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RESEARCH ARTICLE

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Identifying key components for psychosocial interventions in neurorehabilitation: a realist evaluation on young adults with an acquired brain injury

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ABSTRACT

Background: Acquired brain injuries (ABIs), including stroke, lead to younger adults exhibiting a range of psychosocial challenges such as isolation or diminished quality of life. Healthcare services including multidisciplinary teams and nurses play a pivotal role in helping individuals navigate a post-ABI world, but the mechanisms underlying psychosocial support in a younger population remain largely unknown.

Methods: This realist evaluation explores ten initial programme theories derived from a realist review literature. Realist interviews were also conducted to refine these programme theories and clarify which causal and contextual factors are most important for intervention development, as guided by the Six steps in Quality Intervention Development (6SQuID). Six young adults with experience of ABI and seventeen service providers from across the four countries of the UK participated in this theory refinement.

Results: The co-construction refinement process with the participants focusing on psychosocial support to people with ABI resulted in three refined programme theories expressed as context, mechanism, outcome configurations: (1) "Engaging the Individual;" (2) "Empowering the Community," and (3) "Equipping the Professionals."

Conclusion: This realist interview evaluation highlights crucial elements that both experts by experience and service providers identify as necessary to be incorporated into future psychosocial interventions.

➢ IMPLICATIONS FOR REHABILITATION

- Acquired brain injuries, including stroke, are becoming increasingly common among younger adults (aged 18–45) resulting in a variety of psychosocial challenges.
- In this study, key components including: (1) meaningful engagement; (2) empowering communities and; (3) equipping healthcare professionals, have been identified as necessary to develop a psychosocial intervention for young adults with an acquired brain injury.
- Rehabilitation practices should incorporate these evidence-based and age-appropriate components when providing psychosocial support for young adults with an acquired brain injury.

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Brain injury; young adults; realist; evaluation; psychosocial intervention

Introduction

Acquired brain injuries (ABIs), including stroke, traumatic brain injuries (TBIs) and non-TBIs are among the leading causes of death and disability in the UK and worldwide [1]. In 2023–24, there were 335,409 total hospital admissions across the UK, with a rate of 491 per 100,000 of the population (or one ABI admission every 90 s) and an overall economic impact on the UK of £43 billion a year including lost productivity, NHS care and benefits [2,3]. ABI can result in death, or a life with severe, moderate, mild or no apparent disability, and the long-term impact will depend on the location, extent and severity of the damage [4,5]. Accordingly, it is common to experience a range

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of impairments and consequences post-ABI, affecting physical, social and psychological domains [6,7]. Of these, there is particular concern for the long-term consequences of ABI that require ongoing psychological, social and financial support [8,9].

While the onset of ABI can occur at any age, there is increasing evidence that it is a major public health challenge for young adults aged 18–45, particularly as current guidelines tend to cater their approaches towards older survivors (>55), resulting in failure to provide age-appropriate care [10–12]. This can be particularly devastating on young adult's quality of life [13] and leads to a disproportionately greater economic impact experienced during their most productive years [14]. Additionally, recent healthcare trends suggest that young adults are more likely to experience TBIs [15], with the frequency of stroke and other ABIs increasing among younger populations in recent years [16,17]. Equally, young adults typically have a longer life expectancy following their brain injury [18] and they will typically live longer with the effects of their brain injury as they navigate their careers and active social/family lives [19,20]. What follows is a lack of psychological and social support among this cohort [21] as well as for those responsible for their care [22], leading to poorer quality of life [13]. Optimal support for psychosocial functioning post-ABI is characterised by a psychological and social care plan that improves upon patient independence and combats social isolation and occupational deprivation [23,24]. Psychosocial interventions can promote psychosocial functioning by targeting specific post-ABI psychosocial deficits and supporting community reintegration and return to work [23].

Specialist nurses provide a crucial source of support for young adults who have experienced an ABI [10], with evidence suggesting that they can help provide holistic and integrated care from diagnosis onwards. Neurorehabilitation nurses, if available, maintain close contact with ABI survivors and their caregivers [25,26]. Similarly, they are familiar with important contextual patient information [27] and can reinforce the input of other members of the multidisciplinary team [28]. Overall, this suggests that nurses make considerable contributions to the psychological and social wellbeing of ABI patients [25], however there is uncertainty about the evidence base for these contributions [29,30]. While some ongoing research tackles such issues in the general stroke population, there is a dearth of literature regarding psychosocial outcomes for young adults with ABI.

This article builds on a realist review of the literature which identified ten initial Programme Theories (PTs) analysed in this study [31]. These ten PTs include broad rehabilitation contexts, social support, coping strategies, emotional and mental health support, giving back to the community and realistic, meaningful, vocational, holistic and interdisciplinary rehabilitation. More broadly, these ten PTs have been organised within four key clusters: (1) trusting relationships between young adults and healthcare professionals, (2) gaining social connectedness, (3) holistic rehabilitation processes, and (4) interdisciplinary rehabilitation approach [31]. Identifying these initial PTs acts as the first crucial step of the six Steps of Quality Intervention Development' (6SQuID) [32] in understanding the problem faced by young adults with ABI. The present paper acts as step two of the 6SQuID, refining upon these ten initial PTs in order to identify the causal factors that have the greatest scope for change. This is done by co-constructing realist interviews on what works, how, for whom and in what context, incorporating two key theoretical lenses for interpretation of this data. The first theory is "biographical disruption" [33], a concept which describes how the onset of a sudden illness or injury can alter one's thoughts, relationships, peers, sense of identity and overall life trajectory [34]. As many young adults with ABI encounter this disruption at an early stage of life, the potential impact may be greater and longer-lasting [19]. The second is Bandura's [35]; theory of self-efficacy, relating one's self-perception of ability to accomplish a desired task [36]. Previous ABI research suggests that positive self-efficacy can lead to favorable health-related and rehabilitation-based outcomes [37,38]. Among younger stroke patients, self-efficacy has also been shown to promote levels of self-management, particularly when aided by strong social support [39]. These theoretical concepts inform our analysis for the key components required for effective psychosocial intervention for young adults with ABI. Accordingly, the study aims are as follows:

1. To test and refine a series of initial PTs of psychosocial rehabilitation provision for young adults following an ABI regarding what works, how, for whom and under what conditions.
2. To identify the processes of psychosocial rehabilitation for young adults following an ABI across the UK to capture contextual differences between settings.

3. To identify and refine key components to inform the design of a psychosocial intervention for young adults following ABI.

Materials and methods

Realist evaluation

The study takes a qualitative, co-constructive, realist approach to intervention development [40,41]. Realist evaluations begin by establishing a range of initial Program Theories (PTs) which use existing literature to theorise the components of an intervention that may work, who it may work for and why this is [42]. In this study, a realist interview technique is used, guided by initial PTs developed from the literature to refine theories through the process of interview data analysis [43]. This refinement process allows co-construction between participants and researchers in the generation of Context-Mechanism-Outcome (CMO) configurations. These configurations seek to identify the specific contextual factors (C) that trigger certain mechanisms (M) which, when combined, lead to various outcomes (O) [42].

Intervention development framework

This study is one of several phases involved in the YARNS Transitions project (see Table 1.) that utilise the first four steps of a development framework, "The six Steps of Quality Intervention Development" (6SQuID) [32].

As Table 1 shows, the following study seeks to clarify the modifiable causal or contextual factors that have the greatest scope for change. This step is crucial in order to understand what needs to be changes within modern psychosocial rehabilitation practices for young adults with ABI. Similarly, it allows suggestions in the form of mechanisms that can be carried forward for future steps along the 6SQuID framework when developing theories of change and action.

