FULL/LONG TITLE OF THE STUDY

Mood, Activity Participation, and Leisure Engagement Satisfaction (MAPLES): A Pilot Feasibility Study for Low Mood in Acquired Brain Injury.

SHORT STUDY TITLE / ACRONYM

MAPLES Pilot Study for Low Mood in ABI.

PROTOCOL VERSION NUMBER AND DATE

Version 2.1, March 5th 2019

RESEARCH REFERENCE NUMBERS

IRAS Number:	244647
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FUNDERS Number:	Generated by the funder. Enter if applicable

MAPLES Pilot Study for Low Mood in ABI

SIGNATURE PAGE

The undersigned confirm that the following protocol has been agreed and accepted and that the Chief Investigator agrees to conduct the study in compliance with the approved protocol and will adhere to the principles outlined in the Declaration of Helsinki, the Sponsor's SOPs, and other regulatory requirement.

I agree to ensure that the confidential information contained in this document will not be used for any other purpose other than the evaluation or conduct of the investigation without the prior written consent of the Sponsor

I also confirm that I will make the findings of the study publically available through publication or other dissemination tools without any unnecessary delay and that an honest accurate and transparent account of the study will be given; and that any discrepancies from the study as planned in this protocol will be explained.

Chief Investigator:

Signature: 

Date: 07/02/2019

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Name: (please print): Dr. Tom Manly

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STUDY SUMMARY

Low mood/depression occurs at significantly elevated rate following acquired brain injury (ABI). Unfortunately we lack a good evidence-base for ameliorative interventions in this group. Cognitive Behavioural Therapy, for example, appears to be less effective following ABI because of the heavy demands it places on memory, mental flexibility, and comprehension. Behavioural Activation (BA), which places much lower demands on these abilities, is a promising alternative. Depression leads to reduced participation in potentially meaningful and/or enjoyable activities – people may have difficulty anticipating positive experiences, avoid situations through fear of negative outcomes, find it hard to plan or initiate activities etc. This situation is likely to be exacerbated after ABI where physical and cognitive problems can present additional barriers. The central tenet of BA, which has established efficacy in reducing depression in the general population, is that this lack of positive reinforcement creates a cycle that perpetuates low mood. Put simply, it aims to reverse this by helping individuals to schedule and engage in activities. Here we seek to examine the feasibility and acceptability of two group approaches to increasing engagement in meaningful activities in adults with an ABI. The first approach will train participants to plan and engage in pleasurable activities *outside* of the group and develop skills to overcome barriers to engagement. This group will explicitly help participants understand the link between activity level and mood. The second approach will encourage participants to engage in social activities *within* the group, such as crafts, puzzles, and board games and will not explicitly highlight the link between activity level and mood. Participants will be randomised to either the BA training group, the social group, or to a group of waitlisted individuals. This allows us to create a 'treatment as usual' control for the relative efficacy of both groups by repeating the outcome measures before and after this 'waitlist' period, before these participants take up their group places.

Study Title	Mood, Activity Participation, and Leisure Engagement Satisfaction (MAPLES): A Pilot Feasibility Study for Low Mood in Acquired Brain Injury.
Internal ref. no. (or short title)	MAPLES Pilot Study for Low Mood in ABI

