Co-designing for behavioural change: understanding barriers and enablers to addressing sexuality after traumatic brain injury and mapping intervention strategies in a multi-disciplinary rehabilitation unit

Jill H. A. Hwang[A,B,*] iD, Marina G. Downing[A,B] iD, Riccarda A. G. Specht[C] iD and Jennie L. Ponsford[A,B] iD

For full list of author affiliations and declarations see end of paper

*Correspondence to:
Jill H. A. Hwang
Turner Institute for Brain and Mental Health, School of Psychological Sciences, Monash University, Clayton, Vic. 3121, Australia
Email: Jill.hwang@monash.edu

ABSTRACT

Background. Persistent changes in sexuality often follow traumatic brain injury (TBI). However, health professionals remain reticent about discussing sexuality and have reported barriers including uncertainties around whose role it is and limited educational and institutional support. This study employed a co-design and implementation process, aiming to promote team-wide behavioural change, whereby health professionals at a TBI rehabilitation unit would attempt to address sexuality with patients routinely. **Methods.** Focus group sessions with multidisciplinary health professionals were conducted to identify barriers and enablers to behavioural change, identify areas for development, and co-design intervention options. Implementation deliverables were then finalised and provided to the team. The Theoretical Domains Framework was used to map factors influencing behaviours and the Behaviour Change Wheel was used to map interventions. Thematic analysis was used to further analyse barrier themes. **Results.** Thirty-five barriers and eight enablers falling within 12 theoretical domains to behavioural change were identified. Thematic analysis revealed highly correlated barriers in initiating and sustaining change. Nine co-designed intervention options aligned with five intervention functions of the Behaviour Change Wheel, resulting in six final implementation deliverables. **Conclusions.** Barriers were highly interrelated, influencing the approach to implementation deliverables. Simultaneously addressing multiple barriers could potentially alleviate discomfort associated with discussing sexuality. Concerns around initiating change were related to confidence in achieving sustainable changes. Achieving change requires organisational and team-level environmental restructuring and enablement. The next step involves evaluating the effectiveness of the co-design and implementation process in driving behavioural change and potential impacts on patient satisfaction and sexuality outcomes.

Keywords: co-design, implementation, rehabilitation, sexual functioning, sexual health, sexual wellbeing, sexuality, traumatic brain injury.

Introduction

Sexuality is fundamental to the human experience and encompasses more than just the physical and physiological aspects; it also includes psychological, emotional, and social aspects (World Health Organization 2006). It is influenced by a web of complex factors and can be disrupted following traumatic brain injury (TBI). The incidence of sexuality-related changes following TBI has been shown to vary between 29 and 60%, with most individuals experiencing reduced sexuality outcomes or hyposexuality, and a minority of between 9 and 17% experiencing hypersexual changes (Ponsford 2003; Downing *et al.* 2013; Simpson *et al.* 2013; Fraser *et al.* 2020; da Silva *et al.* 2022). Hyposexual changes following TBI range from more overt disruptions such as erectile dysfunction, decreased

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sexual arousal and frequency, anorgasmia, and dyspareunia, to more subtle changes including reduced self-esteem, body-image issues, loss of sexual identity and confidence, communication difficulties, and relationship role changes (Hibbard *et al.* 2000; Sander *et al.* 2012; Yang *et al.* 2018; Fraser *et al.* 2020; J. Hwang, M. Downing, J. Ponsford, unpubl. data).

Due to the multifactorial nature of sexuality, many factors such as neuroendocrine disruption, TBI-related cognitive changes, and other psychological and emotional factors alone or in combination could result in various presentations of post-TBI sexuality changes (Sander *et al.* 2013; Latella *et al.* 2018; Mahajan *et al.* 2023). Findings by Fraser *et al.* (2020) indicated depression as a mediator of associations between hyposexual changes, reduced social participation, and increased fatigue. While personal reactions to sexuality changes can vary widely, some individuals have indicated feeling a sense of loss, resignation, difficulties adjusting to relationship changes, and needing help but not knowing where to find it (J. Hwang, M. Downing, J. Ponsford, unpubl. data).

Despite the prevalence of hyposexual changes and the impact they have on individuals with TBI, assessment and treatment appear to be uncommon. Health professionals mostly focus on hypersexual changes and inappropriate sexual behaviours that present in the smaller minority of individuals, largely motivated by safety concerns (Simpson *et al.* 2013; Hwang *et al.* 2022). Recent investigations have suggested that health professionals rarely address sexuality with patients owing to a fear of 'opening a can of worms', for which they lack confidence in providing support and intervention (Dyer and das Nair 2014; Fraser *et al.* 2021; Hwang *et al.* 2022). In turn, this lack of confidence has been related to a lack of training and clear organisational guidelines. Recent developments in clinical practice guidelines indicate an increasing acknowledgment of the importance of initiating discussions about post-TBI sexuality changes (Royal College of Physicians and British Society of Rehabilitation Medicine 2003; Humanity & Inclusion 2018; Baley *et al.* 2023). Importantly, individuals with TBI have indicated feeling embarrassed to initiate the topic with their healthcare providers although they would like it to be discussed (Sander *et al.* 2012; Arango-Lasprilla *et al.* 2017; J. Hwang, M. Downing, J. Ponsford, unpubl. data). Hence, adopting a reactive stance may unintentionally lead to sexuality issues being overlooked. Aside from the perceived lack of organisational support, health professionals have also voiced their discomfort in navigating this issue within a team environment that consists of differing opinions and comfort levels on the topic (Hwang *et al.* 2022).

