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Implementation of activities of daily living retraining for individuals in post-traumatic amnesia

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ABSTRACT

Background. Despite evidence of the efficacy of activities of daily living (ADL) retraining during post-traumatic amnesia (PTA) following traumatic brain injury (TBI), utilisation of this intervention in practice is unclear. Utilising an implementation science framework, the Consolidated Framework for Implementation Research, this study explored efforts to translate ADL retraining during PTA into the clinical practice of occupational therapists (OTs) working in TBI rehabilitation settings across Australia. **Methods.** Participants were 44 OTs who attended a day-long training workshop that included knowledge and skill-based content regarding ADL retraining during PTA. Baseline and post-training ratings were completed including evaluation of workshop utility, and skill and knowledge-based competencies relevant to the intervention. Approximately 2 years later, nine trained OTs and two administrators were interviewed to explore the results of implementing the intervention. **Results.** Overall, the training workshop was rated as being helpful and OT ratings of confidence ($P < 0.001$) and competencies ($P < 0.001$) significantly improved from baseline to post-workshop. At follow-up, thematic analysis of interviews identified themes related to implementing the intervention as it pertains to patients in PTA, OTs delivering the intervention and the organisational context. Various facilitators and barriers to translation were identified. Participants indicated a positive view of the clinical use of the intervention and development of their knowledge and skills, with the intervention benefiting those in PTA. Despite this, factors such as time, resourcing, team training, and rehabilitation-setting processes posed significant barriers. **Conclusion.** Multiple barriers were identified in implementation of ADL retraining during PTA and require consideration to facilitate translation and promote best practice.

Keywords: activities of daily living, barriers, facilitators, implementation, occupational therapy, post-traumatic amnesia, rehabilitation, training, traumatic brain injury.

Introduction

Following a moderate–severe traumatic brain injury (TBI), functional independence in daily activities is commonly impacted (Andelic *et al.* 2012). Despite evidence supporting early rehabilitation to facilitate recovery following TBI (Borg *et al.* 2011), it has been common practice in Australia to delay some elements of active skills training until patients emerge from the period of post-TBI confusion referred to as post-traumatic amnesia (PTA).

PTA is a phase following emergence from coma (Symonds and Russel 1943) characterised by anterograde and retrograde amnesia, delirium, disorientation, global cognitive difficulties, agitation, and sleep disturbance that may last for days, weeks, or longer (Hennessy *et al.* 2021; Ponsford *et al.* 2023). Agitated behaviour and impaired learning capacity are considered to impede early rehabilitation during PTA (Ponsford *et al.* 2014, 2023). However, individuals in PTA can learn via a relatively preserved implicit memory system (Ewert *et al.* 1989; Gasquoine 1991; Glisky and Delaney 1996). This suggests

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potential to benefit from rehabilitation employing procedural and errorless learning techniques. Given independence in activities of daily living (ADL) is commonly impacted following TBI and requires intervention (Giles *et al.* 1997), we investigated the effectiveness of skills retraining during PTA, using procedural and errorless learning (Trevena-Peters *et al.* 2018*a*). This intervention is referred to as PTA ADL retraining hereafter.

We conducted a randomised controlled trial (RCT) evaluating the efficacy of PTA ADL retraining (treatment) as opposed to treatment as usual in which ADL retraining was delayed until PTA resolution (Trevena-Peters *et al.* 2018*a*). The treatment group showed significantly greater improvements in functional independence at PTA emergence and discharge from the inpatient rehabilitation hospital, with trends toward shorter PTA duration and length of stay. The additional stimulation provided by the intervention did not increase levels of agitated behaviour (Trevena-Peters *et al.* 2018*b*). Economic evaluation found that commencing ADL retraining during PTA led to lower healthcare costs, averaging AU$7762 less for each patient due to shorter hospital stay (Mortimer *et al.* 2019). Based on these findings, recent INCOG 2.0 guidelines (Ponsford *et al.* 2023) recommend that individuals in PTA receive ADL retraining that follow procedural and errorless learning principles. Commencing ADL retraining during PTA had not been recommended practice at the time of the RCT findings (Ponsford *et al.* 2014) and the research team made efforts to facilitate implementation of this intervention. To implement this recommendation, the approach needs to be adopted by occupational therapists (OTs) who play a key role in ADL training following TBI and supported by influential stakeholders (Damschroder *et al.* 2022).

On average, there is a 17-year gap between research output and application to practice (Grol and Grimshaw 2003; Morris *et al.* 2011). Implementation science aims to improve this by promoting success in changing practice (Grol and Grimshaw 2003; Leeman *et al.* 2007; Damschroder *et al.* 2009; Colquhoun *et al.* 2014). Damschroder and colleagues' (2009) Consolidated Framework for Implementation Research (CFIR) is a commonly used framework to aid implementation design, processes, and outcome evaluation through consideration of barriers and facilitators. The CFIR offers a menu of interacting constructs, housed within five domains, associated with effective translation of research into practice. As shown in Fig. 1, domains include the: (1) characteristics of the intervention being implemented, (2) outer setting within which an organisation resides, (3) inner setting contexts, (4) individuals involved in the intervention and/or implementation, and (5) implementation process which encourages ongoing appraisal and evolution. Within the implementation process, the final activity is reflection and evaluation of the advancement of implementation utilising quantitative and qualitative feedback (Damschroder *et al.* 2009).