Co-construction and refinement with stakeholders involved young adults with experience of ABIs, service providers, and academics to create a grounded, acceptable and accessible intervention for young adults with ABI [44]. Doing so avoided underrepresenting or marginalising the voices of this cohort with ABI regarding their psychosocial needs and avoiding the more common focus on older adults in modern healthcare [11].

Participants & recruitment

Two stakeholder groups participated in data generation, with the first being Experts by Experience (EbyEs). The eligibility criteria for EbyEs in this study were young adults residing in the UK who have experienced an ABI/stroke between the ages of 18–45. Recruitment infographics and posters were shared through stroke and ABI charity mailing lists and social media, including SameYou, Different Strokes and Headway [2,45,46]. Infographics and posters featured the research project email, allowing prospective participants to contact the research team.

The second stakeholder group featured service providers including healthcare professionals those in the third sector (including charity workers and voluntary community support). The eligibility criteria for

Table 1. The first six steps of quality intervention development (6SQuID) and integration with the YARNS transition project phases of work and publications.

6SQuID steps	How the step is evidenced
(1) Define the problem and its causes	YARNS Phase 1—Generation of initial PTs *via* realist review[1].
Clarify modifiable causal or contextual factors	YARNS Phase 2—Refinement of initial PTs using realist interviews (Present paper).
Develop a theory of change	YARNS Phase 3—Revising refined PTs into a logic model (Pending submission).
Develop a theory of action	YARNS Phase 4—Development of psychosocial intervention *via* interactive workshops (Pending submission).
Test and refine on small scale	Pending future funding
Collect evidence of intervention effectiveness	Pending future funding

all service providers was that they had to be aged 18 or over and had experience working with or treating young adults with ABI or stroke in the UK. Any participants that did not meet the eligibility criteria were excluded. Service providers were recruited across the four nations (Scotland, England, Northern Ireland and Wales). One site was selected in each nation with healthcare professionals working in acute, community and rehabilitation settings across urban, suburban and rural areas. The respective sites captured the wide range of service provided at the various stages along the rehabilitation pathway. A team service manager was contacted in each of these sites, mapping out active service providers within their team and acting as a liaison for study recruitment. Infographics and posters were shared through service management to service providers to achieve recruitment targets.

Prospective participants emailed the research team, whereupon they were sent participant information sheets and consent forms to complete and return. Once consent was obtained, all participants were sent a short demographic form, and a time/date was arranged for a virtual interview.

Data collection

Realist interviewing

A realist evaluation approach [47,48] was adopted to design and administer a series of semi-structured interviews across relevant stakeholders. These interviews explored and refined a series of initial Program Theories (outlined in Table 2) derived through a realist review of the literature [31].

Data collection was carried out on Microsoft Teams, with interviews audio recorded using the digital recorder AES256, with encryption, between September 2024 and March 2025. Two semi-structured interview schedules (see Supplementary Material 1) were informed by the ten initial PTs from the phase 1 realist review, targeting EbyEs and service providers respectively. Before beginning the interview, the interviewer aimed to put the participant at ease and clarified the interview process, reiterating that they could take breaks, skip questions or cease the interview at any time. Consent was reaffirmed verbally at the start of each interview. The mean interview duration across all participants was 54.83 min (SD = 10.55; range = 31–83). Participants were given a debrief and a final opportunity to add any further relevant information at the conclusion of their interview.

Iterative interview approach and data analysis

All participants were interviewed using a theory-driven, iterative realist approach [43]. Interview recordings were transcribed verbatim using a transcription service approved by the University. The Research Fellow (RF; OC) pseudonymised and proofread each transcript, then uploaded it onto NVivo15 software for data management and analysis [49]. The RF coded participant responses into appropriate *a priori* CMO codes and subcodes within each initial PT using a retroductive approach, involving both inductive and deductive evidence [50]. This was characterised by using researcher-led interpretations of underlying psychosocial drivers when identifying programme theories and subsequent CMO configurations. Similarly, Braun & Clarke's [51]; thematic analysis was also utilised to assist coding and generation of themes. Around 25% of the realist evaluation coding was double checked by the co-investigators (CCh, CC, and LA) to help ensure consistency and rigour. As data analysis progressed, the initial PTs identified in phase 1 and subsequently used to inform interview schedules were refined further. The steps taken in the

Table 2. Initial program theories established in realist review.

#	Initial Program Theory	Description
1	Contextual	Person-centred approach in decision making allows young adults to engage with the rehabilitation programme.
2	Social Support	A balanced group composition fosters a supportive environment within the peer group.
3	Coping Strategies	Adopting suitable coping strategies improves quality of life post-ABI.
4	Realistic Rehabilitation	Rehabilitation in a realistic/real life setting leads to adjustments in life goals.
5	Emotional & Mental Health	Emotional regulation rehabilitation programme enhances self-awareness and social adaptation.
6	Meaningful Rehabilitation	Meaningful psychosocial rehabilitation enhances goal attainment in young adults.
7	Vocational Rehabilitation	Mutual understanding between young adults and employers facilitates a return to work/study.
8	Giving Back to the Community	Giving back to the wider community improves psychosocial recovery outcomes.
9	Holistic Rehabilitation	Holistic rehabilitation increases skills and confidence to participate in daily activities.
10	Interdisciplinary Rehabilitation	Interdisciplinary rehabilitation facilitates improved outcomes.

refinement process corresponded with realist evaluation practices and intervention development frameworks [32,50]. Qualitative evidence was analysed to support, refine or refute initial PTs, with each decision made in collaboration with the research team and the advisory board to enhance rigour. For every refined program theory (RPT), a summary and rationale for the decision was journaled in NVivo15. Once these RPTs were established, they were further examined using the iterative interview approach shown in Figure 1.

The analytic process identified a range of CMO configurations (i.e., the relationship between specific contexts, mechanisms and outcomes within a system). Each CMO configuration overlapped with coding of other RPTs and ultimately led to a series of Mid-Range Theories (MRTs), a descriptive format for CMO configurations [52]. Finally, a series of demi-regularities were identified for each MRT. Demi-regularities capture the nuance within MRTs, showcasing how alterations in one CMO configuration could influence the entire system [53].

Ethical considerations

This study was approved by the University of Edinburgh's School of Health in Social Science Research Ethics Committee (Ref No. 23-24-NUST024) and the Health Research Authority and Health and Care Research Wales (IRAS Project ID: 328958) Research and Development approval was obtained for the participating NHS sites. Written and verbal informed consent was obtained from all participants prior to the commencement of interviews. Confidentiality of participant data was assured, and secure storage was employed.

Results

A total of twenty-three participants were interviewed, with participant demographics listed in Table 3.

All ten initial programme theories (PTs) were analysed to determine if they were to be refuted, refined or supported. Figure 2 visually demonstrates the outcome of this refinement process, with the rationale behind each decision elaborated below.

PT1 Contextual was refuted following extensive evidence during participant interviews. Each refined program theory can be demonstrated in a way that showcases their CMO configurations, but PT1 exhibited overwhelming evidence for contextual codes found in all other PTs and minimal evidence for mechanisms/outcomes. Accordingly, this program theory was refuted. The remaining nine initial PTs were either refined or supported into 3 Refined Program Theories (RPTs), (1) Meaningful Rehabilitation; (2) Psychosocial Health; and (3) Interdisciplinary Rehabilitation.