Despite the expressed desire from individuals with TBI to have sexuality discussed with them, changing professional behaviours is notoriously challenging. This is particularly so in multi-disciplinary healthcare rehabilitation services, where collective action is likely required rather than focusing on individual behavioural processes (Mark and Carl 2015). Partnerships between health professionals and researchers experienced in co-design and implementation methodologies may effectively address such challenges, develop context-sensitive tools, and encourage professional uptake of new practices (Jagosh *et al.* 2012; Peters *et al.* 2013; Grindell *et al.* 2022). The Theoretical Domains Framework (TDF; Cane *et al.* 2012) and the associated Behaviour Change Wheel (BCW; Michie *et al.* 2011) are implementation frameworks developed to analyse factors influencing health professionals' behaviours and design interventions for behavioural change. These frameworks have been used to address various implementation issues, including infectious disease prevention (Suntornsut *et al.* 2016), childhood vaccination barriers (Bonner *et al.* 2021), and management of mild TBI (Tavender *et al.* 2015).

To ensure that the process was driven by the needs and preferences of service users, as the first stage in this study, 20 individuals with TBI were interviewed by Hwang *et al.* (J. Hwang, M. Downing, J. Ponsford, unpubl. data) regarding their experiences of changes in sexuality following TBI and their preferences regarding how it should be addressed. While preferences varied, individuals expressed a desire for more support and felt that health professionals should be broaching the topic early on and providing a clear opportunity to revisit the topic. Hence, the aim of this phase of the study was to co-design context-specific intervention options with TBI health professionals using the TDF and BCW frameworks. These options were then implemented to encourage the routine practice of addressing post-TBI sexuality.

Methods

The reporting of this study is in accordance with the COREQ guideline for qualitative research (Tong *et al.* 2007), and the study was ethically approved by the Monash Health Human Research Ethics Committee (Project ID No. 80518; 8 October 2021).

Design

This co-design and implementation study was conducted with health professionals at a TBI rehabilitation unit in Epworth Healthcare. Fig. 1 outlines the co-design and implementation process of this project. This paper documents steps 2 to 5, with step 1 documented previously (J. Hwang, M. Downing, J. Ponsford, unpubl. data) and step 6 requiring further research to test and evaluate the effectiveness of the co-design and implementation process.

For steps 2–4, qualitative focus group sessions with staff members of the TBI rehabilitation unit were conducted to identify the barriers and enablers, and potential interventions that could facilitate team-wide behavioural changes whereby sexuality could be routinely addressed with patients. In step 5, the research team worked closely with staff members through an iterative process spanning the
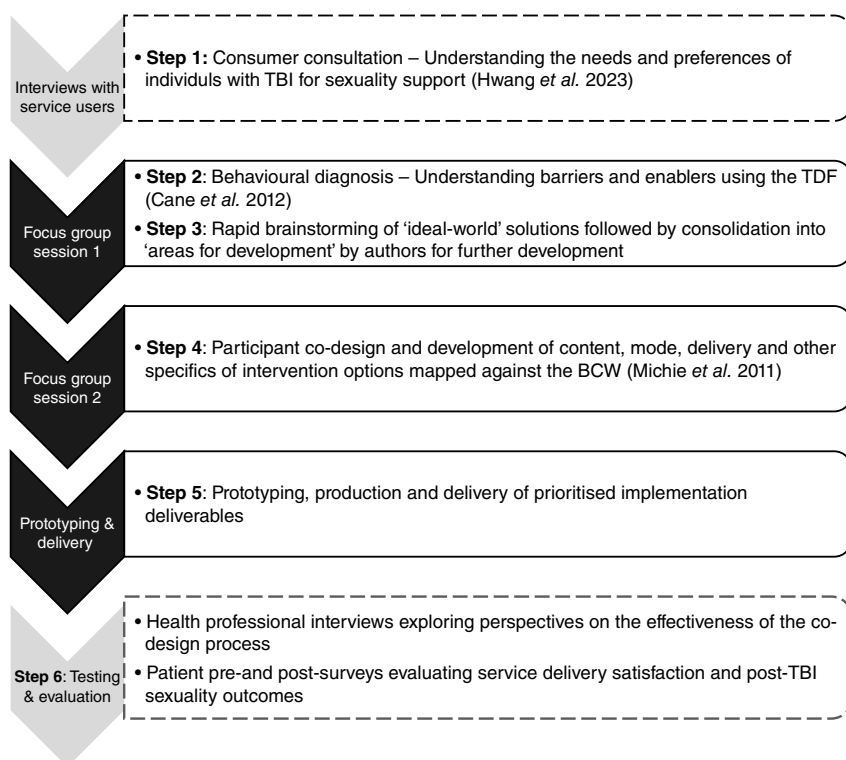
Fig. 1. Six-step process for co-designing and producing implementation deliverables to change professional behaviours around addressing sexuality after TBI.

entire study period, to share key information on the project's progress and to gather feedback that was incorporated to refine the final implementation deliverables of the project.