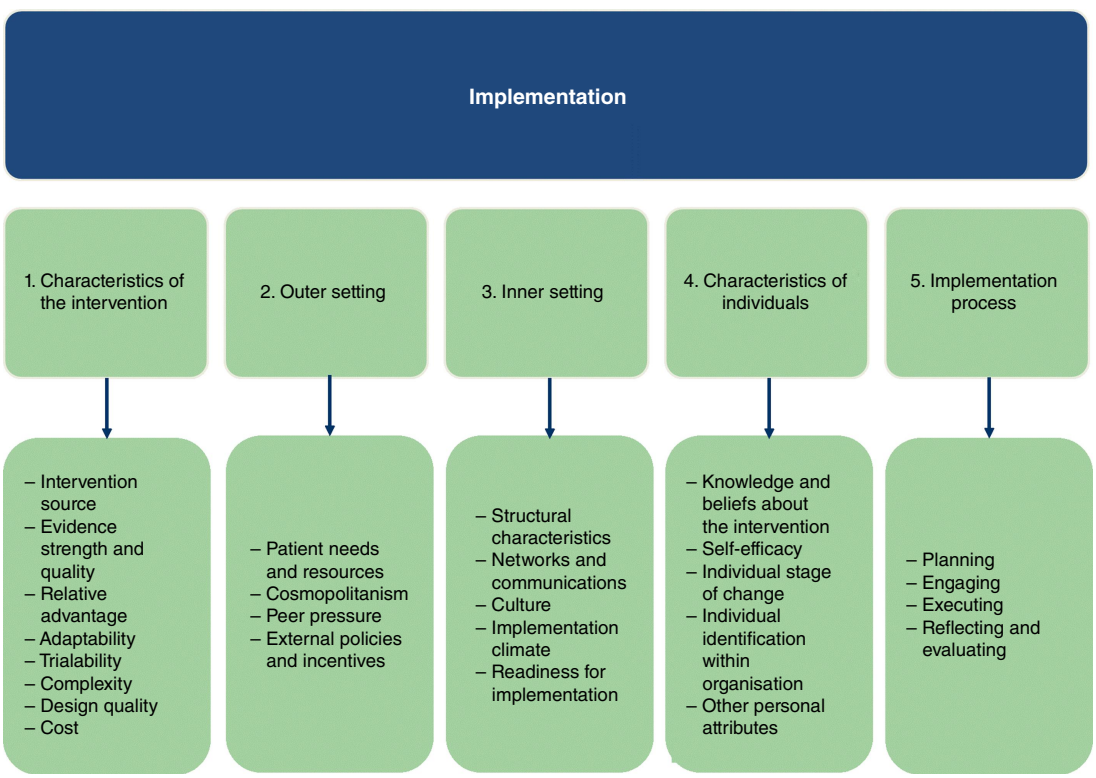

Fig. 1. Model of consolidated framework for implementation research (Damschroder *et al.* 2009).

The CFIR (Damschroder *et al.* 2009) was utilised in designing this study which evaluated barriers, facilitators, and outcomes of the implementation process of PTA ADL retraining. We aimed to understand whether attending a training workshop would increase OTs' self-reported knowledge and skills in conducting PTA ADL retraining. An exploratory aim was to qualitatively examine perspectives regarding implementation of PTA ADL retraining in clinical practice.

Method

Participants

Eighty OTs located across Australia completed workshop training in the PTA ADL intervention in 2017. Of these, 44 completed an anonymous survey at the time of the workshop and consented to research participation. Two years later, multi-stakeholder interviewee participation was purposively sought to span domains from the CFIR and garner varied perspectives regarding implementation. Seven OTs from the training workshop, two further OTs (one involved in the trial and one who received workplace training equivalent to the workshop) and two administrators (OT manager at a centre with TBI rehabilitation and a research funder involved in program translation) engaged in an interview (n = 11). Participant demographics are shown in Table 1. Participants who completed an interview were offered a AU$50 voucher.

Table 1. Participant demographics.

Survey participants, n = 44	
Age (years) (M; s.d.; range)	34.11; 8.53; 2161
Gender (female; male)	42 (95.45%); 2
Clinical experience (years) (M; s.d.; range)	9.52; 6.70; 0–36
Qualification (postgraduate; graduate)	8 (18.18%); 36
Area of work	
Acute (acute/subacute)	12 (27.27%)
Rehabilitation (inpatient; outpatient; mixed)	18 (36.36%); 12 (27.27%); 3 (6.82%)
Other	2 (4.55%)
Interview participants, n = 11	
Age (years) (M; s.d.; range)	36.50; 11.50; 29–63
Gender (female; male)	10 (90.91%); 1
Clinical experience (years) (M; s.d.; range), n = 8 [A]	11.44; 5.31; 4–19
Qualification (postgraduate; graduate), n = 8 [A]	2 (25%); 6
Area of work	
Acute (acute/subacute)	3 (27.27%)
Rehabilitation (inpatient; outpatient; mixed)	4 (36.36%); 0; 1 (9.09%)
Other: paediatric rehabilitation	1 (9.09%)
Research funder	1 (9.09%)
OT manager	1 (9.09%)

Note: multiple areas of work could be selected.
[A] n = 1 missing data; data only collected for clinicians (occupational therapists).

Design and materials

A sequential explanatory mixed methods design was used to evaluate OTs' perception of effectiveness of attending a training workshop in improving knowledge and skills in PTA ADL retraining quantitatively and then capture qualitative perspectives regarding implementation of the intervention 2 years following the workshop. The study has been reported according to the Good Reporting of a Mixed Methods Study (GRAMMS) checklist (O'Cathain *et al.* 2008; Supplementary File S1).

