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FINAL REPORT

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**Capacity building ABI services to improve outcomes for
adults with challenging behaviours: A Feasibility Evaluation**



LSA 2022 Grant Final Report

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Executive Summary

Challenging behaviours are one of the most confronting and difficult issues faced by people with brain injury, their families, support teams and the community. Clinicians report lacking training and confidence in addressing challenging behaviours. PBS+PLUS is an evidence-based, humanistic approach to helping people build a meaningful life and self-regulate behaviour, tailored for people with brain injury. We previously conducted a world-first randomised controlled trial of PBS+PLUS finding it to be effective in reducing behaviours, helping people achieve meaningful outcomes, improving self-efficacy and widely accepted. There is a known gap between research intervention findings and implementing changes to clinical practice.

The generous funding of the Lifetime Support Authority has enabled the completion of a novel study that focused on building the capacity of neurorehabilitation clinicians to deliver PBS+PLUS. In partnership with the South Australian Brain Injury Rehabilitation Service (SABIRS; state-wide ABI service), a twin-stream training model was developed. This encompassed introductory (entire service, 1-day workshop plus intervention guidebook and podcast) and intensive levels (experienced clinicians, introductory level plus self-paced online learning and 6-months group supervision). The aim of the research project was to evaluate the training's impact on patient outcomes and clinician capacity, feasibility and sustainability.

SABIRS, led by Liz Williams, was an ideal partner given their engaged and motivated clinical culture, high organisational readiness for change, and previous exposure to PBS+PLUS through our founders, Mark Ylvisaker and Tim Feeney. We had excellent participation in both training streams, exceeding our targets: 78 clinicians attended training in PBS+PLUS (64 introductory only, 14 introductory and intensive training). Feedback from participants was overwhelmingly positive, with rich examples provided for how PBS+PLUS enhanced their clinical practice, client outcomes and team collaboration. Increasing clinician competency (43%) and self-confidence (27%) in addressing challenging behaviours using PBS+PLUS provides people needing behaviour intervention with greater access to skilled providers. We identified that the benefits of the training were maintained and/or continued to develop over time. In particular, scenarios of application of PBS+PLUS were evident in both inpatient and community settings. This facilitated improved transitions for SABIRS clients moving between teams, in large part due to a shared framework and language. Improved outcomes for clients encompassed both reduction in challenging behaviours and achievement of personally meaningful goals. We found that challenging behaviour severity reduced by almost 50% in 7 clients whose clinicians underwent the PBS+PLUS intensive training, which improved to a 67% reduction by 9 months. Over 92% of individual goals were met and/or exceeded for people with ABI whose clinicians were in the intensive training program.

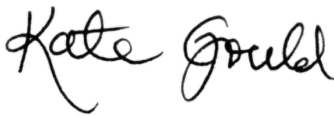
Challenges of this program included the completion of a very comprehensive and rigorous research evaluation design, which encompassed repeated quantitative measures, a single-case experimental design (SCED) with randomised baseline lengths for intensive trainees, data collection and consent processes for people with brain injury during inpatient admission, and qualitative surveys. From a feasibility perspective, this approach to the research was very resource intensive and difficult to implement, resulting in missing data, and difficulty identifying, consenting, timing and keeping participants with brain injury within the SCED protocols. The value of this feasibility trial is the significant learnings obtained, which have informed the design of future implementation trials of PBS+PLUS.

The strong demand and success of the PBS+PLUS training program has been evidenced by the additional translation activities completed within the project period. This has included invited PBS+PLUS workshops in South Australia and twice internationally in Canada, the roll-out of the training package in an Epworth Healthcare Foundation funded trial last year, and over 4,000 downloads of the Relentless Optimism PBS+PLUS podcast. Of great value is the successful funding again from LSA to expand the delivery of the PBS+PLUS training program, focusing on the private sector in South Australia and beyond. This new project is now underway, with the design and activities heavily informed by the initial LSA project. Together, these projects strive to unify the treatment approach in SA and nationally to utilise PBS+PLUS in ABI rehabilitation for people with challenging behaviours.

In summary, the key project findings are:

1. There is a strong interest from clinicians in upskilling in a behaviour intervention approach, PBS+PLUS.
2. The twin-stream training model of a large introductory workshop and an intensive supervision program was feasible, acceptable and valued.
3. PBS+PLUS training resources of the guidebook and podcast provided additional implementation support.
4. Translation and implementation occurred at multiple levels, including the clinicians' own practice, across teams at inpatient and community levels, and in training and onboarding new or junior staff.
5. Additional strengths of this approach included the transdisciplinary nature, with a range of clinical backgrounds finding benefiting including occupational therapy, psychology, social work and speech therapy.
6. We identified improvements in clinical outcomes for some people with brain injury including reduced challenging behaviours, improved self-efficacy in addressing challenging behaviours and achievement of personalised rehabilitation goals.
7. Feasibility evaluation of the research design identified opportunities for simplification.

I wholeheartedly thank the Lifetime Support Authority for funding and supporting this ambitious research and clinical translation project. Our team are grateful for the opportunity to impact the brain injury support sector with this work, and proud of the ways PBS+PLUS and the training have improved clinical experiences and outcomes.



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Background and Project Aims

Challenging behaviours, such as aggression and socially inappropriate behaviour, are common, pervasive and distressing after acquired brain injury (ABI). These behaviours interfere with community participation, relationships and psychosocial outcomes. Australian clinicians report behaviour changes as extremely challenging to treat, with low confidence, training and resources in behaviour interventions. An obstacle in addressing this need is the lack of well-controlled efficacy studies of behaviour interventions for people with ABI.

Our group undertook the world's first randomised controlled trial to evaluate a 12-month, individualised, multi-component Positive Behaviour Support (PBS) intervention for post-ABI challenging behaviours ("PBS+PLUS"). Challenging behaviours of 49 people with severe ABI (TBI, stroke, brain tumour) reduced significantly during the intervention, which was maintained over 8-month follow-up. Close Others (COs; family, carers) significantly improved their self-efficacy in addressing the behaviours of persons with ABI. Furthermore, qualitative investigation revealed PBS+PLUS was positively received and valued by persons with ABI, COs and clinicians. Typically, there is a significant gap between identifying evidence-based interventions and translation into clinical delivery. To successfully change clinical practice to adopt PBS+PLUS and translate our findings into improved outcomes for people with ABI, implementation research is required to determine and evaluate practical, scalable and sustainable capacity-building training programs.

There is a clear need to upskill clinicians to effectively treat challenging behaviours in adults with ABI. PBS+PLUS is an evidence-based approach combining positive behaviour support and cognitive-executive strategies relevant to ABI. Workshops and clinical training programs do not necessarily result in changes to clinical practice. It is essential to determine the effectiveness of implementation activities in improving client/patient outcomes, enhancing service delivery, and to plan for scaling of training. The aim of this project is to evaluate the impact, feasibility and sustainability of a twin-stream capacity-building clinician training program (introductory and intensive modes) in PBS+PLUS for challenging behaviours in adults with ABI.

Objectives:

1. Determine the impact of intensive training on improving outcomes for clients with ABI and clinical skills through measuring changes in self-efficacy in behaviour management of clinicians and close others, objective challenging behaviours of clients with ABI using a multiple baseline single-case experimental design, and via pre-post clinical session analysis by expert independent raters.
2. Evaluate feasibility of the training model by examining attendance, uptake, costs and qualitative appraisal.
3. Measure sustainability by examining client outcomes, implementation activities and self-efficacy across follow-ups at 3- and 6-months and 12-months after the training program.

Method

Ethics approval was obtained from the Monash University (#26579) and Central Adelaide Local Health Network (#17670) Human Research Ethics Committees prior to participant recruitment.

Design

This study was designed to evaluate the implementation of the clinical translation of PBS+PLUS into practice within a service setting.

Implementation Frameworks

As background to the design of this study, we utilised the Knowledge-To-Action Framework (KTA) by Graham et al. (2006), which describes the application of theory to implementation efforts (Refer to Figure 1). The core of the implementation relates to knowledge creation through understanding the experiences and service needs of people with brain injury, family members, carers and clinicians to address challenging behaviours.

Our research to create this knowledge has included survey scoping of people with ABI and their close others (Hicks et al., 2017), qualitative interviews of people with ABI, close others and clinicians (Gould et al., 2019), survey scoping of Australian neurorehabilitation therapists for training and implementation (Carmichael et al., 2020a) and qualitative interviews with Australian therapists to understand obstacles and facilitators (Carmichael et al., 2020b). Synthesising these findings, we have designed and described an intervention (knowledge tool), called PBS+PLUS (Gould et al., 2021a; Feeney & Gould, 2021).

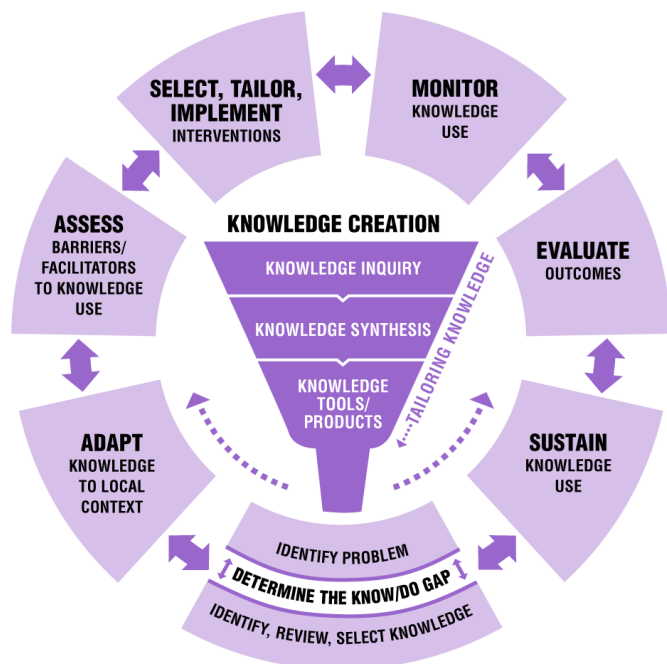


Figure 1. Knowledge-to-Action Framework (Graham et al., 2006; RNAO, 2022)

PBS+PLUS has been evaluated in a Transport Accident Commission/ISCRR funded randomised controlled trial (RCT; Ponsford et al., 2022). In addition, we have quantitatively evaluated participant individualised goal attainment scaling (Gould et al., 2021b), qualitatively examined the experiences of the participants with ABI and their Close Others (Holth et al., 2021) and those of the treating clinicians (Analytis, 2021). Taken together, PBS+PLUS has been found to be an effective, acceptable, feasible and sustainable intervention to improve quality of life and help people self-regulate behaviour after brain injury.