MAPLES Pilot Study for Low Mood in ABI

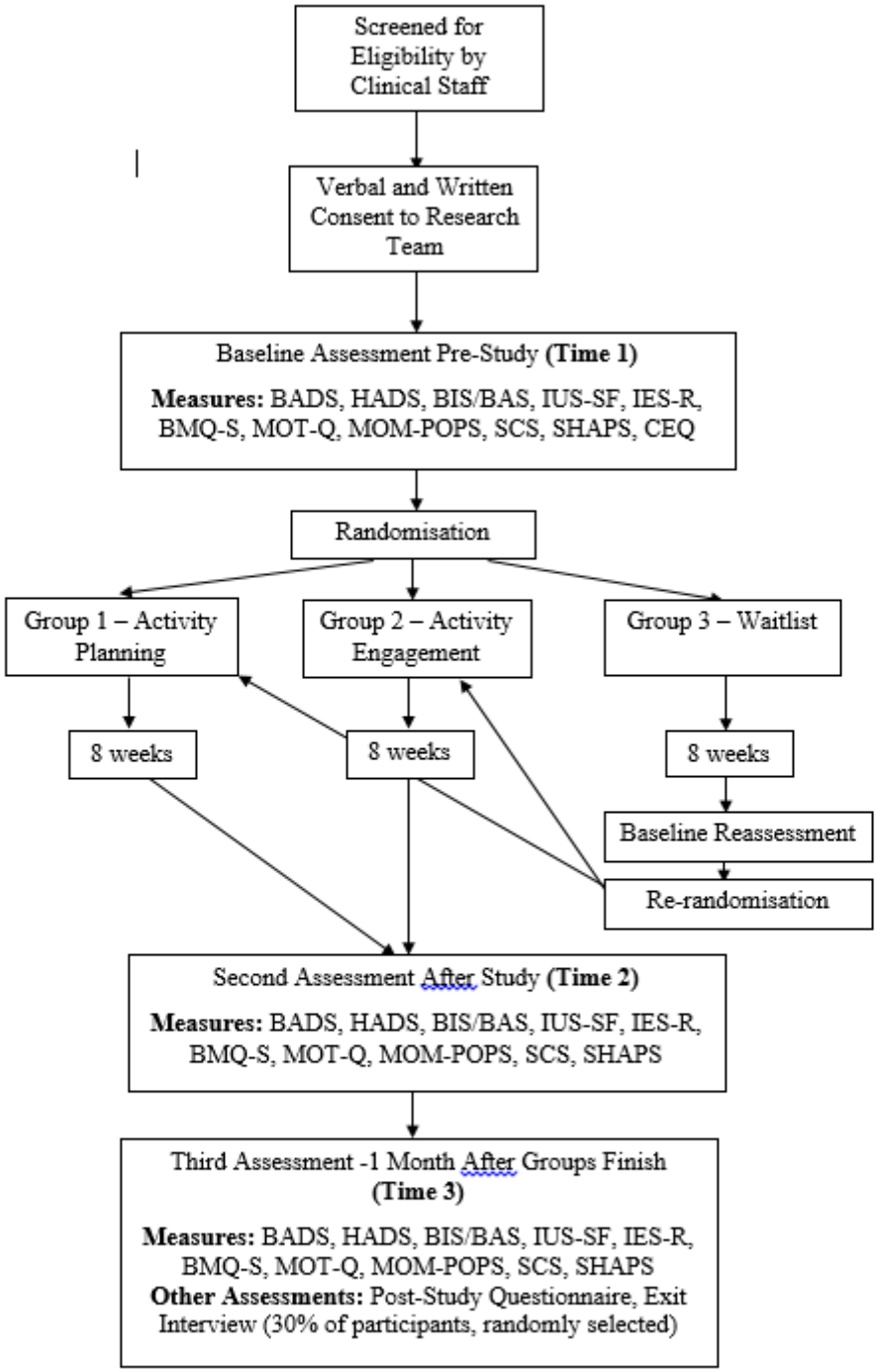
Study Design	Randomised Controlled Trial
Study Participants	Individuals with an Acquired Brain Injury
Research Question/Aim(s)	The primary objective of the MAPLES study is to determine the feasibility of two Behavioural Activation group interventions in individuals with an acquired brain injury (ABI) with low mood. This will be based on participant retention from baseline to 1 month post-intervention, acceptability of the proposed activities in the group sessions and assessments, and participant feedback from the exit interview. A secondary objective of the MAPLES study is to evaluate whether implicitly or explicitly encouraging engagement in meaningful and potentially pleasurable activities in adults with an acquired brain injury has detectable effects on activity level and mood compared to a waitlist control condition.

FUNDING AND SUPPORT IN KIND

FUNDER(S)	**FINANCIAL AND NON FINANCIALSUPPORT GIVEN**
MRC Cognition and Brain Sciences Unit – Core Funds give to Dr. Tom Manly	

KEY WORDS: Acquired brain injury; traumatic brain injury; depression, rehabilitation, executive function

STUDY FLOW CHART



Note: BADS = Behavioural Activation for Depression Scale, HADS = Hospital Anxiety and Depression Scale, BIS/BAS = Behavioural Activation/Behavioural Inhibition Scale, IUS-SF = Intolerance of Uncertainty Scale-Short Form, IES-R = Impact of Events Scale-Revised, BMQ-S = BIRT Motivation Questionnaire-Self, MOT-Q = Motivation for Traumatic Brain Injury Rehabilitation Questionnaire, MOM-POPS = Modified Outcome Measure – Participation Objective, Participation Subjective, SCS = Sense of Control Scale; SHAPS = Snaith-Hamilton Pleasure Scale

MAPLES Pilot Study for Low Mood in ABI

STUDY PROTOCOL

Mood, Activity Participation, and Leisure Engagement Satisfaction (MAPLES): A Pilot Feasibility Study for Low Mood in Acquired Brain Injury.

BACKGROUND AND RATIONALE

Acquired brain injury (ABI) refers to damage to the brain from a blow to the head, from an interruption to the brain's blood supply (stroke) or oxygen supply (anoxia), or as a result of pressure from a growing cancer (Cattelani, Zettin, & Zoccolotti, 2010). In the UK alone, approximately 150,000 people will experience a stroke each year and traumatic brain injuries (TBI e.g. from car accidents, falls) alone are predicted to be the third largest contributor of disease and disability worldwide by 2020 (World Health Organisation, 2006). Taken together, ABI is a leading cause of long-term disability worldwide (Roozenbeek, Maas, & Menon, 2013).

