Core components of project-based intervention after acquired brain injury: Delivering meaningful groups online

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Social activity taxonomy (Figure 2)

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Keywords: rehabilitation, brain injury, complex interventions, social communication, Rehabilitation Treatment Specification System, group interventions, core components

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ABSTRACT

Background: Rehabilitation for cognitive-communication impairments following brain injury can be complex given the heterogenous nature of impairments post-injury. Project-based intervention has the potential to improve communication skills and create a meaningful real-life context where individuals collaborate to develop a concrete product, which benefits others. While evidence for this intervention is emerging, the COVID-19 pandemic prompted increased use of telehealth interventions to serve people with brain injury. This paper aims to describe a framework for the delivery of project-based intervention via telehealth within community rehabilitation settings; and present several case studies of telehealth groups completed in the United Kingdom (UK) and United States of America (USA) during the COVID-19 pandemic.

Methods: A working group was formed to map the components of project-based intervention onto the Rehabilitation Treatment Specification System (RTSS). This system is a conceptual framework that helps to explain the link between treatment theory and ingredients, allowing a clinician to clearly understand how and why a treatment works. First, a literature search was completed to identify eligible studies on project-based intervention after brain injury. Second, those studies were thematically mapped onto the RTSS to identify important intervention components. Third, the presence of these components was assessed for community brain injury groups delivered via telehealth in the UK and USA. These groups

were further described using a taxonomy of social activities that help to describe the degree of meaningful social engagement.

Results: The literature was described with a thematic RTSS summary. Treatment aims focus on skills training and self-efficacy; advocacy and self-empowerment; emotional well-being and quality of life; and collaboration and community belonging. Treatment ingredients involve a range of cognitive and behavioural supports to deliver meaningful activities and contexts to complete a project. Mechanisms of action involve learning by doing and cognitive and affective information processing. All four telehealth groups conducted in the UK and USA involved at least three treatment aims, >7 targets, and >8 treatment ingredients. All groups reported positive experiences from activities that involve working collaboratively to help others and contribute to society.

Conclusions: Project-based intervention delivered via telehealth has the potential for supporting people with acquired brain injury to improve their communication skills and engage in meaningful, collaborative activity. Application of the RTSS helps clinicians to understand the aims and therapeutic ingredients (or clinician activities) through which a person with brain injury may achieve specific treatment targets during the rehabilitation process.

What this paper adds

What is already known on the subject?

Project-based interventions have the potential to improve cognitive, self-regulatory, behavioural and social communication skills, renegotiate identity and reaffirm sense of self, providing a positive impact on quality of life for persons with acquired brain injuries. Projects serve as a context for meaningful engagement for individuals in the chronic phase of traumatic brain injury recovery, without fulfilling, work, family, or social responsibilities. However, most published research has involved in-person projects and few projects have been delivered via telehealth.

What this paper adds to existing knowledge?

While past published works have shared core principles of intervention, a variety of projects, durations, dosages, and methods have been employed. The current paper provides a framework to support more consistent implementation. By mapping previous project-based interventions to the RTSS, clinicians will have a better understanding of the aims, targets, ingredients and theoretical underpinnings of project-based interventions. In the wake of the COVID-19 pandemic, the shift to telehealth moved interventions to a virtual context. The four case projects in this paper demonstrate that it is possible to conduct project-based interventions via telehealth and provides a clear description to guide clinicians in their delivery.

What are the potential or actual clinical implications of this work?

This work begins to build the foundation for more rigorous, empirical examination of project-based interventions. By mapping project-based interventions to the RTSS, core aims, targets, and ingredients are established that can be objectively examined. This investigation also provides a roadmap for clinicians who wish to implement this complex intervention.

INTRODUCTION

Rehabilitation for cognitive-communication impairments following acquired brain injury (ABI) can be complex given the heterogenous nature of impairments post-injury (Snow et al., 1997, Sim et al., 2013). Impairments persist many years after the initial injury (Bond and Godfrey, 1997, Olver et al., 1996), with devastating effects on psychosocial outcomes such as a person's ability to return to work, maintain social relationships and independence in everyday life activities (Meulenbroek and Turkstra, 2016, Rietdijk et al., 2013, Elbourn et al., 2019, Struchen et al., 2008). Cognitive-communication impairments also have a negative impact on a person's quality of life (Dahlberg et al., 2006).

Rehabilitation recommendations for cognitive-communication impairments often highlight the need for individualized person-centered, group treatments that focus on social communication skills within everyday life activities (Togher et al., 2014). A review of 15 studies (to 2013) for people with brain injury concluded that the evidence is strongest for context-sensitive treatments delivered in groups (Finch et al., 2016). Context-sensitive treatments address social communication skills within functional, real-life settings and include individualized goals and activities that promote opportunities for communication practice and feedback. In recent years, context-sensitive approaches to treatment have been explored in the literature (Keegan et al., 2020, Douglas et al., 2019). Such approaches focus on natural, every day, real-world environments where people with brain injury may encounter the most difficulty in their communicative interactions (e.g., retail shops, hairdressers, medical appointments, workplace coffee breaks).

Project-based intervention

Project-based intervention is an emerging example of a context-sensitive treatment. The intervention is intended to deliver a self-identified, meaningful, concrete product or "*project*" by people with brain injury, through engagement in meaningful activities and contexts. Each person is considered an expert contributor and the final product is intended to benefit others (Ylvisaker et al., 2007, Feeney and Capo, 2010, Goldblum, 2010). Projects may include videos, pamphlets, artwork, drama presentations, letters to the press or talks to school children or the community. Each project is completed over weeks and/or months and requires planning and organizational skills, critical thinking, and problem analysis. People are given the opportunity to socially interact and practice and rehearse their communication skills with others, given the support of clinicians and peers. Recent studies of project-based interventions in the chronic phase have reported positive changes to cognitive-communication skills and quality of life (Behn et al., 2019a); and identified contributions to reconstruction of identity and a renewed sense of self (Hoepner et al., 2022). People with brain injury have often described projects as "meaningful to them" (Ylvisaker et al., 2007, p.282).

Projects engage people in meaningful activities in real-life contexts. Finding meaning or salience is important and considered essential to engage people in rehabilitation (Douglas, 2010, Häggström and Lund, 2008, Ylvisaker et al., 2007). Ylvisaker and colleagues (2007) suggested that "in the absence of meaningful engagement in chosen life activities, all interventions ultimately fail" (p.207). People with brain injury want to take part, give something back and be someone (McColl et al., 1998; Schipper et al., 2011). They want to make decisions and exert influence, be engaged in meaningful activities, do things for others, and develop a sense of belonging (Häggström & Lund, 2008). Project-based

intervention may provide such opportunities for people with brain injury to find meaning in their lives.

While the core features of project-based intervention are consistent, specific targets and treatment ingredients are self-determined, flexible, and iterative, which can make it difficult to replicate in clinical contexts. Initially, the delivery of the intervention was guided by ten features (Feeney and Capo, 2010, Ylvisaker et al., 2007): including "focuses on a personally, meaningful goal, ideally a goal that includes a concrete product", "requires deep processing and thorough analysis/investigation of many dimensions of a problem or activity", and "creates a meaningful context for practicing language and communication skills, including peer-related communication" (Ylvisaker et al., 2007, p286). More recently, following a review of the literature and therapist focus groups, the intervention was further described as having six essential components: a project or concrete end-product focus; group-based intervention; individualized communication-based goals; communication partner involvement; acknowledgement and support of participants' cognitive ability; and consideration and plan to address impaired awareness (Behn et al., 2021b). These components were then translated into a checklist of observable behaviours by the therapist and participant during intervention sessions. While this research helps to define and describe the intervention, further work is needed to understand the active ingredients, how these ingredients work and how they may be implemented in clinical practice.