Training

The full-day workshop focused on development of knowledge, skills, and confidence in utilising PTA ADL retraining. The workshop included: (1) information on PTA, memory, and evidence for the intervention, (2) undertaking skills retraining and application for PTA, (3) engagement during PTA and working with individuals with agitated behaviour, and (4) goal setting and evaluation. Stages 2–4 included case descriptions, videos, and case-based learning. The three presenters were clinicians and researchers experienced in TBI rehabilitation involved in the original RCT (all clinical neuropsychologists and one dual-trained OT). Participation in the workshop required payment and took place during work hours in Melbourne, with options for in-person or webinar attendance.

Survey

A study-specific survey was developed for the workshop to capture demographic information and use, confidence, and perceived barriers of ADL retraining during PTA. Workshop utility regarding knowledge, skills, and confidence was rated on a 5-point Likert scale (1 = not at all useful, 5 = very useful). A pre-post workshop self-rated competency evaluation was developed by the workshop presenters. OTs' self rated their knowledge and skills in the areas of PTA and memory systems, ADL skills retraining (including during PTA), engagement during PTA, and goal setting and evaluation. This content was theory-informed (e.g. procedural and errorless learning principles, the neurofunctional approach (Clark-Wilson *et al.* 2014)) but developed specifically for competencies pertaining to the intervention. Competencies were assessed using a 10-point

Likert scale, (1 = do not have, 5 = partly developed, 10 = advanced). Item rating examples include 'knowledge of functional assessment and task analysis' and 'ability to implement procedural learning in a skills retraining program'. Overall confidence in implementing ADL retraining during PTA was also rated (0 = not at all confident, 10 = extremely confident). The survey had paper and electronic versions (Supplementary File S2).

Interview

A semi-structured interview schedule was developed to explore current use of PTA ADL retraining, individual experience of implementation and factors that hindered or facilitated this. Interviews were completed approximately 2 years following workshop training (range 21–23 months). Interviews comprised open-ended questions and non-leading prompts, informed by CFIR domains (e.g. inner setting – organisational support), developed for OTs, then amended for administrators. The interviewer was a female psychology honours student, KS, trained in qualitative research methodology and independent of the original intervention. Participants had no prior relationship with KS and her role as a psychology student was made explicit. Three researchers, involved in the original study, provided supervision. The qualitative component of this study has been reported in accordance with the consolidated criteria for reporting qualitative research (Tong *et al.* 2007; Supplementary File S3).

Procedures

Ethics approval was obtained from Monash University Human Research Ethics Committee (#11270). Written or electronic consent was provided by all participants. Participants who attended the PTA ADL workshop completed a survey and self-rating competency evaluation prior to and immediately following the workshop. At 2-year follow-up, participants were invited via email, to partake in an interview exploring their experiences utilising PTA ADL retraining. Following training, interviews were performed by KS with iterative feedback. Interviews were conducted via videoconference (n = 4; laptop or desktop) or telephone (n = 7). Interviewees participated in the interview at their workplace and the interviewer conducted the interview in a private meeting room or from home. Field notes were made and all interviews were recorded and professionally transcribed.

Data analysis

R Studio (2018) was used to analyse survey data. Descriptive statistics were calculated and repeated measure t-tests conducted to compare pre-training and post-training ratings.

An inductive approach to thematic analysis (Braun and Clarke 2006, 2021*a*) was employed to explore the use of PTA ADL retraining. Inductively derived themes were then mapped deductively to the CFIR domains to consider overarching barriers and facilitators of implementation. A critical realist ontology was adopted assuming access to participants' perceived reality whilst acknowledging this is shaped by culture, language, context (Alvesson and Sköldberg 2017; Braun and Clarke 2021*b*), and interpretation by researchers (Braun and Clarke 2023). Braun and Clarke's (2013) six phases of thematic analysis were followed, beginning with data familiarisation. Following transcript reviews, coding was performed using NVivo 12 software (QSR International) by KS with semantic and latent codes generated. Codes were refined with a codebook developed as per Mac-Queen *et al.* (1998). A second coder independently coded four randomly selected interviews (O'Connor and Joffe 2020). Intercoder reliability was calculated using a Cohen's kappa statistic, ranging from 0 (no agreement) to 1 (perfect agreement) (Viera and Garrett 2005) and indicated moderate agreement (M = 0.56; range = 0.22–0.82). Discrepancies were discussed amongst the research team and reconciled to improve coding reliability and thematic validity. Themes were developed, compared to raw data, refined, and labelled through iterative team discussion (Braun and Clarke 2006, 2021*a*; Chenail 2011). Researcher subjectivity and their relationships with the investigated topic were considered throughout analysis (Braun and Clarke 2023). Alongside KS, the three authors engaged in thematic construction were also involved in the original RCT and training of clinicians, all with extensive backgrounds in TBI rehabilitation (JTP – female, clinical neuropsychologist and occupational therapist, BOT/DPsych; JP – female, clinical neuropsychologist, PhD; AM – male, clinical neuropsychologist, PhD). Actively involved in the research process, the researchers revisited the research question and interviews, fostering reflexive engagement with the data. Member checking was not feasible for the Honours student and, given theoretical inconsistencies with thematic analysis, this was not pursued by the authors to avoid potentially restricting theme construction (Morse *et al.* 2002; Varpio *et al.* 2017; Braun and Clarke 2019). Theoretical sufficiency (Dey 1999) as per deductive mapping to the CFIR was considered methodologically consistent for this study, as opposed to data saturation (Low 2019; Braun and Clarke 2021*c*). Data collection and analysis were informed by 'meaning-richness' to create a sufficient account of implementation of the intervention according to the CFIR (Dey 1999; Braun and Clarke 2022).