ABIs can have far-reaching negative effects on an individual's physical, cognitive, behavioural, emotional, and social status (Hyder, Wunderlich, Puvanachandra, Gururaj, & Kobusingye, 2007; Teasell et al., 2007). The purpose of rehabilitation is to enable those with an ABI successfully reintegrate into community by developing essential skills necessary for a patient's goals (Turner-Stokes, 2008). However, the continued success of rehabilitation can be significantly reduced by depression (Jorge et al., 2004; Medley & Powell, 2010). Roughly 66% of individuals with an ABI and depression do not fully recover (Whelan-Goodinson, Ponsford, Johnston, & Grant, 2009). Individuals with an ABI and depression are more likely to experience greater difficulties in all other aspects of day-to-day function (Jorge et al., 2004; Medley & Powell, 2010). Alarmingly, individuals with an ABI are at least 3 times as likely to die by suicide compared to the general population (Fazel, Wolf, Pillas, Lichtenstein, & Långström, 2014).

Clearly, there is an urgent need to develop an effective intervention for depression in ABI populations. Though existing therapies for depression such as Cognitive Behavioural Therapy (CBT) have a strong evidence base in the general population, they place heavy demands on skills often compromised in ABI, such as comprehension, memory, and mental flexibility. Thus, mixed outcomes for CBT in ABI (Waldron, Casserly, & O'Sullivan, 2013) are not surprising. An alternative is Behavioural Activation (BA). Individuals with depression have difficulties imagining positive future activities, and tend not to plan or engage in them (MacLeod & Byrne, 1996; Morina et al., 2011). This limits their experience of events that provide positive reinforcement that maintain a positive mood (Kanter et al., 2010). In BA, individuals plan positive events and overcome barriers to their occurrence. Despite its simplicity, BA has large effect sizes (Mazzucchelli, Kane, & Rees, 2009) on par with medication and CBT (Dimidjian et al., 2006; Richards et al., 2016). BA may therefore help ameliorate depression in ABI.

Here, we will investigate the benefits of BA primarily in people who have sustained traumatic brain injuries (TBI) and, for the first time in ABI, examine the efficacy of group rather than individual therapy. There are clear economic advantages to group, compared with individual, therapy and, when they work well, the supportive dynamics of groups of people with similar challenges can enhance therapeutic effects. It might be expected that conventional BA, in which people learn about the importance of activity engagement, of scheduling activities in everyday life and of overcoming barriers and resisting avoidant behaviour would lead to more generalised and lasting gains than simply engaging in rewarding activities without such knowledge and skill acquisition. However, it is also possible that cognitive problems (e.g. in remembering details) may undermine these gains. Accordingly, we will compare this conventional BA group ("activity planning") with a second intervention group ("activity engagement") in which participants will be encouraged to engage in potentially rewarding activities (crafts, games, social discussion) but which will not emphasise planning and scheduling activities outside of the group. Here it is possible that, through positive experiences of engagement, participants implicitly or explicitly generalise to increase activity levels in daily life. This second intervention also serves to make it clearer, should the "activity planning" be associated with

greater gains in activity and mood that it is likely attributable to the conventional BA component rather than more general group dynamics.

Cognitive impairments in ABI such as inability to override habits in favour of new behaviours may pose barriers to BA's success. Incorporating cognitive training developed specifically for ABI may enhance the effectiveness of BA. For example, Goal Management Training (GMT; (Levine et al., 2000, 2011) is designed to help individuals with ABI overcome habits, generate solutions, and attain goals. GMT is well-suited to groups, with participants providing support and feedback to one another, alongside "homework" designed to encourage understanding and application of skills (Levine et al., 2011).

Hence, reducing the impact of cognitive impairments in ABI may contribute to improvements in mood alongside BA. Therefore, the proposed study will investigate the feasibility and acceptability of two ABI-specific BA interventions, and whether one or other intervention is superior in improving mood and activity levels and how each compares to participants assessed and re-assessed on the outcome measures over the same period but with no intervention other than care as usual (waitlist condition)

Objectives

The primary objective of the MAPLES study is to determine the feasibility of two Behavioural Activation group interventions in individuals with an acquired brain injury (ABI) with low mood. This will be based on participant retention from baseline to 1 month post-intervention, acceptability of the proposed skills in the group sessions and assessments, and participant feedback from the exit interview.

A secondary objective of the MAPLES study is to evaluate whether training adults with an acquired brain injury to plan and engage in meaningful, valued, and/or enjoyable activities has detectable effects on activity level and mood compared to a waitlist control condition.

Hypotheses

There are no specific hypotheses related to the level of acceptability and feasibility of the trial.

Study Groups

1) Activity Planning Group – BA Intervention arm
2) Activity Engagement Group – the social group
3) Waitlist Group

HA-1: Relative to participants in the Waitlist Group, participants in the Activity Planning and Activity Engagement Groups will have greater increases in activity level from pre- to post-intervention and at 1 month post-intervention.
H0-1: There will be no differences in activity level from pre- to post-intervention and at 1 month post-intervention across all groups.

HA-2: Relative to participants in the Waitlist Group, participants in the Activity Planning and Activity Engagement Groups will have greater improvements in mood from pre- to post-intervention and at 1 month post-intervention.
H0-2: There will be no differences in mood from pre- to post-intervention and at 1 month post-intervention across all groups

STUDY DESIGN and METHODS of DATA COLLECTION AND DATA ANALYIS

Trial Design

Activity Planning Group

Generally, those receiving BA training develop and maintain a schedule based on activities that have been enjoyable, pleasant, meaningful, or interesting in the past (Mazzuchelli et al., 2010). Clients are then instructed to monitor their daily mood and participation in these activities to identify the connection between them. Clients are then taught how to increase the frequency and quality of positive events and decrease negative ones (Lewinsohn, 1976; Lewinsohn et al., 1980). In GMT, participants learn how to identify precursors to becoming distracted from their goals and strategies to orient themselves to their environment in order to prevent goal neglect (Levine et al., 2000, 2011).