RPT1: Meaningful Rehabilitation is refined from PT4 Realistic Rehabilitation, PT6 Meaningful Rehabilitation, PT7 Vocational Rehabilitation and PT9 Holistic Rehabilitation. The rationale for refining these initial PTs together was that goal setting and determining what is most meaningful to the patient was a crucial step shared across these four PTs. Accordingly, the refined theory that was generated

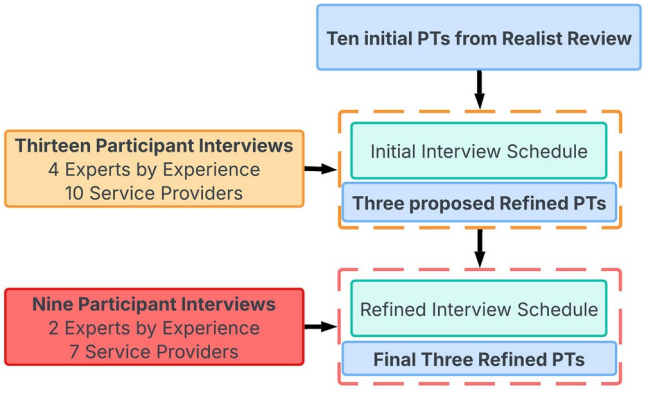

Figure 1. Flowchart illustrating iterative interview schedules and initial PT refinement.

Table 3. Participant demographic information.

Demographic	EbyEs ($n=6$)	Service providers ($n=17$)
Biological sex (%)		
Male	1 (16.67%)	3 (17.65%)
Female	5 (83.33%)	14 (82.35%)
Nation (%)		
Scotland	1 (16.67%)	4 (23.53%)
England	3 (50.00%)	5 (29.41%)
Northern Ireland	2 (33.33%)	3 (17.65%)
Wales	0 (0.00%)	5 (29.41%)
Age in years (%)		
21–35	3 (50.00%)	6 (35.29%)
36–45	2 (33.33%)	3 (17.65%)
>45	1 (16.67%)	8 (47.06%)
Type of ABI (%)		
Stroke	4 (66.67%)	
Traumatic Brain Injury	1 (16.67%)	
Brain Tumour	1 (16.67%)	
Mean time since ABI (SD)	4.03 (3.43)	
Place of Work (%)		
Hospital		7 (41.18%)
Rehabilitation Centre		6 (35.29%)
Community Centre		3 (17.65%)
Charity Organisation		1 (5.88%)
Job Title (%)		
Nurses		3 (17.65%)
Occupational Therapist		3 (17.65%)
Nursing Manager		2 (11.76%)
Speech and Language Therapist		2 (11.76%)
Assistant Psychologists		2 (11.76%)
Clinical Psychologist		1 (5.88%)
Physiotherapist		1 (5.88%)
Medic		1 (5.88%)
Discharge Co-ordinator		1 (5.88%)
Charity Manager		1 (5.88%)
Experience in years (%)		
1 to 5		3 (17.65%)
5 to 10		5 (29.41%)
10 to 20		6 (35.29%)
>20		3 (17.65%)

relates to what young adults with ABI and service providers deem most meaningful in the individual's lives (e.g. identity or role) and translating this into realistic, manageable and obtainable goals with the support of nursing staff and other service providers across the rehabilitation pathway.

RPT2: Psychosocial Health is refined from PT2 Social Support, PT3 Coping Strategies, PT5 Emotional & Mental Health and PT8 Giving Back to the Community. The rationale for refining these initial PTs together was that peer involvement was shared across these 4 PTs and participants often sought to improve psychological wellbeing and reintegrate young adults back into society as part of this process. Therefore, the refined theory that was generated relates to the identification and treatment of psychosocial components and challenges with a particular focus on how these influence the lives of young adults with ABI. Furthermore, this theory showcases how engagement with healthcare professionals and peers with lived experience can lead to improved psychosocial health.

RPT3: Interdisciplinary Rehabilitation is supported from PT10 which shares its name. The rationale for this support is reflected in having sufficient evidence across participant groups and across UK nations to remain largely unchanged from the initial theory. As current neuro-rehabilitative practices utilise the full range of the interdisciplinary team, it is important to theorise and demonstrate how members of these teams can interact in order to boost healthcare professional's skills, knowledge and confidence with the ultimate goal of improving the health and wellbeing of young adults with ABI. As current neuro-rehabilitative practices utilise the full range of the interdisciplinary team, this refined theory demonstrates how members of these teams can interact in order to boost healthcare professional's skills, knowledge and confidence with the ultimate goal of improving the health and wellbeing of young adults with ABI.

Many of the contexts, mechanisms and outcomes interact within and beyond the specific RPT they were coded to. For example, "Support Network" was a widely evidenced context originally identified in PT2—Social Support. Despite this initial PT being refined into RPT2—Psychosocial Health, the context of "Support Network" is still important evidence when determining what is most meaningful to the

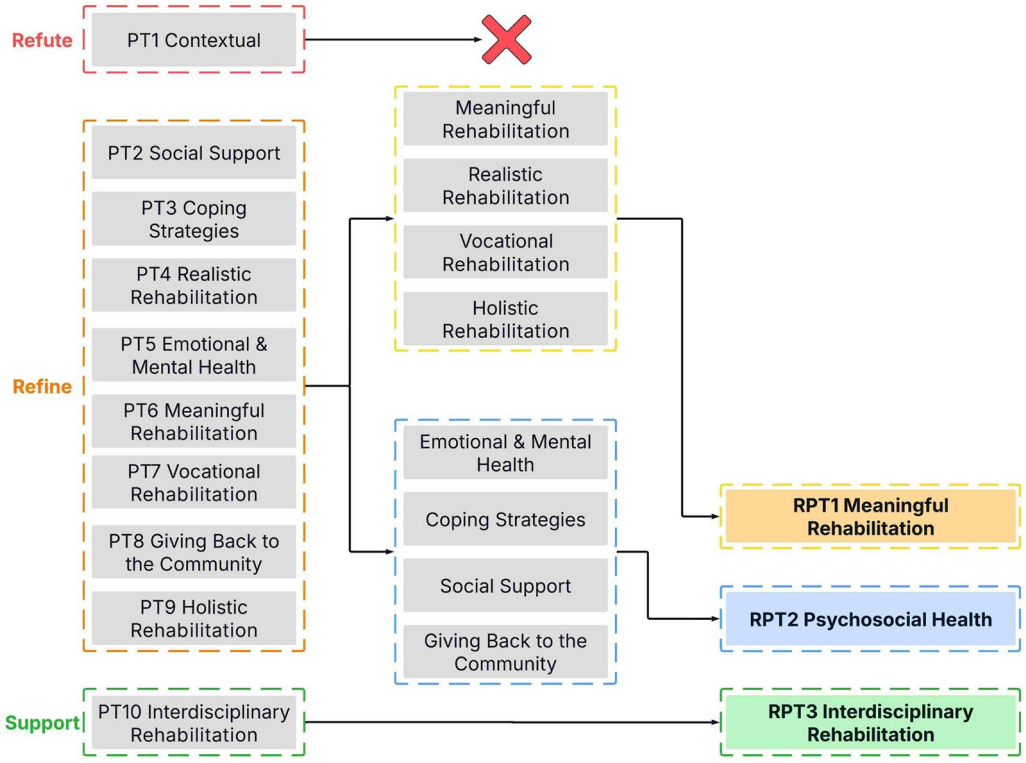

Figure 2. Refinement of initial program theories.

individual (RPT1) and how the wider interdisciplinary team can get involved (RPT3). As such, three Context-Mechanism-Outcome (CMO) configurations were established by this study, each primarily corresponding with one RPT, but drawing on evidence uncovered in the other two RPTs.