To enable inclusive and person-centred research and implementation outcomes in community practice of PBS+PLUS, a co-design approach was utilised by our research group to collaboratively develop intervention training resources including a clinical intervention guidebook and podcast series with people with living expertise of ABI, family members and clinicians (Carminati, et al, 2024).

In 2021 Dr Gould established a training and research clinic, the Positive Behaviour Service at the Turner Clinics, Monash University. The training program in this LSA project has been piloted at the Positive Behaviour Service with 10 registered or provisional psychologists and speech and language therapy trainees. Research evaluations have been conducted with trainees, which have demonstrated improvements in self-reported confidence, skills and knowledge of PBS+PLUS and neurobehavioural interventions as well as improvements in objective ratings of clinical skills and intervention delivery based on independent external ratings. A summary of the PBS+PLUS project implementation pathway is provided below in Figure 2.

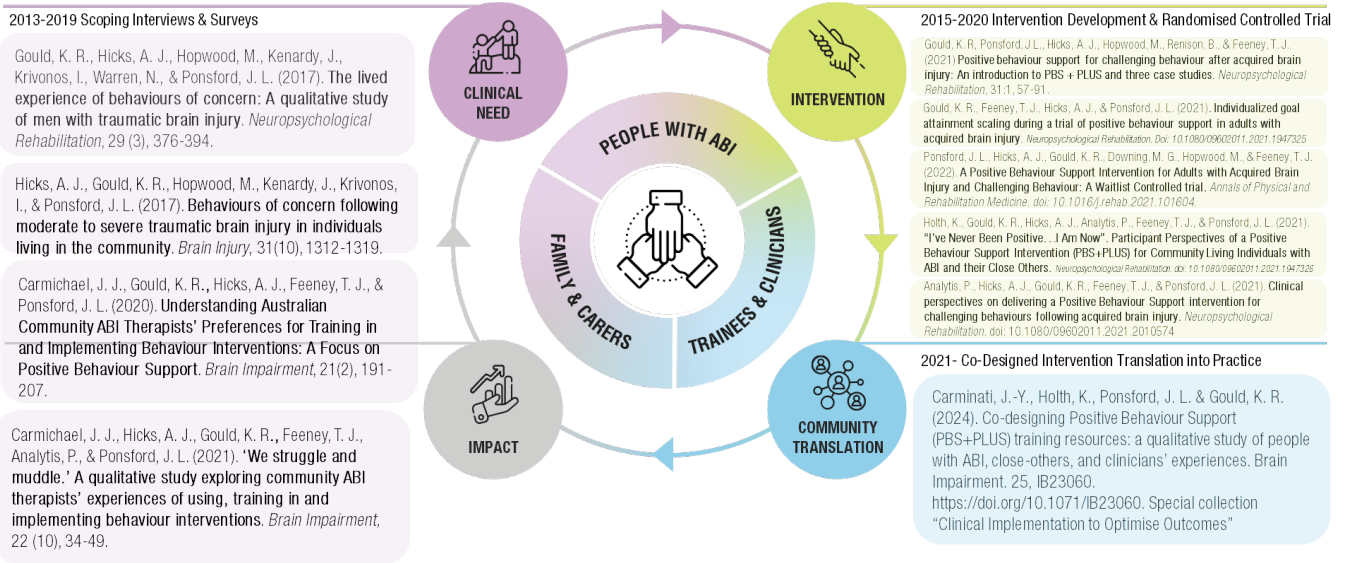


Figure 2. PBS+PLUS Implementation Pathway and Related Publications

The Intervention: PBS+PLUS

PBS+PLUS is a non-prescriptive, multi-component and holistic approach, designed to be transdisciplinary (i.e., transcending the traditional boundaries of clinicians' respective disciplines) and delivered by skilled therapists in collaboration with the person with ABI and the everyday people in their lives (Gould et al., 2021a). It is underpinned by the premise that individuals with ABI will be motivated to improve their behavioural self-regulation when it is associated with achieving meaningful outcomes.

PBS+PLUS is aligned with the PBS approach as described by Carr et al. (2002) and outlined in Gould et al. (2021a). Briefly, this alignment is reflected in the Foundational Principles of PBS+PLUS, where PLUS is an acronym for Person driven; Learning together; Uniting supports; and Skill building (Gould, et al., 2021a). Refer to Figure 3 for a summary of the PBS+PLUS approach.

A Flexible Framework is used to guide individuals to identify and evaluate progress towards meaningful outcomes and improved quality of life, in a process which is client-driven and encourages client autonomy. PBS+PLUS includes common PBS practices (e.g., environmental modification, antecedent strategies, behaviour analysis, positive behaviour momentum whereby easy tasks with a guaranteed high level of success are introduced before difficult tasks). In addition, complementary tools for implementing PBS within the ABI population are incorporated to address ABI-related cognitive-executive impairments (e.g., reduced insight, increased impulsivity) which contribute to the challenging behaviours and impact on the implementation of the PBS approach. These strategies include a non-prescriptive Strategy Menu based on the work of Ylvisaker and Feeney (1998) and specific cognitive-executive capacity-building and self-regulatory procedures including development of a positive-integrated post-injury identity, self-regulation scripts and meaningful projects (Gould, et al., 2021a).

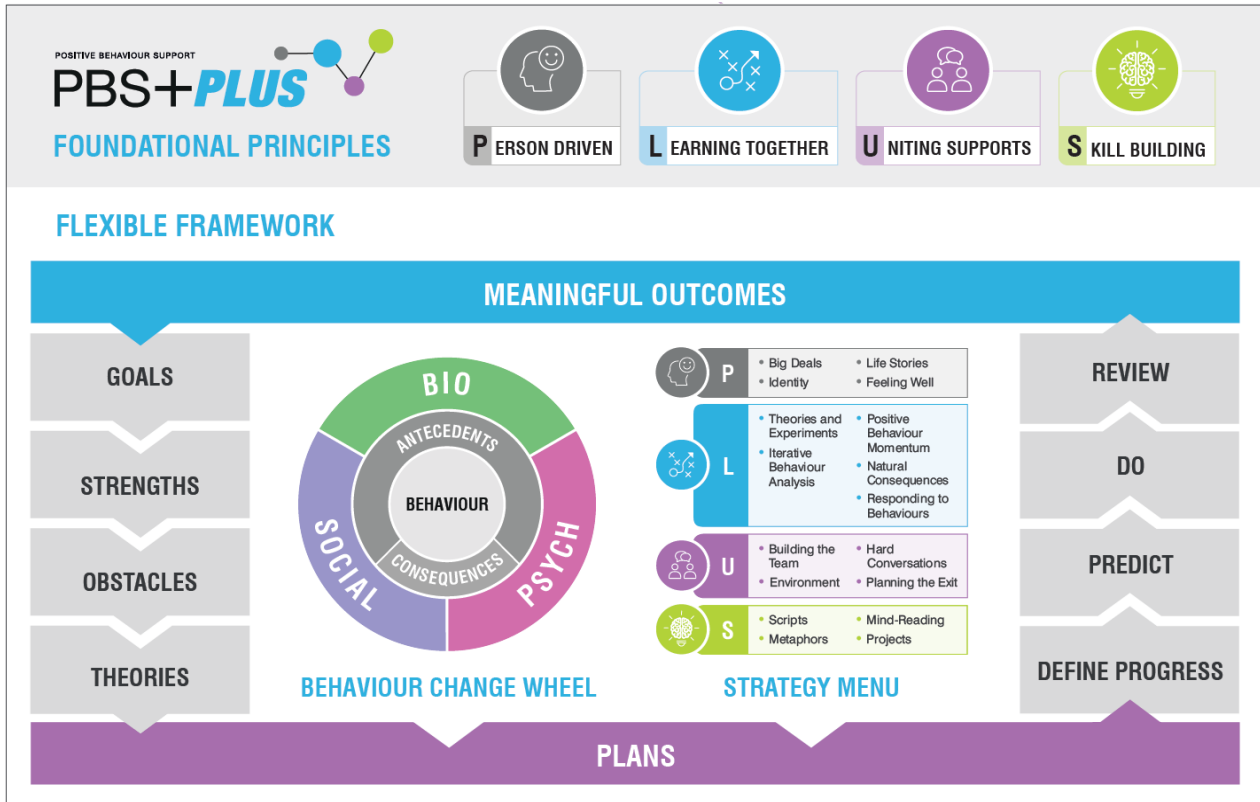


Figure 3. PBS+PLUS Approach

Both formal supports (i.e., therapists) and natural supports (i.e., CO) are involved in the intervention using a mentoring/coaching model (Carr et al., 2002; Feeney et al., 2001; Feeney, 2010a). The long-term goal is to enable individuals with ABI to succeed with predominantly natural supports, promoting enduring maintenance of gains (Carr et al., 2002; Feeney, 2010a).