Delivery of telehealth rehabilitation

At the start of 2020, the COVID-19 pandemic challenged how rehabilitation professionals worldwide provided intervention services to people with brain injury including context-sensitive treatments. Access to the community and real-life settings was severely

restricted and telehealth became the main environment for rehabilitation. In the United Kingdom (UK), there was an overall reduction in referrals and access to adult speech and language therapy (SLT) services (Chadd et al., 2021, Clegg et al., 2021) with 52% of adults receiving less therapy as before lockdown and 44% receiving no therapy at all (Clegg et al., 2021). Where services were provided, more than 60% were provided remotely (Chadd et al., 2021). SLTs in the United States of America (USA) also had to make a substantial shift in service delivery. Prior to the COVID-19 pandemic, only 4.5% of therapists surveyed provided services via telehealth (American Speech-Language-Hearing Association, 2020). In May of 2020, ASHA reported that 84.8% used telehealth. Prior to the pandemic, therapists may have been cautious about using telehealth and reluctant to accept an alternative to in-person contact (Regina Molini-Avejonas et al., 2015). However, the increased use of technologies more recently is likely to have addressed such a barrier with one survey of SLTs suggesting more than 70% will use telehealth in the future (RCSLT, 2020).

The concept of telehealth rehabilitation is not new, and prior to the pandemic, several systematic reviews found positive evidence for telehealth services to adults with communication needs (Regina Molini-Avejonas et al., 2015, Weidner and Lowman, 2020), including those with brain injury (Coleman et al., 2015). One review of 103 studies found that telehealth offers clear advantages over non-telehealth (in 85.5% of studies) including access to care, cost-effectiveness, and satisfaction (Regina Molini-Avejonas et al., 2015). In brain injury, telehealth can be used to conduct assessments of cognition and language, which produce comparable results to those completed in-person (Brearly et al., 2017, Hall et al., 2013, Chapman et al., 2021, Coleman et al., 2015), and monologic and conversational discourse (Turkstra et al., 2012, Rietdijk et al., 2018).

Evidence for the feasibility and preliminary efficacy of telehealth rehabilitation for adults has focused mainly on services for people with aphasia post-stroke (Weidner and Lowman, 2020). Less attention has been given to those people with cognitive-communication impairments. However, one recent study compared communication partner training for 34 people with brain injury delivered via telehealth compared to in-person (Rietdijk et al., 2020b, Rietdijk et al., 2020a). Positive gains in perceived communicative ability and conversational skills were found with comparable results between the two groups. Therapeutic rapport was also comparable between groups. Some participants reported a preference for in-person delivery. However, those in the telehealth group acknowledged in-person delivery was not essential (Rietdijk et al., 2020c). A combination of in-person and telehealth delivery was proposed as ideal by participants. While this study provides preliminary evidence for using telehealth rehabilitation with people with cognitive-communication impairments, more information is needed on how to deliver treatments; in particular, context-sensitive treatments to people with brain injury. Currently, one study has addressed the implementation of project-based interventions in telehealth (Hoepner et al., 2022). It will be discussed further in our review of previous project-based interventions.

The overall purpose of this paper was to facilitate an understanding of how to use project-based intervention in clinical practice for people with brain injury and explore the delivery of this intervention via telehealth (either partially or in full). The specific aims of this paper were to:

1. Enhance our understanding of project-based intervention through a theoretically driven description of the core components.
2. Describe our experiences of delivering the core components of project-based intervention via telehealth for people with brain injury in community settings.

METHODS

Working group

To describe the components of project-based intervention, a working group (the authors) of five speech and language therapists (SLTs) were convened in mid-2021 to examine the evidence and map the components of the intervention. All authors were practicing SLTs with over 20 years' clinical experience both as an SLT (range 20-33 years) and in working with people with ABI (range 20-33 years). Four authors (NB, JH, MC, and JH) had over 15 years' experience each in delivering project-based intervention (range 15-23 years) and one author (PM) had 15 years' experience in working on projects in a research capacity. The group met online fortnightly or monthly via zoom and communicated regularly through email.

Literature review

To identify studies, a literature search was performed. This search was not intended as a systematic or scoping review but rather a broad search to identify studies focused on project-based intervention for people with acquired brain injury. The following electronic bibliographic databases were searched on the 10th November 2021 by the first author (NB): CINAHL, APA PsycINFO, Medline (EBSCO), SpeechBITE and PubMed. The following three key terms were entered into each database:

1. *Population terms*: brain injury OR head injury OR brain damage OR brain trauma OR TBI OR ABI
2. *Intervention terms*: intervention OR therapy OR treatment OR rehabilitation
3. *Type of intervention*: project AND communication

Search strategies were amended in accordance with the limiters of each platform, as not all databases performed the inclusion of search techniques. The first author used Endnote to screen the titles and abstracts for suitability. If eligibility was inconclusive from abstracts alone, the full text of the article was reviewed. Full-text reviews were completed by two authors (NB and JHo). Studies were eligible for inclusion if both authors agreed on eligibility. Any disagreements were resolved by consensus agreement. Additional articles known to the research team but not identified in the searches were also included.

For the purposes of this review, we defined project-based intervention as an intervention that delivered a self-identified meaningful concrete product, or "*project*" by participants, in which the individual can be considered an expert contributor and a product that will benefit somebody. Interventions were required to be delivered to an adult with brain injury, with the focus on non-progressive traumatic and non-traumatic brain injuries. Progressive conditions (e.g., dementia) were excluded. A range of studies and methodologies were included e.g., observational, qualitative, descriptive papers and service evaluations. Conference abstracts were excluded. Search limiters were articles in English with adult and human-only populations. After reviewing titles and abstracts for relevance, 17 articles met criteria for inclusion. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Liberati et al., 2009) were used for the reporting the results (see Figure 1).