Results

Training

Of the 44 OTs who completed a survey prior to training, 33 (76.74%) endorsed wanting to engage in more ADL retraining with individuals in PTA. Pre-training, on average they

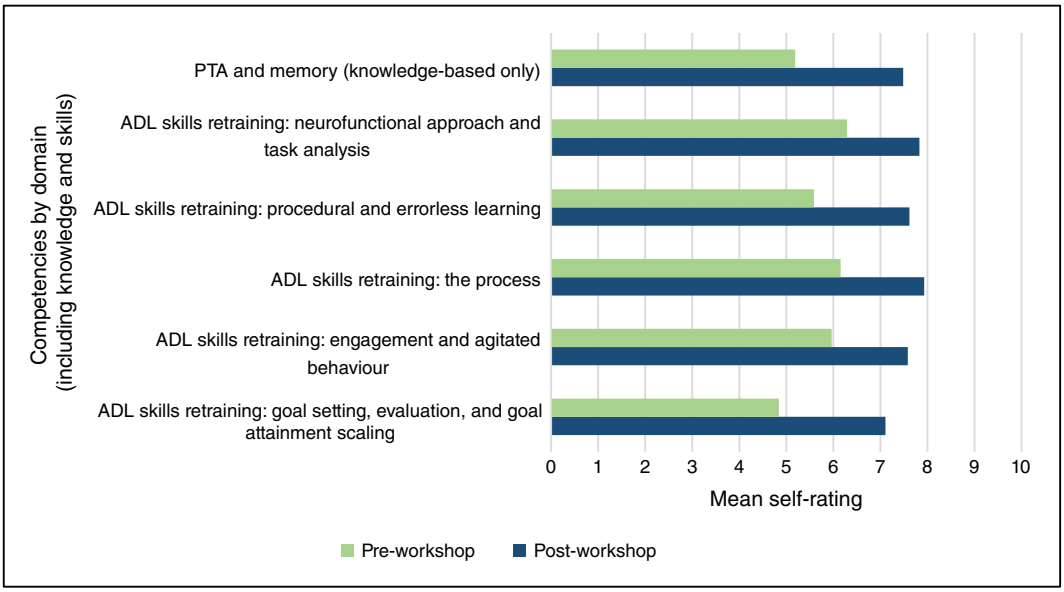

Fig. 2. Self-rated ADL retraining during PTA competencies pre- versus post-workshop. Competency ratings from 1 to 10 (1 = do not have, 5 = partly developed, 10 = advanced). All pre-post comparisons were statistically significant ($P < 0.001$).

completed ADL retraining with approximately 12.83% (s.d. = 21.35%) of patients in PTA. OTs identified the following barriers in undertaking ADL retraining during PTA: time (65.91%), resources (36.36%), training (22.73%), confidence (22.73%), and it being beyond the scope of their role (11.36%). On a scale of 0 (very poor) to 10 (excellent), the quality of training within their completed Occupational Therapy degree relating to skills retraining following brain injury/severe cognitive impairment was rated as relatively poor ($M = 3.32$; s.d. = 2.71; range 0–9).

Forty-two of the 44 OTs completed the post-training survey. Overall, workshop training was rated to be helpful in improving knowledge, skills and confidence in PTA ADL retraining ($M = 4.74$; s.d. = 0.44; scale 1 (not at all useful)–5 (very useful)). Self-ratings of confidence in ADL retraining during PTA (0 (not at all confident)–10 (extremely confident), rated by 41 OTs) significantly improved from baseline ($M = 4.48$; s.d. = 2.4) to post-training ($M = 7.70$; s.d. = 1.24), $t(40) = 9.78$, $P < 0.001$. Competency self-assessment ratings in areas of knowledge and skills covered in the training workshop are summarised by domain in Fig. 2. Results of paired *t*-tests by domain indicated a positive change from baseline self-assessment of competencies compared to post-training ($P < 0.001$; Supplementary File S4).

Interviews

Interviewees ($n = 11$) discussed their experience or role in implementing PTA ADL retraining with interviews averaging 31.83 min (range: 8.37–62.00). Seven themes and 21 sub-themes were identified through thematic analysis. Fig. 3 depicts the relationship of themes. Concentric circles represent the influence on implementation of the organisation and the individuals within this (OTs and patients). Some themes overlap multiple domains, indicating dual influence. Themes were placed within the CFIR process of implementation (planning, engaging, executing, reflecting, and evaluating) to allow for evaluation of implementation efforts and to inform future endeavours (Damschroder *et al.* 2009).

Theme: changing practice

Overall, interviewees reported that their rehabilitation practice during PTA had changed following training. They were more confident in starting intervention earlier, 'I think I'm definitely much more confident to get in there and actually start ADL retraining for people in PTA much earlier' (Amy, OT). They also indicated implementing it more frequently, 'I probably just do it more, and more consistently, more routinely. I will do the grooming task at a set time every day' (Emma, OT).