The intervention will consist of weekly 1 hour group sessions over the course of 8 weeks, covering 8 overarching themes:

1) Introduction to Group Therapy
2) Identifying Enjoyable Activities
3) The Automatic Pilot and Planning Pleasurable Activities
4) Goal Review and Balancing Enjoyable and Routine Activities
5) Identifying Solutions to Goal Neglect
6) Increasing Mastery and Managing Fatigue
7) Active Approaches to Engagement
8) Relapse Prevention

All sessions will be administered by Andrea Kusec. Although we have received feedback from individuals with an ABI on the content covered within the Activity Planning Group, if participants within the MAPLES study react negatively to the content covered within the program then such content will be removed from the intervention or restructured so as to not potentially cause distress for future participants.

Activity Engagement Group

Individuals randomised to the Activity Engagement Group will meet weekly for 8 weeks for 1 hour and engage in various social activities such as board games, crafting, puzzles, similar to the social group in McDonald et al.'s (2008) social arm. Participants in this group will not have specific therapeutic goals and outcomes and will only be encouraged within each session to engage in activities within the group. The group will follow the below schedule:

1) Board games
2) Shirt Making
3) Puzzles
4) Painting
5) Trivia Day/"Pub Quiz"
6) Figurine painting
7) Origami/papercraft
8) Clay sculptures

All sessions will be administered by Andrea Kusec. If participants within the Activity Engagement group strongly oppose engaging in one of the above sessions (e.g., clay sculptures) that session will be replaced with a reasonable substitute (e.g., knitting).

Waitlist Group

Individuals who are randomised to this arm of the trial will be waitlisted for 8 weeks, and then randomised again into either the Activity Planning Group or Activity Engagement Group.

Method

All participants will complete a baseline assessment, a post-intervention assessment, and a 1-month follow-up assessment. Participants in the waitlist group will complete an additional baseline

assessment prior to being re-randomised into either the Activity Planning Group or the Activity Engagement.

Randomisation Procedure

The MAPLES study will use pre-determined randomisation. Prior to any recruitment, Dr Peter Watson (Departmental Statistician) will generate a randomisation sequence known only to him in which the condition allocation of each consecutive consenting participant will be listed. These will be placed in sealed envelopes showing only the participant number.After conducting a baseline assessment, the researcher (Andrea Kusec) will simply open the next envelope in the sequence. In order to maintain approximate parity in group size across the duration of the study (e.g. such that participants recruited later are not more likely to appear in one or other condition and such that the groups are approximately balanced at any point of study termination) randomisation will occur in subblocks of varying lengths. The researcher will not know the length of the current block over which randomisation has been balanced such that she could guess that, e.g. if the last 3 allocations had been to condition A, the next was bound to be B. At the outset of the study, Dr Watson will similarly create randomised sequence that will determine to which of the two intervention groups each participant initially randomised to the wait-list condition will be allocated after the wait period. Again, these will be balanced over variable length subblocks and will be opened in order by the researcherafter completing the second baseline assessment with Waitlist participantsIn this manner, randomisation is conducted blind to any information about the participants and cannot influence or be influenced by the results of baseline assessments.

Baseline and Outcome Measures.

Demographic information will be collected from participants, including months since injury, type and cause of injury (e.g., non-TBI, hypoxia), comorbidities, Glasgow Coma Scale Scores, length of post-traumatic amnesia, duration of loss of consciousness, and data from initial assessment at Cambridgeshire Community Services, including measures of fluid and crystallised intelligence, dysexecutive syndrome, and frequency of brain injury symptoms (measured via the European Brain Injury Questionnaire). If available, we will additionally collect information on previous diagnosis of depression, as well as any psychological treatments received (e.g., Cognitive Behavioural Therapy) and any pharmacological treatments for depression. This information will be collected from the participant's medical charts. This information will only be collected if the participant has consented to it. If a participant denies access to medical information they will not denied participation in the main study.

Baseline assessment of all below measures will be collected. Participants will be randomized into one of three conditions: 1) Activity Planning Group; 2) Activity Engagement Group, or 3) Waitlist.

Primary Outcome Measures

There is no primary outcome measure to determine its acceptability and feasibility. Determining these aspects will be based on 1) the post study questionnaire and qualitative data from the exit interviews; 2) the face validity of the intervention materials from participants, and 3) retention of participants within the trial.

The ***Behavioural Activation for Depression Scale*** (BADS) measures activity theorized to underlie depression according to BA (Kanter, Mulick, Busch, Berlin, & Martell, 2007, Kanter et al., 2009). Overall scores on the BADS will be used to determine the secondary objective of the trial.