RPT 1: Meaningful rehabilitation

CMOC #1—engaging with the individual

Young adults with ABI were placed at the centre of participant responses, illustrating the importance of their identity, what was most meaningful to them and their goals post-ABI. Participants highlighted five mechanisms, three contexts and four outcomes pertaining to CMOC #1 as shown in Figure 3.

Mechanism—Breaking down goals

Service providers, including nurses, discussed the importance of setting goals across the rehabilitation pathway, and how these should be broken down into realistic and attainable steps with an overall target at the end. Goals should be revisited at regular intervals as they progress towards recovery.

Mechanism—Person-centred caring

This mechanism requires active listening on behalf of healthcare professionals to understand what young adults want/need out of rehabilitation, thus avoiding the "one-size-fits-all" approach. Implementation of person-centred rehabilitation may require making feasible adjustments to existing rehabilitative practices, including close loved ones, accommodating any needs/impairments they may have with regular consultations to ensure an individualised approach is maintained.

Mechanism—Trusting relationships with healthcare professionals

Consistent follow-ups can help facilitate engagement with meaningful rehabilitation targets and encourage young adults to be more honest and forthcoming about their needs. Beyond facilitating engagement, nurses are in a position to build up trust and rapport, discuss everyday life issues, hobbies and

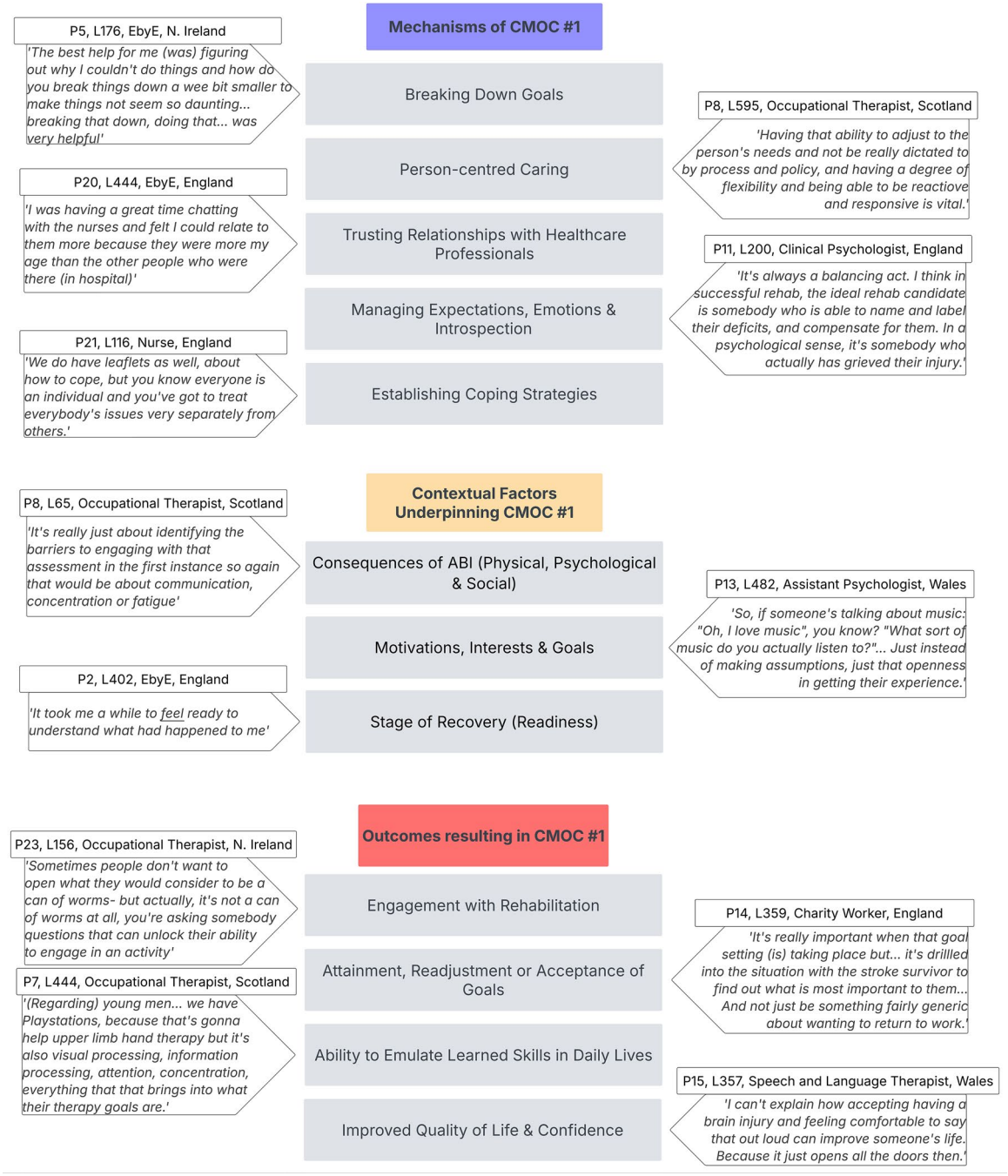

Figure 3. CMOC #1—Engaging with the individual.

other interests beyond rehabilitation, so helping to put young adults at ease and help ensure comfort and psychological safety.

Mechanism—Managing expectations, emotions & introspection

This mechanism centres around information provision, signposting and psychoeducation to allow young adults to learn about themselves (i.e., "the evolving self"), their expectations of the service/journey and management of emotions. Lack of insight into one's own condition as well as poor, unattended mental health needs can be detrimental to motivation and ability to engage in rehabilitation. Accordingly, these are crucial mechanisms to promote and maintain.

Mechanism—Establishing coping strategies

young adults also need to be armed with a range of coping strategies (examples including breathing exercises to manage feelings of anxiety or anger, or memory exercises to ground oneself and promote cognitive ability). Establishing a stable support network to help guide young adults as they progress in their ABI recovery is a vital requirement.

Context—Physical, psychological & social consequences of ABI

Young adults with ABI exhibit a wide range of physical, psychological and social impairments, all of which can confound aspects of everyday life including activities (e.g. hobbies, sports, job, and education), finance, relationships, independence, and overall quality of life. These consequences are important to consider when determining the rehabilitation pathway.

Context—Motivations, interests & goals

EbyEs were often in a stage of life involving developing their career, pursuing education, raising a young family and paying a mortgage when ABI occurs. These life events can all be affected post-injury, so healthcare professionals need to understand their unique motivations and goals. The underlying reason behind goals is also vital (e.g. a young adult wants to return to driving so they can take their children to school). Additionally, young adults with ABI can exhibit a range of interests that allow feasible adjustments to be made, as well as offering opportunities for establishing trusting relationships with healthcare professionals.

Context—Readiness to engage & stages of recovery

Readiness to engage is a crucial determining factor that can influence the effectiveness of psychosocial interventions. EbyE interviews suggest that major (typically physical) improvements are commonly observed earlier, during the acute stages of recovery. Strategies promoted at the wrong time (e.g. too early) can harm overall engagement and potentially hinder the efficacy of these recovery stages.

Outcome—Engagement with rehabilitation

When a young adult's impairments, needs, motivations and goals are considered and tailored towards along the rehabilitation pathway, their frequency, level and consistency of engagement should also improve, leading to gains across other outcomes in this configuration.