Many reported more readily using the key principles of the ADL retraining approach, 'The errorless learning approach … I hadn't really done much work around that prior to doing that course … for cognitive retraining this is probably the best way' (Scott, OT). However, some noted not always implementing the approaches as prescriptively as taught, for example, using an error-based approach when cognitive impairments were less severe.

Theme: improving patient outcomes

Awareness of positive patient outcomes according to research findings was a facilitator of implementation, 'you

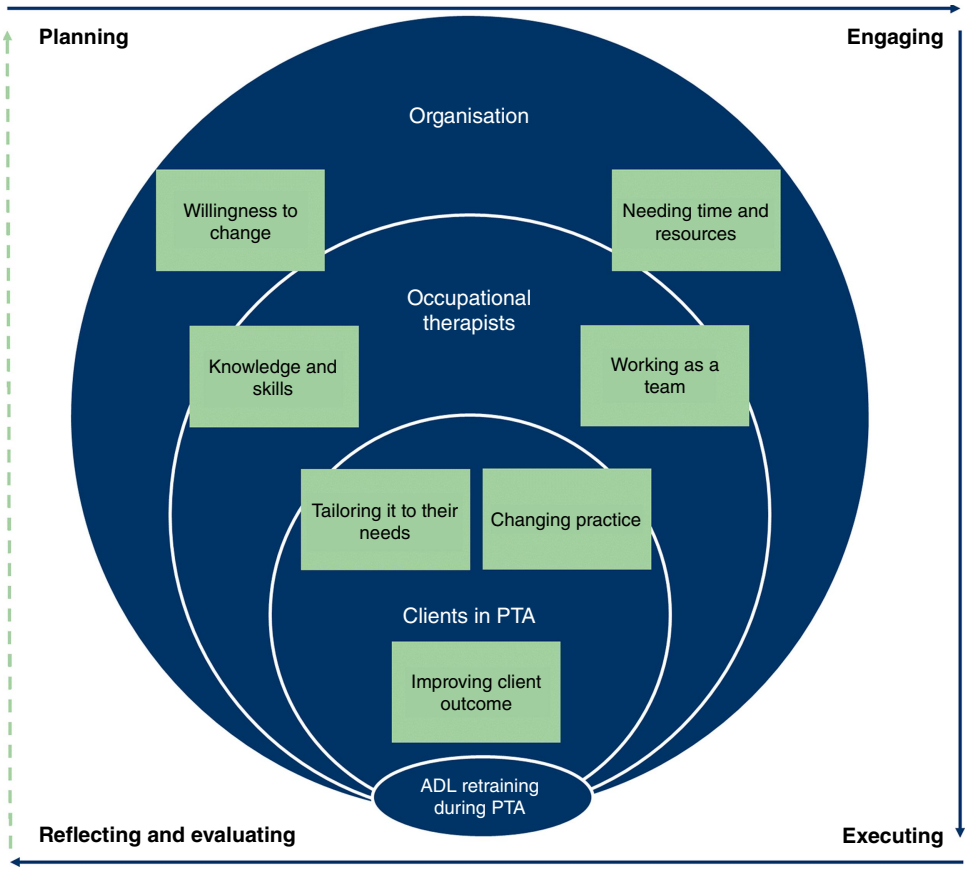

Fig. 3. Representation of interview themes in the context of the CFIR implementation process (Damschroder *et al.* 2009).

can start working on restoring some independence. I think that is very important because the sooner you can help a person start their rehab journey the better' (Julia, Research Funder). Observation of the benefits for patients, particularly progressing towards independence, was central, 'I think doing ADL retraining, getting people independent earlier in their ADLs whilst they're in PTA just gives that biggest sense of autonomy for the patients, [it] then helps with other aspects, things like their behaviour' (Kylie, OT). Interviewees also found that PTA ADL retraining allowed patients to achieve independence and develop a sense of routine sooner. 'It's just giving them context. It's giving them a routine. It's giving them meaning … they feel more human' (Emma, OT).

Reduced PTA duration was noted as a benefit by some, 'I think we did see a reduction in the amount of time people were in PTA after the training we did' (Chloe, OT). PTA ADL retraining was also considered to facilitate discharge through earlier rapport building, enhanced independence, and awareness of discharge requirements, 'The level of independence in personal care is better when they emerge from PTA, it's also better when they're being discharged, which to me means potentially they need less attended care' (Sarah, OT Manager).

Prior fears of exacerbating agitated behaviour through increased stimulation during the intervention were reported to be unfounded with some suggesting it reduced agitation, 'I guess there's that element of more sensory deprivation and that actually causing agitation rather than people engaging in activities causing agitation. That was probably one of the main things' (Laura, OT).

Theme: tailoring it to their needs

Considering individual patient strengths and difficulties and premorbid functioning and routines was consistently noted as important when implementing the intervention, 'We find out about them as a person beforehand and what their normal routine is, and then we try and replicate that on the wards as much as possible' (Claire, OT). Various patient factors such as demographic background, cognitive status, and extent of other injuries could, however, impact use of the intervention, 'I do ask staff whether they're utilising it and people will say, yes, they are. But it's not suitable for everyone' (Sarah, OT Manager).

Involving patients' families in rehabilitation was noted as both a facilitator and barrier in implementation. It was particularly important to an interviewee utilising the intervention in a paediatric setting, 'For them [families] to be encouraging or assisting their children to be using ADL retraining, so their families do actually feel like they are doing something positive' (Alice, OT). Despite this, two interviewees outlined challenges, 'Sometimes, there are

cultural factors that come into play where a family wants to help someone more than they need to' (Sophie, OT). Another stated that family presence could be distracting initially, however, had longer term value, 'I don't tend to do it the first couple of times [involve families], because they [patients] could be easily distracted. But after that I bring families in so they get some insight and sometimes can actually carry that through' (Scott, OT).