Additional Measures

The ***Hospital Anxiety and Depression Scale*** (HADS; Zigmond & Snaith, 1983) is a widely-used measure of depression and anxiety in clinical settings.
The ***Behavioural Inhibition/Behavioural Activation Scales*** (BIS/BAS) measures an individual's disposition toward avoiding and engaging in activities (Carver & White, 1994).
The ***Intolerance of Uncertainty Scale-Short-Form*** (IUS-SF) measures an individual's degree to which they are bothered by uncertainty (Carleton, Norton, & Asmundson, 2007).
The ***Impact of Events Scale-Revised*** (IES-R) measures acute and routine life stress (Weiss, 2007).
The ***Brain Injury Rehabilitation Trust Motivation Questionnaire-Self*** (BMQ-S) measures difficulties with overall motivation in ABI (Oddy, Cattran, & Wood, 2008).
The ***Motivation for Traumatic Brain Injury Rehabilitation Questionnaire*** (MOT-Q) measures level of motivation for rehabilitation-related activities (Chervinsky et al., 1998)
The ***Modified Outcome Measure-Participation Objective, Participation Subjective*** (MOM-POPS) measures an individual's desired and actual participation in home and community activities (Brown et al., 2004).
The ***Sense of Control Scale*** (SCS) measures an individual's perceived ability to exert control over their life (Lachman & Weaver, 1998a, 1998b)
The ***Credibility/Expectancy Questionnaire*** (CEQ) measures participant expectations of treatment outcome and perceived credibility of the treatment (Devilly & Borkovec, 2000). This measure will only be given at Time 1.
The ***Snaith Hamilton Pleasure Scale*** (SHAPS) measures an individuals' ability to experience pleasure in day-to-day activities (Snaith et al., 1995).

Along with the above measures, participants in the Activity Planning Group will be asked to submit a copy of their activity schedules in order to conduct exploratory analyses of what type of activities individuals with an ABI commonly engage in.

The questionnaire battery described above will be administered at baseline (Time 1), post-intervention (Time 2) and 1-month post-intervention (Time 3) either in person, via post, or by online questionnaire software (e.g., MRC CBU local server JTOS) as per convenience for the participant. Participants who are first randomised to the waitlist condition will complete the questionnaire battery again prior to starting in the Activity Planning or Activity Engagement Group.

Feasibility and practicality of the trial will be assess in two ways: 1) through a post-study questionnaire administered to all participants, and 2) semi-structured exit interviews. Semi-structured exit interviews will be conducted by a member of the research team that has not administered the intervention or conducted the assessments. Approximately 30% of participants (randomly selected) will be invited to take part in the exit interviews. The interview will cover critical aspects of the trial to ensure success of a full-scale trial, such as utility of content covered in the treatment, whether homework was sufficiently challenging and perceived to be useful, and the impact of the treatment on daily life. These will be conducted in person by a member of the MRC CBU research team not conducting the intervention.

Analysis

Quantitative data analysis will be conducted by Andrea Kusec and supervised by senior members of the research team and by the trial statistical consultant (Dr. Peter Watson). A general linear model using the BADS across the multiple assessments points will be used to determine the effectiveness of the intervention. In line with our hypotheses, it is predicted that the Activity Planning Group will show improvements in activity level and greater reductions in low mood relative to the Activity Engagement Group and Waitlist group. Effect sizes will be estimated based on the trial data. Exploratory analyses investigating the relationship of the secondary questionnaires to outcome will be conducted using correlation analyses.

Qualitative data analysis will be conducted using an interpretive description framework, a technique developed to identify clinically-relevant strategies in complex health care populations. Themes will be coded and organised by Andrea Kusec, using Dedoose qualitative coding software. The interpretation and discussion of the themes will be assisted by the service user on the steering committee in order to enhance validity.

STUDY SETTING

Setting and Participants

Participants will be recruited through Cambridgeshire Community Services (CCS) in clinics that work with individuals with an ABI. Participants will be identified through NHS ABI databases, community ABI databases, and based on referral from clinicians within CCS.

SAMPLE AND RECRUITMENT

Eligibility Criteria

Participants will be deemed eligible to participate based on the below described inclusion and exclusion criteria.

Inclusion criteria

Participants will be included in the study if they:
1. Have a diagnosis of acquired brain injury
2. Are 18 years old or over
3. Speak and comprehend English
4. Are a client of Cambridgeshire Community Services
5. Are a minimum of 3 months post-ABI
6. Are identified as having low mood. Low mood will be identified by either:
6a. A score of at least 7 on the depression subscale of the Hospital Anxiety and Depression Scale (HADS-D; Zigmond & Snaith, 1983), indicating clinically significant levels of depression, or;
6b. Clinicians within Cambridgeshire Community Services have identified that a client has low mood (i.e., through their own administration of the HADS within the past 3 months of screening date, through clinical interview determining that the client has low mood/would benefit emotionally from increased activity level)

Exclusion criteria

Participants will be excluded from the study if they:
1. Are incapable of attending to and/or understanding the intervention materials (i.e., severe cognitive disability)
2. Have a diagnosis of dementia or other neurodegenerative disorder
3. Are currently undergoing or will undergo a psychological intervention for low mood or depression (e.g., CBT) during the timeframe of the trial
4. Unstable psychotropic medication (i.e., have recently started/have recently changed medications)
5. Are actively suicidal (i.e., have attempted suicide in the past 3 months, currently self-harm, and/or have a concrete plan to attempt suicide in the future, as identified by referring clinician)

Recruitment

All participants will primarily be referred to the study by the ABI clinical team within CCS.

