspiracy theories". But that is a primary source of her worldview. Maybe ask an open-ended confidential question at the end? Like " Is there anything that could help us understand your partner's communication style.”</p>	<p><b>Benny:</b> “It was a useful way to practice some introspection, and led to my thinking about how I could work to improve my conversational skills.”</p> <p><b>Marge:</b> <i>(No answer).</i></p>
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**“Did you find the "CoRS-ABI Conversation Practice Form" which you used for rating during each intervention session, helpful? What, if anything, would make it more helpful?”**

<p><b>Michelle:</b> “Yes, I found it helpful to hear my partner's feedback and talk about how it went.”</p> <p><b>Kaladin:</b> “I think the form was great and would not change anything.”</p>	<p><b>Joy:</b> “It was useful to focus in on progress but it was one of the moments I had to face my shame.”</p> <p><b>Diana:</b> <i>(No answer)</i></p>	<p><b>Sante:</b> <i>(No answer).</i></p> <p><b>Stephanie:</b> Yes, it was helpful.</p>	<p><b>Benny:</b> “Yep, the form was helpful in assessing/reinforcing the techniques learned in a session.”</p> <p><b>Marge:</b> <i>(No answer)</i></p>
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## CHAPTER V

### DISCUSSION

The main contribution of the present study was evaluation of a novel intervention, Collaborative Interpersonal Strategy Building (CISBAR), addressing social communication challenges after brain injury that is grounded in the treatment literature and leverages both social cognitive approaches and conversational coaching methods. This integrated package of treatment ingredients has not previously been evaluated. Social cognitive training to promote attention to non-verbal cues and perspective-taking was integrated with metacognitive strategy instruction (MSI) to target clients' individual, personally relevant goals. Effective treatment ingredients previously used in conversational coaching approaches in the literature included collaborative goal-setting, goal attainment scaling (GAS), and joint review and reflection of audio/video-recorded conversations (Meulenbroek et al., 2019). CISBAR added new elements including a system for selecting individualized and equivalently challenging conversation practice conversation topics, and the use of the Conversational Rating System for Acquired Brain Injury (CoRS-ABI), which I had developed and piloted before starting the present study.

Measuring potential change in conversation with a partner is difficult due to contextual variability introduced by partner, topic, or situation in a way that is difficult to reliably control (Steel & Togher, 2018). In light of these difficulties, it was encouraging to see treatment effects with a first evaluation of a novel intervention. In the present study, GAS results and visual analysis of repeated measures for two participants showed proof of concept and encouragement for further evaluation. Taken as a whole, results of the present study supported the conclusion of the literature review that combining a social cognitive component with conversational coaching elements has the potential to become an effective social communication intervention. Further, results of social

validity measures showed high endorsement for participant satisfaction and perception of effectiveness.

The first part of the present chapter discusses the primary findings of the study with respect to the conceptual frameworks of CISBAR and research hypotheses, key treatment ingredients, and candidacy. The second part discusses the limitations of the current study and directions for future research. The chapter concludes with a brief summary of main findings and clinical implications.

### **Primary Findings**

This section summarizes the major findings and contributions of the present study in the context of the existing literature, examining the treatment effects, key treatment ingredients, candidacy, participant endorsement, and delivery by teletherapy.

### ***Treatment Effects***

It was hypothesized that there would be a functional relationship between the administration of CISBAR and the personalized social communication goal behaviors of participants. Visual analysis of communication target counts (CTCs) scored by blinded raters did support a treatment effect in two participants, and results of goal attainment scaling (GAS) supported treatment effects in all participants. The GAS results were particularly strong. An effect size based on the GAS results using the Percentage of Goal Obtained (PoGO) method (Ferron et al., 2020) showed that both self and partner estimates of goal attainment averaged approximately 92% post-intervention. At the one-month follow-up, the PoGO effect size was 100% goal attainment per self-report, with 92% goal attainment per partner report.

It was also hypothesized that self and partner perceptions of social communication behaviors would show improvement as measured by the La Trobe Communication Questionnaire (LCQ) and the CoRS-ABI Self and Partner Rating Form. This was highly supported for all

participants. The results of the present study improve upon prior studies in partner-rated perceptions of social communication changes. As mentioned in the literature review, partner perceptions of communication did not improve significantly as measured by the LCQ in some prior studies of conversational coaching interventions (Hoepner & Olson, 2018; Finch et al., 2019). In contrast, the present study showed sizable pre/post perceived improvements communication, which may be partially explained by the social cognitive elements of CISBAR, which served to rehabilitate attention to one's partner during a conversation, as well as the high level of engagement of each communication partner in all intervention sessions.

### ***Key Treatment Ingredients***

**Theoretical approach.** The treatment ingredients of CISBAR could be divided into those that are based on social cognitive models (Cassel et al., 2019) and those that are based on conversational coaching (Ylvisaker, 2006). It is felt that both of these theoretical groundings are important for effective social communication intervention approaches following brain injury.

Social cognitive approaches to treating social communication after brain injury incorporate training in emotion recognition to help clients learn to recognize and understand the perspectives of others during online interactions (Westerhof-Evers et al., 2017). In the intervention phase of CISBAR, I provided explicit training to attend to non-verbal partner cues indicating engagement, disinterest, or impatience while targeting clients' personal functional goals. I encouraged primary participants and ECPs to express their own emotions and listen to the emotions of their partners throughout the intervention phase. The effectiveness of this approach was demonstrated by the high percentages of change on the "Partner Sensitivity" index of the LCQ. Comments made by participants in session and on the social validity questionnaire, particularly by Joy and her ECP Diana, provided further conceptual support for the social cognitive

tenet that explicit training in emotion perception may allow people with brain injury to make positive changes in sensitivity to partner in conversational interactions.

Conversational coaching interventions for social communication after brain injury utilize a contextualized, person-centered approach that starts with collaborative goal-setting and strategy instruction and builds in opportunities for rehearsal with modeling and positive reinforcement (Finch et al., 2017; Hoepner & Olson, 2018). CISBAR also followed this framework, incorporating the elements of metacognitive strategy instruction and joint reflection of video or audio-recorded conversations into an integrated treatment package. The power of these components is suggested by the positive GAS outcomes and high acceptability of the intervention for both primary participants and partners.