Theme: knowledge and skills

Interviewees indicated the training for this intervention aided their knowledge and skills to successfully implement PTA ADL retraining. Some added that previous experience in key principles (e.g. task analysis, errorless learning) facilitated their practice, 'The course that I went through many, many years ago had a pretty heavy influence on the importance of ADL retraining, functional retraining, task analysis … So I felt like I already had that background' (Chloe, OT).

There was a general consensus that the knowledge and skill of all allied health staff was an important component to implementing PTA ADL retraining. Some suggested this as a target, 'The wider team that don't have that specific training, on reflection, is reliant on us providing that information and the education' (Amy, OT).

Theme: working as a team

OTs often reported the necessity of working with other disciplines to implement ADL retraining, particularly during PTA when patients can require more support. Some reported that they received input from other allied health staff, aiding the intervention, 'Everyone's on board. I work quite closely with my neuropsychologist on the same thing, and with the physiotherapist' (Emma, OT). In contrast, at times, more assistance for implementing ADL retraining was required than was available, particularly to assist mobility, 'They need two people to assist and there's not actually nursing staff available at that time' (Amy, OT).

In regard to working within the wider rehabilitation team, interviewees indicated they were motivated to implement the intervention, thereby proactively educating other staff in the method and beneficial outcomes:

> Well, I feel positive about it, I feel positive about work that I have done with people, you can see the benefits. I guess my colleagues are seeing that too because we're teaching our OTA [occupational therapy assistant] to use errorless learning techniques. (Scott, OT)

Theme: needing time and resources

Interviewees required resources to implement the intervention, including equipment, facilities, staffing, time, and documentation processes. When resource needs were met, implementation was easier, but a lack of staffing resources could pose a barrier, 'The first challenge is that it is more resource intensive. So hospitals don't like spending more money on allied health staff' (Julia, Research Funder). The provision of additional OT staff time in one setting was noted to be beneficial, 'A lot of clinicians actually feel pressured in their role … We did get extra staffing on board after the study with the evidence that was there to support the need for that intervention' (Sarah, OT Manager).

Having the necessary equipment (e.g. commodes, transfer equipment) and environment aided or hindered the feasibility of the intervention. One interviewee mentioned, 'I guess with mobility and self-care equipment, we've had a huge shortage [and] sometimes I've had to reschedule sessions' (Amy, OT), while another noted the absence of a meal-preparation area, 'We don't have meal prep facilities on the ward, so you're quite restricted in terms of what ADL retraining you can be doing' (Claire, OT). Hospital facilities, however, could also facilitate intervention implementation, 'They all have their own single bathrooms. It's really good from a routine of engaging in self-care' (Amy, OT).

Documentation processes and resources, particularly those provided in training (e.g. prompt sheets, visual aids, ADL retraining manual), were noted by the majority to assist implementation:

> I use the ADL poster – and then I use that with patients to be like, 'Well, this is what they can do. This is what they can't do, what they need assistance for', to help translate that onto the ward for nursing staff. (Emma, OT)

One interviewee mentioned that the ADL retraining manual and other resources had been adopted when training OTs, 'For our grads and new grads … after we had the session, a lot of the resources provided got embedded into our tutorial program' (Chloe, OT). In contrast, some had not engaged with these resources:

> I must admit I haven't really used the resources or, I've often thought about them and gone, 'Oh, they would be really great, and I'd love to sit down and think about how to implement those.' But you just get so caught up in everyday work. (Kylie, OT)

Theme: willingness to change

When PTA ADL retraining was encouraged by the organisation, this enabled implementation, 'with management pushing for us to go back to that [ADL retraining]; at the moment we are doing a lot of restructuring so that we are doing a lot more ADL retraining' (Chloe, OT). However, when organisational support was lacking this made it difficult to implement change. One interviewee described the difference in the scope of their role in implementing PTA ADL retraining between two hospitals:

> While at [one hospital] … with OTs doing the Westmead PTA scale as well, it could be very difficult to fit in daily

ADL retraining, whereas at [another hospital] with the neuropsychology input, that gave OTs a bit more time to do ADL retraining. (Laura, OT)

When staff were not engaged or motivated to change this made it challenging for interviewees to implement the intervention effectively. This was often dependent on other allied health staff assisting patients in the continuity of ADL retraining, in particular, nursing staff. Some noted difficulties in shifting practices, 'It's a cultural change thing. I think if you have the support of the senior management or the senior nursing staff and it was seen as part of their role, then you could affect change' (Claire, OT). Others proposed such difficulties may arise from a lack of time, 'They're just so busy that they often don't have the time to allow people to practise the task and will just do it for them' (Ashleigh, OT). Despite these challenges, willingness to promote research evidence was important to help facilitate workplace change and educate colleagues on the benefits of using PTA ADL retraining, 'I remember a little while ago when we did have some patients in PTA, we did actually use the recent research … to advocate for patients. So that was really helpful' (Chloe, OT). An OT Manager (Sarah) suggested that research evidence could be beneficial to facilitate ongoing skill-development and intervention implementation, 'I think that there were some very simple and positive outcomes from the research papers … It'd probably be useful if there's an online program that just briefly states what the key findings and benefits were'.