This study was conducted by a female-only research team with over four decades of collective experience in conducting psychological research comprising two (M. D. and J. P.) PhD holders, a doctoral student (J. H.) undertaking clinical training in neuropsychology, and a research master's student (R.S.). Prior to the focus group sessions, there had been established relationships between the research team and participants. J. P. had previously held a clinical managerial position for 20 years and J. H. was undertaking a clinical placement at the unit as a neuropsychology student at the time of the study. Accordingly, researchers J. P. and J. H. took extra caution in reflecting on their own assumptions and biases by continuously checking in with different staff members across the unit to ensure that the co-design and implementation process was always aligned with the staff stakeholders' opinions and needs.

Participants

Health professionals who worked in either inpatient, outpatient (including Community Integration Team and Transitional Living Centre), or both settings of the TBI rehabilitation unit at Epworth were invited to participate via their managers, word-of-mouth, and email invitations. Participants ($n = 22$) with a mean age of 38.3 years (s.d. = 7.4) were recruited and split into two focus groups based on availability. Thirteen participants were allocated

to group 1 and nine participants to group 2. Each participant attended either one or both sessions within their allocated group. See Table 1 for participant characteristics. All participants provided their electronic consent through an online form prior to the sessions. Other than the focus group facilitator and researchers J. P. and J. H., no other non-participants were present. Participant quotes are contextualised according to participant number (e.g. P1), followed by workplace setting (e.g. IP = inpatient; CIT = Community Integration Team; TLC = Transitional Living Centre).

Focus group sessions

For both groups 1 and 2, two sessions lasting 2 h each were conducted in person within the hospital grounds with a 1–2 week interval between each session. Sessions were facilitated by an occupational therapist who is a highly experienced sexuality expert and educator, who had no prior relationship with participants. Researchers J. H. and J. P. were in attendance for all sessions and discussed their observations and reflections with the facilitator at the end of each session, which were journaled by J. H. All sessions were recorded audio-visually. Recordings and written materials from the focus group sessions were electronically transcribed by researchers R. S. and J. H.

In the first session, participants reflected on how they felt about addressing sexuality with patients and what sexuality means within the context of their discipline and practice. Participants explored their perceived barriers through anonymous exercises to encourage honest feedback. The

Table 1. Participant characteristics.

	n
Gender	
Female	19
Male	3
Clinical role	
Neuropsychologist	4
Occupational therapist	4
Physiotherapist	4
Doctor	3
Social worker	3
Speech therapist	2
Clinical psychologist	1
Nursing	1
Team setting	
Inpatient	12
Outpatient/Community Integration Team/Transitional Living Care	7
Both inpatient and outpatient	3
Focus group attendance	
Total attendance	22
Attended both sessions	10
Attended focus group 1 only	6
Attended focus group 2 only	6

facilitator recorded these barriers on a whiteboard, classifying them as individual or institutional barriers. Participants indicated with post-it notes which barriers they considered most relevant.

Following this behavioural diagnosis process, participants picked two to three barriers to brainstorm 'ideal world' solutions for. To encourage expansive idea generation, participants were asked to disregard any pragmatic constraints such as infrastructure, funding, time, or other resources. At the conclusion of session one for both groups, researchers J. P., J. H. and the focus group facilitator rapidly consolidated the ideas into five broad areas for further refinement and development. These five 'Areas for development' were selected based on the most prominent and inter-related staff concerns discussed in the focus group sessions, and on potential to lead to attainable implementation deliverables within the study timeframe and resource constraints.

In the second session, participants engaged in a co-design process to develop intervention options by working on the five 'Areas for development' in greater detail than they did in the first session. Using butcher's paper blocks, participants wrote down their ideas, with the added consideration

of workplace, time, and resource constraints. Participants were provided design prompts (see Supplementary Appendix S1) for each intervention to encourage specificity in idea generation by generally reflecting on what needed to be achieved, who may be involved, how it could be achieved, and when and where it might be applicable. Each participant was given the opportunity to work on defining up to two distinct areas. Participants then engaged in a group discussion of the ideas from this exercise.

Co-design and implementation frameworks

The TDF v2 (Cane *et al.* 2012) is a validated theoretical framework developed to assist implementation researchers in identifying factors that influence health professionals' behaviours. The framework entails 14 domains spanning 84 theoretical constructs and has been extensively used in similar research investigating facilitators and barriers to implementing evidence-based behaviours across various clinical contexts (Beenstock *et al.* 2012; Islam *et al.* 2012; Tavender *et al.* 2014).

The BCW is often used alongside the TDF (Michie *et al.* 2011). The BCW is a model of behaviour developed from 19 frameworks of behaviour change to aid intervention design. It includes COM-B model as a behaviour diagnosis tool, linking to intervention functions that categorise interventions according to which behavioural change can occur, and to policy categories. The TDF is a more detailed variant of the COM-B model for behavioural diagnosis and thus was selected over COM-B for the purposes of this study. The APEASE criteria – (1) Affordability, (2) Practicability, (3) Effectiveness/cost-effectiveness, (4) Acceptability, (5) Safety/side effects and (6) Equity – are commonly used in conjunction with the BCW for prioritisation purposes during the co-design and implementation process (Michie *et al.* 2011).