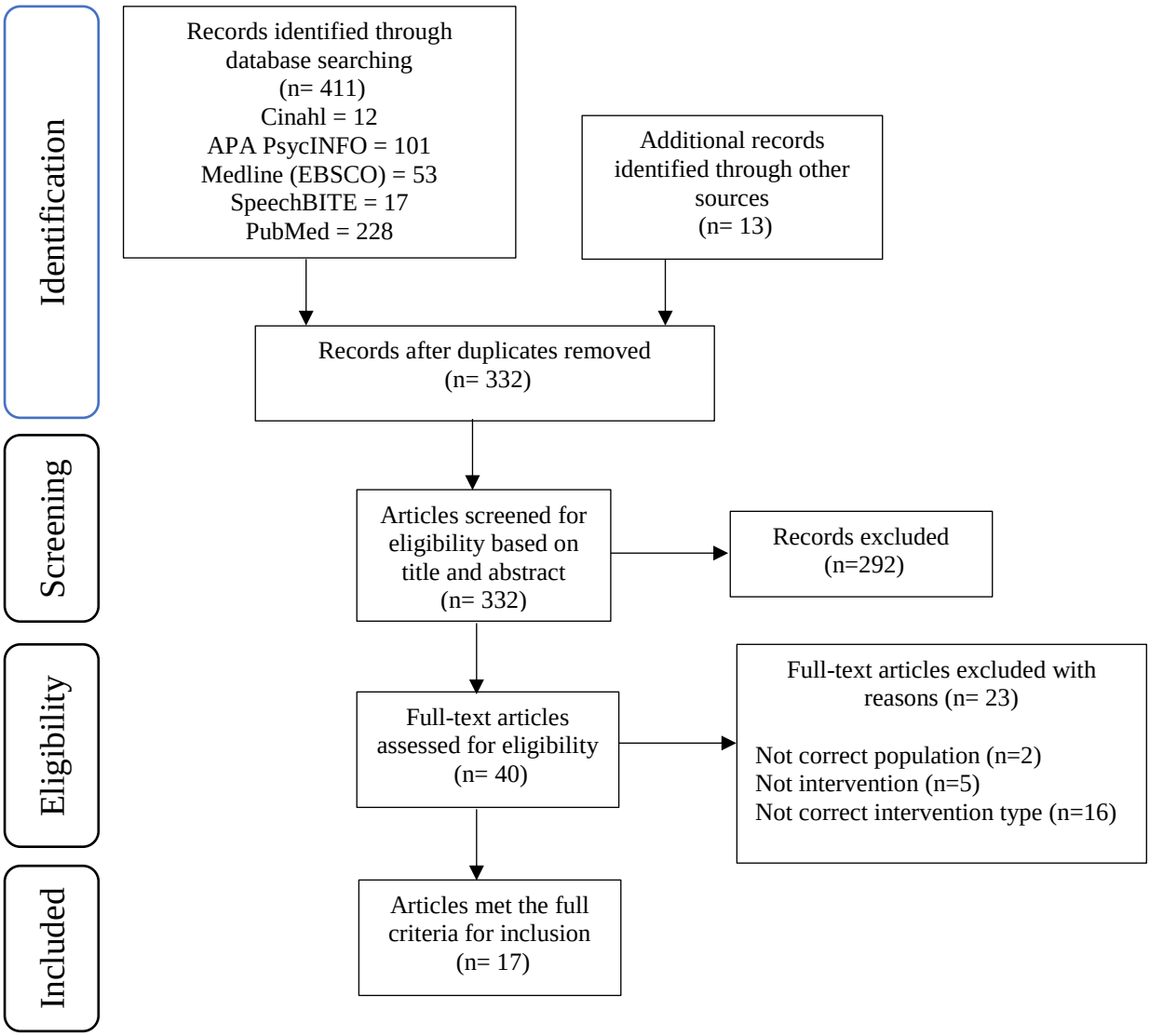

Figure 1. PRISMA diagram

Mapping to Rehabilitation Treatment Specification System (RTSS)

The rehabilitation treatment specification system (RTSS) (Hart et al., 2014, Whyte et al., 2014, Hart et al., 2018) is a system for classifying all treatments delivered in rehabilitation. Application of this system has been proposed as a method for enhancing clinical practice and knowledge translation for SLT treatments (Turkstra et al., 2016),

including for people with brain injury (Meulenbroek et al., 2019, Keegan et al., 2020). The RTSS emphasizes the use of theory to describe and organize treatments, specified using three parts: *targets*, which refers to the specific aspect of functioning that is directly altered by the treatment (e.g., turn-taking, initiations, question-asking); *ingredients*, which refer to the clinician's actions selected and the objects they use to make changes in the target (e.g., modeling, feedback, role-play, use of video); and *mechanisms of action*, which refer to the hypothesized means by which the ingredients produce a change in the target (e.g., learning by doing, altered cognitive and affective processing) (Hart et al., 2014, Whyte et al., 2014, Turkstra et al., 2016). Mechanisms of action for behavioural interventions are unlikely to be visible (Meulenbroek et al., 2019, Hart et al., 2018). These three components help to predict why and how a target will change. Many treatments are undertaken in the hope of changing a *treatment aim*, which refers to a more distal or "macro" aspect of functioning (e.g., improved everyday conversations) that may be altered indirectly as a result of a change in the target. Multiple targets with a range of ingredients are typically needed to bring about the accomplishment of an aim.

All authors first met to discuss and understand the RTSS framework. The third author (PM) had extensive experience in defining interventions using RTSS. A summary of the components and the RTSS manual was made available to all authors. Details about the treatment aims, targets, mechanisms of action and ingredients of project-based intervention from each eligible study were then independently extracted by each author. For ingredients, detailed information about the dosage, format, treatment components and methods of instruction was extracted using a method similar to that used by Meulenbroek and colleagues (2019). This information was then compiled by the first author (NB) in a Microsoft Excel© document. This document was shared with all co-authors who were asked

to individually categorise treatment components and methods of instruction as either essential, desirable, or non-applicable, to the broad delivery of project-based intervention across all papers (irrespective of clinical population). As there were similar components across the different studies, the first author then synthesized this information further into a single condensed description broadly relevant to project-based intervention in ABI compriseing the aims, theories, targets, ingredients, and mechanisms of action. The working group then discussed this synthesis and categorized the essential, desirable, and non-applicable components as a group. The third author (PM) who has led publications implementing RTSS (Meulenbroek et al., 2019, Ness et al., 2021) then created a thematic description of the RTSS components to simplify the data. Using this approach, he organized a final iteration of the framework. The co-authors and a second independent expert in RTSS for speech and language therapy (see acknowledgements) reviewed the framework. Each author then used the framework to describe their own delivery of project-based intervention in their own clinical or academic practice using the RTSS framework to confirm the utility of the mapping process.

Mapping to taxonomy of social activities

Levasseur, Desrosiers, and Whiteneck (2010) developed a six-level taxonomy of social activities to characterize degrees of meaningful social engagement. Derived from a detailed literature search, the authors differentiate between person's involvement in social activities and the goal of the activity. On the lower end of the taxonomy (levels one and two), individuals are preparing to connect with others, while on the upper end (levels five and six), individuals are working with others to contribute to society (see Figure 2). Upper levels of the taxonomy have been proposed to be important in the successful delivery of

project-based intervention (Behn, 2016). Each author mapped their telehealth interventions to this model.

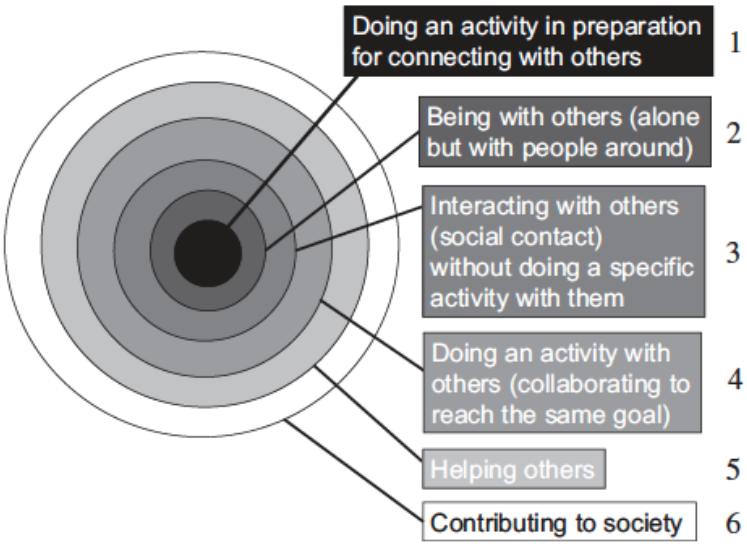

Figure 2. Taxonomy of social activities
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Telehealth project-based intervention groups

During the pandemic, four authors from the UK and USA (NB, JH, MC and JH) delivered project-based intervention via telehealth to people with ABI. This paper presents a series of four case studies that evaluate rehabilitation services by mapping the project-based interventions using the RTSS framework and a taxonomy of social activities, and then describing the outcomes of the four case studies. Ethical approval was not required as data was collected within the context of routine clinical practice. All participants consented to take part in the intervention.

<u>Lecture group</u>

The lecture group was a community brain injury project-based intervention group delivered online over the course of 12 weeks in the UK. Nine participants (five male, four female) with ABI were recruited from private case managers and brain injury charitable organisations in the UK. All participants were community dwelling and several years post-injury.

Weekly, 1-hour, group sessions (12 weeks in total) were conducted via Zoom. Two Zoom breakout rooms were used to facilitate two groups at the same time (5 and 4 participants respectively). Groups were facilitated by four SLT students supervised by a SLT (NB). All participants were offered 30–45-minute weekly individual sessions facilitated by a student. Individual sessions provided further support to help participants achieve their individualized social communication goals (e.g., to ask questions, to go off on fewer tangents, to wait my turn to speak, to pause more often when speaking, to improve awareness of communicative ability).

The group co-created a lecture presentation delivered to speech and language therapy students. Participants agreed that the presentation should describe their post-injury experiences of brain injury and important key messages they would like the students to know (e.g., how to interact with people in the early days post-injury; advice to give family, friends and employers; general tips and advice to support communication). Participants all contributed to the creation and delivery of presentations including the format and content. All but one participant were speakers at the lecture in the final week of the group, in which the participants responded to questions from the students following their presentation.