The components of PBS+PLUS are not unique to this approach and the PBS and ABI strategies are used elsewhere. However, bringing these components together into one approach offers a different direction in behaviour management within the ABI context. This direction is non-prescriptive, individualised and client-driven, rather than client-centred as seen in other behaviour management approaches, and interventions are collaboratively designed with a focus on improving quality of life to address challenging behaviours. As such, PBS+PLUS may present a change from clinicians' usual practice (Feeney, 2010a). Consistent with this departure from typical practice, only 15.67% of respondents in a recent survey of Australian clinicians rated improving quality of life as an important approach to addressing challenging behaviours (Carmichael et al., 2020a). Furthermore, the extent to which PBS+PLUS is person-driven may also represent a change in clinical practice that is challenging to implement (Analytis et al 2021).

Clinical Training Setting

A twin-stream approach to clinical training was developed, encompassing introductory and intensive streams.

Introductory Training

One full day introductory training workshop was conducted for all SABIRS neurorehabilitation clinical staff (Figure 4). This was provided in person locally and video-recorded for the benefit of future staff, with an option to provide this as a virtual session if covid-19 restrictions prevented face to face training.

The workshop aimed to provide clinical staff with an introduction to the key clinical concepts of the PBS+PLUS approach. Training was delivered by Dr Kate Gould and experienced neurorehabilitation clinicians from the RCT: Nadine Holgate, Dr

Belinda Renison and Dr Kim Trezise. This enabled attendees to build on team understanding regarding essential intervention concepts and build capacity for all team members to broadly understand and reinforce/support approaches in clients' programs (designed by those who participated in intensive training). All attendees were also provided with a detailed and practical co-designed clinical intervention guidebook and access to the Relentless Optimism podcast to enable them to expand their depth of understanding of PBS+PLUS strategies.



Figure 4. Photos of the project team in Adelaide (L-R: Liz Williams, Kate Gould, Jao Carminati, Kim Trezise, Nadine Holgate and Belinda Renison) and the introductory workshop.

Intensive Training

In addition to attending the introductory workshop and receiving clinical guidebook, attendees of the intensive training engaged in a more intensive online synchronous program. This was open to a small group of key interested experienced SABIRS clinicians from a range of disciplines including (but not limited to) clinical psychology, neuropsychology, occupational therapy, speech and language therapy, social work and nursing. Selection of appropriate staff was undertaken by SABIRS project lead Liz Williams to ensure that staff were likely to be able to undertake the training and continue to implement the approach longer-term.

The intensive trainees participated in further education, training and consultative support. They were guided through the training program, guidebook and resources. The focus on intensive training sessions was to discuss applying PBS+PLUS to active cases to build learning and capacity, as well as form a sustainable community of practice. This group received clinical supervision from Dr Kate Gould and the clinical research team. The intensive training involved approximately 12 x 1.5hr fortnightly group training and case discussion sessions and 1.5hr self-paced online training per fortnight (i.e. approximately 36 hours over 6 months). Two booster supervision sessions were provided two months after the intensive training ended (3 hours).

Mixed Multiple Baseline Single Case Experimental Design

This design was selected as it accommodates interventions with slow/delayed changes and no expected washout. In multiple baseline designs (MBD), the intervention is introduced sequentially to different patients or settings or behaviours. MBD can be viewed as multiple AB designs, with as many AB designs as there are target patients, settings or behaviours. This methodology has previously been used to demonstrate reduction in challenging behaviours using PBS (Feeney, 2010b).

Participants

Clinician Participants

Participants in the study were neurorehabilitation clinicians from the South Australian Brain Injury Rehabilitation Services (SABIRS; inpatient and outpatient/community teams) and a small selection of invited local private service providers, who took part in introductory clinical training in PBS+PLUS. A subgroup of experienced clinicians were invited to participate in the intensive training stream. Eligibility criteria for the intensive training stream included at least 3 years' experience in neurorehabilitation, and at least 1 client with ABI and close other within their caseload who presented with challenging behaviours.

Close Other Participants

Each clinician participating in the intensive training stream was asked to identify a suitable client with ABI and challenging behaviours and close other (CO) dyad (e.g. available family member or carer) for whom they would implement the collaborative PBS+PLUS intervention. After discussing the project with the person with ABI and CO, the clinician obtained consent to provide their contact details to the researcher. To circumvent any undue pressure, a research team member, instead of the clinician, invited the person with ABI and CO to participate in the study and obtained their written informed consent.

Participants with ABI

Participants with ABI were asked to consent to data about their injury and treatment being provided to the research team by their clinician and/or close other. In situations in which a close other was unavailable, the person with ABI was contacted by a researcher to complete the measures.

Measures

A brief structured survey requiring approximately 5-10 minutes to complete was used to collect demographic information from all participants, clinical experience variables from clinician participants, and injury information from CO or ABI participants. Self-ratings of knowledge, confidence and skills in behaviour interventions were also collected.

Challenging Behaviour Self-Efficacy Scale (CBSES)

The CBSES, originally developed to measure self-efficacy in managing challenging behaviours in children with autism (Hastings & Johnson, 2001), was used as the primary outcome to assess the self-efficacy of clinicians and COs in addressing the challenging behaviour of participants with brain injury. It involves rating 5 items on a scale from 1 to 7, with 1 representing less self-efficacy and 7 more self-efficacy (e.g., How confident are you in dealing with the challenging behaviours of the person with brain injury? 1=not at all confident, 7=very confident; To what extent do you feel that the way you deal with the challenging behaviours of the person with brain injury you care for has a positive effect? 1=no positive effect at all, 7=has a very positive effect). Item 2 (How difficult do you personally find it to deal with the challenging behaviours of the participant with brain injury) was modified for clinicians to also subsume 'professionally' instead of only 'personally'. This scale has shown good reliability, with Cronbach's alpha > 0.90 (Hastings & Johnson, 2001), and has detected significant group interaction effects and sustained gains in our RCT (Ponsford et al., 2022). The CBSES measure takes approximately 3 minutes to complete.

Overt Behaviour Scale (OBS)

The OBS was a secondary outcome measure completed by COs or people with ABI regarding the behaviours of the participant with ABI. The OBS is a 34-item measure of challenging behaviour occurring within the previous 3-months (Kelly et al., 2006). It encompasses verbal aggression, physical aggression (against objects, self and others), inappropriate social and sexual behaviours, perseveration, wandering/absconding, and lack of initiation, each rated by using objective numerical criteria for severity, frequency and impact. The Clinical Weighted Severity score (CWS; sum of severity levels; range 0–84) was selected as the secondary measure. The OBS demonstrates good concurrent and convergent/discriminant validity, strong inter-rater reliability ($r=0.97$), and stability (duration 1 week, $r=0.77$). The OBS has demonstrated responsiveness to change following interventions in adults with ABI (Kelly et al., 2006; Ponsford et al., 2022).

Goal Attainment Scaling

GAS (Kiresuk & Sherman, 1968) is an ordinal outcome measure assessing individualised goal achievement. GAS quantifies achievement of rehabilitation goals by assessing within-subject longitudinal change with reference to predetermined criteria created specifically for each goal (Martin et al., 2000; Turner-Stokes, 2009). GAS has five levels with values ranging from (-2 Much less than expected outcome, to +2 Much greater than expected outcome). Clinicians, rather than an independent researcher, were involved in setting and reviewing goals with the participant with ABI and COs, as these tasks are considered an integral part of the intervention (Marson et al., 2009; Wheeler, 2014). GAS has excellent sensitivity to change and high inter-rater reliability (Hurn et al., 2006; Krasny-Pacini et al., 2013). ABI rehabilitation studies using GAS indicate promising reliability, feasibility and concurrent validity (Bouwens et al., 2009; Joyce et al., 1994; Malec, 1999; Rockwood et al., 1997; Turner-Stokes et al., 2009). In our RCT, we found that participant goals focussed on a range of behavioural, psychological, interpersonal and functional areas (Gould et al., 2022). Following 12 months of PBS+PLUS, 84.6% of goals were achieved and 53.3% exceeded their expected outcome.

Independent Expert Rater Session Review

With participant consent, treatment sessions from the start and end of the intensive training period were audio- and video-recorded and used to evaluate treatment fidelity. Treatment fidelity was assessed by an independent speech therapist with 21 years' experience in ABI rehabilitation and PBS (MC). MC independently rated session integrity (presence or absence of 20 PBS+PLUS components; e.g., identify or review valued outcomes with the individual) and quality (rated 1–10) by reviewing session videos and audio recordings from at least four sessions for each clinician (ensuring that 20% of sessions are reviewed in line with treatment adherence rigour (RoBiNT Scale; Tate et al., 2013). This methodology was utilised in our RCT for a random sample of 100 session recordings, in which we found a mean of 66% (SD 14%, range 30–90%) of the 20 integrity items were included in each session, and mean session effectiveness was rated as 8.61/10 (SD 0.98, range 6–10). Results of the session ratings were discussed with clinicians to enable them to improve treatment fidelity in response to feedback.

Qualitative Interview

A one-off semi-structured qualitative interview was undertaken with clinician participants who completed the intensive program to explore their perceptions of the training received, their experiences, facilitators and obstacles to implementing the training into clinical practice, their recommendations for future training and intervention translation, and explore burden of the research component for feasibility of future implementation evaluations. Researchers conducted the interview at a time and platform (phone or video call) of their choice. The interview was audio-recorded to enable transcription.

Procedures

Recruitment

Participants (Clinicians, COs, people with ABI) were invited to take part in the study by research staff. Clinicians were provided with a written explanatory statement and consent form as part of the emailed advertisement regarding the two training streams. They had the opportunity to discuss the study with a senior researcher. If they agreed to take part, written informed consent was obtained. Clinician participants who did not consent to the research were still able to participate in the training. For COs and participants with ABI, following their approval, the researcher contacted them via their preferred method (e.g. phone, email, teleconference) to discuss the study, provide a copy of a plain language explanatory statement and obtain their written or recorded verbal consent to take part. Individuals with ABI and COs were informed that they may still receive the PBS+PLUS treatment from their clinician if they choose not to participate in the study.