Outcome—Attainment, readjustment or acceptance of goals

When goals are established with the young adult, plans on how to achieve these goals will be assisted and they are more likely to be attained. In instances where this occurs, new goals can then be set to foster ongoing engagement. When such goals cannot be met, for reasons within or beyond the young adult's control, certain mechanisms can help them accept why this has occurred and allow them to readjust goals accordingly.

Outcome—Ability to emulate learned skills in daily lives

Upon discharge from hospital or following community support, young adults with ABI should have learned how to access a variety of resources that will add to and build their skill set so that they are able to engage in rehabilitation at home. Healthcare professionals should ensure that rehabilitation activities are applicable to real-life settings.

Outcome—Improved quality of life & confidence

By experiencing ABI rehabilitation in a way that caters to individual needs and interests, improvements in quality of life, levels of self-efficacy and confidence may improve for young adults with ABI and their loved ones.

Having explored the various contexts, mechanisms and outcomes for RPT1, it is now possible to showcase the overarching Mid-Range Theory (MRT) supported through evidence in the form of demi-regularities (i.e., showcasing how alterations in a CMO configuration may influence the whole).

MRT underpinning CMOC #1—engaging with the individual

Data supports the importance of healthcare professionals working alongside young adults with ABI to identify and understand core motivations, interests and goals and the extent by which impairments following stroke/ABI influence these. Additionally, it is vital to understand where young adults are along the rehabilitation pathway and to what extent they are ready to engage with rehabilitation in pursuit of their core goals and values. This will increase the likelihood of efficient engagement with rehabilitation services and help young adults attain their goals (e.g. return to work/study), readjust goals that are no longer desired (e.g. exploring alternate career pathways) and accept when goals need to change. By addressing these, it will be possible to teach a variety of skills that can be implemented in real-life settings and in daily living, ultimately improving quality of life, self-efficacy [35] and levels of confidence despite the biographical disruption brought on from their ABI [33].

Demi-regularities when considering CMOC #1—engaging with the individual

Motivation is paramount but barriers can arise to reduce the likelihood of engaging in rehabilitation and accomplishing goals. While young adults may be equipped with youthful motivation and tolerance, sometimes the service they wish to engage in is not flexible, accessible or available (suggesting it is not age appropriate).

> 'I remember calling my nurse that I'd been given a phone number for, saying…, "They wanna put me back on to full time (work), I don't feel comfortable yet, I don't feel ready," and she sort of just told me to man up. And… you don't know enough to be able to stand up for yourself.' (P20, L17, EbyE, England)

Unrealistic goals are also harmful as they may inflate the disappointment if one fails to reach them. There are various components that may emerge in a young adult's background that act as barriers to efforts aimed at improving psychosocial health. These can include fatigue, diminished motivation, limited capacity, lack of insight into one's impairments, a poor social support network, substance use/abuse or self-defeating behaviours. Such barriers may lead to poorer quality of life and an inability or unwillingness to adapt behaviours/perceptions. In such cases, they may benefit from greater involvement with the wider multidisciplinary team, as well as government schemes, social work and charity involvement. Rehabilitation activities offered at the wrong time, or when young adults are not ready to engage will result in needless resource expenditure and may damage future engagement. This is particularly relevant for longer-term support.

> I do understand that… some community stroke teams offer only maybe 12 weeks of rehab… That suits some people but quite a lot of time it doesn't suit a lot of other people… I genuinely think it has to be the right time for stroke survivors to receive further support when they're ready.' (P18, L109, Nurse, N. Ireland)

The outcome is similar if the activities do not pursue the interests of the individual in some shape or form. EbyEs have reported difficulty engaging in activities they are interested in as a result of certain healthcare professionals being unfriendly, apathetic, unknowledgeable or using medical jargon. Many young adults have difficulty expressing this as a potential barrier (either due to lack of confidence or communication difficulties), often leading them to cease involvement altogether. Additionally, one-size-fits-all approaches still emerge in today's services, reducing take up. Many roles have unique qualities that can make their pursuit post-ABI extremely difficult, if not impossible. Many employers/

education facilities cannot offer feasible adjustments to the workplace to accommodate certain ABI/stroke impairments (e.g. strategies to manage fatigue) and the adjustments that can be offered may be insufficient (e.g. financially). Those who are self-employed/funded may have pronounced difficulties in this regard. Additionally, young adults who are developing their careers may have engaged in training that is not easily transferrable to another role post-injury. Other roles (e.g. parenting) may not have alternatives and so failing to carry them out at a pre-injury level may negatively impact motivation and mental health of clients and their peers.

> 'After about three months, relationships often fall apart y'know? The first three months the family are compensating heavily for that person but then that point is when it all kind of starts… people might start not be able to go back to work, financial difficulties, relationship problems…' (P7, L294, Occupational Therapist, Scotland)

RPT2: Psychosocial health

CMOC #2—Empowering the community

Participants living/working in community settings, highlighted the importance of community/peer supports for young adults with ABI. The following CMO configuration showcases the "Psychosocial Health" RPT, illustrating the importance of combatting isolation and empowering individuals within a wider young ABI community. Participants highlighted three mechanisms, three contexts and two outcomes pertaining to CMOC #2 as shown in Figure 4.