Themes within CFIR domains

To aid evaluation, inductively derived themes were deductively mapped to the CFIR to highlight the barriers and facilitators of implementation. Table 2 shows the constructs within the first four CFIR domains which facilitated or hindered implementation of the intervention according to the themes determined through thematic analysis. Given the study's aim, the 'Implementation Process' domain was not included and rather utilised by the researchers when considering the study's findings in the context of implementation processes employed (Damschroder *et al.* 2022).

Discussion

This study aimed to assess the outcome of efforts to translate evidence of PTA ADL retraining into clinical practice of OTs across Australia using quantitative and qualitative feedback from an intervention training workshop and 2-year follow-up interviews, respectively. Overall, training in the intervention was deemed efficacious by OTs and follow-up interviews revealed seven themes capturing barriers and facilitators in implementing the intervention, influenced by organisational, clinician, and patient factors. Aligned with the CFIR (see Fig. 1), the longer term vision of this study was to enable consideration of identified barriers and facilitators to inform ongoing implementation efforts (Damschroder *et al.* 2009).

Facilitators of implementation

Key facilitators in implementing the PTA ADL retraining were reflected across the themes of OTs' knowledge and skills, changing practice, and improving patient outcomes. Willingness to change, needing time and resources, working as a team, and tailoring it to their needs included some facilitatory elements. Reflecting the CFIR domain of characteristics of individuals, OTs' knowledge, skills, and self-efficacy aided implementation and they indicated a change in their practice, using PTA ADL retraining more regularly and earlier with patients. Further, OTs advocated for use of the intervention and described being equipped to individualise the approach for the patient. Regarding the intervention characteristics, supportive evidence coupled with observed patient benefit were notable drivers. Patient benefits reflected the RCT findings including earlier independence in ADLs, briefer PTA duration and low levels of agitation (Trevena-Peters *et al.* 2018*a*, 2018*b*). Further advantages included fostering an earlier therapeutic alliance and enabling higher order ADLs to be addressed following PTA emergence, thereby maximising independence at discharge. At the inner setting, when time and resource needs were met, and there was managerial and team support, implementation was facilitated. However, when absent they served as barriers. Lastly, at the outer setting, whilst OTs prioritised ADL retraining for individuals in PTA, this behaviour change did not appear to have strong traction at an organisational level.

Barriers to implementation

Barriers to implementation of the intervention were captured within themes of changing practice, tailoring it to their needs, knowledge and skills (of the team), working as a team, willingness to change, and needing time and resources. In considering the inner setting, whilst OTs' skill development facilitated implementation, relevant knowledge across the wider team was lacking, with a need for broader training identified. Clinicians' knowledge and skills represent key features underpinning potential success of intervention implementation (Tavender *et al.* 2014; Pilli *et al.* 2023). Similarly, it is known that harmonising discipline-specific and team-wide approaches can be challenging, but facilitates implementation (Wright *et al.* 2016). OTs noted that working as a team could pose a challenge, for example, when required input from another staff member was not available or when seeking input for carry over of the intervention (i.e. skills retraining practice). Whilst OTs

Table 2. Reported facilitators and barriers of PTA ADL retraining implementation according to the CFIR domains and constructs.

	Facilitators	Barriers
CFIR: intervention characteristics	– Evidence strength and quality – Relative advantage	– Adaptability
Relevant themes	– Improved patient outcome – Changing practice	– Tailoring it to their needs – Changing practice
Summary	OTs indicated positive views regarding the evidence underpinning the intervention and that PTA ADL retraining promoted positive patient outcomes. Such advantages aided OTs in using the intervention more frequently and earlier in the rehabilitation process.	The intervention appeared to be implemented in a less rigorous manner than that of the RCT by some OTs. Further, some participants reported that the intervention did not suit all clients, for example, due to low levels of physical or cognitive functioning.
CFIR: inner setting	– Readiness for implementation	– Implementation climate – Readiness for implementation
Relevant themes	– Needing time and resources – Working as a team – Willingness to change	– Knowledge and skills (team) – Working as a team – Willingness to change
Summary	Implementation was facilitated when required needs of the intervention, such as time and equipment, were met by the organisation, in addition to wider team input and managerial support to enable change. Intervention-specific resources were deemed helpful overall.	OTs perceived a shortfall in relevant knowledge across the broader team. OTs needed support from management and colleagues for effective implementation, particularly in addressing barriers of staffing capacity, recognition of it as part of their role, and team involvement (e.g. assistance from a second staff member).
CFIR: outer setting	– Patient needs and resources	– Patient needs and resources
Relevant themes	– Improving patient outcomes – Tailoring it to their needs	– Needing time and resources
Summary	OTs prioritised active rehabilitation of ADL skills retraining for those in PTA.	Meeting patient needs to allow intervention engagement could be in conflict with that available at the inner setting. Traditional PTA inpatient wards were at times not well equipped to enable skills retraining (e.g. lacking kitchen facilities or necessary assistive equipment) and the time required to implement the intervention, of OTs with patients, could be inhibitory.
CFIR: characteristics of individuals	– Knowledge and beliefs about the intervention – Self-efficacy – Individual stage of change	
Relevant themes	– Knowledge and skills (OTs) – Tailoring it to their needs – Changing practice	
Summary	OTs reported gains in their knowledge, skills, and self-efficacy relating to the intervention following the training workshop and at 2-year follow-up as well as use of the intervention over time. This aided confidence in advocating for the intervention. OTs felt equipped to individualise the intervention for patients and involve families when deemed appropriate.	

indicated willingness to implement the intervention, changing behaviour within their workplace was often challenging. There is a need for managerial support to underpin successful training, resourcing, and, ultimately, the implementation of PTA ADL retraining.