Sample identification

All participants will primarily be referred to the study by the ABI clinical team within Cambridgeshire Community Services (CCS). Our collaborators within CCS, Andrew Bateman (Service Manager of CCS), Judith Allanson (Consultant in NeuroRehab and Clinical Lead) and Cara Lawrence (Occupational Therapist) will assist in facilitating recruitment from CCS.

The clinical staff within CCS will first identify participants from their NHS ABI records of clients currently or previously associated with the service. Upon identification of potentially suitable clients, the clinical staff will either 1) provide an invitation letter to a client with an ABI in person that meet eligibility criteria about the study or 2) send invitation letters to those identified within their ABI database that meet eligibility criteria. The invitation letter will provide a brief overview of the study and its procedures. If the client is interested, the client will be given the option to either consent for the research team to approach them (via phone call, SMS, email, mail, or in person meeting) and thus consent for the clinician to pass on their contact information to the research team. Although clients can take as much time as needed to decide whether to participate or not, clinicians will follow up with clients up to a maximum of two additional times on top of initial contact if they have not heard from the client within 2 weeks. Once in contact with the research team, an appointment will then be made within CCS to take written informed consent and schedule a baseline assessment. No potential participants will be contacted by the research team unless they have given consent to a member of the clinical team in CCS.

Clinicians within CCS will be responsible for the initial contact with clients and reviewing their medical information with respect to the inclusion/exclusion criteria. No personal information will pass to the research team until a potential participant makes contact with the researchers or, with the participant's consent, the clinical team pass contact details to the research team. Alongside contact information, the research team will ask eligible participants for consent to access their CCS medical records for details of the nature of their injury such as injury type, and location within the brain. Access to medical records will be part of the clinician consent process (in brief) as well as part of the consent process with the research team. Access to medical records is necessary to describe the demographic represented in our sample, as well as to determine whether injury-related variables (e.g., frontal vs non-frontal lobe injuries) affect outcome in the trial. Participants who refuse to give access to their medical records to the research team will still be welcome to participate. As a thank you for their time and effort in being part of the study, all participants will be given £50 at the end of study completion.

Consent

The clinical staff within CCS will be responsible for obtaining consent to either pass on their contact details to the research team or signpost the interested and eligible participant to the research team via a letter of invitation. By extension, the clinical staff will be responsible for determining assessment of capacity to consent in the first instance. Although in order to be eligible to participate, potential participants must be able to have the capacity to consent, an individual's ability to provide consent will be re-evaluated by a member of the research team by requesting the potential participant summarise what the study comprises and what the requirements are.

A member of the research team will then be responsible for communicating in detail the purpose of the study, the study requirements, and the time commitment. Importantly, it will be emphasized that participants have the right to withdraw at any time in the trial. The consent form will be read through and discussed in detail and questions addressed prior to obtaining written evidence of consent, signed by the participant and researcher. Participants will be encouraged to take their time reflecting on their decision to participate. At all stages in this process, the comprehension and communication needs of each individual participant will be considered, in order to support the individual's ability to make an independent decision.

ETHICAL CONSIDERATIONS

Assessment and management of risk

There is a risk that participants will become distressed by discussion that focuses attention in mood and engagement, will be distressed by others' shared experiences or interaction style or suffer increased vulnerability to disclosure of sensitive information by other members of the group. These are always issues in therapeutic groups that are run in many NHS and other settings. Our view is that the potential benefits of the group outweigh these risks that are mitigated to the greatest extent possible by sensitive group coordination, establishing an agreed set of rules with group members (e.g. about confidentiality) and having an agreed set of procedures for coping with distress (the PI is a qualified clinical psychologist and the groups will take place in clinical settings in which groups are routinely run). Participants will be made aware throughout that they can withdraw from the group/study at any stage should they feel uncomfortable.

The risk of a breach of confidentiality is managed by the research being conducted in accordance with best practice. Personally identifiable information ("PID" - names, addresses, dates of birth etc.) are kept strictly separate from fully anonymised research data (questionnaires, session recordings). PID are held in a secure 'haven' on our computer server and/or locked filing cabinets and will be retained for only 12 months after the last participant has completed the study (in case of a need to re-contact), after which they will be deleted. Understanding how we look after personal information is a key part of informed consent.

At the time of consent we make potential participants aware that there are limits to our duty of confidentiality if information is disclosed that indicates a significant risk of harm to the participant or another individual. If such a disclosure occurs we will follow our standard operating procedures of alerting the individual's GP (in the case of self-harm) or appropriate protection agencies (in the case of harm to others).