Data Collection

Please refer to Figure 5 which summarises the measures planned to be collected at each time point for each group. Further details are provided below. All research measures were collected by a researcher team member who was independent of the training program delivery.

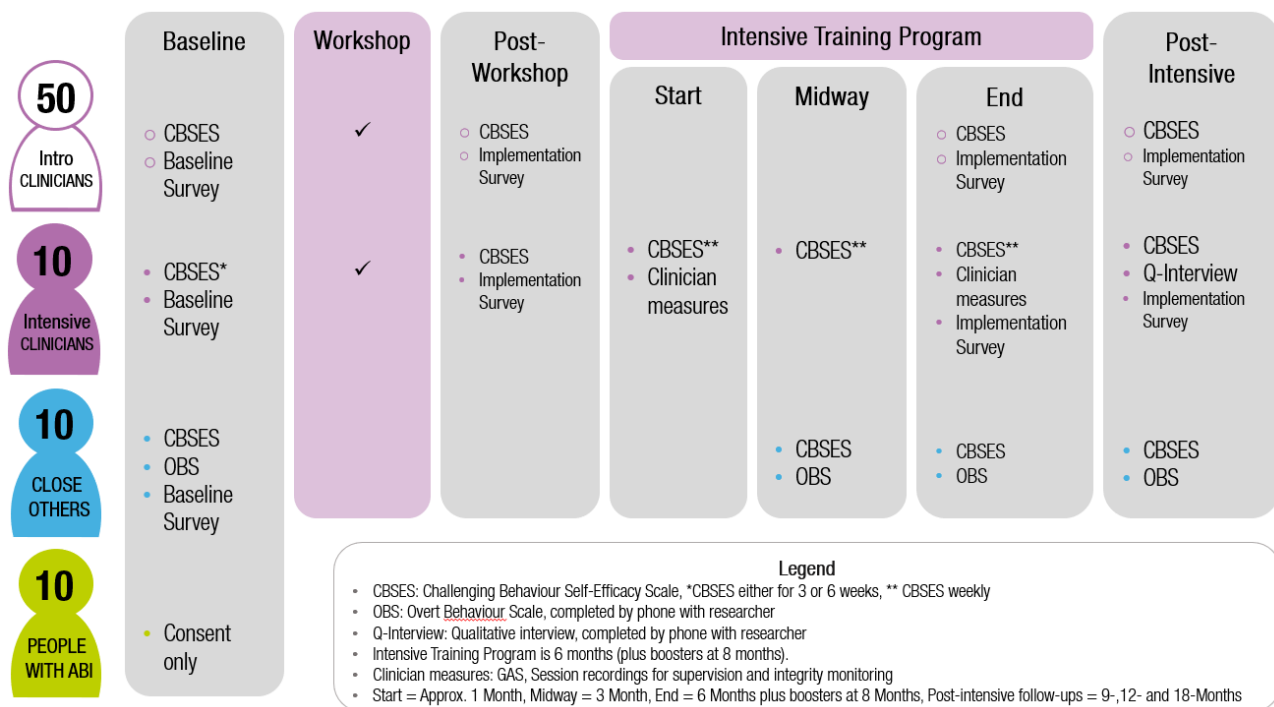


Figure 5. Measure collection for each group during study

Baseline

All participants (Introductory and Intensive Clinicians, COs, people with ABI) completed a baseline assessment which encompassed a brief demographic survey and relevant additional information prior to engaging in the training or the intervention. The CBSES was also collected via an online survey portal from clinicians. Using the SCED protocol, a multiple baseline design was used in which Intensive Clinicians repeated the CBSES weekly for a randomised number of weeks of 3 or 6 weeks before starting the intervention. CO and/or ABI participants completed the CBSES and the OBS via a 30-minute phone call with a researcher.

Intensive Training Stream

Intensive Clinicians repeated the CBSES (online, five-items) during the training period. Within the PBS+PLUS initial sessions clinicians were asked to collaboratively develop and collect GAS goals with the participant with ABI and CO as part of the intervention. They were asked to audio or video record two intervention sessions at the start and end of the training. A brief

session log was to be completed by clinicians to record delivery of the intervention. GAS outcomes were collected again by clinicians at the end of the training period. Researchers completed a mid- and end of training OBS and CBSES with COs via an approximately 30-minute phone call.

Follow-Up

Introductory and Intensive Clinicians were invited to repeat the online CBSES and self-ratings of behaviour intervention knowledge skills and confidence, as well as answer a brief series of questions rating the introductory workshop and indicating their practical implementation of PBS+PLUS in the two-weeks following the workshop. With the exception of the workshop-ratings, these measures were collected again at 9-, 12- and 18-months.

After completing the training, Intensive Clinicians were invited to participate in an optional one-off qualitative interview conducted by the researchers over the phone or video call. Researchers completed the OBS and CBSES with COs via a 30-minute phone call at 3-, 6-, 9-, 12- and 18- months.

Data Analysis

Descriptive information regarding the participants was summarised. SPSS v25 and STATA v18 were used for data cleaning, to compute variables and examine descriptive frequency data. Independent sample t-tests were used to examine differences between introductory and intensive groups across CBSES and PBS+PLUS competency measures at each time point. The percentage of missing data for each measure was examined.

As part of the mixed multiple baseline design SCED (MBD), each participant/outcome was plotted as its own time-series on a graph by study intervention week. Clinicians' self-ratings on the CBSES were graphed using GraphPad Prism (Version 10). Visual interpretation of individual findings followed recommendations by (Krasny Pacini & Evans, 2018) and established guidelines whereby both within- and between-phase analyses assessed the stability, level and trend of the data (Lane & Gast, 2014). The split-middle method was used to examine linear trend. This was created for the baseline phase and subsequently projected into the training phase, with a stability envelope around the trend. To assess for statistical significance, the Tau-U statistic was used. It is ideal for small datasets as it accounts for trends in the baseline phase as well as autocorrelation (Vannest, 2018). As Tau-U values generate an effect size, values below 0.20 suggested small change, 0.20-0.60 medium, 0.61-0.80 large, and greater than 0.80 large to very large change between phases (Vannest & Ninci, 2015). An online calculator was used to conduct Tau-U analyses: <http://www.singlecaseresearch.org/calculators/tau-u>.

To quantify the intervention training effectiveness, the mean difference between the intervention and the baseline measurements was the test statistic, utilising the Monte Carlo random sampling procedure.

GAS data was summarised and raw scores reported (Ruble et al., 2012). A final average GAS outcome score for each participant was determined by computing the mean across all goals (Ruble et al., 2012).

Expert independent session analysis ratings, attendance and pre-post self-ratings of implementation were summarised and descriptively analysed.

Qualitative interviews were transcribed, checked for accuracy, and analysed using a six-stage iterative thematic analysis to produce an understanding of the key themes and create a visual thematic map (Braun & Clarke, 2006; 2022). Multiple research team meetings were held with researchers KG, JP, JC and AC to explore, generate and reflect on themes and the thematic map.

Results

Introductory Workshop: Quantitative Evaluation of Introductory Workshop Summary

Clinician Demographics

78 clinicians participated in the PBS+PLUS training. Most clinicians (n=64, 82%) completed the introductory workshop only, while 14 continued as intensive trainees (Figure 6).



Figure 6. Training participant numbers

58 clinicians completed the baseline survey. The mean age of participants was 43.45 years (SD=11.84, range 24-72), and the majority were female (n=51, 88%). Most clinicians held a Bachelor's degree (n=26, 45%). As seen in Figure 7, the predominant professional backgrounds were occupational therapy (n=14, 24%), speech pathology (n=11, 19%), physiotherapy (n=8, 14%), and psychology (n=7, 12%).

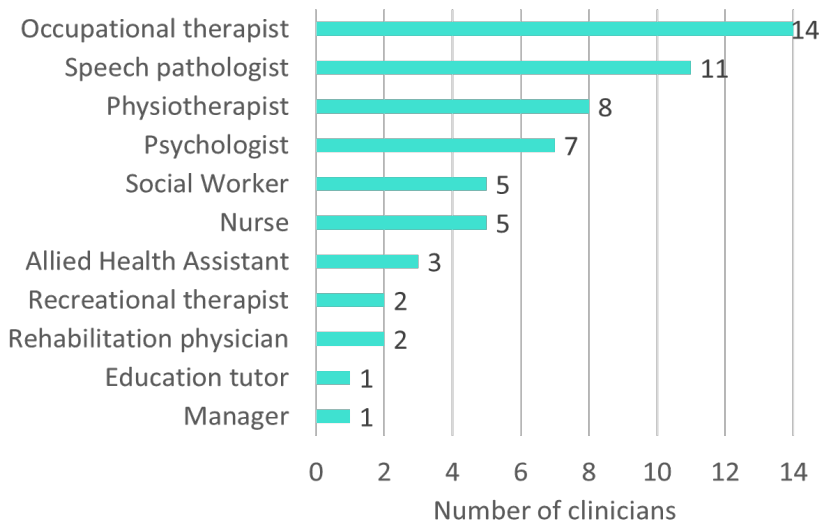


Figure 7. Professional roles of clinicians.

Clinicians primarily worked in general community settings (n=27, 47%), outpatient rehabilitation centres and inpatient rehabilitation centres (n=22, 38%). All participants worked in metropolitan areas, with many also working online (n=26, 45%) and in rural locations (n=14, 24%).

Clinician experience ranged from 1 year to 50 years (mean=11.48, SD=10.29), with most practitioners having 1-4 years of experience (28%), followed by equal proportions having 10-19 and 20+ years of experience (25%).

On average, clinicians reported that approximately 34% of their clients with an ABI experienced challenging behaviours, with most practitioners reporting rates between 10-25%.

Introductory Workshop Follow-Up Survey Completion

As shown in Figure 8, baseline data indicated strong initial engagement, with excellent response rates observed early in the process—95% following the workshop and 81% after the intensive training phase. As anticipated, there was a natural decline in participation at the longer-term follow-up points.