Data analysis

As recommended by Bonner *et al.* (2021), a combination of deductive and inductive techniques was used to analyse the focus group transcripts to achieve a comprehensive understanding of the rehabilitation team's sentiments. Participants shared a wide variety of sentiments, which were sometimes conflicting and resulted in the identification of barriers and enablers. The TDF was used in the present study to contextualise the behavioural diagnosis process in identifying the current barriers and enablers (Cane *et al.* 2012). Barriers and enablers were defined by the authors as: factors or characteristics of the environment, team, or of individuals within the team, that deterred or facilitated the achievement of behavioural change, whereby the team would attempt to address sexuality with patients routinely. Author J. H. first produced a coding guideline for the TDF domains and referred to the general principles of

each BCW intervention function outlined by Michie *et al.* (2014) to guide the deductive mapping process (see Supplementary Appendix S2).

Data-driven barriers and enablers were inductively and semantically coded by a single coder (J. H.). These were mapped to the theory-driven TDF domains using a deductive and directed approach to content analysis, as described by Hsieh and Shannon (2005). Thirty-five inductively coded barriers were mapped to 12 of the 14 theoretical domains of the TDF. Eleven barriers fell under the 'Environmental context and resources' domain (see Supplementary Appendix S3; Cane *et al.* 2012). Considerable repetition was seen due to the thorough analysis of each barrier across the different spheres within the TDF domains (e.g. individual, environmental context, social, and organisational). These barriers were also noted to be highly interrelated. Hence, Braun and Clarke's (2022) reflexive thematic analysis process was utilised for further analysis. Inductive codes were used to develop themes and subthemes, which were refined through discussions within the research team. A thematic map depicting a visual representation of the relationships between themes and subthemes was produced (see Fig. 2).

The BCW was used to contextualise the intervention co-design and implementation process (Michie *et al.* 2014).

Solely localised team-level interventions were considered, hence only intervention functions of the BCW were used for the purposes of this study. Participant quotes relating to co-designed intervention options were inductively coded and summarised for accessibility. Summaries of the intervention options (see Supplementary Appendix S4) and final implementation deliverables were deductively mapped against the nine BCW intervention functions. Through a highly iterative process with staff members of the unit, the APEASE criteria were used to prioritise the most appropriate co-designed intervention options or parts of options for implementation delivery within the unit. Constant feedback loops were created with health professionals and consumer feedback was gathered for the patient-directed resource.

Data were coded and managed through NVivo (v14; QSR International Pty Ltd 2022). Frequency of codes was not considered in the analysis due to the inability to code for non-verbal behaviour in focus groups such as nodding to express agreement with another participant (Atkins *et al.* 2017). Transcripts were cross-coded by researcher R. S. for all coded themes for barriers and enablers. Any coding disagreements were resolved through research team discussions, and amendments were made when deemed necessary. The percentage of agreement was 99.90 (s.d. = 0.34, Range = 97.51–100), and intercoder concordance was
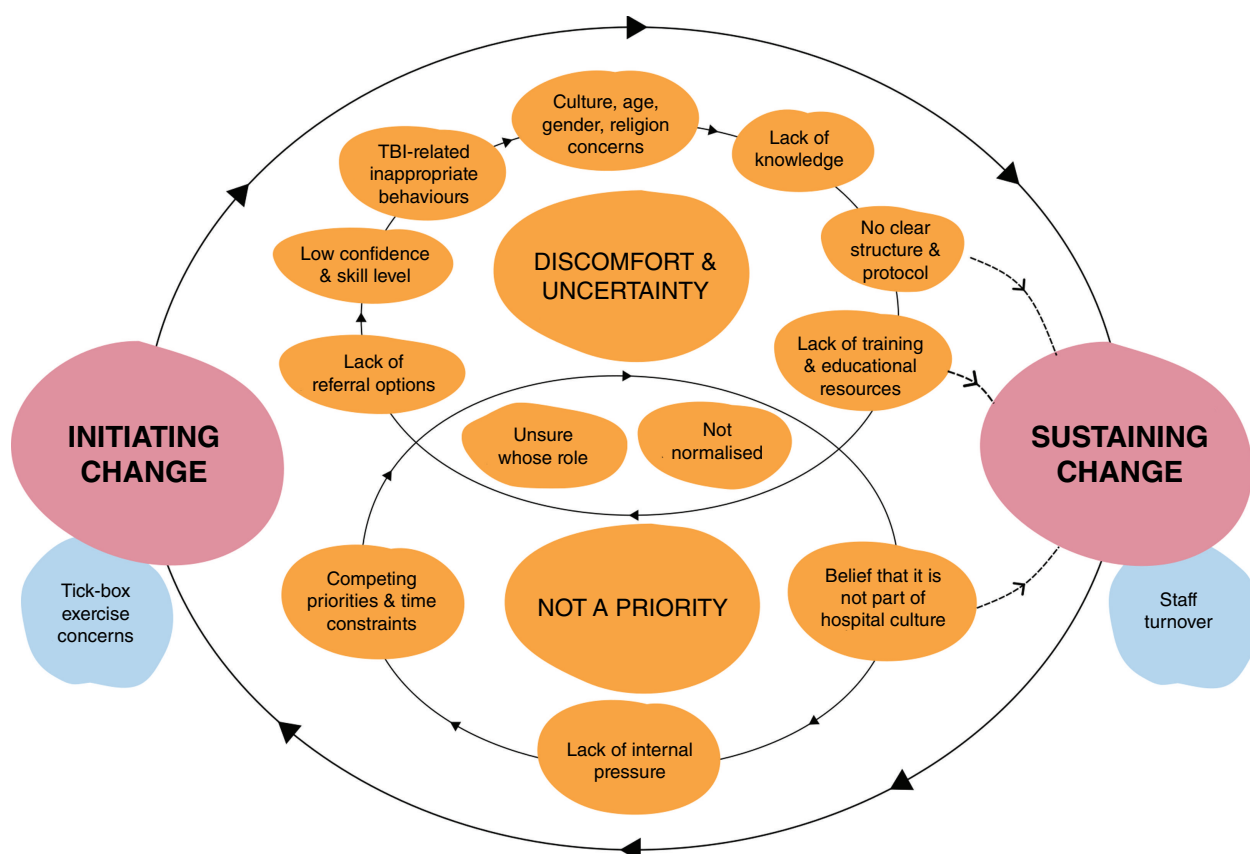