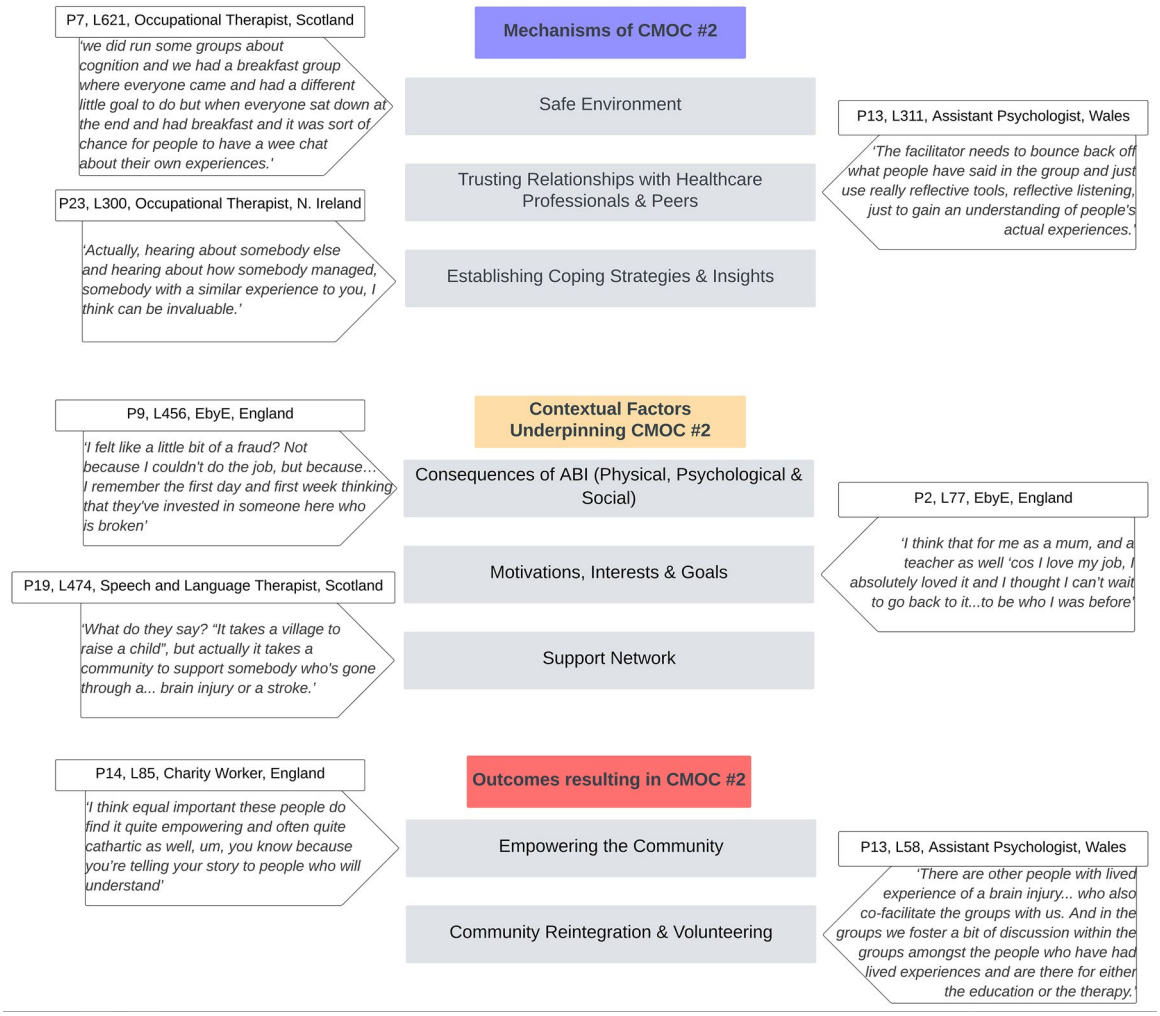

Figure 4. CMOC #2—Empowering the community.

Mechanism—Safe environment

When determining the implementation of any psychosocial intervention, it is important that the delivery format, whether in-person, hybrid or virtual, is safe and physically/technologically accessible for all involved. Young adults with ABI need to feel comfortable disclosing and listening to post-ABI experiences for optimal psychological benefit, and healthcare professionals need to ensure risks regarding discussions of sensitive topics are mitigated.

Mechanism—Trusting relationships with healthcare professionals & peers

In order to cultivate a sense of belonging and camaraderie among young adults, it is important to develop trusting relationships by catering to their age-appropriate interests, motivations and wider support networks. Encouragement for peers to meet beyond the confines of the psychosocial intervention should be encouraged if feasible.

Mechanism—Establishing coping strategies & insights

Alongside social integration, engagement with peers and healthcare professionals is an opportunity to learn from other's experiences and insights in a setting outside the hospital where medical jargon can be avoided. Details explored can include how ABI affects day-to-day life, it's wider influences on employment, finances, relationships and importantly, identifying solutions that young adults with ABI can employ where relevant.

Context—Physical, psychological & social consequences of ABI

In a peer-support context, it is important to understand the types and severities of impairments, and how this affects young adults and those around them post-injury. This is similar to the ABI consequences disclosed in CMOC #1, but with a greater focus on how these can be used to fit with community support efforts and to identify topics to be discussed with like-minded individuals in similar and relatable circumstances.

Context—Psychosocial motivations, interests & goals

Healthcare professionals should determine a series of psychological and social goals/motivations/interests of young adults with ABI and attempt to relate these to their peers so they can participate in engaging activities together. Participants who are open about their motivations and goals can check progress themselves or with peers. Likewise, young adults can learn from their peers who have similar goals but have progressed to further stages of goal attainment.

Context—Existence of a support network

Onset of ABI often affects those closest to the survivors, and so efforts to strengthen an ABI community should seek to include their family members and friends. Identifying the support network is of increasing importance when individuals are more dependent, providing opportunities for healthcare professionals to engage with relevant information, contacts and other support.

Outcome—Empowering the community

EbyEs accounted that they knew very few people who have experienced a brain injury, especially at their age. Offering a psychosocial intervention with a component focused on engagement with peers, information provision and adopting coping strategies may ultimately improve psychosocial health and empower the wider ABI community.

Outcome—Community reintegration & volunteering

Engagement with community-based rehabilitation can help combat feelings of isolation and encourage social integration for young adults with ABI. Fostering community support may lead to a positive feedback loop, where the community evolves together, and those who availed of support from those with lived experience become volunteers themselves for those requiring support in the future.

MRT underpinning CMOC #2—Empowering the community

By mapping out and understanding the physical, psychological and social consequences following ABI and the motivations, interests and goals of young adults (in a social context), nurses and other members of the multidisciplinary team/third sector may be better able to provide a safe environment, either in-person or online, whereby young adults with ABI (and their caregivers) can establish trusting relationships, combat isolation and establish an overall sense of empowerment. Subsequently, this can lead to the signposting of others to these services, encourage young adults to meet outside of these sessions, or continue to engage in peer support programmes as volunteers as a positive feedback loop. Doing this requires young adults with ABI to understand that they are not alone and so it is important to host relevant peer support programmes where young adults can engage with like-minded individuals of similar demographics and derive a sense of belonging. With healthcare professionals/peer involvement, young adults with ABI (and their caregivers) will be provided with an outlet where they can gain new insights into ABI (e.g. unpacking medical jargon), as well as how to navigate a post-ABI world equipped with a plethora of coping strategies [35].

Demi-regularities when considering CMOC #2—Empowering the community

Absence of a strong social support network outside/within this peer support may affect engagement and inhibit empowerment. What constitutes a "safe" environment may differ from individual to individual (e.g. online/in-person). If an environment is deemed unsafe, levels of engagement will be lower. Young adults with ABI are a relatively small subpopulation of the overall ABI/stroke population, with many finding that they are the only one in this situation that they know of.

> 'There's no local support groups for young people. Everything is geared up towards older people, so if you do go to them but just you just feel like that, that nobody there really shares that journey you're on.' (P1, L35, EbyE, Scotland)

If young adults find they cannot relate to their peers, either due to a mismatching of age or levels of ABI severity, engagement with peer support will be lower, and reducing the opportunity for others in a negative feedback loop. In any instance where engagement is negatively affected, feelings of empowerment and levels of giving back to the community will also likely be decreased. Additionally, it is vital that young adults focus on themselves prior to giving back to the ABI community, as engaging in this altruistic behaviour too soon may impair their own recovery.

> 'I have seen a couple of stroke survivors over the years who's natural reaction to having a stroke has been "Well I'm gonna work hard to support other stroke survivors" and they… have almost ignored their own recovery.' (P14, L108, Charity Worker, England)

RPT 3: Interdisciplinary rehabilitation

CMOC #3—Equipping the professionals

Study participants described the varying levels of involvement and experience of current healthcare professionals when treating and providing assistance to young adults with ABI. The following CMO configuration primarily showcases the "Interdisciplinary Rehabilitation" RPT, illustrating the importance of staff aptitude and experience when working with young adults with ABI. Participants highlighted three mechanisms, four contexts and two outcomes pertaining to CMOC #3 as shown in Figure 5.