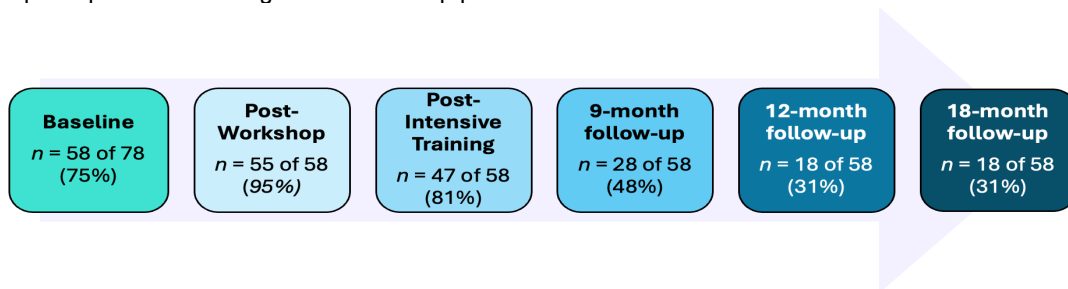


Figure 8. Recruitment flow chart across time points

Clinician Perspectives on the Introductory Workshop

Clinicians endorsed the workshop as high-quality (91%), informative (91%), relevant (82%), clear (93%) and engaging (84%), delivered by knowledgeable presenters (96%).

Challenging Behaviour Self-Efficacy Scale (CBSES)

The workshop produced an immediate, statistically significant improvement in challenging behaviour self-efficacy, with total CBSES scores increasing by 16.4% (3.16 points) from baseline (19.22) to post-workshop (22.38). This improvement was maintained and enhanced over time, with scores increasing by 26.6% (total increase of 5.12 points from baseline) to reach 24.34 at 18-month follow-up.

PBS+PLUS Self-Rated Competence

The workshop produced an immediate 38% increase (1.78 points) in PBS+PLUS self-rated competency scores from baseline to post-workshop, with scores improving from 4.77 to 6.55. This improvement was enhanced over time, with scores increasing 43% to reach 6.83 at 18-month follow-up.

Impact of PBS+PLUS Introductory Workshop on Practice

First, clinicians successfully and consistently integrated the PBS+PLUS approach into their practice, with high self-reported implementation rates (up to 79% at the 12-month follow-up) across both current and new clients throughout the follow-up period. Clinicians also reported consistently assessing the suitability of clients that came through their service for PBS+PLUS.

Second, clinicians reported widespread, long-term collaboration and knowledge sharing. For example, 12 months post-workshop, 68% of clinicians reported still discussing PBS+PLUS with colleagues, and a third of intensive trainees reported mentoring a colleague about PBS+PLUS.

Third, clinicians actively engaged with multiple PBS+PLUS resources up to 18 months post-workshop, with strongest utilisation of the intervention guidebook (up to 74%), workshop content (consistently ~50%), supplementary handouts/templates (up to 57%), and the Relentless Optimism podcast (up to 43%).

Fourth, clinicians demonstrated ongoing commitment to professional development, with almost half of the clinicians seeking additional PBS+PLUS resources by 12 month follow-up and pursuing broader knowledge about behavioural interventions. Overall, there was a pattern of stronger and more sustained implementation in clinicians who completed the intensive training.

Taken together, these findings suggest that the workshop led to meaningful changes in clinical practice, with more substantial changes observed among clinicians who completed the intensive training. The enhanced effects seen at later time points may be attributed to knowledge and information being shared or passed on by intensive training clinicians to their colleagues over time.

Clinician Perspectives of Research Feasibility

The methodology was well-received, with over 96% of practitioners finding the surveys easy to complete and approximately 91% agreeing that the questions accurately captured their feedback. Clinicians provided helpful suggestions for improvement, particularly about reducing the length, frequency, and timing of the surveys. Clinicians reported that these factors made follow-ups more difficult and may have impacted response rates and data quality.

Intensive Training: Single-Case Experimental Design (SCED) Summary

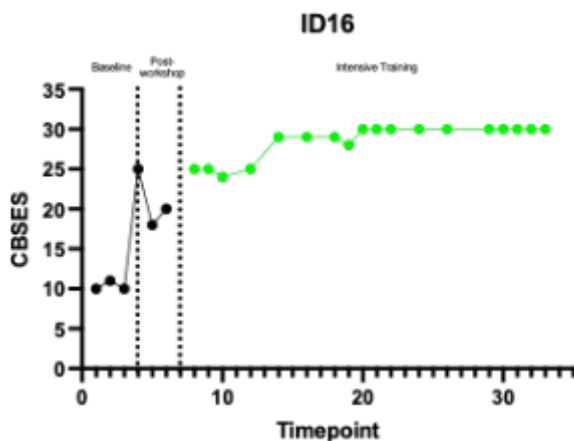
Clinician Demographics

A total of 11 practitioners (n=9 female, 2=male) participated in the study. The mean age of participants was 44.3 years (range from 32 to 60 years). On average, participants had 13.8 years of clinical experience (range from 0.3 to 29 years). The proportion of clients with challenging behaviours in their caseloads ranged from 15% to 50%.

There were two clinicians who commenced the intensive training for 1 month but withdrew due to workload issues. These vacancies were quickly filled by two new clinicians, who completed the remaining intensive program. Otherwise, attendance by the final 11 clinicians in the training was excellent.

Key Findings

A total of 9 out of 11 (82%) intensive clinicians demonstrated mean-level improvements in CBSES scores from baseline to intensive training period. Tau-U analyses showed statistically significant improvements in CBSES scores following the introduction of the intensive training period after baseline for 4/11 (36%) intensive clinicians. An example SCED is shown below, indicating significantly improved self-rated efficacy in addressing challenging behaviours during the intensive training.



There were challenges in using the CBSES as a repeated measurement in a SCED study. Participants were asked to rate their levels of self-efficacy in managing their clients' challenging behaviours every week. Levels of self-efficacy may fluctuate depending on several factors, and the CBSES was not designed to be used on a weekly basis. In addition, there was variability in the level of completeness of data, with some individuals providing limited data. It may be more beneficial to cautiously interpret these SCED results alongside other data presented throughout this report.

Intensive Training: Treatment Integrity

All 11 practitioners submitted session recordings for evaluation by an independent expert (MC), with a total of 30 sessions reviewed (n=24 videos, n=6 audio files). Of these 30 sessions, the following PBS+PLUS components were present (Table 1). All 11 clinicians also submitted records with self-ratings of their own delivery of PBS+PLUS, with 91 records in total. Self-rating of PBS+PLUS delivery was generally similar or lower in frequency compared with external ratings (Table 1).

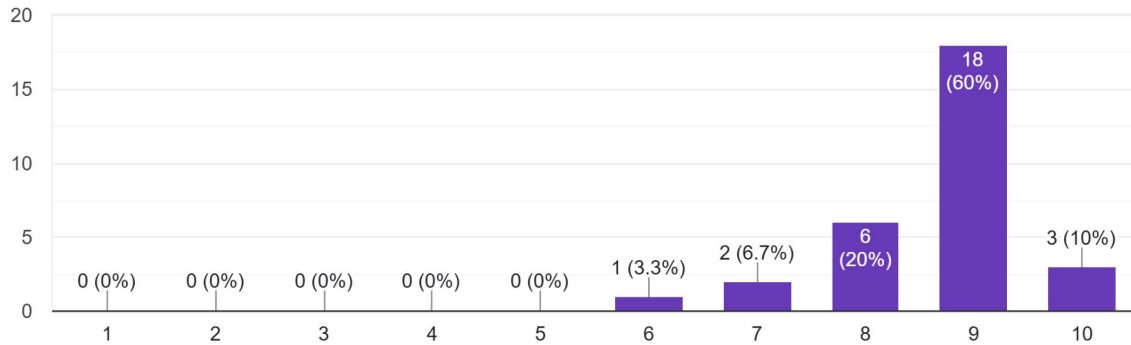
Table 1. PBS+PLUS Treatment Integrity based on external and self-ratings

PBS+PLUS Component	External Rater (%)	Self-Rating (%)
Meaningful Outcomes	96.7%	91.2%
Flexible Framework	93.3%	75.8%
Building the Team	40%	36.3%
Planning the Exit	56.7%	39.6%
Iterative Behaviour Analysis	70%	52.7%
Theories & Experiments	73.3%	62.6%
Theory of Mind	60%	37.4%
Antecedents	93.3%	63.7%
Positive Behaviour Momentum	76.7%	52.7%
Self-Regulation Scripts	66.7%	42.9%
Metaphor	33.3%	28.6%
Immediate, Natural & Logical Consequences	83.3%	38.5%
Hard Conversations	26.7%	13.2%
Environmental Modification	90%	52.7%
Living & Feeling Well	100%	70.3%
Identity	36.7%	29.7%
Projects	20%	29.7%
Life Stories	0%	2.2%

Session effectiveness was generally rated highly ($m=8.67$, Range: 6-10) by the external rater (Figure 9a) and somewhat lower according to self-ratings ($m=7.27$, Range: 5-9, Figure 9b). Clinicians also asked clients to rate session effectiveness, finding a similar distribution of scores to their own ratings ($m=7.37$, Range: 4-10, Figure 9c). There were noted to be the highest proportion of 10/10 rated sessions according to client's reports (15.7%).