**Collaborative Goal-setting and Goal Attainment Scaling (GAS).** The benefits of the collaborative approach utilized throughout the present study were seen in the social validity results, and were also noted by the research assistant scoring treatment fidelity in the findings showing high engagement by participants and a good balance of collaboration. Prior research has shown that involving clients in the measurement of outcomes through GAS can increase buy-in, engagement, and treatment satisfaction (Grant & Ponsford, 2014), which were strongly shown in the fidelity and social validity data for the present study. Working on changing everyday behaviors can be extremely difficult for anyone, with or without a brain injury. Therefore, it is imperative to spend the necessary time before commencing therapy ensuring that both client and clinician are seeing eye to eye on what needs to be changed.

**Conversational prompts.** The present study contributed a novel method of ensuring an equivalent pool of personalized, challenging conversation topics which could be used for scoring of repeated measures across time to show treatment effect in a multiple baseline design. The same

conversation topic could not be used across all samples because the dyad would tire of discussing it and would be likely to show practice effects. However, variability in degree of interest and feeling across topics could introduce an additional confounding variable. Therefore, I created the Conversation Topic Survey used in the present study. This allowed the primary participant and ECP to each indicate topics with a high degree of interest and feeling to be included in a pool of topics that could be randomized. In general, the system worked smoothly, providing topics that maintained the interest of participants and facilitated conversation practice and reflection.

### *Candidacy*

Among the four participants, it was notable that both Michelle and Joy showed high awareness of deficits at intake and also made the most progress. This is consistent with some prior studies showing a relationship between a higher degree of self-awareness and more favorable rehabilitation outcome following acquired brain injury (Ownsworth & Clare, 2006). Benny's TBI a year prior was more recent than other participants, which may have made it more difficult for him to have the necessary insight to make progress in the CISBAR intervention. It has been noted that in many people who have experienced a brain injury, self-awareness improves with the passage of time, perhaps due to the combination of neurological recovery and the additive effects of negative consequences from experience may improve self-awareness (Douglas, 2010). Therefore, it may be helpful for clinicians to assess self-awareness using formal or informal measures and to consider time post-onset when determining who would be most likely to benefit from CISBAR, but further research with a larger number of participants would be necessary to determine specific candidacy guidelines.

Several of the treatment ingredients already included in CISBAR have been associated with positive changes in self-awareness after brain injury, including motivational interviewing (Medley

& Powell, 2010), combining GAS with motivational interviewing (Lewis et al., 2017), and joint video reflection (Hoepner, 2021). It is not yet known whether providing additional awareness training within CISBAR for clients with compromised insight would improve outcomes, and if so, which procedures would be most effective. Goverover et al (2007) found that providing an awareness training intervention to adults with brain injury significantly improved performance on activities of daily living and self-regulation compared to a control group. More closely related to the present study, Hoepner (2021) found improvements in self-awareness of social communication in participants with brain injury, as shown by increased agreement on the LCQ, following an intervention featuring video self-modeling program with a system of prompts and judgements. Based on the literature, it would likely have been beneficial to incorporate additional awareness training with Sante and Benny, either before or during the CISBAR intervention.

Another potential issue related to candidacy or treatment response is the type of communication target selected by participants. Both Michelle and Joy demonstrated high frequencies of interruption during baseline and expressed concern with interruption at intake, leading to the selection of interruption as the repeated measure. In contrast, Sante and Benny, who did not demonstrate an issue with interruption during intake or baseline, set goals related to verbosity and efficiency of communicating a message. These two participants did not show as much progress as Michelle and Joy. One potential interpretation is that CISBAR, as implemented in the present study, had a differential effect on various treatment targets. It may be that certain communication profiles are more amenable to change, suggesting the need for further research with larger numbers of participants to analyze the effects of communication target on outcomes.

### ***Participant Endorsement***

Modifying one's social communication patterns requires a sufficient level of motivation and self-efficacy (Braden et al., 2010). These factors can be strengthened through patient engagement techniques utilized in the present study, including motivational interviewing (Medley & Powell, 2010), collaborative goal-setting (Sugavanam et al., 2013), and goal attainment scaling (Grant & Ponsford, 2014). Patient engagement in healthcare is a co-constructed process that allows the individual to become more active and invested in their own treatment (Bright et al., 2015). An important finding in the present study was participants' and partners' positive feedback regarding CISBAR. The social validity data showed high acceptability of the intervention, and positive comments by participants highlighted their appreciation of the person-centered focus and flexibility which allowed them to have a say in the course of treatment. Furthermore, treatment fidelity data scored by a research assistant indicated high participant engagement in sessions.

Overall the results of this experimental evaluation suggest that CISBAR led to positive outcomes for participants and encourage further research studies to strengthen and broaden the effects of the intervention.

### ***Teletherapy***

The recent COVID-19 pandemic forced a switch of treatment delivery to remote platforms such as Zoom. CISBAR was not originally designed to be delivered using a remote format hence it is important to consider delivery format as a key variable. Results showed that CISBAR was able to be carried out using teletherapy. A potential advantage of this finding is that it increases accessibility and decreases geographical barriers to treatment (Ownsworth et al., 2018). An additional benefit of teletherapy for SLPs treating social communication is the ease of videorecording and transcribing sessions quickly and easily with use of improved automatic

transcription software and services. Using automatic transcription services may ease feasibility and lessen clinical burden of performing more in-depth discourse analysis to measure client progress on person-centered conversational goals.

The CISBAR intervention has not yet been evaluated in a face-to-face format. Therefore, it is not known whether the treatment would have been more (or less) potent in person. For example, it is possible that training and modeling of metacognitive strategies could have been carried out more effectively with Sante and Benny in person. Future research would be required to analyze the possible advantages of a different delivery format.