Finally, a particular concern in this trial is management of suicidal intentions. Although individuals who are actively suicidal (i.e., have attempted suicide in the past 3 months/have a concrete plan to attempt suicide in the future) will be excluded from the study, it is possible that some participants may express thoughts such as wishing they were better off dead or gone. The research team will in all cases treat the mention of suicide and suicidal ideation as an adverse event and follow both MRC CBU and CCS protocol in determining whether the participant is at immediate risk of harming themselves or others, and take necessary steps to ensure the well-being of the participant (e.g., if actively suicidal, remove them from the trial and call emergency services). All incidences such as these will be recorded and followed up as appropriate.

The groups in this trial are being offered in addition to any services normally accessed by participants. The study will not therefore deprive participants of other interventions and, potentially, of course, offers something beneficial to which they might not otherwise have access. It is possible that being offered the prospect of a therapeutic group but then having to wait some weeks before it begins would induce distress at the delay that would not otherwise have occurred. Such delays are, of course, common in clinical services and would be inevitable given the study's resources, access to rooms, need to recruit certain numbers for a group to begin etc. – it would be very rare to go straight from referral/initial assessment straight into such an intervention. We are also at pains to point out to potential participants that the reason this is research is because we do not know whether one or other intervention is of any benefit and the occurrence of delay is an important aspect of drawing meaningful scientific inference.

Research Ethics Committee (REC) and other Regulatory review & reports

Prior to any data collection, a favourable opinion will be sought from the Cambridge Central Research Ethics Committee (REC). A detailed record will be kept of all correspondence with the REC, and annual reports will be submitted as required. Upon completion of the study, the REC will be notified immediately. The REC will additionally be notified in the case of premature termination of the trial and in the case of adverse events.

Regulatory Review & Compliance

Prior to recruitment, Dr. Tom Manly and the research team will ensure that appropriate approvals are in place. For any amendment, the research team will in agreement with the sponsor will submit information to the appropriate REC following the appropriate timeframe.

Peer review

The MAPLES study has been independently externally reviewed by the MRC quinquennial review panel as part of the overall research programme directed by Dr. Tom Manly. The MRC quinquennial review panel consists of experts within psychology as well as experts outside of psychology that are both UK based and international. The trial, as part of the larger research programme, has received positive feedback from the MRC based on its overall value and impact.

Patient & Public Involvement

The MAPLES study has and will continue to benefit from the invaluable input of service users. Eleven individuals with an acquired brain injury and four caregivers were interviewed about typical barriers and facilitators of engagement in day-to-day and enjoyable activities. Interview participants were also asked to provide feedback on the content covered within the Activity Planning group and whether they found the topics useful. Notable feedback from participants includes 1) the importance of managing fatigue and 2) the perceived importance of practising social engagement skills. The Activity Planning group now emphasises fatigue management in relation to planning and engaging in activities, as well as roleplay to practice skills related to engaging and communicating with others. The current content in the Activity Planning group has also been modified to remove discussion around self-rewards (e.g., a cup of tea for every increase in activity) and generating alternative solutions (i.e., back up plans for activities). Participants felt that self-rewards and generating alternative solutions for all activities would be unmanageable in the long-term and thus could affect long-term outcome in the MAPLES study. The results from these interviews have been essential in ensuring that the proposed treatment has face validity with individuals with an ABI and their caregivers.

Secondly, the MAPLES study steering committee will include a service user of CCS. We have consulted with an occupational therapist based within CCS to recommend a suitable service user to be part of the steering committee. Along with their insight into how to enhance acceptability of the trial (i.e., ways to prevent attrition), they will be involved in the dissemination of the research. The service user on our steering committee will be of great aid in helping ensure our research is accessible to clients with an ABI.

Continual patient and public involvement is not only important in trial management but from those participating in the research as well. The MAPLES study will therefore benefit from conducting exit interviews will all participants in order to enhance acceptability of a future full scale trial.

Protocol compliance

Protocol compliance will be managed primarily by review of recruitment strategies, intervention delivery, and assessment administration during the steering committee meetings. Andrew Bateman, Judith Allanson, and Cara Lawrence will be able to provide feedback on method of recruitment from the CCS clinical staff. Importantly, no client information should be passed on to the research team without documentation of evidence of eligibility (i.e., noted in medical records with evidence of meeting eligibility criteria). Regular review of documentation of evidence of eligibility will be conducted by a member of the MRC CBU research team not conducting the screening process nor conducting the intervention.

All group sessions will be audio-recorded in order to code the sessions for intervention fidelity. This will help ensure protocol compliance. Assessment session compliance (i.e., completing the full

questionnaire battery) will be done by using a checklist and comment section to input any information as to why an assessment was completed only in part (i.e., severe participant fatigue).

Any protocol deviations, whether accidental or intentional, will be documented and reported to the Chief Investigator and Sponsor immediately. Immediate action will be taken to resolve non-compliance.

Data protection and patient confidentiality

Paperwork and files relating to study participants will be stored in locked filing cabinets at the MRC Cognition and Brain Sciences Unit, only accessible by the research team. Personally identifiable data and anonymised data will be stored separately in order to decrease the risk of breaches to confidentiality. Only the research team will have access to personal information (contact details) for the purposes of contacting participants. The research team will only access medical records once for the purposes of collecting injury-related information. Medical information will not be stored with participant contact information and will only be linked to anonymised participant indicators. The research data (questionnaires, administered in person, by post, or online) will only contain anonymised participant indicators.