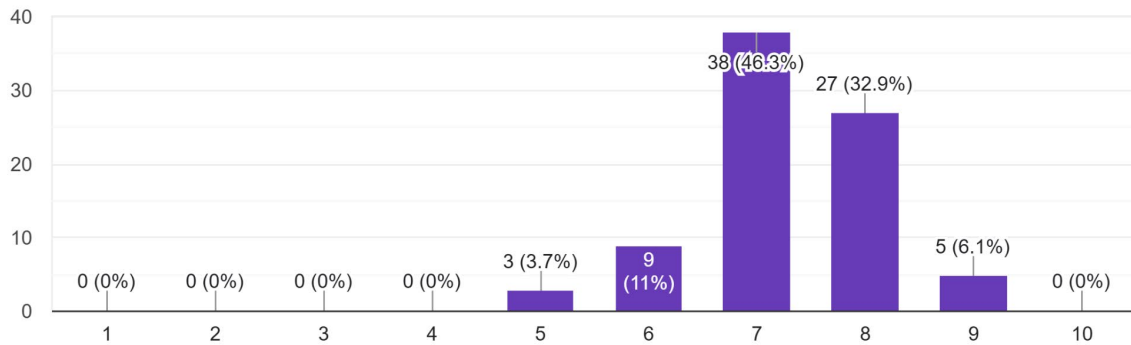
External-Rating: How effective do you think session was? (1-10)

30 responses



Therapist Self-Rating: How effective do you think session was? (1-10) Guide: 1 - not helpful; 3 - only a little helpful; 5 - somewhat helpful; 7 - quite helpful; 10 - Extremely helpful

82 responses



Participant Self-Rating: How effective do you think today's session was? (1-10) This could be done with the person with ABI, or a close other, or a team ...at helpful; 7 - quite helpful; 10 - Extremely helpful

51 responses

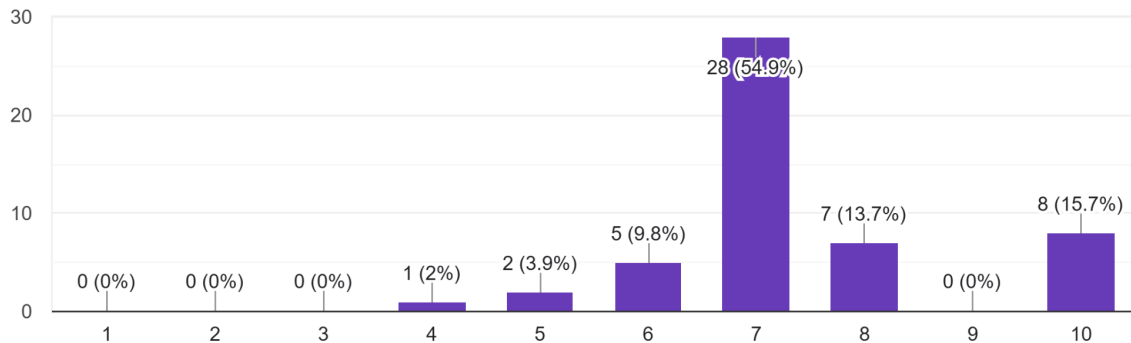


Figure 9. Ratings of PBS+PLUS session effectiveness according to an expert independent rater (9a), treating clinician (9b) and client participant (9c).

Intensive Training: Qualitative Findings

All intensive trainees (n=11) and clinicians who delivered the intensive training (n=4) took part in one-on-one qualitative interviews.

Overall, trainees reported that the intensive program was positive and beneficial to themselves and the broader service. Participants liked the supervision session content, structure, group size, duration, and frequency. All participants provided positive facilitator feedback and felt trainers were supportive, practical, and skilled.

Through reflexive thematic analysis, six themes were identified and describe the lifecycle of intensive training participation (see Figure 10).

Relating to the pre-training phase, **“Planting on Familiar Ground”** describes pre-existing knowledge, skills, and beliefs of clinicians. For most, the intensive training program largely *“built on what [they] already knew”* (Audrey, trainee) and consolidated pre-existing knowledge acquired through previous behavioural support training: *“I wasn’t familiar with the PBS+PLUS approach, but...it’s just all clicked as it’s gone along. It’s not felt like necessarily new information, but it’s reinforced my sense or understanding of things”* (Asia, trainee). This contributed to organisational buy-in, whereby clinicians were enthusiastic and committed to the training as it aligned with their existing knowledge and client-focussed approaches.



Figure 10. PBS+PLUS Intensive Training Thematic Map

During the training, participants felt that the PBS+PLUS training was **“Adding to the tool kit”** by learning various strategies that could be used easily with clients: *“I just love its intention of how you work with the person. I know it’s about the behaviours of concern, but I’ve actually found I can use this with all of my clients. I just adapt it. It can be used in so many ways.”*

Learning was maximised through **“The Right Conditions for Growth”**, as trainees reflected that the extended training period of 6-months, opportunity to practice and discuss strategies, and learn with multi-modal resources was vital for their skill development: *“You could think on something, go away and apply it, come back and review how it’s gone”*.

As a result of the training, **“Taking Root Through Shared PBS+PLUS Language”** describes shared language being used and adopted throughout the service and with clients with ABI. The accessible terminology supported collaborative, client-directed care: *“Clients are very responsive to the language or the way you’re working on things. Like instead of goals, you have Big Deals, using more metaphorical language. People really connect with the language”*.

“Bearing Fruit” covers interviewees reflections on the many benefits of the training, including improved confidence and competence in working with their clients and challenging behaviours, working more collaboratively, and connecting the team: *“It helped me grow as a person, as a clinician and challenged me.”*

Finally, **“Branching Out”** speaks to the ongoing implementation of PBS+PLUS beyond the intensive training period. Trainees reported knowledge transfer through teaching other staff within their service about PBS+PLUS and leading procedural changes within their service: *“I have seen PBS+PLUS changing the kind of conversations we have as a broader team. It’s started to even influence some of our service policies and procedures as well.”*

Intensive Training: Client Outcomes

ABI and Close Others Demographics

Measures were completed with 4 participants with ABI via self-report and 3 CO informant reports. Participants completed between 2-5 timepoints, up to 18-month follow-up.

ABI participants who completed self-ratings were four women on average 44 years of age (SD=8.04, range 35-53 years), between 0-3 years following traumatic brain injury (n=2) or stroke (n=2), self-reported to be mild to severe.

CO participants were a mother (n=1), sister (n=1), and wife (n=1), with mean age of 63 years (SD=4.36, range 60-68 years). They responded to measures regarding their persons with injury, who were male, around 40 years of age (SD=3.53, range 29-56 years), and all less than one-year following moderate to severe TBI.

Challenging Behaviours at Baseline (OBS)

On baseline OBS, the most commonly reported challenges behaviours were verbal aggression (77.78%), inappropriate social behaviours (77.78%) and lack of initiation (77.78%). Perseveration (44.44%) and physical aggression (33.33%) were also reported.

Outcomes summary

Mean OBS Clinical Weighted Severity (CWS) score of person with ABI and CO participants (n=7) are shown in Figure 11. A decrease in CWS score was seen from baseline to the end of the intensive training (reduction of 49%), and again at 9-month follow-up (67% reduction), indicating reduced frequency and severity of reported challenging behaviours. This decreased score was generally maintained up to 18-month follow-up.

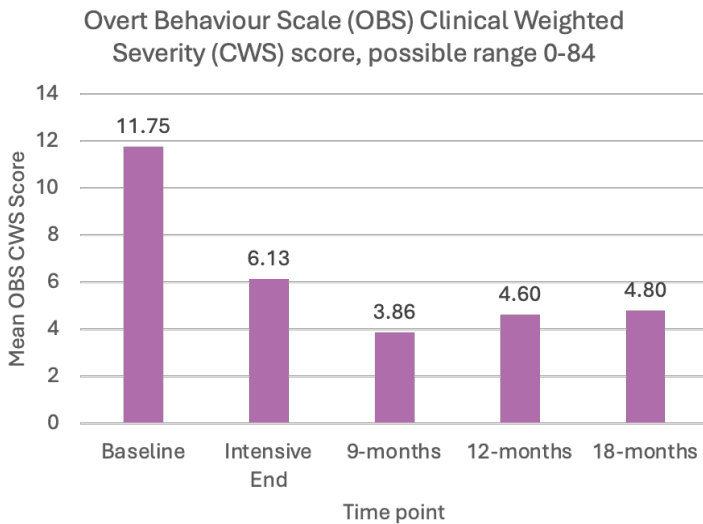


Figure 11. Mean OBS CWS score for client and close other participants

Similarly, Figure 12 shows increased mean CBSES score for ABI and CO participants comparing pre- and post-intensive training, indicating improved self-efficacy in supporting challenging behaviours of approximately 29%. At 9-month follow-up, mean CBSES scores returned to baseline and were generally stable.

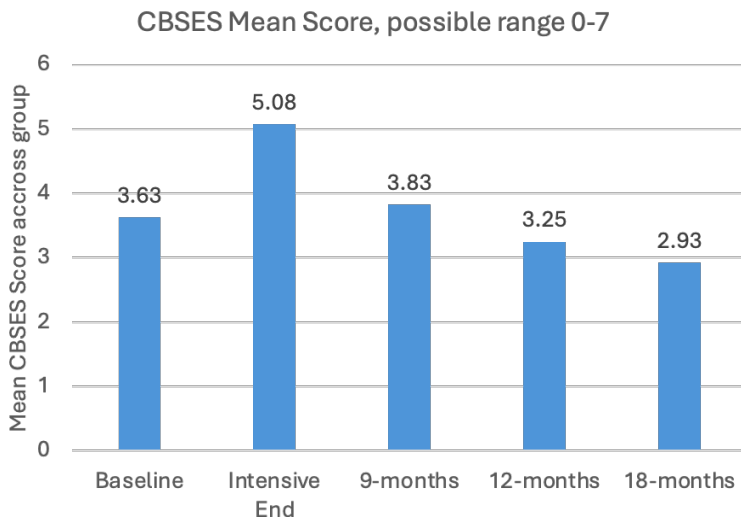


Figure 12. Mean CBSES score for client and close other participants

Goal Attainment Scaling

Intensive clinicians (n=11) set a total of 17 GAS goals with their clients. Of these goals, 13 (76.47%) were reviewed at least once. Level of final achievement ranged from -1 (baseline) to +2 (much greater than expected outcome), with 7.69% (n=1) at -1 (no change from baseline), 46.15% (n=6) at 0 (expected outcome), 30.77% (n=4) at +1 (greater than expected), and 15.38% (n=2) at +2 (much greater than expected). Overall goals met and/or exceeded was 92.3%, with mean GAS level of final achievement was +0.54.