Fig. 2. Thematic map of health professionals' perceived barriers around making practice changes to address sexuality after TBI.

high, with excellent agreement (Mean Kappa = 0.95, s.d. = 0.19, Range = 0.00–1). Member checking was performed, whereby all participants were invited to comment on and validate the accuracy of the authors' group-level summary of identified barriers, enablers, and proposed interventions. Twelve participants responded and all agreed that the summary was accurate. Participants were also provided the option to check transcripts for accuracy, although all declined this option.

Results

Step 2: behavioural diagnosis – identifying current context-specific barriers and enablers

The thematic map of health professionals' perceived barriers in Fig. 2 illustrates two themes: 'Initiating change' and 'Sustaining change'. These themes encompass two major subthemes: 'Discomfort and uncertainty' and 'Not a priority', as well as 14 minor subthemes. Together, they broadly capture the clinical team's sentiments regarding the highly intertwined barriers that could hinder achieving unit-wide behavioural change in addressing sexuality routinely.

Barriers: initiating and sustaining change

The team's concerns and confidence in initiating change were seen to be influenced by their assessment of the sustainability of these changes. As depicted in Fig. 2, many of the barriers were noted as highly interrelated and hard to tease apart. There were also specific concerns relating to the two themes.

Tick-box exercise concerns. Specific to concerns around initiating change, participants indicated that forcing team-wide change to clinical practice could result in a superficial exercise with no real impact: 'If we made it practice that everyone has to talk about it then it becomes a tick box exercise, but it doesn't necessarily mean that we're going to do it effectively.' (P17, IP)

Staff turnover. A few participants had previously received training within Epworth on addressing sexuality, but reported that behaviour change was difficult to sustain given historically high staff turnover: 'When there is a high turnover, how do we then make sure that people aren't slipping through the cracks with education in this area?' (P7, IP)

Discomfort and uncertainty

The team expressed 'feelings of anxiety and awkwardness' (Anonymous exercise) and uncertainty: 'how do we initially bring up this conversation?' (P9, IP). These feelings were interrelated, with the low confidence and skill level stemming from a perceived lack of knowledge, referral options, training and educational resources, and other barriers illustrated in the thematic map.

Low confidence and skill level. Most of the team felt they lacked confidence, expertise, and experience in addressing sexuality: 'Lack of confidence due to inexperience of talking about sexuality.' (Anonymous exercise)

Lack of knowledge. Participants indicated that they had limited knowledge about sexuality in the context of TBI and options for assessment and interventions. Therefore, they felt uncertain in navigating issues with patients: 'I [feel] limited in my knowledge and advice that I could give to the patient.' (P21, IP)

Lack of referral options. Adding to the discomfort and uncertainty was the lack of solutions participants felt they could provide if patients were to open up about sexuality issues: 'How do we find clinicians to refer to for them to know about in the community who won't brush them off or won't say: 'Oh I really don't know about that'.' (P6, TLC)

Culture, age, gender, and religion concerns. The team reported low confidence in navigating demographic differences: 'We don't know enough about different cultures, you know? What offends whom? … are there certain things we need to know that we don't, where we step on a trap or a landmine and we don't realise?' (P6, TLC)

TBI-related inappropriate behaviours. Relating to cognitive and personality changes that can result after a TBI, the team raised fears around encouraging inappropriate behaviours: 'There are patients who are inappropriate already before you even started to talk about anything intimate.' (P16, IP)

No clear structure and protocol. Participants felt that behavioural change is hard to sustain or even achieve if there are no structures or protocols put in place following behavioural change efforts: 'I think we had sexuality training about five years ago. But once we do one big workshop then it drops off for the next cohort of people to come through.' (P7, IP)

Lack of training and educational resources. Most of the team reported having received little to no prior training and were unaware of existing educational resources to help advance knowledge in post-TBI sexuality or provide to patients: '[Lack of] informational materials to provide; lack of training.' (Anonymous exercise)

Not a priority

The team admitted that addressing sexuality was not considered a priority at the time of the focus group discussions due to competing priorities, time constraints, minimal internal pressure for change, and the belief that prioritising patient sexuality outcomes is not part of the hospital's culture. As illustrated in the thematic map, this deprioritisation intersected with the feelings of discomfort and uncertainty. This was reinforced by shared barriers around being unsure whose role it is, and that discussing the topic is yet to become normalised in healthcare.