Change was measured through pre-post intervention scores on the Communicative Participation Item Bank (CPIB: Baylor et al., 2013) and Goal Attainment Scaling (GAS: Behn

et al., 2019b) for individualized social communication goals; and qualitative interviews (individual and focus groups) conducted post-intervention.

Motivational Interviewing for Peers

The motivational interviewing for peers project was delivered partly in-person and partly-online, over the course of six months within a community-based brain injury group in the USA. The motivational interviewing for peers group included 12 participants (seven male, five female) initially. Participants were regular attendees of the Blugold Brain Injury Group, a university-based, community intervention group for persons with acquired brain injuries.

The first two 1 ½ hour sessions met in-person, however; sessions were transitioned to fully online beginning with the third session, at the onset of the COVID-19 pandemic. With the transition to telehealth, participants received orientation to the platform in session three, along with technological troubleshooting support by SLT students via phone, chat, or directly in the telehealth platform. Eight sessions were conducted over six months, facilitated by three SLT students and their SLT supervisor (JHo).

Participants identified value in the interactional techniques used by the SLT students and their supervisor (JHo). As a result, they sought to learn specific techniques and practice with peers. Student clinicians delivered training on motivational interviewing microskills, then participants collaboratively reviewed video interactions, followed by hands-on practice implementing these skills in authentic, low-stakes peer support opportunities. To support the development of effective use of motivational interviewing microskills, each interaction was followed by a group debriefing, where clinicians and peers provided constructive feedback about the interaction.

Change was measured in the session following the end of the eight-week intervention, through a qualitative focus group discussion and field notes taken by the supervisor and SLT students.

Positive Educational Peer-delivered talks (PEPtalks) Group

The PEPtalks group was a weekly community group delivered online in the USA. The group initially comprised seven participants (four male, three female) who had a diagnosis of ABI with significant changes to cognition and communication. More than half of the group had a co-occurring mental health diagnosis with five participants demonstrating challenging behaviours. Participants were recruited from a state-wide Home and Community-Based Support program for adults with ABI. The Communication Disorders Program at The College of St. Rose served as a service provider and placement for SLT students.

Weekly sessions of 2 hours/week were delivered via Zoom for 16 months. Group routines established pre-pandemic supported the transition from in-person to telehealth. Support was initially provided by group facilitators, family, and carers to help participants manage technological challenges that arose from the transition to telehealth. Supports were pre-negotiated with group members as part of intervention including, planned routine for the structure of the sessions, multimodal delivery of memory, organizational and technology supports (e.g., Zoom link sent via group Facebook page, email, and text) and SLT student preparatory work with individual participants weekly.

PEPtalks are participant-selected video projects designed to provide solutions to life participation obstacles or challenges following neurological impairment. Topics are identified when a participant has successfully overcome an obstacle (i.e., thereby has

become the expert) or is currently experiencing a challenge or specific area of weakness that they may become aware of through supportive counselling (i.e., is the person is in the process of developing expertise). Communication, cognitive, behavioural, and self-regulatory goals are identified and targeted as part of project development (i.e., including the video script, draft and final recorded video, and the caption to accompany a social media post) with the aim of strengthening impairments addressed within the video. Multiple levels of apprenticeship teaching and collaboration with a video production department then supports participants in the production of short, aphasia-friendly, accessible video resources that are shared through social media (i.e., YouTube: https://www.youtube.com/channel/peptalks, Tik Tok @peptalks_tbi).

Change from the intervention was measured qualitatively through weekly clinical notes on individual progress toward self-selected goals and a five-question qualitative interview conducted post-intervention.

The *Moving* Message Group

The *Moving* Message Group hosts an annual 1-mile walk/roll fundraising and awareness fund raising event (typically in person) in September each year in the USA. Participants are recruited from the TBI Waiver and Neuro Services Program at The College of Saint Rose in Albany, NY. In March of 2020, five participants (3 female, 2 male) who were 8-39 years post-injury met as a planning committee through virtual meetings. They participated from March through August.

Participants attended monthly planning meetings and met for 2-7 hours weekly with an assigned SLT student, either one-to-one or in small groups with other participants. All sessions were delivered virtually via Zoom. College staff and SLTs supervised and supported

the sessions, and two of the participants (1 male, 1 female) were accompanied by a family member as needed. Although not required, all five participants completed project-work independently at home. Participants self-selected projects that ranged in length from 1 week to 24 weeks, depending upon the individual's goals and interests in being part of the event.

All projects were meaningful to the participant and were chosen as a way of working on a current challenge. The initial small projects focused on developing speeches for the event, designing, and collaborating with a company to produce masks and t-shirts for the event, writing and managing new biographies. Participants received communication supports as needed including, writing and editing support for emails, coaching and counselling techniques to support the participant through the challenges faced, recording and reviewing the speech, providing feedback to help improve the quality of the speech, and using problem solving scaffolds to improve awareness and make necessary changes.

A 10-question written questionnaire was completed by four (of five) participants who completed a specific project for the event. The questions focused on feelings about participation, suggestions for changes to next year's event, supports that were or were not helpful, confidence in communicating with familiar and unfamiliar people, and general observations about their abilities. In addition, ongoing, participant feedback and observations were collected throughout the program planning and weekly sessions.

RESULTS

Developing the framework according to RTSS

Interventions described in the literature were delivered in a range of countries including Australia, South Africa, UK, and USA; and involved people with traumatic and non-traumatic injuries, including people with stroke and aphasia. Interventions were delivered individually, to a group, or combination of the two. The length and duration of the interventions varied considerably where reported. Intervention lengths ranged from four weeks to 18 months (three to 36 hours total). Methods included descriptive, qualitative, single cases, pre-post design, and controlled trials. A full description of the 17 studies can be found in Supplementary Material A. The final iteration of the RTSS mapping framework is shown in Figure 3. The framework provides a description of project-based intervention according to the theme aims, targets, and ingredients. This description can then be used like a “menu” of elements to consider when designing an intervention for people with ABI.