Project Steering Committee

A large steering committee was established at project outset to enable early planning and establishment of subsequent scaling of the program. This included representatives of major national disability stakeholders (e.g. funders, advocates, Brain Injury Association of Australia), private and public services, relevant academics for research oversight, and people with living expertise of brain injury (people with ABI, family). Bi-annual meetings were conducted. The Committee provided strategic advice and support to the project to support its effective delivery and translation planning. One key suggestion that we are in the process of implementing includes transitioning our program to a micro-credential at Monash University.

Membership:

Angela & Darren Bridges (living experience contributors)
Dr Belinda Renison (Integrated Rehabilitation)
Dr Carlo Ziino (VNRS)
Elissa Morriss (ABIOS Princess Alexandra Hospital)
Jacqui Beaty (SA Health)
Kathryn Ayles (Brain Injury SA)
Prof Keith McVilly (Uni Melb)
Dr Lisa Johnston (Epworth)
Liz Williams (SABIRS)
Dr Luke Delaney (Alfred Health)
Marie-Clare Couper (BIAT)

Nick Rushworth (Brain Injury Australia)
Samantha Grant (Inspire Rehab & Psychology)
Sharon Cates (LSA)
Tanya Lancaster (Brain Injury SA)
Dr Alinka Fisher (Flinders University)
Cassie Citroen (TAC)
Dr Erin Leif (Faculty of Education, Monash University)
Russ Fox (Faculty of Education, Monash University)
Janet Wagland (Brightwater Group, WA)
Dr Steve Joncas (Ottawa, Canada)

Translation and Sustainability Plan

Comprehensive translational activities were undertaken throughout the project including national and international conferences, workshops and in-services. Clinician trainers and trainees have also delivered community presentations. A community of practice was established. Four PBS+PLUS manuscripts have been published during the grant period. Findings related to the current project are currently being prepared as manuscripts and will be finalised following project completion and inclusion of additional data sites. LSA funding will be acknowledged as appropriate.

PBS+PLUS Published Manuscripts

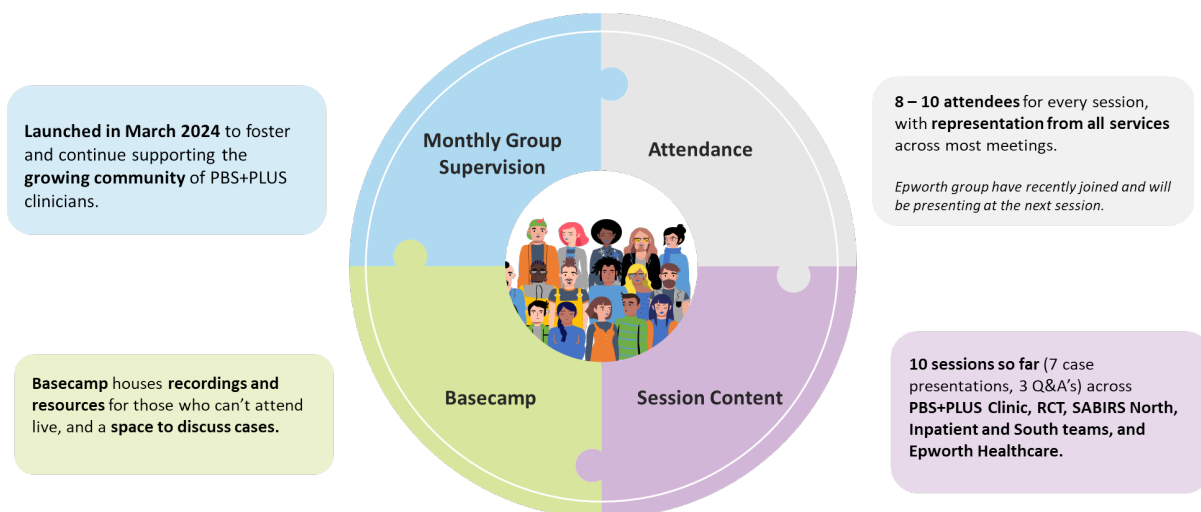
- Ponsford, J. L. Hicks, A. J., Gould, K. R., Downing, M. G., Hopwood, M., Feeney, T. J. (2022). A Positive Behaviour Support Intervention for Adults with Acquired Brain Injury and Challenging Behaviour: A Randomised Controlled Trial. *Annals of Physical and Rehabilitation Medicine*, 65(2), 101604. doi: 10.1016/j.rehab.2021.101604.
- Holth, K., Gould, K. R., Hicks, A.J., Analytis, P., Feeney, T.J., Ponsford, J. L. (2022). "I've never been positive ... I am now". Participant perspectives of a positive behaviour support intervention (PBS+PLUS) for community living individuals with ABI and their close others. *Neuropsychological Rehabilitation*, 32:9, 2411-2428. doi: 10.1080/09602011.2021.1947326
- Analytis, P., Hicks, A. J., Gould, K. R., Feeney, T. J., Ponsford, J. (2023). Clinical perspectives on delivering a Positive Behaviour Support intervention for challenging behaviours following acquired brain injury. *Neuropsychological Rehabilitation*, 33(2), pp281-304. Doi: 10.1080/09602011.2021.2010574
- Carminati, J.-Y., Holth, K., Ponsford, J. L. & Gould, K. R. (2024). Co-designing Positive Behaviour Support (PBS+PLUS) training resources: a qualitative study of people with ABI, close-others, and clinicians' experiences. *Brain Impairment*. 25, IB23060. <https://doi.org/10.1071/IB23060>. Special collection "Clinical Implementation to Optimise Outcomes"

Project Funded Manuscript Plan

- Quantitative Introductory Workshop Evaluation data: inclusion of other site data underway for preparation this year
- Quantitative SCED Intensive and Client Outcomes manuscript: data collection complete and manuscript to be prepared this year
- Qualitative Intensive manuscript: draft complete and to be updated with inclusion of other site data this year
- Quantitative Turner Clinic data manuscript: current honours student undertaking analysis for manuscript preparation 2026

Community of Practice

A community of practice in PBS+PLUS was established in March 2024. This provides a space for clinicians to connect with each other, ask questions and continue to build on their foundational PBS+PLUS knowledge. A case presentation format is used, incorporating a biopsychosocial formulation of challenging behaviours and the flexible framework. Clinicians share completed interventions or seek support from peers for ongoing cases. There are 8 – 10 multidisciplinary attendees for every session, with representation from Monash University PBS Service provisional psychologists, Monash University RCT, and the LSA funded trainees from SABIRS North, Inpatient and South across most sessions. Recent trainees from Epworth Healthcare have recently joined.



PBS+PLUS Conferences and Workshops (2022-2025)

Johnston, L., & Gould, K. R. (2022). What is the potential for PBS+PLUS implementation in Epworth community brain injury rehabilitation settings?: A clinician trainee's perspective. Paper presented at Epworth Healthcare Research Month, Online, 17th October 2022.

Gould, K. R., Carminati, J., & Ponsford, J. (2022). An international transdisciplinary training program for allied therapy students in Positive Behaviour Support: Findings from a pre-post feasibility study. Datablit presented at 19th Neurorehabilitation Special Interest Group of the World Federation of NeuroRehabilitation, Online and Maastricht, The Netherlands, 12th-13th October 2022.

Feeney, T., Ponsford, J., Gould, K. R., Hicks, A., & Holgate, N. (2022): Positive Behaviour Support Following Brain Injury. Full-day workshop presented at the 8th National Brain Injury Conference, Sydney, 28th-30th June 2022.

Ponsford, J., Gould, K. R. & Hicks, A. (2022). "I've Never Been Positive. I Am Now.' Positive Behaviour Support for Adults with Acquired Brain Injury: Results from a Randomised Controlled Trial, Goal Attainment and Participant Perspectives". Paper presented at the 8th National Brain Injury Conference, Sydney, 28th-30th June 2022.

Gould, K., Carminati, J., & Ponsford, J. (2022). An international transdisciplinary training program for allied therapy students in Positive Behaviour Support: Findings from a pre-post feasibility study. Paper presented at the 45th Australasian Society for the Study of Brain Impairment Conference, Online, 5th-7th May 2022.

Ponsford, J., Gould, K., Hicks, A., & Analytis, P. (2022). Positive Behaviour Support for Adults with Acquired Brain Injury and Challenging Behaviours. Paper presented at the 19th International Conference on Positive Behaviour Support. San Diego, California and Online, 13th-16th April 2022.

Chew, K., Ponsford, J., & Gould K. R., (2023). "I desperately need to know what to do." Addressing cyberscams in acquired brain injury (ABI): A qualitative exploration of the experiences and approaches of Australian clinicians and service providers. ePoster presented at Digital Health Week, 7th-9th February 2023. Sydney, Australia and Online. Winner of the ePoster Influencer Award.