Unsure whose role. There was ambiguity regarding which team member should be responsible for addressing sexuality, and who should initiate the topic: 'Bringing it up versus waiting for client to bring it up; who will have the conversation?' (Anonymous exercise)

Table 2. Enabler themes and quotes mapped against TDF domains.

TDF domain	Enablers	Sample quotes
Knowledge	Holistic team understanding of sexuality	As a speechie for me it really starts with someone being able to have a good relationship with people around them, the family, people that they're really close to. (P19, CIT)
		From a psychology perspective, the psychological aspect of interest or desire in sex. (P7, IP)
Skills	Belief that they have transferable skills	I think my excitability was reminding us all that we have the skill and know how to apply it. (P7, IP)
Professional role and identity	Belief that the team should be developing the skill within their role	I have seen lots of patients and I think this hasn't been addressed as a topic with them. And I think it's a real specialist service that I just think we can definitely improve on and develop within [TBI unit]. (P21, IP)
Optimism	Belief that addressing barriers will improve confidence and comfort levels	if we address the [barriers] that I have [indicated as relevant] I wouldn't have the discomfort. (P20, IP)
Beliefs about consequences	Belief that not addressing it could lead to poor patient outcomes	Well, it means that you could miss something that is potentially correctable medically. (P3, Both)
	Normalising discussions on sexuality and post-TBI sexuality issues	…to just normalise that's something that people are experiencing, so you might experience it as well. (P4, IP)
Intentions	Prepared for change	…disappointed that we haven't done this well and challenged to see what we might be able to do better. (P19, CIT)
Social influences	Belief that they are well supported by the team	I feel like there's a spectrum of when [sexuality] comes up and if it's quite mild we're able to manage it, but other times we're seeking out [support from Neuropsychology]. (P15, IP)

Note: participant quotes are followed by (participant number, setting). CIT, Community Integration Team; IP, Inpatient. All = inpatient and outpatient settings.

Not normalised. Participants expressed discomfort with going against the grain considering that discussions on sexuality are not yet normalised in healthcare: 'Being that person, being the only to talk to someone about it. Puts a lot of pressure on that.' (P5, CIT)

Competing priorities and time constraints. Participants indicated that it had been difficult to prioritise addressing sexuality outcomes due to more pressing concerns and being time poor: 'We just forget to ask about all these other things … we're just too focused on 'are they going to hurt themselves are they going to fall out of bed?'' (P9, IP)

Lack of internal pressure. A few of the participants felt that the team had been relying on external pressure to make team-wide changes: 'The case conference form got reviewed because of the fund requirements … there's always an external pressure to change your forms.' (P7, IP). 'And where has our internal pressure gone?' (P18, CIT)

Belief that it is not part of the hospital's culture. There was a perception that the practice of addressing sexuality is not part of the hospital's culture and therefore the team had not considered prioritising it: 'Also the therapists' assumptions of the [organisational] culture.' (P12, CIT)

Enablers

Table 2 outlines the enablers reported by the team that could increase the likelihood of incorporating discussions on sexuality with patients into routine practice. When deductively mapped to the TDF domains, eight enabler themes

were identified, as compared to the 35 barrier themes (see Supplementary Appendix S3), thereby endorsing the behavioural change problem at hand. Participants shared a wide variety of sentiments. While some expressed a keenness to initiate and engage in change, others expressed reticence ('Intentions'). Participants also expressed low self-efficacy related to a perceived lack of skill ('Self-efficacy'), which contrasted with beliefs that the team already had the existing skillset that was transferable to addressing post-TBI sexuality well ('Skills'). In relation to the intertwined nature of barriers mentioned earlier, participants believed that addressing the barriers would improve confidence and outcome levels ('Optimism').

Step 3: identifying and consolidating areas for development

The five areas that were identified and consolidated for further development by the researchers included: (1) Patient informational resources, visual aids, ward poster, and handouts, (2) Roles and referrals, (3) Training, (4) How to have conversation and confidence, and (5) Case conference and clinical team integration.

Step 4: co-design and development of intervention options

Nine intervention options arose from the co-design process: (1) Staff training, (2) Staff educational resources, (3) Patient

informational resources, (4) Visual cues for normalisation, (5) Documentation, (6) Patient sexuality liaison and coordinator, (7) Case conference meetings, (8) Sexuality champion (s), and (9) 6-week medical follow up. Supplementary Appendix S4 provides a detailed summary of the co-designed intervention options which were further mapped onto the BCW intervention functions (Atkins *et al.* 2017). The nine co-designed interventions were categorised into five BCW intervention functions. These included: **Training**, **Education**, **Enablement**, **Environmental restructuring**, and **Modelling**, with six of the nine co-designed intervention options corresponding to the **'Enablement'** and **'Environmental restructuring'** BCW intervention functions.