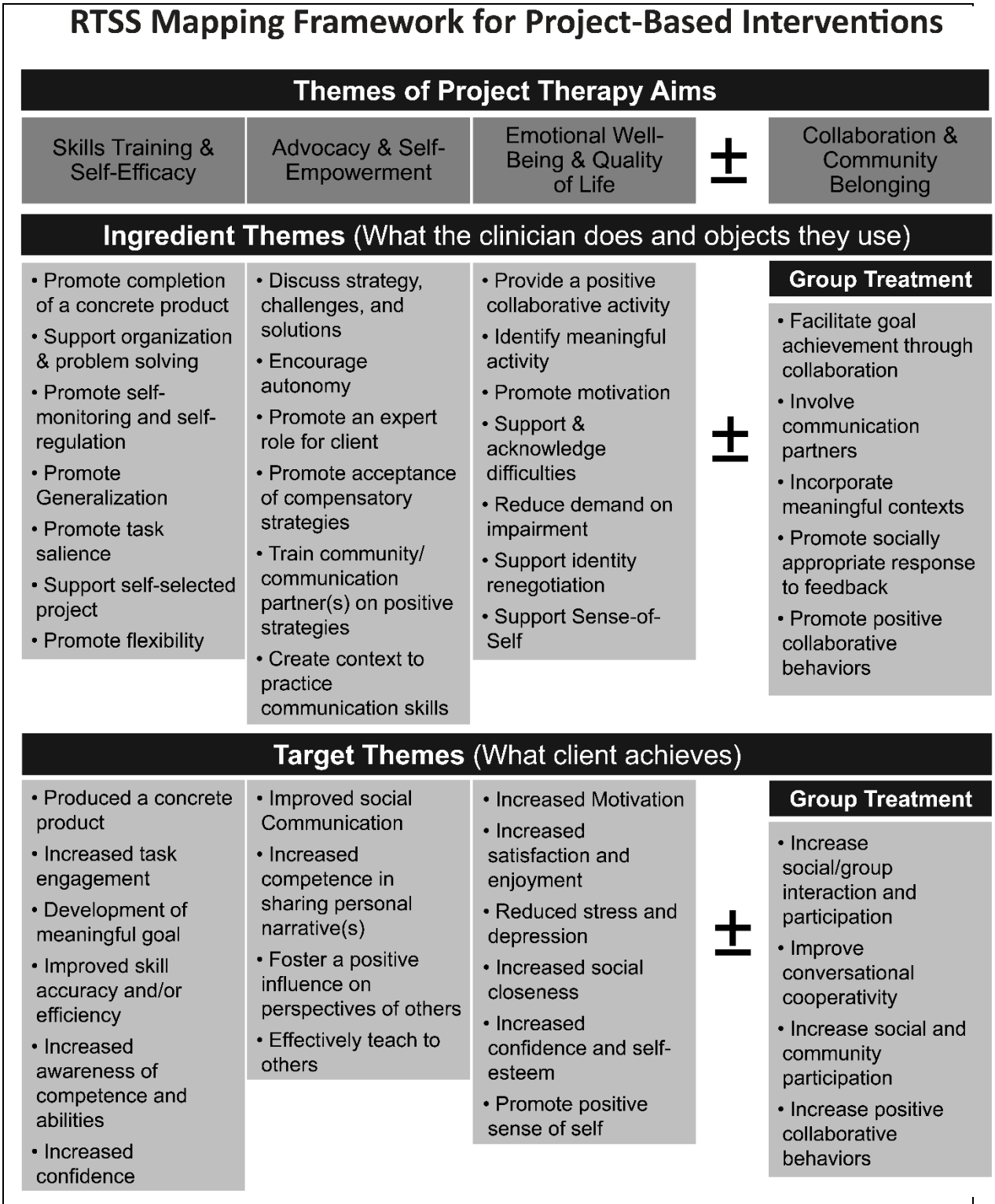

Figure 3. *Four theme aims and the ingredient and target themes for project-based intervention.*

NOTE: Our review revealed four themes regarding treatment targets for project therapy, illustrated above in columns. Ingredient themes are clinician actions and the objects used to change a target.

Target themes are measurable aspects of what the client does. The fourth column reflects the common targets in group-based therapy. However, these targets can also be targeted in non-group formats.

Our review revealed four main theme aims related to the intervention: skills training and self-efficacy; advocacy and self-empowerment; emotional well-being and quality of life; collaboration and community belonging. Target themes (measurable aspects of what the client does) are listed under each of the thematic aims. The fourth column reflects the common target themes targeted in group-based intervention. However, these targets can also be targeted in non-group formats. For each of the four theme aims, ingredient themes are listed. Each ingredient theme may be comprised several clinician actions and the objects used to change a target. For example, for targets related to changing motivation and self-efficacy, ingredients may include self-talk, focus on past success, allowing the individual to choose the activity, discussing activities collaboratively and asking the individual for feedback on progress. Reviewed studies are shown in Table 1 as mapped to the treatment theme aims.

Table 1. Included studies mapped to the four theme aims.

Treatment aims	Studies from review
Skills training and self-efficacy	Behn et al., 2019a, Behn et al., 2021b, Behn et al., 2019b, Behn et al., 2021a, Hoepner et al., 2022, Ylvisaker et al., 2007, Feeney and Capo, 2010, Goldblum, 2010, Sacchett and Lindsay, 2007, Purves et al., 2011, Cairns, 2007, Howell et al., 2021, Cherney et

	al., 2011, Walker et al., 2005, Thomas, 2004, Sarno and Chambers, 1997
Advocacy and self-empowerment	Hoepner et al., 2022, Ylvisaker et al., 2007, Feeney and Capo, 2010, Cherney et al., 2011, Goldblum, 2010, Purves et al., 2011, Sacchett and Lindsay, 2007
Emotional well-being and quality of life	Behn et al., 2019a, Behn et al., 2021b, Behn et al., 2019b, Behn et al., 2021a, Cherney et al., 2011, Walker et al., 2005, Thomas, 2004, Mumby and Whitworth, 2012, Feeney and Capo, 2010, Sarno and Chambers, 1997, Sacchett and Lindsay, 2007, Cairns, 2007
Collaboration and community belonging	Behn et al., 2019a, Behn et al., 2021b, Behn et al., 2019b, Behn et al., 2021a, Feeney and Capo, 2010, Ylvisaker et al., 2007, Sarno and Chambers, 1997, Howell et al., 2021, Walker et al., 2005, Thomas, 2004, Mumby and Whitworth, 2012, Cherney et al., 2011, Goldblum, 2010, Purves et al., 2011, Hoepner et al., 2022

As theories and mechanisms of action were largely unspecified in the reviewed literature, these two components of the framework were not considered in depth. Our group did agree to adopt the mechanisms of action used by other RTSS working groups. These included, “learning by doing” for skills training; and “cognitive and affective processing” for changing psychological representations (Hart et al., 2018, Meulenbroek et al., 2019). In addition, the expert panel agreed on additional mechanisms of action for project-based intervention more broadly including increased knowledge, self-awareness, group, and feedback processes.

Mapping the telehealth project-based intervention groups

Table 2 describes each of the four groups according to the proposed RTSS mapping framework (i.e., aims, targets, mechanisms of action and treatment ingredients). The table

also identifies for each group the levels from the activities of social taxonomy considered most relevant. These levels are described in greater detail for each group in supplementary material B.

Table 2. RTSS elements of project-based intervention groups

				Treatment ingredients		Levasseur levels
Group	Aims	Targets	Mechanism of action	Dosage	Clinician activities	
Lecture group (UK)	Skills training and self-efficacy; advocacy and self-empowerment; collaboration and community belonging	Produce a concrete product (lecture); development of meaningful goal; improved skills accuracy and/or efficiency; improved social communication; effectively teach to others; increased activities; increased confidence and self-esteem; increased social/group interaction	Learning by doing, cognitive and affective processing; knowledge; self-awareness; feedback processes; group processes	1h, 1x week group sessions, 12 weeks, 30-45min individual sessions via telehealth (as requested), home assignments	Promote completion of a concrete product (lecture); support organization and problem solving; support self-selected project; discuss strategy, challenges, and solutions; create context to practice communication skills; facilitate goal achievement through collaboration; promote socially appropriate response to feedback; promote positive collaborative behaviours	Levels 1, 4, 5 and 6
Motivational interviewing for peers (USA)	Skills training and self-efficacy; emotional well-being and quality of life; collaboration and community belonging (peer-to-peer support)	Produce a concrete product (motivational interviewing skillset); improved skills accuracy and/or efficiency; improved social communication; increased competence in sharing personal narrative, effectively teach others; promote positive sense of self;	Learning by doing, cognitive and affective processing; knowledge; self-awareness; feedback processes; group processes	1.5h, 2x/month, in person and telehealth, 8 group sessions over 16 weeks (6/8 completed via telehealth)	Promote completion of a concrete product (motivational interviewing skills); promote self-monitoring and self-regulation; discuss strategy, challenges, and solutions; encourage autonomy; create context to practice communication skills; facilitate goal achievement through collaboration; promote socially appropriate response to	Levels 4, 5 and 6

		increased social/group interaction; increased positive collaborative behaviours			feedback; promote positive collaborative behaviours	
PEPtalks (USA)	Skills training and self-efficacy; advocacy and self-empowerment; emotional well-being and quality of life; collaboration and community belonging	Produce a concrete product; increased task engagement; development of meaningful goal; increased awareness of competence and abilities; improved social communication; increased competence in sharing personal narrative; effectively teach others; increased motivation; increased satisfaction and enjoyment; increased activities; increased social closeness; promote positive sense of self; increased social/group interaction; increased positive collaborative behaviours	Learning by doing, cognitive and affective processing; knowledge; awareness; feedback processes; group processes	2h, 1x /week group sessions, in person and telehealth, ongoing, individual sessions as needed in person or via telehealth, home tasks	Promote completion of a concrete product; support organization and problem solving; promote self-monitoring and self-regulation; promote task salience; support self-selected project; promote flexibility; discuss strategy, challenges and solutions; encourage autonomy; promote an expert role for client; promote acceptance of compensatory strategies; train community and communication partners on positive strategies; create a context to practice communication skills; provide a positive collaborative activity; support and acknowledge difficulties; reduce demand on impairment; involve communication partners; incorporate meaningful contexts; promote socially appropriate response to feedback; promote positive collaborative behaviours	Levels 1,3,4,5 and 6