### **Study Limitations**

This section addresses study limitations and challenges related to carrying out the methodology of the single case multiple baseline design, establishing valid and reliable measurement, and the CISBAR intervention.

### ***Study Design***

**Variability of Baseline.** Variability is expected in conversational discourse data due to the complex, dynamic relationship between speakers and how communication behavior may change depending on topic, situation, mood (Steel & Togher, 2018). Still, the variability in baseline data was not ideal for showing treatment effect in a multiple baseline/multiple probe design, and this variability did not seem to be improved by collecting five or more observations of baseline data.

The difficulty with establishing stable baselines for targeted behaviors in the present study suggests that it would be beneficial in future studies to modify the procedures to make baseline more stable. One possibility would be to increase the length of each baseline sample to 10 minutes, as described in Mann et al. (2015), or to incorporate three different 10-minute discourse tasks into each conversation sample, as in Finch et al. (2017). Another possibility is to reduce the variability



in communication partner behaviors such as interruption and verbosity by providing a more structured protocol to the communication partner to control for these effects. Conversation partners may create conditions by which problematic social communication behaviors are more likely to emerge (Barnes et al., 2021). Further work is needed to develop conversation sampling procedures that minimize confounding sources of variability.

**Timing of Introducing Intervention.** Since videorecorded conversation samples needed to be prepared in randomized order batches to scorers in order to preserve phase blinding, it was difficult to get the scores of each baseline sample back from raters in time to make a careful determination of when to introduce intervention with each of the four participants. I was attempting to schedule baseline and treatment sessions with participant dyads up to three times a week, but there was often a lag between when I would have to make a decision about when I could move each dyad into the intervention phase and when I would have all of the scored data back from the raters. This resulted in at least one misjudgment in determining the timing of introducing intervention. I introduced the intervention for Sante following a decrease in the targeted behavior in baseline, which was not ideal since the behavior could have continued to decrease on the next observation without the intervention. Rather than relying on a clinical determination that baseline was relatively stable (problem behaviors were still evident), in retrospect it would have been better to wait to receive each batch of blinded rater scoring before scheduling the next session with each dyad. However, that would have delayed the flow of sessions for participants, which might have resulted in frustration and more delays on the participant side. I made a judgement to prioritize getting the sessions in with participants while I could, to stay ahead of the risk of attrition by keeping up scheduling momentum. The strategy worked to keep participants engaged and motivated enough to finish the study in a timely fashion, but the downside of that prioritization

was that the visual analysis data was less strong than it might have been if I had waited to see each batch of data after it was fully scored, or if I could have had each sample scored right away. I could have informally scored samples myself in order to judge time to intervene, and in retrospect that might have been the best solution, but that was not anticipated by my research plan and would have added an additional layer to the scoring process.

### *Measurement*

**Repeated Measures.** A strength of single case experimental designs is the use of repeated measures that allow analysis of change over time (Gast & Ledford, 2014; Tate & Perdices, 2019). The CTCs were designed to provide an objective way to measure progress during the intervention across the four participants. Training was provided to blinded raters with the aim of ensuring reliability and validity. However, even after training that attempted to establish common guidelines, determinations of what counted as an interruption and how to measure speaking turns were still subject to variability across raters.

Because CISBAR includes training in attending to non-verbal turn-taking cues during conversation and also facilitates self-reflection and self-regulation of turn-taking, it was hypothesized that turn-taking, as measured by a frequency count of interruption and measurement of average duration of speaking turn, would be most amenable to change as a result of the CISBAR intervention. Although interruption count and average duration of speaking turn were anticipated to be relatively objective measures that could be measured consistently by unbiased raters who viewed the conversation samples, actual measurement proved to be more complex than anticipated. Even after requiring raters to go through a training program including demonstrating at least 80% agreement with the other rater on all scored aspects of a conversation sample, analysis of the final double-scored data revealed only moderate reliability. This method of measurement

was not as reliable as anticipated. Therefore, it is strongly suggested that future studies utilize alternate measurement methods. One promising option would be utilizing software that can automatically detect changes in speaker, so that CTCs such as length of speaking time, ratio of speaking time between different speakers, and interruption could be calculated automatically. This would also have the benefit of allowing the researcher instant access to all data in order to flexibly make intervention decisions. With quick access to reliable, objective data related to the goals of each participant, the clinician could provide this data to participants as objective feedback to supplement the feedback they receive from their partner and the clinician during each session.

Furthermore, measurement was made more complex by the dynamic and interactional nature of conversation sample data. The research plan did not anticipate how to account for differences in number of interruptions and length of speaking time in the conversation partner. Especially in short conversations of 6-7 minutes, these conversation partner factors could result in significant variability in the number of opportunities the primary participant had to interrupt or to take a longer speaking turn themselves. I attempted to address this by looking at different ways to score the CTCs, such as measuring “number of times participant allowed the partner to complete a thought”, but the results did not show as clear a pattern of presence of the problem behavior compared to simply number of interruptions, so a determination was made to make both CTCs measurable in such a way that a higher number indicates a greater frequency of the problem.

The difficulty of obtaining reliable, objective measurements for the CTCs was a limitation that can be greatly improved upon in future studies. Most participants and ECPs evaluated the intervention highly on the Social Validity Questionnaire and spoke enthusiastically about the impact they perceived on their communication as a whole. The perceived helpfulness of the intervention procedures was further supported by the perceived improvements in communication

reported by most participants on pre/post measures and GAS. The mixed results from the CTC data, which themselves had lower than expected reliability, points to limitations in the measurement methods used as well as differences in how the various types of data were captured. Although the positive results from self-reported outcome measures were encouraging, it is important to recognize that expectancy bias can inflate the degree of perceived improvements from any treatment program (Lê et al., 2022).

When applying the design comparable effect size (D-CES) to the CTC data, the fact that different participants had different targets presented a barrier to optimal use of an effect size estimation, which assumes that all measurements use a common dependent variable. Future study design could be strengthened by recruiting only participants targeting interruption for one study, and only participants targeting wordiness for a separate study. This would likely simplify data plotting for visual analysis, and allow calculation of an effect size that would be more closely representative of the change possible in behavior when all participants have a similar behavior target.