Step 5: prototyping, production, and implementation delivery

Six final implementation deliverables resulted from the co-design and implementation process. Table 3 outlines these deliverables along with the barriers targeted and mapped against the corresponding BCW intervention functions that were met.

Discussion

Following an expressed desire by individuals with TBI to have sexuality addressed during rehabilitation, this study aimed to change team-wide behaviours such that health professionals would attempt to address sexuality in individuals who had sustained TBI. In collaboration with health professionals from a TBI rehabilitation unit, the study explored barriers and enablers, co-designed intervention options, and produced implementation deliverables. Resultant implementation deliverables included: (1) multidisciplinary staff training workshops, (2) staff educational resources, (3) a patient brochure that was vetted by service users, (4) building sexuality into the existing case conference meeting structure, (5) establishing patient sexuality liaisons, and (6) inclusion of topic in formal documentation. Deductive utilisation of the TDF and BCW allowed for a structured and thorough approach to understanding the behaviour change factors and implementable solutions identified from a naturalistically driven co-design process (Michie *et al.* 2011; Cane *et al.* 2012; Bonner *et al.* 2021).

Despite sexuality resources having been available for decades, participants expressed a lack of knowledge of post-TBI sexuality issues, and existing management approaches, resources, and external referral pathways. A resource that is often highlighted as a possible model to assess sexuality in brain injury rehabilitation is the Permission, Limited information, Specific suggestions, and Intensive therapy (PLISSIT) sexual counselling model by Annon (1976) (Khajeei *et al.* 2019; Marier Deschênes *et al.*

2019; Auger *et al.* 2020). There is also the 'You and Me' program by Simpson (1999), a 15-module education program designed for staff to educate clients and families on sex and sexuality after a TBI. Of greater significance, a novel cognitive behaviour therapy (CBT) approach for sexuality problems after TBI was developed by Fraser *et al.* (2022) within the same TBI rehabilitation unit a year prior to this study. A couple of participants also indicated receiving sexuality training within the unit a few years earlier. However, they reflected that no lasting change in clinical practice had eventuated due to high staff turnover and a lack of structure to oversee and reinforce implementation efforts.

Many of the barriers were interrelated and this had implications for intervention. For example, participants reflected that much of the discomfort around addressing sexuality could be dispelled, at least in part, by targeting other barriers (e.g. instilling structure and routine in asking patients about sexuality, providing training and resources). The discomfort was seen by participants as an indirect target for intervention. This finding expands on the inferences made in previous literature around personal discomfort being a key barrier to addressing sexuality (Dyer and das Nair 2013; Arango-Lasprilla *et al.* 2017; Hwang *et al.* 2022). Another flow-on effect of barriers being interrelated was that each implementation deliverable targeted multiple barriers concurrently.

Almost a third of identified barrier themes fell under the 'Environmental context and resources' TDF domain. Accordingly, intervention options co-designed by health professionals leaned heavily towards the **'Enablement'** and '**Environmental restructuring'** BCW intervention functions. This is unsurprising given that these TDF domains and BCW intervention functions have previously been linked by expert consensus as relevant in bringing about desired behavioural change (Atkins *et al.* 2017). Furthermore, participants' sentiments around the barriers to initiating change were seen to be impacted by their confidence in whether changes made would be sustainable. These findings suggest that health professionals may require more environmental and social scaffolding in their workplace to feel confident in initiating change. This is supported by a theory-led systematic review on behaviour change interventions (Mark and Carl 2015). The review purports that a combination of normative and relational restructuring, modifications of peer expectations and norms, and reinforcement of these modifications is most likely to achieve professional behaviour change.

Given the lack of internal pressure to prioritise sexuality and to enact practice changes that was identified by participants, it appears that sexuality often flies under the radar relative to other competing clinical priorities. This may reflect the fundamental discomfort around addressing this personal issue that has also been highlighted in previous research (Dyer and das Nair 2013; Hwang *et al.* 2022).

Table 3. Summary of final implementation deliverables.