Moving Message Group (USA)	Skills training and self-efficacy; advocacy and self-empowerment; emotional well-being and quality of life; collaboration and community belonging	Produce a concrete product; development of meaningful goals; improved skill accuracy and/or efficiency; increased awareness of competence and abilities; improved social communication; increased competence in sharing personal narratives; effectively teach others; increased social connection; promote positive sense of self; increased social and community participation.	Learning by doing, cognitive and affective processing; knowledge; awareness; feedback processes; group processes	Dosage varied for everyone. Monthly meetings and further 2-7 hours per week, (one-to-one and small groups sessions), over the course of 1-24 weeks	Promote completion of a concrete product; support organization and problem solving; support self-selected projects; promote an expert role for the client; train community/communication partner(s) on positive strategies; create context to practice communication skills; support and acknowledge difficulties; support sense of self, incorporate meaningful contexts.	**L**evels 1, 3, 4, 5 and 6

Outcomes from the telehealth project-based intervention groups

Lecture group

Seven participants attended all 12 group therapy sessions, one attended ten sessions and one attended eight sessions. An average of eight individual sessions were attended by participants (ranging from 5-10). Four (of nine) participants perceived improved communicative participation on the CPIB and all but one participant achieved at least one of their social communication goals. The one participant who did not achieve their goal withdrew from the group as goal feedback was perceived as too confrontational due to impaired insight and awareness, and the physical abilities and personalities of other group members did not match their expectations. For that participant, they indicated a preference for individual rather than group sessions.

Participant's comments described their experiences of the group and individual sessions. The group provided an opportunity for people to meet others and "feel part of something" that inspires and helps others, "I thought what we tried to tell people is just help you know help them and that's the way I looked at it you know, what we've been through we're helping others and helping them to sort of learn from our experiences." Participants reported that being part of a group enabled them to have a new experience of talking to others, "I'd never spoken to anybody before in a big group, but I was well up for the challenge and I thought it was a good experience" and "it [the group] brought out a different me anyway." The group provided the space for participants to share ideas that contributed to the final lecture, "we all put you know ideas together and we all…bounced off each other… and we listened to each other which was good." There were challenges within the group, but several

participants acknowledged how this was part of the process. “So, there will be disagreements, feel challenging and at the end we will all pull together to complete the, the task”. One participant reported that they would have liked further opportunities to practice their communication skills within small group tasks.

Several participants reported increased awareness of their communication difficulties and confidence in talking with others, “I was quite impressed with myself, but it did really work it built up a lot of confidence and yeh when it comes to asking questions now and just getting involved in the conversations in the group yeah that was really helpful”. Participants spoke frequently about their individualized goals and how useful it was to have that focus within group and individual sessions, “it just seems to work for me. And doing the one-to-one it just seems to make me much more confident around people” and “it’s helping you work on a goal that’s gonna help you in life so it’s best to do it that way”. Obtaining specific feedback about goal performance was beneficial, “ I think gives you good tools as well” with several participants noticing changes in other participants, “I’ve noticed [participants name] has come a lot more out of his shell which is quality”. Overall, participants reported that group and individual sessions helped them to achieve their goals and commented that doing the group via telehealth was acceptable although several suggested a hybrid format moving forward.

Motivational Interviewing for Peers

Eight participants attended all eight sessions. Four of the participants, who initially attended in person, chose not to attend in the online context. Observational findings are purely descriptive and drawn from clinical field notes. Initially, participants struggled to apply central

tenets of motivational interviewing, such as inhibiting the righting reflex and evoking one's solutions to a problem. Instead, they responded with egocentric stories/examples and directly provided solutions to the peer's problems. Participants were more successful using strategies such as open-ended questions, affirmations, reflections, and summaries (OARS) given ongoing support by clinicians/peers and debriefing practice scenarios. Through guided debriefings, participants discussed use of OARS and evoking of one's own potential solutions. Over time, a few participants recognized the purpose and value of evoking rather than directly prescribing solutions. Those participants became powerful peer models within role plays and during debriefings. All eight regular attendees reached emerging proficiency in OARS and a mindset shift from egocentric, advice givers towards collaborators who inhibit their own experience and solutions to evoke a peer's own potential solutions.

Participant comments during the focus group discussion provide descriptive evidence of the interactional gains made throughout the group. Several statements make evident a shift in mindset from sharing their own solutions to helping peers realize their own solutions: "It's not about me, it's about them.", "It's about helping them to find their own solutions.", "People just need a space to talk through it" and "It's better when they are talking more than me. Sometimes you just need to get them going. They figure it out as they talk." Other comments provide evidence of improved self-awareness and perspective taking, reduced egocentrism: "You've got to keep the focus on the person you're helping. When you talk about yourself too much, it takes away from that" and "I realize now that I used to talk too much. Now, I am more aware of what I'm saying and wait before I jump in." Participants also identified specific strategies that they employed, such as affirmation and promoting self-

confrontation/self-evaluation: “It’s important to affirm their feelings. A lot of times, they have the solutions. [participant’s name] came into our discussions with all of the solutions but I don’t think she knew it. She just needed to hear that what she was thinking made sense” and “if they say something that doesn’t make sense or isn’t a good plan, we just ask them questions so they can evaluate it.”

PEPtalks group

Of the seven participants, one male participant was unable to attend sessions via telehealth, due to lack of internet access. The remaining participants attended at least 85% of sessions. Participants commenced nine PEPtalk videos during the 16-month period, with seven completed during this time, and a further two completed in the two months following a gradual transition back to in-person sessions.

Informal interviews with the six participants provided key insights into the telehealth experience. Participants reported that the intervention was a “good thing, necessary at the time” and it was “good being able to see people and communicate when we weren’t able to meet in person.” Zoom features including name tags, pinning and mute were identified as helpful cognitive and communication supports and telehealth, as a service delivery option, allowed participants a way to communicate and be productive, when they otherwise would not have had the opportunity. Unanimously, however, in-person services are preferred. Participants reported feeling somewhat “disconnected” and “distracted” during sessions but that they felt they had “accomplished [something] using Zoom”.

The shift to telehealth provided an opportunity to maximize efficiency, proceduralize technology supports and renegotiate rules and guidelines for respectful interaction (i.e., including general meeting etiquette, response to others' technology challenges and using social media). Participants were observed to learn and practice new communication and cognitive skills demanded by telehealth contexts. In addition, social isolation was reduced for the time participated in PEPtalks activities each week. Regarding questions specific to their experiences working on projects, one participant reported "I like helping people, it's who I am." A participant who contributed to several PEPtalks projects stated that "it feels weird that me- the one who knows nothing-is the expert on something." All six participants had at least some contribution to a final product during the telehealth-only groups. One positive outcome was the evolution of the PEPtalks "voting after stroke/TBI" video following a highly politically oriented discussion where the topic sensitivity was acknowledged, concerns validated, and impulsiveness related to political sensitivities were addressed.

Moving message group

All five participants attended 95% of the monthly virtual sessions. Four of the five members worked actively on individual projects related to the fund-raising event. The fifth participant wanted to hear updates and add feedback but chose not to complete an individual project. One participant worked with a SLT student for 7 hours per week while a second participant worked with a SLT student for 2 hours per week. The remaining three participants worked individually with a qualified SLT for 2 hours per week. All individual sessions were conducted virtually through Zoom.