Another barrier to implementation was a mismatch between the needs of patients and the intervention and resources available in the inner setting, including environmental setup, equipment, and time. Such findings are not uncommon. The need for resources and time to spend with clients have previously been reported as implementation challenges in care and rehabilitation following TBI (Tavender *et al.* 2014; Wright *et al.* 2016). When considering the intervention characteristics, some OTs indicated the intervention did not suit all clients and they had to implement it in a less rigorous manner. This translation of knowledge-to-practice likely resulted in a 'watered-down' version of the intervention. It is also possible that the inclusion criteria of the original study (i.e. able to follow a single stage command, etc.) were not routinely applied.

Future implementation

To promote a holistic view of translation of evidence into practice, multiple domains such as that from the CFIR need to be considered (Grol and Grimshaw 2003; Damschroder *et al.* 2009; Damschroder and Hagedorn 2011; Damschroder 2020). To do so, this study employed a mixed-methods and longitudinal design to capture various outcomes and perspectives, as well as change over time regarding implementation of the intervention (Peters *et al.* 2013). To inform factors that influence implementation, data were gathered from the 'real world', specifically OTs and healthcare administrators (Peters *et al.* 2013).

Reflections on the further process stages of implementation are useful and can inform future endeavours. Within this, engagement warrants attention. Training efforts were focused at the level of upskilling OTs, with less consideration given to implementation leaders and champions who have influence, hold responsibility for overseeing implementation and thereby drive change (Scott *et al.* 2012; Damschroder 2020). In future, earlier liaison with management and the appointment of willing and engaged champions to train staff, facilitate, and monitor use of the intervention would be helpful (Bernhardsson *et al.* 2017).

Engagement also involves training in the intervention. Whilst workshop findings were suggestive of positive implementation momentum, the training lacked a longitudinal and holistic approach. Although important and commonly employed, education alone has a finite effect on implementation (Scott *et al.* 2012; Jones *et al.* 2015) and additional strategies such as reminders and feedback are recommended (Grol and Grimshaw 2003). Further allied health training opportunities and involvement in PTA ADL retraining (i.e. regular skills practice) warrant consideration to build a multi-faceted training package (Bernhardsson *et al.* 2017). For example, education regarding errorless and procedural learning would likely benefit other team members in delivering therapy during PTA, such as physiotherapy. There may also be potential for intervention co-delivery with nursing staff and/or allied health assistants to address staffing issues. Lastly, training in the intervention during university, clinical placements, and in work-commencement at rehabilitation centres is important to aid sustainability (Morris *et al.* 2020).

Beyond education, funding of OT time is required to enable the intervention. This is challenging in the context of hospital financial constraints. The study's economic evaluation demonstrated that provision of PTA ADL retraining is cost saving through shorter length of stay (Mortimer *et al.* 2019). Therefore, the argument could be made that more patients could be treated in a given time-frame. Engagement of external change agents (e.g. funding bodies) to leverage the existing evidence and facilitate intervention decisions at rehabilitation centres may be helpful.

Execution of the implementation plan requires reflection. Changing existing and possibly, ingrained practices, is challenging. However, the fact that recent clinical practice guidelines have recommended the use of ADL retraining in PTA (Ponsford *et al.* 2023) will hopefully promote change and willingness of hospitals to invest resources in this practice. Inner and outer setting factors will need to be addressed along with provision of accessible training to promote behaviour change (Ritchie *et al.* 2017; Hyzak *et al.* 2023).

Limitations

The study had several limitations. Despite theoretical sufficiency, consenting interviewees may have been those with an interest in the intervention, conceivably impacting breadth of perspectives obtained. Further, only 46% of those interviewed worked in inpatient adult rehabilitation settings – the intended intervention setting. Capturing additional perspectives from those working in the primary inpatient TBI rehabilitation centres and further stakeholder involvement would have been valuable. Lastly, the study occurred prior to the update to the CFIR (Damschroder *et al.* 2022) and is, therefore, not reflective of these changes, which include benefits such as further delineation between implementation strategies and the 'innovation' being implemented. Despite this, given straightforward comparability of the original and updated CFIR domains, the study's findings remain relevant (Damschroder *et al.* 2022).

Conclusion

Efforts to implement ADL retraining during PTA appear to have had some impact on the practice of OTs trained in this approach. Overall, training in this intervention was deemed efficacious by OTs. At follow-up, interviewees reported using ADL training more frequently during PTA and described benefits of the intervention as drivers of implementation, particularly improved functional independence for patients. Despite this, the need for extra staff time, resources, and environmental setup to deliver the intervention, and challenges in organisational willingness to adopt the change, represented key barriers to implementation. In considering future implementation of ADL retraining during PTA, accessible and ongoing training for OTs and the wider rehabilitation team is likely required alongside further involvement of administrators to leverage research findings, foster a climate for change, and negotiate time and resource needs. Perpetuating implementation of this efficacious treatment to enable best-practice rehabilitation for individuals in PTA is imperative.

Supplementary material

Supplementary material is available online.

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Data availability. The data that support this study will be shared upon reasonable request to the corresponding author.

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