On the other hand, an important strength of the CoRS-ABI and the procedures of the current intervention as a whole is offering the flexibility to guide participants in collaborative goal-setting allowing them to reach a functional communication goal that is personally meaningful. In the present study, I found that some functional communication goals chosen by participants, most notably Michelle's self-defined goal of conveying her message without becoming sidetracked, did not map clearly to an externally measurable CTC. Further work would be required to identify valid, reliable, and objective measurement methods for this type of goal. One promising option would be computerized calculation of cohesion using discourse analysis software, as described in the recent systematic review of interventions for discourse and social communication by Lê et al.

(2022). Future work may apply discourse analysis methods to quantify a broader range of personally motivating goals selected by participants. For future studies aiming to optimize the collaborative goal-setting aspect of the intervention, it would be beneficial to expand the types of possible CTCs, after conducting pilot studies to ensure they could be reliably and validly measured.

### ***Treatment***

It was expected that CISBAR would foster greater self-regulation of verbosity and impulsivity through the joint review and reflection process, which involved evaluating and critiquing the primary participant's communication performance in each structured conversation. However, the joint review and reflection did not seem to have an effect on reducing verbosity and impulsivity in conversation. This was shown by both analysis of the LCQ results and by the visual analysis of the data from Sante and Benny, the two participants targeting verbosity, neither of whom demonstrated measurable reduction of average duration of speaking turn. It seems that frequent opportunities for structured conversations with a supportive partner actually helped conversations flow better with fewer hesitations, as shown by the pattern of LCQ changes across participants, rather than causing participants to self-monitor their utterances more closely, as was initially expected.

Similarly, according to both self and partner LCQ results, Michelle improved more on other aspects of communication than on her target goal, "getting sidetracked in conversation". This could have been because her primary strategy, "Meditation", helped her relax anxieties related to speaking which allowed conversation to flow more freely, but did not have as great an effect on the self-regulation required to suppress impulses to get sidetracked.

Similar patterns were seen in Sante and Benny, whose goals related to the “Conversational Effectiveness” index of the LCQ, but did not show significant perceived improvements in communication according to this index. The pattern of LCQ results across participants showed that perceived communication changes following CISBAR tended to be less related to self-regulation and suppression and more related to greater perceived ease making conversation. Joy’s goal of improving turn taking did, however, align well with her improvements with CISBAR, as shown both in the repeated measures and pre/post data. In general, the data suggest that different communication targets responded differently to CISBAR.

The literature examining different cognitive communication constructs may provide insight into expected response of particular communication targets to treatment. Effective social communication relies heavily on executive functions (Coelho, 2002; Bracy & Snow, 2007; Bosco et al., 2017) and memory (Youse & Coelho, 2005; Hill et al., 2018). Interruption and verbosity both violate the common expectation of turn-taking in conversation (Barnes et al., 2021), and are both more frequently present in communication after brain injury (Hill et al., 2018). Since executive functions are responsible for initiating and maintaining goals, suppressing impulsive or inappropriate utterances, and monitoring task performance (Hill et al., 2018), it was expected that executive function deficits were the primary basis for both interruption and verbosity. The executive function of suppression is necessary for both inhibiting the impulse to interrupt, and for inhibiting irrelevant and redundant content during a lengthy speaking turn. With such conceptual similarities, it was initially expected that both interruption and verbosity would respond well to the CISBAR intervention.

However, brain injury localization studies more frequently identify interruption as associated with frontal lobe damage (Arco et al., 2004), while verbosity seems to be more often

associated with right hemisphere damage (Blake, 2006). Hill et al. (2018) described how deficits in working memory was implicated in the production of disorganized, rambling utterances in adults with brain injury. Despite some conceptual similarities, the underlying causes of verbosity following brain injury may differ, thus requiring differentiated treatment methods. It is likely that some communication targets will respond more robustly than others. Attending to the cognitive underpinnings that may be responsible for a particular communication difficulty may help the clinician select strategies that are optimal.

**Conversational Rating System for Acquired Brain Injury (CoRS-ABI).** An unexpected finding of the present study was that both self and partner CoRS-ABI results indicated greater perceived improvements in “Speech Quality in Verbal Communication” (encompassing the items intelligibility, fluency, prosody, and voice quality) than “Non-Verbal Aspects of Communication” and “Interactional Aspects of Communication”, both of which were more explicitly targeted in CISBAR. One possible explanation is that since there was no critique of these aspects during the joint reflection sessions, participants became more confident in these aspects that had previously troubled them. Some participants, particularly Benny, may have become more aware of his own limitations with respect to aspects of communication that were critiqued during reflection sessions, causing higher perception of deficits in targeted areas. These findings point to a need to critically evaluate the validity and reliability of the CoRS-ABI, which might result in eliminating or revising the “Speech Quality in Verbal Communication” subsection and making any other changes to resolve potential validity issues.

As a new instrument, the CoRS-ABI will require further testing to establish validity and reliability. Prior pilot testing has shown the CoRS-ABI to be a useful tool for client education, establishing a common vocabulary, and collaborative goal-setting. As in the pilot study,

participants in the present study commented positively on the helpfulness of the CoRS-ABI for selecting meaningful communication goals. It was used by giving participants an understanding of various components of social communication which could be targeted in the intervention. It also provided written, visual scaffolding to support collaborative goal-setting. Both the primary participant and ECP completed the CoRS-ABI Self and Partner Rating Form prior to setting goals. This process facilitated a common understanding between primary participant, ECP, and clinician regarding what was meant by each included aspect of communication. It also allowed a fruitful comparison between the perspectives of the primary participant and ECP, allowing comparison of perceived strengths and challenges, which then facilitated metacognitive strategy selection and reflective discussion when reviewing past conversations.

This study is the first time the CoRS-ABI was used as a pre-test/post-test measure in an intervention study. While the total CoRS-ABI scores showed great improvement following the intervention which seems to show proof of concept, the breakdown of scores across the three categories was unexpected, and would warrant further research.