Moving to telehealth was challenging for many people initially. Evaluation of the process was dynamic and ongoing, which allowed tasks to be modified as needed, scaffolding to be provided to

support maximum independence, and meaningful people to be included. Participant feedback corresponded to each of the four treatment aims. Participants spoke to collaboration and community building, “I loved the feeling of being involved in a larger group planning process.” Others expressed a sense of empowerment and self-efficacy, “I feel strong after recording my speech and feeling as if I can do anything I set my mind to.” Advocacy was addressed through development of mask with a message, “can’t stop me from sharing my story”. One participant shared about the attendees, “everyone was reading bios and messages and saying ‘wow, I didn’t know that’.” Participants also expressed gains in emotional well-being, “[I just] love doing something to help someone else”, and “[being] the expert in communication after my brain injury”, and “I felt accepted and needed.” One of the benefits of telehealth was the feeling of accomplishment among those who participated. The participants initially expressed trepidation about their ability to use Zoom, and as a result, being able to use Zoom was celebrated at the end of the group. The feedback has been fed forward to help prepare for the next *Moving* Message Group. Given the success of the virtual experience, the use of some virtual aspects may be useful in the context of upcoming in-person events.

DISCUSSION

Project-based intervention delivered via telehealth has the potential for supporting people with acquired brain injury to improve their communication skills and engage in meaningful, collaborative activity. Four expert clinicians implemented novel, project-based interventions through telehealth and hybrid platforms. Acknowledging that by their nature, project-based interventions are individualized and flexible, the authors sought to identify a core set of treatment aims, targets, ingredients, and mechanisms of action. Drawing upon nearly 70 years combined experience using project-based interventions, the authors identified important

components, using the RTSS to classify the delivery of the interventions theoretically. Application of the RTSS helps clinicians to understand the therapeutic ingredients (or therapist activities) through which a person with brain injury may achieve specific treatment targets during the rehabilitation process.

The review of the literature revealed 17 studies that broadly explored project-based intervention. While the review was not intended to be a systematic review nor a description of intervention effectiveness, the studies highlighted a range of projects completed with different intensities and dose. Such variability in the literature can make it difficult for clinicians to know how to implement an intervention into clinical practice. The studies reviewed highlighted the complexity of the intervention with multiple aims, theories, targets, ingredients, and mechanisms of action, which need consideration when delivering the intervention. The RTSS was useful as a theoretical framework to convey the science and support implementation of project-based interventions into clinical practice.

Through use of RTSS, the aims of the reviewed studies could be grouped broadly into three distinct categories: skills training and self-efficacy; advocacy and self-empowerment; and emotional well-being and quality of life. These aims provide a potential starting point for clinicians when delivering project-based intervention for people with ABI. The fourth aim, collaboration and community belonging, refers to the delivery of the intervention within a group context which may or may not be a consideration for clinicians. The targets of project-based intervention, defined according to each of the four aims, provide clinicians with what the client aims to achieve, and may align with potential outcomes to measure progress. The complexity of the intervention may be attributed to multiple aims and targets. The role of the

clinician is to define these for each individual, as intervention needs to be person-centered and individualized for people with brain injury (Finch et al., 2016, Togher et al., 2014). Having a clear set of targets will directly influence the ingredients used and to what extent (i.e., what the clinician does) in order to maximise benefit (Turkstra et al., 2016). A more complex project may require multiple ingredients of benefit to the individual, however, focus on a carefully chosen few may have the greatest impact for making positive changes in the skills of the individual.

Theories to describe project-based intervention were largely unspecified. Theories of learning are often lacking in the training and practice of rehabilitation (Hart et al., 2014). A well-established theoretical understanding of an intervention and its effects can help to explain the changes that may occur from ingredients on the target. Project-based intervention may be described using a range of cognitive, behavioural, emotional, and social learning theories. Understanding such theories should be an important consideration for clinicians when delivering project-based intervention, and an area of research focus in the future.

Mechanisms of action were difficult to identify from the literature as they were not explicitly mentioned by authors. Mechanisms of action are the hypothesized means by which change occurs from the ingredients administered, and a single ingredient may have different mechanisms of action (Hart et al., 2018). They are related to '*how*' change or learning occurs for the chosen target. However, mechanisms of action are hard to characterize, often unknown and thus inferred (Turkstra et al., 2016). Our team often referred to them as the "*magical unicorns of therapy*" due to the difficulty in identifying them. In behavioural interventions, mechanisms of action are not typically observed nor reported in the literature (Meulenbroek et al., 2019); although Hart et al., (2018) suggests learning by doing, and altering affective and

cognitive processing, as putative mechanisms. For project-based intervention we proposed further mechanisms of action including, knowledge, self-awareness, feedback, and group processes. There are methodologies from within behaviour change theory for linking behavioural change techniques with hypothesized mechanisms of action (Carey et al., 2019, Michie et al., 2018). Within that literature, 26 mechanisms of action have been identified including “beliefs about capabilities”, “knowledge”, “motivation”, “intention”, “optimism” and “emotion”. Such literature may help in the future for understanding how treatment ingredients effect change on a chosen treatment target. However, these will remain intended targets while the actual mechanisms of action in each therapeutic encounter might still be different as they are bound to the nature of the interaction.

Across the four groups and 32 participants, the project-based intervention service evaluations each share common targets and underlying treatment theories. While there is overlap between treatment aims, ingredients, and mechanisms of action, those elements are often specific to given projects. Given the diversity of case projects presented, this provides clinicians with a sense of typical aims, treatments, and mechanisms of action for different types of projects.

Across the four aims and four project groups, ingredients related to task salience, meaningful activities and contexts were common. People with brain injury want to take part, give something back, and be someone (McColl et al., 1998, Schipper et al., 2011). They want to make decisions and exert influence, be engaged in meaningful activities, do things for others, and develop a sense of belonging (Häggström and Lund, 2008). Project-based intervention provides opportunities for participants to engage with a range of activities and contexts that

help each person find meaning and salience during the intervention. Consideration of the goals of project activities chosen and the person's involvement in those activities is likely to influence the degree of meaning derived from each project. Each of the four groups addresses at least three of the levels proposed by Levasseur and colleagues (2010) including, the higher levels related to helping others and/or the broader society. Consideration of multiple activities and contexts may have the potential to influence quality of life more broadly (Behn et al., 2019a), renegotiation of self and identity (Ylvisaker et al., 2008, Ownsworth and Haslam, 2016) as people with brain injury construct alternative success-oriented, non-problem saturated alternative personal narratives (Hoepner et al., 2022).

This paper provides a preliminary exploration about how project-based intervention may be delivered via telehealth (either fully or in a hybrid format). There was a range in the length of intervention from 12 weeks to 18 months, which is consistent with the variability identified from a review of the literature. Some targets such as, improved social communication, and improved skill accuracy and/or efficiency, may be addressed in relatively short periods of time (of several weeks). Other targets such as, reduced stress and depression, and ability to effectively teach others may occur over longer periods (of several months). In each of the four groups, the intervention could be delivered via telehealth with few problems identified from this delivery method. Encountering so few problems is encouraging given a more recent intervention for people with brain injury reported some technical problems with telehealth delivery and that clinicians may miss non-verbal cues and the intervention may not be fully representative of real-life contexts (Rietdijk et al., 2020c). However, in the project-based intervention such "problems" may provide an opportunity to problem solve and discuss

strategies, challenges, and solutions, which are treatment ingredients. Issues that arose for some participants (e.g., lecture group) appear more related to insight and awareness, and need for individual sessions, which are unrelated to the delivery method. Telehealth seems an appropriate method for delivering project-based intervention and authors intend to continue with such groups, either completely via telehealth or using a hybrid format.

The groups described in this paper report on a range of positive outcomes related to each of the four aims proposed by the RTSS. Participants made individual changes to their communication skills through increased awareness and/or better performance from an increased use of strategies and opportunities to practice their skills with others. Participants responded well to the opportunity to meet and interact with others which reduced social isolation for some. The project focus was empowering and helped to make changes to insight and awareness, with the opportunity to be an expert in something that led to productive activities that helped others. Participants improved in confidence and enjoyment from engagement in rehabilitation services, at a time when such services were reduced.