Gould, K.R., Analytis, P., Hicks, A.J., Feeney, T.J., Ponsford, J.L. (2023). Perspectives of clinicians on delivering a Positive Behaviour Support intervention for challenging behaviours following acquired brain injury. Paper presented at the International Brain Injury Association of America 14th World Congress on Brain Injury, Dublin, Ireland, 29th March to 1st April 2023. Abstract published in Brain Impairment, <https://doi.org/10.1080/02699052.2023.2247822>

Ponsford, J.L., Holth, K.L.B., Gould, K.R., Hicks, A.J., Analytis, P. Feeney, T.J., (2023). "I've Never Been Positive ... I Am Now". Participant Perspectives of a Positive Behaviour Support Intervention (PBS+PLUS) for Community Living Individuals with ABI and their Close Others. Paper presented at the International Brain Injury Association of America 14th World Congress on Brain Injury, Dublin, Ireland, 29th March to 1st April 2023. Abstract published in Brain Impairment, <https://doi.org/10.1080/02699052.2023.2247822>

Gould, K.R., Feeney, T.J., Hicks, A.J., Ponsford, J.L. (2023). Positive Behaviour Support and Goal Attainment Scaling in Adults with Acquired Brain Injury. Paper presented at the International Brain Injury Association of America 14th World Congress on Brain Injury, Dublin, Ireland, 29th March to 1st April 2023. Abstract published in Brain Impairment, <https://doi.org/10.1080/02699052.2023.2247822>

Ponsford, J.L., Hicks, A.J., Gould, K.R., Downing, M.G., Hopwood, M., Feeney, T.J. (2023). Positive Behaviour Support for Adults with Acquired Brain Injury and Challenging Behaviour: A Randomised Controlled Trial. Paper presented at the International Brain Injury Association of America 14th World Congress on Brain Injury, Dublin, Ireland, 29th March to 1st April 2023. Abstract published in Brain Impairment, <https://doi.org/10.1080/02699052.2023.2247822>

Gould, K. R. & Holgate, N. (2023). How to join the Community of Practice in "PBS+PLUS" – An evidence-based intervention for challenging behaviours after brain injury: Clinician training through co-designed intervention guidebooks, podcasts, workshops and supervision. Presented at the Australasian Society for the Study of Brain Impairment Conference, Darwin, Australia, 4-6 May 2023.

Chew, K., Ponsford, J. & Gould, K. R. (2023). "I desperately need to know what to do." Addressing cyberscams in acquired brain injury (ABI): A qualitative exploration of the experiences and approaches of Australian clinicians and service providers. Presented at the 20th Conference of the Neuropsychological Rehabilitation Special Interest Group of the World Federation of Neurological Rehabilitation, Glasgow, Scotland, 7-9th June, 2023.

Gould, K. R., Carminati, J., Holth, K., & Ponsford, J. (2023) "The person [is]...driving it, making the changes": A qualitative study of the experiences of people with ABI, close others and clinicians in co-designing Positive Behaviour Support (PBS+PLUS) training resources. Presented at the 20th Conference of the Neuropsychological Rehabilitation Special Interest Group of the World Federation of Neurological Rehabilitation, Glasgow, Scotland, 7-9th June, 2023.

Gould, K. R. (2023). Behaviour Change after Acquired Brain Injury. Invited presentation to Synapse Peer Support Group, Online, 31st August 2023.

Gould, K.R., & Holgate, N. (2024). Helping people to identify and progress towards their personally meaningful aspirations following brain injury using PBS+PLUS. How To session presented at the Australasian Society for the Study of Brain Impairment Conference, 2-4 May 2024. Sydney, Australia.

Feeney, T., Ponsford, J., & Gould, K.R. (2024). Evaluating and Implementing PBS+PLUS: an evidence-based intervention for challenging behaviours after brain injury. A WFNR NR SIG sponsored symposium. [Invited 1.5hr Symposium]. Presented at the 13th World Congress for Neurorehabilitation. 22-25 May 2024, Vancouver, Canada.

Gould, K., R. & Caporaso, M. (2024). PBS+PLUS Introductory Workshop. Ottawa Rehabilitation Service. [Invited full day workshop], 29th May 2024, Ottawa, Canada.

Gould, K.R., Holgate, N. & Johnston, L. (2024). PBS+PLUS Workshop Series. Invited in-services. Epworth Healthcare. 28th March, 4th April, 11th April and 18th April, Melbourne, Australia

Gould, K.R. & Trevena-Peters, J. (2024). Problem Solving GAS in Neurorehabilitation. Invited hybrid online in-service for South Australian clinicians (SABIRS and One Rehab), 8th April 2024.

Gould, K.R. (2025). Introduction to PBS+PLUS (Invited full-day workshop), Community Head Injury Resource Services of Toronto (CHIRS), 19th February, Toronto, Canada.

Gould, K. R., Williams, L., Carminati, J., Corso, K., Holgate, N., Renison B., Trezise, K. & Ponsford, J. (2025). A twin-stream model of capacity building positive behaviour supports for brain injury rehabilitation services. Symposium title: Challenging Behaviour after Brain Injury: Practice Innovations in Clinical Neuropsychology. International Neuropsychological Society Annual Meeting, February 12-15, New Orleans, USA.

Milestones

Milestone	Activities	Status
Milestone 1: Project commencement	Grant and partnership agreements signed.	Completed
Milestone 2: Establish project including committees and recruitment	Project establishment including steering committee for key internal, partner, external and consumer stakeholders and ethics submission Invitation and recruitment of clinician participants for introductory workshop (40 intro only, 10 intro plus intensive)	Completed
Milestone 3: Data collection	Collection of baseline data for both clinician groups (randomised multiple baselines for intensive group only)	Completed
Milestone 4: Data, Workshop and Intro group	Invitation, recruitment and collection of baseline data for 10 ABI and 10 CO participants Delivery of introductory workshop Follow-up survey of intro group	Completed
Milestone 5: Data collection	Collection of initial GAS data by clinicians and OBS by researchers (1 month after start of intensive training)	Completed
Milestone: 6 Training Program/ collection of OBS	Delivery of 24-week intensive training program (June to October 2023) Collection of OBS by researchers at end of training	Completed
Milestone: 7 Training sessions	Booster supervision/training sessions	Completed
Milestone: 8 Progress Report	Follow up data collection (3 Months after end of training)	Completed
Milestone: 9 Data	Follow up data collection (6 Months after end of training)	Completed
Milestone: 10 Data collection	Qualitative data collection	Completed
Milestone: 11 Progress Report	Follow up data collection (12 Months after end of training) Data cleaning and analysis	Completed
Milestone 12: Final Report	Preparation and submission of two journal articles Submission of findings for conference presentation Presentation of findings to South Australian Brain Injury Rehabilitation Service Preparation of final project report	Completed Completed In progress Completed
Final acquittal and consumer summary	Due 3 months after project completion.	In progress

Issues Encountered and Risk Management

There were no significant issues or risks encountered.

Financial Acquittal

Please refer to the financial acquittal report for details on the budget and expenditure.

Summary and Conclusions

Challenging behaviours are an area of significant impact on the lives of people with brain injury and the people who support them. Having effective, understandable and sustainable means to help people self-regulate behaviour and positively rebuild their lives after brain injury are crucial. PBS+PLUS is an approach with established efficacy and acceptability. This project aimed to upskill South Australian neurorehabilitation clinicians in PBS+PLUS to enhance service delivery and improve client outcomes. A twin-stream training model, combining an introductory workshop for broader staff, and an intensive six-month program for selected clinicians was trialled to examine feasibility and effectiveness.

Each of the three objectives of this research program were met during the project.

Objective 1. Determine the impact of intensive training on improving outcomes for clients with ABI and clinical skills through measuring changes in self-efficacy in behaviour management of clinicians and close others, objective challenging behaviours of clients with ABI using a multiple baseline single-case experimental design, and via pre-post clinical session analysis by expert independent raters.

Based on quantitative and qualitative data from clinicians (Introductory and Intensive) and lived experience (people with ABI, family) the PBS+PLUS twin stream training program has been broadly effective in increasing clinical competency and improving client outcomes. We found:

- Reductions in challenging behaviours in clients with ABI evaluated using the Overt Behaviour Scale. behaviour severity reduced by almost 50% in 7 clients whose clinicians underwent the PBS+PLUS intensive training, which improved to a 67% reduction by 9 months.
- Improved quality of life and achievement of personally meaningful goals for people with ABI who receive treatment from clinical trainees, evaluated using Goal Attainment Scaling. Over 92% of individual goals were met and/or exceeded for people with ABI whose clinicians were in the intensive training program.
- Increased clinician self-rated competency (43%) and self-confidence (27%) to understand, assess and support individuals and their families/carers experiencing post-ABI behaviour change.
- The effectiveness of clinicians delivering PBS+PLUS was rated highly according to an expert independent reviewer (on average 8.67 out of 10).

Objective 2. Evaluate feasibility of the training model by examining attendance, uptake, costs and qualitative appraisal.

We increased our understanding of the feasibility and scalability of the clinical training model to inform future implementation trials and expansion to a national program. The clinical training program was feasible and acceptable, with high attendance and uptake. Qualitative appraisal was positive. In contrast, the research evaluation paradigm was overly complex, collected superfluous follow-up data, resulting in reduced completion rates. We have now modified the research design to a pre-post and single follow-up method, with further piloting conducted through a funded trial at Epworth healthcare. Future research to continue the clinical training, with simplified research protocols and fewer/more proximal time points

Objective 3. Measure sustainability by examining client outcomes, implementation activities and self-efficacy across follow-ups at 3- and 6-months and 12-months after the training program.

Several measures indicated ongoing improvements in outcomes during follow-up including introductory workshop attendees challenging behaviour self-efficacy, PBS+PLUS self-rated competence, ongoing use of the PBS+PLUS approach, professional development and resources. ABI and CO ratings of behaviour self-efficacy returned to baseline after the PBS+PLUS interventions, but objective improvements in challenging behaviours continued following the PBS+PLUS.

Taken together, these comprehensive findings demonstrate the strengths of the twin stream training model of PBS+PLUS, underscored by a strong relationship with the South Australian Brain Injury Rehabilitation Service and committed clinicians undertaking and delivering the training. The accomplishments and learnings afforded by the generous funding of the Lifetime Support Authority will continue to support the evolution and expansion of this approach to uplifting behaviour intervention skills in the sector. Ultimately, we hope this work continues to improve the lives of people with ABI and those who support them, enabling them to navigate behavioural challenges and access opportunities that promote wellbeing, engagement, and self-determination. It is a privilege that PBS+PLUS can contribute to people with ABI's pursuits in leading meaningful, purposeful lives.

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