It is also unclear how much the improvements in CoRS-ABI, LCQ, and GAS may be due to a placebo effect based on the expectation of positive change with the intervention.

### **Next Steps**

One of the most important next steps in this research trajectory is to improve measurement. There is a great need for more objective measurements of treatment targets and valid, reliable outcome measures for social communication after brain injury. Advancements in automated speech recognition, transcriptions, and discourse analysis open up avenues of research not previously possible. The growing popularity of teletherapy and advancements in automatic transcription could bring discourse analysis back into the toolbox of busy SLPs. However, for such



advancements to benefit SLPs and the clients they serve, there is further need for research identifying, investigating, and validating such tools. This should be done in partnership with clinicians to make sure the methods are acceptable to stakeholders and can be feasibly implemented.

Further refinement of the CISBAR intervention incorporating lessons learned from the current study is a desirable and anticipated next step. The treatment results suggest that CISBAR is a promising intervention that warrants further development and study. Results suggest that incorporating awareness training for clients with limitations in insight might be helpful. Additionally, evaluating possible cognitive drivers of communication challenges might help refine and tailor the selection of effective metacognitive strategies. These two additions to the clinician protocol would be worthy of investigation.

Improving the internal validity of the experimental design is another important next step. This could be achieved by strengthening the stability of the baseline by having longer or differently structured conversational samples, quicker access to rating data to improve judgments of timing of introducing intervention, and utilizing automatic transcription and scoring tools.

### **Summary of Main Findings and Clinical Implications**

This was the first study evaluating the effectiveness of CISBAR, an intervention characterized by integrating social cognitive training, a new conversational rating system, and a new system of selecting equivalently challenging conversational topics within a package comprised of conversational coaching treatment ingredients identified as effective in the literature.

The conversational rating system, CoRS-ABI, includes self and partner rating forms which assist the client and clinician in setting relevant, patient-centered goals, as well as a separate conversation practice form to guide joint reflection within each session. According to participants

in the present study, this self-rating process also served an educational need by providing them with a common vocabulary to talk about social communication issues, which helped facilitate meaningful change. The self-rating process is sufficiently flexible to accommodate a wide range of social communication issues and needs commonly identified after brain injury. However, pre/post-treatment questionnaire results as well as visual analysis of repeated measures showed patterns of differentiated effectiveness of CISBAR by treatment target.

CISBAR further incorporates metacognitive strategy instruction (MSI) and joint reflection on structured conversations with an everyday communication partner (ECP). CISBAR builds on prior research suggesting effectiveness of MSI and joint reflection for this population (Hoepner, 2021), combining these ingredients into an integrated treatment package that can be easily implemented by SLPs in person or remotely.

Results showed improvement in targeted social communication behaviors as measured by blinded raters for the two primary participants, who both targeted interruption and demonstrated awareness of deficits, but not the two who targeted wordiness and had reduced awareness of deficits. These differentiated treatment effects warrant further study.

With further enhancements to increase treatment potency across a range of communication targets, CISBAR shows promise in addressing the need to equip SLPs with effective, accessible, patient-centered tools to treat adults with social communication concerns following ABI.

## APPENDIX A

### Conversation Topic Survey

Please circle a number to show your interest and the strength of your feelings about each topic.

If necessary, you may eliminate a certain topic from the study altogether by circling “E”.

	<b>Interesting?</b> E = eliminate topic 1 = no interest 5 = high interest	<b>Strong feelings?</b> E = eliminate topic 1 = can discuss calmly 5 = a “hot-button” issue that really pushes your buttons
Does social media make us more alone?	E 1 2 3 4 5	E 1 2 3 4 5
Should what you say on social media be grounds for getting fired?	E 1 2 3 4 5	E 1 2 3 4 5
Should social media sites have a “dislike” button?	E 1 2 3 4 5	E 1 2 3 4 5
Is online learning as good as face-to-face learning?	E 1 2 3 4 5	E 1 2 3 4 5
Do machines represent a threat to humans?	E 1 2 3 4 5	E 1 2 3 4 5
What role will robots play in our future?	E 1 2 3 4 5	E 1 2 3 4 5
What does it mean to be a ‘real man’?	E 1 2 3 4 5	E 1 2 3 4 5
Should transgender people be able to use the restroom of their choice?	E 1 2 3 4 5	E 1 2 3 4 5
Why aren’t more girls choosing to pursue careers in math and science?	E 1 2 3 4 5	E 1 2 3 4 5
Is dating a thing of the past?	E 1 2 3 4 5	E 1 2 3 4 5
How should children be taught about puberty?	E 1 2 3 4 5	E 1 2 3 4 5
Are affirmative consent rules a good idea?	E 1 2 3 4 5	E 1 2 3 4 5
Should high schools drop football because too many players are getting injured?	E 1 2 3 4 5	E 1 2 3 4 5

Do sports teams have a responsibility to hold players to a standard for their personal conduct?	E 1 2 3 4 5	E 1 2 3 4 5
Is it offensive for sports teams to use Native American names and mascots?	E 1 2 3 4 5	E 1 2 3 4 5
What—if anything—does the current Hollywood film industry lack?	E 1 2 3 4 5	E 1 2 3 4 5
Do violent video games make people more violent in real life?	E 1 2 3 4 5	E 1 2 3 4 5
Is TV too white?	E 1 2 3 4 5	E 1 2 3 4 5
What current musicians do you think will stand the test of time?	E 1 2 3 4 5	E 1 2 3 4 5
To which writer would you award a prize?	E 1 2 3 4 5	E 1 2 3 4 5
What is a hero?	E 1 2 3 4 5	E 1 2 3 4 5
How much freedom should parents give their children?	E 1 2 3 4 5	E 1 2 3 4 5
Are adults hurting young children by pushing them to achieve?	E 1 2 3 4 5	E 1 2 3 4 5
Are parents violating their children's privacy when they post photos and videos of them online?	E 1 2 3 4 5	E 1 2 3 4 5
At what age should people be allowed to buy cigarettes, drink alcohol, vote, and fight in wars?	E 1 2 3 4 5	E 1 2 3 4 5
Do 'shame and blame' work to change behavior?	E 1 2 3 4 5	E 1 2 3 4 5
Do 'saggy pants' mean disrespect?	E 1 2 3 4 5	E 1 2 3 4 5
Do teachers assign too much homework?	E 1 2 3 4 5	E 1 2 3 4 5
What are the best ways to learn about history?	E 1 2 3 4 5	E 1 2 3 4 5
What do you think of grouping students by ability in schools?	E 1 2 3 4 5	E 1 2 3 4 5