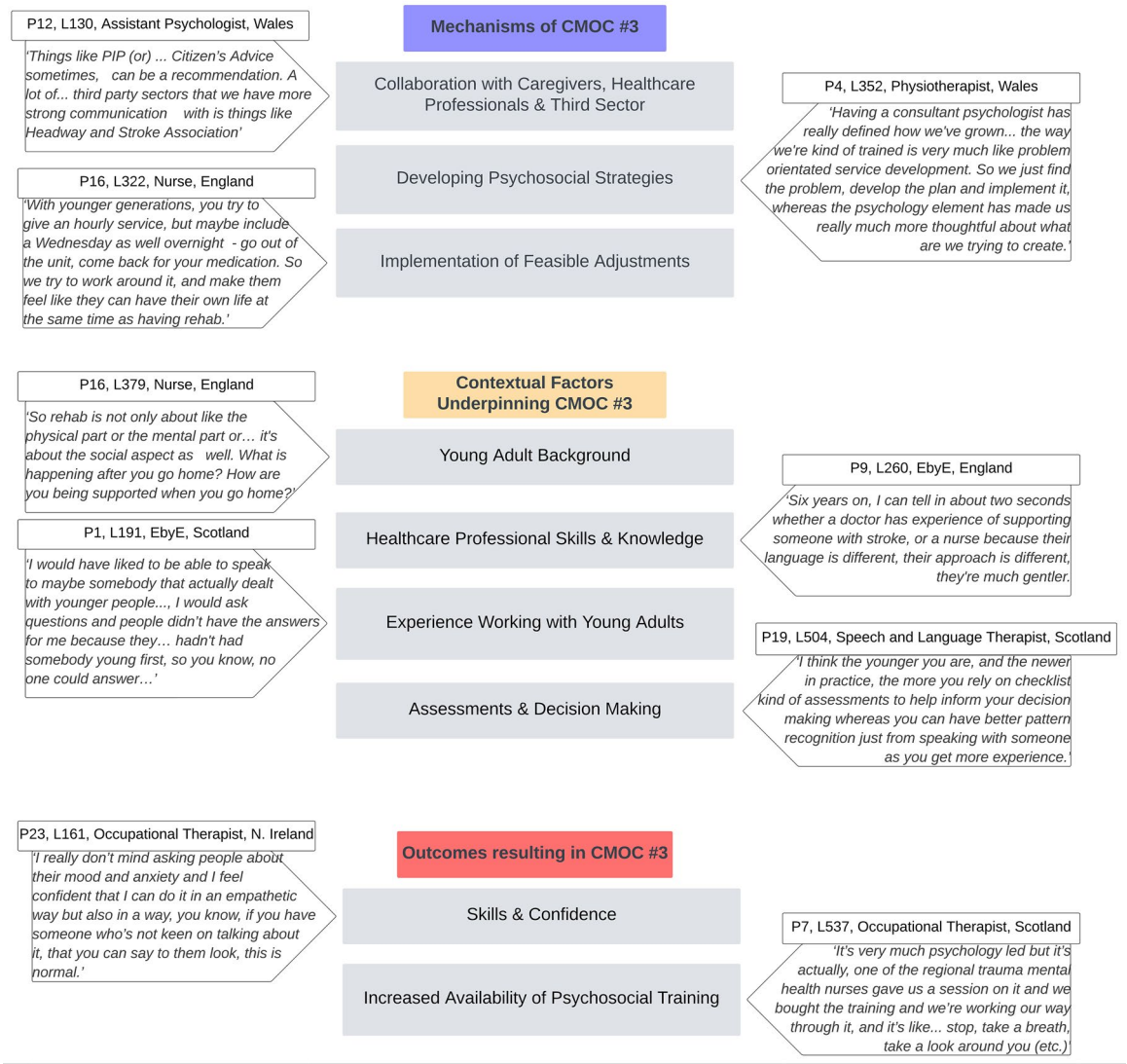

Figure 5. CMOC #3—Equipping the professionals.

Mechanism—Collaboration with carers, healthcare professionals & third sector

Healthcare professionals should work in tandem with carers and third sector organisations to ensure seamless and effective rehabilitation. Primary caregivers and family members of young adults with ABI should be consulted to aid in rehabilitation progress and the identification of important contextual factors such as motivations and goals of the patient. Third sector and commercial organisations (e.g. gyms, community centres, charities, bus services, and DVLA) should be identified and supported as applicable.

Mechanism—Developing psychosocial strategies

Timely and efficient psychosocial strategies are paramount to promoting psychological and social recovery in young adults with ABI, especially as this form of support is usually lacking in the more acute stages of recovery.

Mechanism—Implementation of feasible adjustments

EbyEs noted more favourable outcomes where rehabilitation strategies catered to their needs and circumstances. As such, it is important for healthcare professionals to utilise a person-centred approach when implementing holistic and effective psychosocial strategies.

Context—Young adult background

Beyond impairments and their consequences, it is important for healthcare professionals to understand the full context of young adults with stroke/ABI. This enables healthcare professionals to better understand age-appropriate needs, and highlights points of contact in instances where third-party contacts are necessary (e.g. employers).

Context—Healthcare professional skills & knowledge

Each member of the interdisciplinary team will have a well of foundational knowledge and skills that contribute to the betterment of those under their care. Drawing from this knowledge is vital, as is sharing it with other members of the interdisciplinary team.

Context—Experience working with young adults

Healthcare professionals have been found to augment their approaches when treating ABI survivors of a younger age, and with greater experience these augmentations will become more effective and more easily implemented. Not only does this work together with the making of feasible adjustments, but greater experience working with young adults with ABI also contributes to more trusting relationships and relatability between neurorehabitation teams and their younger clientele.

Context—Assessments & decision making

Rehabilitation teams will have a wide range of assessments and outcome measures to draw upon that can help the decision-making process concerning which psychosocial strategies are required. While some assessments are useful, many service providers acknowledged how they can feel impersonal, especially when there is a lack of communication within the team as this can lead to patients having to repeat themselves to different members of the team.

Outcome—Skills & confidence

As healthcare professionals become more experienced, they, and the wider interdisciplinary team, may improve their service together. Greater experience and confidence appeared to lead to a reduced dependency on assessments as well, allowing them to bypass the dispassionate nature of assessments, while still obtaining useful, actionable information.

Outcome—Increased availability of psychosocial training

Working closely with the interdisciplinary team, while being mindful of the many psychosocial challenges found in young adults with ABI, can lead to improvements in psychosocial training. This was particularly noticeable in one participating rehabilitation centre which had a robust psychological department, leading other members of the team to become much more mindful of psychological factors and pursue more psychosocial training, ultimately supporting their own area of expertise.

MRT underpinning CMOC #3—Equipping the professionals

Young adults with ABI (and their caregivers) may exhibit a wide range of physical, psychological and social factors that may influence their day-to-day lives either pre- or post-ABI. The diverse nature of these factors [33] can often force healthcare professionals to fall back on their foundational skills and knowledge on the topic of stroke/ABI (and their own experiences), with more typically aged survivors. However, individuals in younger stages of life may not find these strategies so useful. Experience with this cohort is an important contextual factor that can impact upon assessments and decision making. Consequently, it is important for the interdisciplinary team to share experiences and relevant notes, in addition to

working closely together and with young adults with ABI, their caregivers and the wider third sector for support and signposting purposes. Focus should support nursing staff to develop psychosocial awareness, as well as knowledge of psychological/social services within the multidisciplinary team. Feasible adjustments should be tailored to meet individualised needs and can be altered periodically over the course of the rehabilitation journey for optimal effect. By working in this way, teams and sites across the UK should observe improvements in their skills and greater confidence when treating young adults with Stroke/ABI. There may also be a better understanding of psychosocial strategies and outcomes that have been raised previously as being important for this age group.

Demi-regularities when considering CMOC #3—Equipping the professionals

Many service providers have minimal experience in the treatment of young adults with ABI/Stroke and this can negatively impact upon their confidence in their role, subsequently leading them to fall back on one-size-fits-all approaches or otherwise help their clients in a limited capacity. Similarly, services across the UK have varying healthcare professional roles, numbers and experience, placing a burden on patients, healthcare professionals and the wider healthcare system.