Barrier themes	TDF domain	Implementation deliverables	BCW intervention function
Limited knowledge about post-TBI sexuality and options for assessment and interventions; unsure what sexuality may entail	Knowledge	Multi-disciplinary staff training workshop: • 2 h training workshop • Basic information what sexuality entails and epidemiology of sexuality changes after TBI • Training on how to broach topic and multi-disciplinary roleplay activities	**Training; enablement**
Unsure how to discuss; low confidence and skill; belief that sexuality is too large and complex to tackle	Skills		
Some staff in precontemplation stage	Intentions		
Unsure whose role it is or what is expected of them	Professional role and identity		
Lack of educational or training resources	Environmental context and resources		
Anxiety, nervousness and apprehension; concerns about being inappropriate	Emotions evoked		
Limited knowledge about post-TBI sexuality and options for assessment and interventions; unsure what sexuality may entail	Knowledge	Staff educational resources: • 1-page staff infographic • 16-page comprehensive staff guide on sexuality after TBI	**Education**
Lack of educational or training resources; lack of good referral options	Environmental context and resources		
Unsure how to discuss	Skills	Patient brochure: • Trifold brochure providing basic information on sexuality after TBI and how to seek help • Serves as a reminder for staff to address topic	**Environmental restructuring; enablement**
Lack of education or training resources	Environmental context and resources		
Staff forgetting to ask	Memory, attention, and decision processes		
Discussing topic is not yet normalised across health care	Social influences		
Unsure whose role it is or what is expected of them	Professional role and identity	Case conference meetings: • Inclusion of topic within existing case conference meetings for service planning and delivery • Amendment of case conference form to include sexuality in relevant subheading	**Environmental restructuring; enablement**
Not something that is routinely or usually done	Memory, attention, and decision processes		
Anxiety nervousness and apprehension; embarrassment or discomfort	Emotions evoked		
No clear protocol on how to address sexuality within the unit; no structure to sustain behavioural change	Behavioural regulation		
Unsure whose role it is or what is expected of them	Professional role and identity	Patient sexuality liaisons: • Neuropsychologists to initiate discussion before discharge • Social workers to raise topic again at discharge	**Modelling; environment restructuring; enablement**
No clear protocol on how to address sexuality within the unit; no structure to sustain behavioural change	Behavioural regulation		
Discussing topic is not yet normalised across health care	Social influences	Documentation: • Team-wide commitment made to formally document all attempts made to address sexuality and provide recommendations for follow up on relevant existing forms	**Environmental restructuring; enablement**
No structure to sustain behavioural change	Behaviour regulation		
Unsure whose role it is or what is expected of them	Skills		

However, the persistent lack of clinical attention despite availability of resources and a growing body of research providing health professionals with clinical tools aligns with the notorious research-to-practice gap faced by clinical researchers (Morris *et al.* 2011; Marier-Deschênes *et al.* 2020; Fraser *et al.* 2022). It further highlights the difficulty of achieving team-wide behavioural change and underscores the importance of interventions that target behavioural regulation at environmental and structural levels to ensure that meaningful and lasting changes can be made (Mark and Carl

2015). Making practice changes to address sexuality routinely involves health professionals working against the odds to navigate social and professional stigma around speaking about sexuality, a topic that is uncomfortable for most to initiate. Encouraging health professionals to broach this highly sensitive topic might require support provided on multiple levels such as training and changes to institutional practices.

Strengths and limitations

Several aspects of the study served as strengths that underpinned the implementation efforts. A conscious effort was made to utilise existing infrastructure and systems with which staff were already familiar during the implementation process, with the aim of smoothing transitions and minimising workflow disruptions. Having a research member as part of the clinical team (J. H.), longstanding knowledge of the team culture (J. P.), and maintaining constant feedback loops between staff and the research team over a lengthy study period may have helped in increasing stakeholder buy-in and trust that real change would follow. Managers were also involved from the outset, leading to top-down encouragement and possibly boosting staff confidence that their participation in the co-design and implementation process would bring about meaningful change. Finally, service users played a key role in initiating the co-design and implementation process, despite the present study's primary focus on engaging staff stakeholders. As such, the approach was significantly influenced by consumer consultation as reported in a prior study (J. Hwang, M. Downing, J. Ponsford, unpubl. data), and by the patient-oriented resource that was produced as one of the implementation deliverables.

This study also has several limitations. First, not all identified barriers and co-designed intervention options could be addressed and delivered due to research time and resource constraints. Due to these constraints, the research team was also unable to achieve embedded environmental restructuring interventions such as staff orientation training modules that were viewed by participants to be an effective intervention for targeting multiple barriers. However, the detailed exploration and provision of health professional co-designed intervention options in this study will likely support future implementation efforts to achieve this. Lastly, the implementation deliverables were designed to address identified barriers, but their effectiveness in doing so remains uncertain. Hence, as a final step in the co-design and implementation process, this study will be followed by an evaluation of the process through staff interviews and patient surveys of service delivery satisfaction and sexuality outcomes.

Conclusion

This study employed a co-design and implementation process to develop and produce six implementation deliverables with the aim of achieving team-wide behavioural change, whereby health professionals at a TBI rehabilitation unit would attempt to address sexuality with patients routinely. Barrier and enabler themes to achieving behavioural change were identified and determined as highly interrelated. Accordingly, implementation deliverables targeted multiple barriers concurrently and might have an indirect effect of dispelling some of the discomfort around addressing sexuality. The findings of this study suggest that environmental restructuring and enablement at the organisational and team levels might be required to achieve meaningful and sustainable practice changes. The next step is to evaluate the effectiveness of the co-design and implementation process in achieving behavioural change and any resultant impacts on patient satisfaction and sexuality outcomes.

Supplementary material

Supplementary material is available online.

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Author affiliations

[A]Turner Institute for Brain and Mental Health, School of Psychological Sciences, Monash University, Clayton, Vic. 3121, Australia.

[B]Monash-Epworth Rehabilitation Research Centre, Epworth Healthcare, Richmond, Vic. 3121 Australia.

[C]Faculty of Psychology and Neuroscience, Maastricht University, Maastricht, The Netherlands.