Limitations

This paper is not intended to show efficacy nor effectiveness of the intervention for people with brain injury. The interventions described provide clinical case examples of the telehealth delivery of projects. Further research is needed using well-controlled methodological designs, either single-case or group-level studies. The review conducted was neither a scoping nor systematic review. The reviewed studies included a broad range of methodological designs which were not assessed for quality or effectiveness. The studies were

simply used to guide the development of an intervention framework using RTSS. Through use of this framework, we have more clearly defined the intervention for future research studies. These studies should involve independent researchers in the identification of intervention components rather than the clinicians who delivered the intervention, as was done in this study.

Conclusions

This paper presents a description of project-based intervention as defined by an underlying theoretical framework. The description highlights the complexity of project-based intervention and the need for clinicians to be clear with respect to the aims of the intervention and the rehabilitation theories that drive their decisions, as both will in turn influence their choice of targets and ingredients when delivering the intervention. Research to date has focused on in-person delivery of projects however, the COVID-19 pandemic has presented a challenge (*and opportunity*) for clinicians to consider the delivery of rehabilitation interventions via telehealth. During this uncertain time, clinicians need to creatively adapt to provide rehabilitation services. This paper highlights how project-based interventions could be successfully delivered via telehealth to support those people with communication impairments following a brain injury. The paper also provides a clinician guide to delivering projects in clinical practice, with further research needed about the implementation of project-based intervention in clinical practice, and refinement of the treatment components, to guide future empirical research studies.

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Supplementary Material A

Study (Country)	Study type	Participants	Short description of project focus	Delivery method (Group or individual)	Length / Duration
Behn et al., 2019ab; Behn et al., 2021ab (UK)	Feasibility controlled trial	21 people with ABI (13 with TBI)	Creation of a product that helps others understand the brain injury experience (e.g., educational video, pamphlet, artwork, podcast)	Group	6 weeks / 20 hours (10 x 2-hour sessions)
Cairns, 2007 (UK)	Case study	1 person with post-stroke aphasia	Construct a personal communication book or portfolio to convey basic information and needs	Individual	Not reported
Cherney et al., 2011 (USA)	Pre-post design	14 people with post-stroke aphasia	Drama class that worked towards a final unscripted performance that provided an explanation of stroke and aphasia, and the emotional impact.	Group	18 weeks / 27 hours (weekly 1.5h sessions)
Feeney & Capo, 2010 (USA)	Case studies	Not reported	Projects include literacy project group, current events group, and political debate group.	Group	Not reported
Goldblum et al., 2010 (SA)	Descriptive study	Not reported	Projects include writing letters to the press, talks to school children, community-education open evening, book club.	Combination	Not reported.
Hoepner er al., 2021 (USA)	Qualitative study	10 people with ABI (8 with TBI)	Creation of a presentation for healthcare providers regarding consequences of ABI, strategies and supports, and insight of the lived experience.	Group	6 months / 18 hours (twice monthly 1.5h sessions)
Howell et al., 2020 (UK)	Parallel group design	12 people with ABI (5 with TBI)	Peer was trained to facilitate a peer-led group	Combination	4 weeks / 16 sessions (with peer facilitator)

			intervention that discussed rehabilitation-specific topics chosen by the group members.		+ 8 weeks / 16 hours (8 x 2h sessions)
Mumby & Whitworth, 2012 (UK)	Service evaluation	39 people with post-stroke aphasia	Support to people with aphasia and their carers though collaborative goal setting, provision of information and bridge to other services, and indirect support.	Combination	6 weeks followed by access to other stroke and aphasia services over a 12-month period
Purves et al., 2011 (UK)	Qualitative case study	1 person with post-stroke aphasia	Use of sentence shaper software to create and revise a recording of a reading; and then obtain ethical approval and co-write this journal paper.	Individual	10 weeks / 17 hours
Sacchett & Lindsay, 2007 (UK)	Case study	1 person with post-stroke aphasia	Create a personalised communication book that could be used to communicate with others	Combination	12 weeks / 36 hours (12 x 1-hour individual session, 12 x 2-hour group sessions)
Sarno & Chambers, 1997 (USA)	Descriptive study	19 people with post-stroke aphasia	Participate in gardening as a leisure activity (e.g., propogate seeds and cuttings, arrange flowers).	Group	8 weeks / 3 hours; 3 x 1-hour sessions
Thomas, 2004 (Australia)	Mixed methods longitudinal study	14 people with TBI (12 with TBI)	Fund-raising to take part in a 9-day outdoor adventure course; followed by individualised goal-directed groupwork.	Group	18 months
Walker et al., 2005 (Australia)	Pre-post design	11 people with TBI	Fund-raising to take part in a 9-day outdoor adventure course; followed by individualised goal-directed groupwork.	Group	18 months (9 monthly meetings, 9-day course, 7 x fortnightly meetings)
Ylvisaker et al., 2007 (USA)	Service evaluation	7 people with TBI	Not reported	Group	Not reported

Supplementary material B

Levasseur et al. levels	Lecture Group	Motivational Interviewing for Peers Group	PEP talks	*Moving* Message Group
1 - Doing an activity in preparation for connecting with others	Prepare individual lecture slides; edit slides between sessions	NA	Identifying personal life participation challenges and strategies to discuss with peers to be generalized into group script.	Preparing a speech, writing, editing, and practicing the speech. Writing their individual bio to share at the event.
2 – Being with others (alone but with people around)	NA	NA	NA	NA
3 – Interacting with others without doing a specific activity with them	NA	NA	Group members may participate in group interactions without necessarily contributing to a specific topic discussion.	Participants worked together to give feedback about bios, speeches, and letters. Participants spoke on the phone and emailed with companies to order t-shirts and masks.
4 – Doing an activity with others (collaborating to reach the same goal)	Group sessions involved lecture content planning; discussing each person's post-injury journey; reaching agreement on most salient points to include in lecture; creation of scripts; practice and rehearsal of slides.	Participants collaborated with each other to learn, practice, implement and refine their interactions and ability to support one another (particularly to support new group members or those with an immediate struggle).	Participants collaborate with each other, student clinicians and paid and unpaid caregivers to complete the script for presentation in a PEPtalks video. Group members rehearse and deliver their script in a formal or informal recording environment. Members edit, give, and receive feedback to obtain consensus on a final product.	Provided information about what it is like to have a neurogenic communication disorder with others. Also, participants helped prepare the event, helped others set up booths, provided support to other participants, and talked with new people at the event
5 - Helping others	Project intent was to educate students about brain injury and long-term effects, and how each person's injury can be different; and what they as	Participants gain skills in delivering peer supports, improved awareness of their own interactions and the interactions of others.	Group members are often motivated by the idea that creating a video will potentially help someone else facing similar obstacles.	The event is attended by 300 people who interact with one another, read bios, read posters about different communication problems,

	students can do to support the recovery process.		Participants can use their challenging experiences and what they have learned to help others. Altruism may provide the motivation to help some group members address their own self-awareness of skills, strategies, and self-regulatory behaviour.	listen to speeches, visit vendor booths, and participate in a day that recognizes and celebrates the competency of individuals with neurogenic communication disorders.
6 – Contributing to the greater society	Talk is intended to encourage person-centred practice in rehabilitation for students once they graduate thus, influencing other patients.	Skillsets directed at improving interactions with peers in the group context may generalize to improved interactions with everyday partners (spouses, significant others, children, parents, and friends).	Video products are created with the goal of helping other individuals facing similar life participation obstacles, especially those in the chronic phase of ABI recovery; or those with obstacles not commonly addressed in traditional clinical settings. Participants indirectly inform caregivers of strengths, preferences, and effective strategies.	The event contributes to local and larger society. Individuals get a sense that the person is "doing something to help someone else" and being "the expert in communication after my brain injury."