> 'I think every time I've been to the GP to go "I'm experiencing headaches or this"…, (they have) had that slight panic in their face, "oh you were young when that happened?," and so they almost really don't know what to do.' (P20, L162, EbyE, England)

Multidisciplinary teams that do not always share their understanding of any given case can lead to repeated conversations and conflicting information being experienced, as well as false assumptions that certain aspects of a young adult's impairments will be treated by others (i.e., siloing). If professionals lack the skills/knowledge to support learning or present it in such a way that is not user friendly or relevant to their everyday life, then positive psychosocial outcomes may not be obtained and could harm future engagement.

> 'I remember some consultant coming to me and I asked how long I would be, and he told me I'd probably back in work in two weeks and then admitted that he didn't actually know very much about recovery and that he was the wrong person to ask…I remember talking to a nurse and…she said "you won't be running for a long time."' (P9, L232, EbyE, England)

Discussion

The following study sought to test a series of initial PTs of psychosocial rehabilitation provision for young adults with ABI identified in a preliminary realist review, identify psychosocial processes across different UK settings and refine the key components needed to inform the design of a psychosocial intervention for young adults with ABI in the future. Having reported on the ten PT's and the subsequent three RPTs using published data and realist interviews with EbyEs (i.e., young adults with ABI) and service providers, it has been possible to identify the core elements of CMO configurations and MRT development. These now require further testing in an implementation phase. The key insights include the role that MRTs can play. Existing research has highlighted how current services can fail to provide age-appropriate services for young adults with ABI [11]. To target this, MRT1 identified young adult impairments, goals and stages of recovery in order to inform and modify applicable psychosocial processes. Moving from engagement with the individual to the young ABI community as a whole, it is vital to address current psychosocial services as many young adults with ABI express feelings of isolation, anxiety and difficulty navigating a post-ABI world [54,55]. Accordingly, MRT2 established the importance of utilising a safe environment and in facilitating trusting relationships to aid in this navigation. Literature suggests that this cohort are a heterogenous subpopulation, with a variety of unique considerations typically unfound in older adults [56]. With respect to this, MRT3 highlighted that a well-equipped interdisciplinary team is crucial to cater to this heterogeneity, especially in areas concerning psychological and social deficits post-ABI [57].

Viewing each of these MRTs through the lens of Bury's [33]; theory of biographical disruption and Bandura's [35]; theory of self-efficacy helps to ground these findings further. Active engagement with young adults with ABI will help cultivate a deeper understanding of what is most meaningful to them at their current stage of life, their goals, their identity and their relationships with their loved ones and peers [34,58], demonstrated across all three MRTs. While various outcomes have been highlighted across

these, including improved quality of life, goal attainment and skills/confidence of the healthcare professional, many outcomes contribute towards the patient's level of self-efficacy [36]. Improving self-efficacy among young adults with ABI is therefore a crucial overarching outcome as demonstrated by this study. Despite this, there are a series of demi-regularities to be mindful of when developing psychosocial interventions for young adults with ABI in the UK. Many barriers to engagement were raised that support existing literature including diminished motivation, low mood, fatigue, apathetic staff, and inaccessible/inflexible services [27,59,60]. Similarly, if attendees of peer support programmes feel they do not belong or cannot relate to their peers, or young adults with ABI believe their service providers to be inexperienced or engaging in "one-size-fits-all" approaches, engagement with the community and healthcare services will also diminish [61,62]. While these demi-regularities are framed in such a way to showcase how diminished levels of engagement occurs in this cohort, it also showcases areas to consider, target and improve upon in order to reach acceptable engagement levels, subsequently leading to the provision of better psychosocial support.

This study showcases the efficacy of conducting realist evaluations among the ABI community. This led to the generation of MRTs that can be used by healthcare professionals, including nurses, in the treatment of psychosocial outcomes for young adults with ABI. This study identified the following key components as crucial when developing evidence-based, age-appropriate psychosocial interventions for this cohort: (1) meaningful engagement with young adults with ABI; (2) empowering this sub-population's community and; (3) equipping the professionals responsible for their care. More specifically, these can provide a useful framework for the contextualisation and treatment of specific psychosocial domains, including self-efficacy, psychological impairments (i.e., depression, anxiety, suicidal ideation), social deficits (i.e., isolation, relationships, children, substance use) and activities of daily living (i.e., return to work, hobbies, sport, driving). It may also prove useful for non-psychosocial domains such as financial support or physical rehabilitation, which do not directly employ psychosocial mechanisms but can invariably lead to positive psychosocial outcomes when managed effectively. More broadly, identifying the relevant MRTs and demi-regularities are crucial developments when using the 6SQuID framework, providing detail on the causal and contextual factors that have the greatest scope for change among young adults with ABI. In doing so, the broader YARNS Transitions project is able to continue develop the components necessary for a psychosocial intervention among this cohort, clarifying the mechanisms of change and how these will be delivered [32]. This can be done through a series of interviews or workshops to further refine and prioritise the areas in which psychosocial support is needed for young adults with ABI. This will allow further clarity on the nature of any psychosocial interventions that follow and generate transferrable knowledge for use among other psychosocial interventions in both national and international contexts.

This study demonstrates the importance of realist evaluations when informing future public health interventions [50]. Various attributes of this study enhance the rigour of its findings, including its UK-wide scope, its use of theoretical concepts, the 6SQuID framework and co-construction elements. The following study should be viewed in light of several methodological limitations. While EbyEs were utilised extensively *via* co-construction with the advisory board, only six EbyE participants were recruited in the data collection window, four of whom had experienced a stroke and five of whom were female. The limited number of EbyE participants and lack of diversity regarding their ABI may influence the generalisability of this study's MRTs. Despite these limited numbers, participants were engaged across each data collection phase as part of the 6SQuID approach, ensuring consistency to findings. It is the recommendation of this study that future research take this into consideration and test the established MRTs across young ABI groups to confirm transferability of findings. Similarly, while this study features EbyEs and service providers, it does not include caregivers of young adults with ABI who would be experts in their own right. This perspective may have been especially pertinent in MRT2. Furthermore, while care was taken to ensure a rigour approach in viewing and refining interview data through a realist lens, there is still a degree of interpretation and subjectivity when establishing how CMO configurations interact within their core components [52].

Acquired brain injury (ABI) can cause a range of psychosocial challenges in young adults who require evidence-based, age-appropriate, person-centred and long-term support. This realist evaluation was conducted on ten initial PTs identified through a realist review [31] to better understand the psychosocial rehabilitation needs for this population. This article reports the refinement of the ten initial PTs to three refined programme theories through analysis of data from twenty-three interviews with young adults

with ABI and service providers. In doing so, subsequent CMO configurations and MRTs can be drawn. This realist evaluation identifies the importance of meaningful engagement with young adults with ABI (1), empowering this sub-population's community (2) and equipping the professionals responsible for their care (3) as key for psychosocial support. These three MRTS therefore act as the basis for the generation of a psychosocial intervention for this cohort.

Author contributions

CRediT: **Oisín Cleary**: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing; **Catherine Clarissa**: Formal analysis, Funding acquisition, Investigation, Methodology; **Lissette Aviles**: Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Writing – review & editing; **Carolina Henriquez Galindo**: Investigation; **Elaine Haycock-Stuart**: Conceptualization, Project administration, Supervision, Writing – review & editing; **Rosie Stenhouse**: Conceptualization, Writing – review & editing; **Aisha Holloway**: Conceptualization, Funding acquisition, Supervision, Writing – review & editing; **Daniel Kelly**: Conceptualization, Funding acquisition, Supervision, Writing – review & editing; **Colin Chandler**: Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Writing – review & editing.

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Appendix

[Supplementary Material 1 Here—"Interview Schedules"]