What role should police have in schools?	E 1 2 3 4 5	E 1 2 3 4 5
What are the best teaching methods for getting students to behave well in class?	E 1 2 3 4 5	E 1 2 3 4 5
When do pranks cross the line to become bullying?	E 1 2 3 4 5	E 1 2 3 4 5
How well do you think standardized tests measure student abilities?	E 1 2 3 4 5	E 1 2 3 4 5
How should parents handle a bad report card?	E 1 2 3 4 5	E 1 2 3 4 5
How important are parent-teacher conferences?	E 1 2 3 4 5	E 1 2 3 4 5
Should schools cancel summer vacation?	E 1 2 3 4 5	E 1 2 3 4 5
Should the school day start later?	E 1 2 3 4 5	E 1 2 3 4 5
Should we rethink how long students spend in high school?	E 1 2 3 4 5	E 1 2 3 4 5
Should college education be free?	E 1 2 3 4 5	E 1 2 3 4 5
Is college overrated?	E 1 2 3 4 5	E 1 2 3 4 5
Do you support affirmative action in college admissions?	E 1 2 3 4 5	E 1 2 3 4 5
Is it ethical to eat meat?	E 1 2 3 4 5	E 1 2 3 4 5
How important is it to be attractive in our society?	E 1 2 3 4 5	E 1 2 3 4 5
How should schools handle unvaccinated students?	E 1 2 3 4 5	E 1 2 3 4 5
Should farm animals have more legal protections?	E 1 2 3 4 5	E 1 2 3 4 5
When is animal testing justified?	E 1 2 3 4 5	E 1 2 3 4 5
How should nations and individuals address climate change?	E 1 2 3 4 5	E 1 2 3 4 5
How important is keeping a clean house?	E 1 2 3 4 5	E 1 2 3 4 5
Do people complain too much?	E 1 2 3 4 5	E 1 2 3 4 5
How much control do you think you have over your fate?	E 1 2 3 4 5	E 1 2 3 4 5

How should the U.S. handle immigration?	E 1 2 3 4 5	E 1 2 3 4 5
What do we owe our veterans?	E 1 2 3 4 5	E 1 2 3 4 5
Do leaders have moral obligations?	E 1 2 3 4 5	E 1 2 3 4 5
How should we prevent future mass shootings?	E 1 2 3 4 5	E 1 2 3 4 5
What is your relationship with guns?	E 1 2 3 4 5	E 1 2 3 4 5
What should be the purpose of prison?	E 1 2 3 4 5	E 1 2 3 4 5
What do you think of the police tactic of “stop-and-frisk”?	E 1 2 3 4 5	E 1 2 3 4 5
Do poor people ‘have it easy’?	E 1 2 3 4 5	E 1 2 3 4 5
Should restaurants do away with tipping?	E 1 2 3 4 5	E 1 2 3 4 5
Do laws banning offensive words make the world a better place?	E 1 2 3 4 5	E 1 2 3 4 5
Is Amazon becoming too powerful?	E 1 2 3 4 5	E 1 2 3 4 5
What words or phrases should be retired?	E 1 2 3 4 5	E 1 2 3 4 5
Are there topics that should be off-limits to comedy?	E 1 2 3 4 5	E 1 2 3 4 5
Do rich people get off easier when they break the law?	E 1 2 3 4 5	E 1 2 3 4 5
Should physician-assisted suicide be legal in every State?	E 1 2 3 4 5	E 1 2 3 4 5
Should texting while driving be illegal in every state?	E 1 2 3 4 5	E 1 2 3 4 5

Source (search term: “list of opinion topics”):

<https://www.nytimes.com/2017/03/01/learning/lesson-plans/4E1-prompts-for-argumentative-writing.html>

**APPENDIX B**  
**Conversational Rating System for ABI (CoRS-ABI)**  
**Self and Partner Rating Form**

Based on the Pragmatics Rating Scale by MacLennan, 2002;  
 Modified by Iwashita, 2019

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Check one:**     Self report     Partner report (check here if you are a family member, caregiver, or other person who knows this person well)

First language learned: \_\_\_\_\_ Other languages: \_\_\_\_\_

Cultural influences, if applicable:

\_\_\_\_\_

**Conversational Rating Scale**

0	1	2	3	4	?
Not at all a problem	Minor problem	Medium problem	Larger problem	Major problem	Unsure

**1. Non-Verbal Aspects of Communication**

	Score	Changed since the brain injury?
<b>Facial Expression</b> Using appropriate facial expressions such as smiling, expressing surprise, etc.		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Eye contact</b> Looking at someone while talking to them		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Body Language</b> Appropriately using body language, gestures, and physical space between you and your conversation partner		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure

<b>Listening</b> Ability to listen while others are speaking		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
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## 2. Speech Quality During Verbal Communication

	Score	Changed since the brain injury?
<b>Intelligibility</b> Speaking your words clearly so your speech is easily understood		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Fluency</b> Speaking smoothly without false starts, cut offs, stuttering, etc.		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Prosody</b> Using enough expression in your voice (intonation, emotion, rhythm), using appropriate volume, and talking neither too fast or too slow		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Voice Quality</b> Speaking with a clear vocal tone, without hoarseness or breathiness		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure

## 3. Interactional Aspects of Communication

<b>Cohesion</b> Conveying a clear and well-organized message that can be understood by the listener		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Appropriateness</b> Ability to avoid doing or saying things that make the other person feel uncomfortable		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Responsiveness</b> Answering your partner's questions and comments promptly		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure



	Score	Changed since the brain injury?
<b>Interruption</b> Speaking over someone else or starting to speak before they are finished		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Repair</b> Clarifying, confirming, asking questions, and/or providing explanations to fix conversation breakdowns		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Emotional Regulation</b> Managing emotions such as anger and frustration during interactions		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Relevance</b> Making sure what you say relates to the topic being discussed		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Elaboration</b> Providing enough detail on each topic		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Initiation</b> Ability to introduce a new topic to the conversation		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Wordiness</b> Talking too much		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Limited Speech</b> Talking too little		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure
<b>Perspective Taking</b> Shows understanding of the perspective of the listener		<input type="checkbox"/> Same as before <input type="checkbox"/> Changed <input type="checkbox"/> Not sure

### Communicative Strengths

Please describe areas of success and strength in communication with others in the space below.

## Treatment Priorities

*Which communication skills or goals do you think are most important to address? Please list these priorities for treatment on the lines below. Put a "1" in the box of the one you think is most important to work on right away, a "2" for second most important, and so on.*

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**APPENDIX C**  
**Conversational Rating System for ABI (CoRS-ABI)**  
**Conversation Practice Form**

Based on the Pragmatics Rating Scale by MacLennan, 2002;

Modified by Iwashita, 2019

Client Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Conversation Context**

Who participated in this conversation? \_\_\_\_\_

What was the location of this conversation? \_\_\_\_\_

What was the primary topic of this conversation? \_\_\_\_\_

**Conversation Rating**

0	1	2	3	4	?
Not at all a problem	Minor problem	Medium problem	Larger problem	Major problem	Unsure

What I'm Working On	My rating	Partner rating	Examples

## **Suggested Conversation Reflection Questions**

1. What did you do well in this conversation?
2. Describe any differences between how you rated yourself in this conversation and how your partner rated you.
3. What surprised you about your partner's ratings or examples?
4. What did you notice when you watched/listened to certain parts of this conversation again?
5. What ideas or strategies might help you move toward your goals?
6. How can you help yourself remember to use these strategies during the conversation?
7. When is it hard to remember to do this? What makes it easier?
8. What should be the focus in the upcoming week?

## **Notes**

**Main points of client reflection:**

**Plans for next practice:**

**APPENDIX D**  
**Conversational Rating System for ABI (CoRS-ABI)**  
**Clinician Assessment and Goal-Setting Packet**

Based on the Pragmatics Rating Scale by MacLennan, 2002;  
Modified by Iwashita, 2019

Client Name: \_\_\_\_\_ Your Name: \_\_\_\_\_

Clinical Interview Notes:

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What is this person's first language? \_\_\_\_\_

Other languages/cultural influences: \_\_\_\_\_

**Scoring Instructions**

For best results, collect conversation samples across different communication contexts with different communication partners important for the person's social relationships.

When filling out these ratings, consider whether and to what degree you can see problems for the person themselves and their communication partner arising directly from these behaviors. Due to individual and cultural differences in communication expectations, not everyone will have the same goals and expectations. Bringing awareness first to your own set of expectations about communication, next take a moment to center your scoring of this form on this person's own communication contexts and goals.

Conversation Sample #1 Topic, Situation, Partner? \_\_\_\_\_

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Conversation Sample #2 Topic, Situation, Partner? \_\_\_\_\_

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Conversation Sample #3 Topic, Situation, Partner? \_\_\_\_\_

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## 1. Nonverbal Aspects of Communication

0	1	2	3	4	?
Not at all a problem	Minor problem	Medium problem	Larger problem	Major problem	Unsure

	#1	#2	#3	#4	Comments
<b>Facial Expression</b> Using appropriate facial expressions such as smiling, expressing surprise, etc.					
<b>Eye Contact</b> Looking at someone while talking to them					
<b>Body Language</b> Appropriately using body language, gestures, and physical space between you and your conversation partner					
<b>Listening</b> Ability to listen while others are speaking					

## 2. Speech Quality During Verbal Communication

	#1	#2	#3	#4	Comments
<b>Intelligibility</b> Articulating your words clearly so your speech is easily understood					
<b>Fluency</b> Speaking smoothly without false starts, cut offs, stuttering, etc.					
<b>Prosody</b> Using enough expression in your voice (intonation, emotion, rhythm), using appropriate volume and talking neither too fast or too slow					
<b>Voice Quality</b> Speaking with a clear vocal tone, without hoarseness or breathiness					

### 3. Interactional Aspects of Communication

	#1	#2	#3	#4	Comments
<b>Cohesion</b> Conveying a clear and well-organized message that can be understood by the listener					
<b>Appropriateness</b> Ability to avoid doing or saying things that make the other person feel uncomfortable					
<b>Responsiveness</b> Answering your partner's questions and comments promptly					
<b>Interruption</b> Refraining from speaking over someone else or starting to speak before they are finished					
<b>Repair</b> Clarifying, confirming, asking questions, and/or providing explanations to fix conversation breakdowns					
<b>Emotional Regulation</b> Managing emotions such as anger and frustration during interactions					
<b>Relevance</b> Making sure what you say relates to the topic being discussed					
<b>Elaboration</b> Providing enough detail on each topic					
<b>Initiation</b> Ability to introduce a new topic to the conversation					
<b>Verbosity</b> Wordiness, talking too much					
<b>Limited Speech</b> Talking too little					

	#1	#2	#3	#4	Comments
<b>Perspective Taking</b> Shows understanding of the perspective of the listener					

**Summarize client, partner, and clinician perspectives below:**

Areas of concern	Client score	Partner score	Clinician scores				Comments (possible sources of differences, examples, facilitating and exacerbating factors)
			#1	#2	#3	#4	

**Highest priorities identified by client:**

**Highest priorities identified by partner:**



**Instructions for Clinician:** *If Goal Attainment Scaling (GAS) is used, the below worksheets can be used with the client and family during goalsetting and treatment planning.*

Goal #1: \_\_\_\_\_

At this level, I would consider this problem solved	
Where I hope to be after _____ weeks/months	
Where I hope to be after _____ weeks/months	
Where I am now	

Goal #2: \_\_\_\_\_

At this level, I would consider this problem solved	
Where I hope to be after _____ weeks/months	
Where I hope to be after _____ weeks/months	
Where I am now	

## APPENDIX E

### Partial List of Suggested Options for Metacognitive Strategies for Conversation

Concern Identified on CoRS-ABI	Strategy	Instructions	Possibly helpful?
Non-Verbal Aspects of Communication: Listening	Mindful listening	Give your partner the gift of your full attention while they are speaking. Stay in the present as you focus entirely on listening.	
Non-Verbal Aspects of Communication: Listening	Visualization (dynamic, pictures)	While listening to your partner, allow your mind to create mental images to illustrate the meaning of what they are saying.	
Non-Verbal Aspects of Communication: Listening	Visualization (dynamic, text)	When your attention starts to drift while listening to your partner, bring your attention back by imagining the words they are saying typed up like subtitles as they are speaking.	
Non-Verbal Aspects of Communication: Listening	Summarizing	After listening to your partner, try summarizing or reflecting back in your own words what you think they meant. Allow them to clarify.	
Speech Quality During Verbal Communication: Fluency	Letting go	Let go of stress and self-judgement, allowing your words and thoughts permission to come and go freely. Allow and accept any errors and memory lapses as a normal part of being human.	
Interactional Aspects of Communication: Cohesion	Preparation	Before speaking, take a minute to outline in your head the main points of what you will say. Organize the information so that your most important point is first.	
Interactional Aspects of Communication: Cohesion	Meditation	Take a few deep breaths and clear your mind before the conversation, and at any time during the conversation when you want to bring yourself back to a focused state.	

**APPENDIX E, Continued**

<b>Concern Identified on CoRS-ABI</b>	<b>Strategy</b>	<b>Instructions</b>	<b>Possibly helpful?</b>
Interactional Aspects of Communication: Interruption	Body language	Watch for nonverbal cues of when to talk, when to listen.	
Interactional Aspects of Communication: Interruption	“Vine vs. bubble”	Thinking of conversation as a vine you are growing between both of you, rather than creating separate bubbles.	
Interactional Aspects of Communication: Repair	Ask for feedback on how much listener understands	Ask for feedback after making a key point. For example, “Does that make sense?” “Is that clear?”, “What did you take away out of all that?”, “Do you have any questions?”	
Interactional Aspects of Communication: Wordiness	Personalize content	Remember whom you are talking to. Tailor your content and language to your partner, and ask them questions based on their interests and experience.	
Interactional Aspects of Communication: Wordiness	Transition phrase	Adopt a short transition phrase such as “And you?” or “And what do you think?” to keep the conversation flowing smoothly.	
Interactional Aspects of Communication: Perspective-Taking	Putting yourself in their shoes	Practice imagining how your partner might be feeling or interpreting the topic. Check with your partner to see if you are right.	
Interactional Aspects of Communication: Perspective-Taking	Self-questioning	Develop a question you will routinely ask yourself during conversations. For example, “Am I talking too much?”, “Are they interested in this?”, “Is it true, is it necessary, is it kind?” “Am I sure they’re done talking?”	



## APPENDIX F

### FIDELITY CHECKLIST: CISBAR Observation Form

Session Code: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

**Key:** Y = Yes, N= No, N/A = Not applicable

#### Introduction

- \_\_\_ 1. Greeted the participants
- \_\_\_ 2. Described the plan for the session
- \_\_\_ 3. Collaborated with participants to select and customize an appropriate metacognitive strategy (initial treatment session)
- \_\_\_ 4. Explained and modeled strategy
- \_\_\_ 5. Asked primary participant to predict performance during a short practice task
- \_\_\_ 6. Provided opportunity to practice strategy during the practice task
- \_\_\_ 7. Provided opportunity to reflect on performance during the practice task

#### First Conversation

- \_\_\_ 8. Instructed participants to hold a 6-7 minute conversation on a topic selected at random

#### Joint Reflection

- \_\_\_ 9. Allowed participants to rate the primary participant on target areas
- \_\_\_ 10. Led a guided joint reflection on the conversation
- \_\_\_ 11. Played back the audio of the conversation for participants during the reflection discussion
- \_\_\_ 12. Provided feedback that supported and reinforced use of the participant's metacognitive strategy

## Second Conversation

\_\_\_ 13. Instructed participants to hold a 6-7 minute conversation on the same topic

## Wrap Up

\_\_\_ 14. Asked for the participants' thoughts on the second conversation

\_\_\_ 15. Praised what the participant did well in the second conversation

\_\_\_ 16. Asked for the participants' thoughts on the session as a whole

## Please consider the whole session when answering the following questions.

1. Level of collaboration: How would you rate the clinician's overall interaction on a collaboration scale of 1 = very directive, 2 = mostly directive with some collaboration, 3 = good balance between providing structure and collaborating, 4 = very collaborative with some direction, and 5 = open-ended with limited feedback and structure (circle one) 1 2 3 4

5

2. Clarity of feedback: How clear was the clinician when instruction or feedback was provided, on the following scale: 1=Unclear, 5=Very clear and understandable (circle one) 1 2 3 4

5

3. Incorporation of client and ECP input: When client or ECP shared perspective or opinions, how well did the clinician incorporate that into the intervention: 1=Did not incorporate client input; 5=Fully acknowledged and incorporated client input (circle one) 1 2 3 4 5

4. Rate your perception of the client's level of engagement. 1=Did not appear engaged; 5=Highly engaged and interactive (circle one) 1 2 3 4 5

5. Rate your perception of the ECP's level of engagement. 1=Did not appear engaged; 5=Highly engaged and interactive (circle one) 1 2 3 4 5

## General Comments:

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