The first type of information transferring between CCS and the research team will be contact details for participants who have expressed an interest in potentially taking part/hearing more about the study (i.e. who have consented for the NHS clinician to pass this information on). This will typically be conveyed to the research team in a phone call. We will ask clinicians not to use email and delete any such email (after writing down the details) should it be sent. On receiving the phone call the researcher will write down the details and keep them in a locked filing cabinet at the CBU – a secured building with strict guidelines on visitors arriving via reception and being accompanied in movements around the building. The researcher will also make an electronic record which will be retained only in space within the CBU's secure computing area to which the MAPLES research team have access. If contact details are given to the researcher in person whilst at a CCS site, these will be listed on a separate piece of paper (i.e. not in a note book or diary) or recorded on an encrypted laptop and returned to the CBU as soon as is possible. Here they will be locked in the filing cabinet/transferred to the secure computing area and then deleted from the laptop.

If participants do not consent to take part or withdraw from the study, paper and electronic contact details will be immediately deleted from our records.

Once consent is given we will allocate a unique participant number to an individual. There will be an electronic and paper version of the key linking names with participant numbers. Only the participant number and never the name or date of birth etc. will be used on all other documents and electronic records (questionnaires, tests, clinical information etc.) in the study.

The researcher will have a copy of the key on an encrypted, strong password protected USB drive during her visits to CCS or participants' homes so that she can, by opening it in a laptop, allocate the correct number to any documents (test scoresheets, questionnaires etc.). The encrypted USB drive will have no information other than the key (i.e. that might give context to what the key was) and no external labels linking it to the study. The key will never be copied to the laptop. Any electronic information relating to participants will be stored on the encrypted laptop, that, during transit, will be carried separately from the encrypted USB drive. Similarly, any questionnaires, scoresheets etc. carried from CCS or homes back to the CBU will have only a participant number. If there is consent for the researcher to view medical records, she will make written electronic notes of details pertinent to characterising a participant's neurological impairment. No scans or photocopies of medical notes will be made and only the participant number will be used to identify the electronic record. No details that could uniquely identify an individual (e.g. unusual occupation) will be recorded. Clinical notes would never be removed from the CCS site.

On returning to the CBU, all such anonymous electronic records will be transferred from the laptop to the CBU servers and then deleted from the laptop. Anonymous paper records will be electronically scanned with the files being stored on CBU servers in addition to the paper records being retained in a locked filing cabinet for the duration of the study (in the long term only electronic versions will be stored). The USB key will be kept in the locked filing cabinet between CCS/home visits.

In the above manner, if the encrypted USB drive was lost or stolen it is extremely unlikely that the strong password could be guessed. Even if it was, the only information available would be a list of names and numbers which would have little meaning outside of the study context. Similarly, if the laptop was stolen and the encryption bypassed, or paper records lost or stolen, there would only be clinical details, questionnaire scores etc. that could not be linked to any individual.The data will be analysed at the MRC Cognition and Brain Sciences Unit. Analysis will primarily be conducted by Andrea Kusec with input from Dr. Tom Manly, Dr. Fionnuala Murphy, Dr. Polly Peers, and Dr. Peter Watson, the statistician at the MRC Cognition and Brain Sciences Unit. All data that is analysed will be fully anonymised and will be stored in an encrypted computer.

Only anonymised data will be kept in the long-term, stored locally within the MRC Cognition and Brain Sciences Unit. The MRC recommends that trial data is stored for at least 20 years post-completion of the trial. However, there is increasing emphasis on making fully anonymised data 'open' for scientific review and such that other research questions could be addressed by researchers around the world – indeed it is now a condition of publication in some journals. When data are made open, in principle they are preserved indefinitely. Hence, the data will be stored as open access files online indefinitely. Dr. Tom Manly will serve as the data custodian.

Access to the final study dataset

Only Dr. Tom Manly and Andrea Kusec will have access to any dataset that has personally identifiable information, although at 12 months post-trial completion all personally identifiable information will be permanently deleted. Prior to uploading the fully anonymised final dataset as described above, only members of the research team will have access to the full dataset. In the participant information sheet, it is explained that data may be reanalysed for a separate analysis or as part of a larger study.

REFERENCES

Brown, M., Dijkers, M.P.J.M., Gordon, W.A., Ashman, T., Charatz, H., & Cheng, Z. (2004). Participation Objective, Participation Subjective: A measure of participation combining outsider and insider perspectives. *Journal of Head Trauma Reahbilitation, 19,* 451 – 481.

Carleton, R. N., Norton, M. A. P. J., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety Disorders*, *21*(1), 105–117. https://doi.org/10.1016/j.janxdis.2006.03.014

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*, 319–333. https://doi.org/10.1037/0022-3514.67.2.319

Cattelani, R., Zettin, M., & Zoccolotti, P. (2010). Rehabilitation treatments for adults with behavioral and psychosocial disorders following acquired brain injury : A systematic review. *Neuropsychology Review*, *20*(1), 52–85. https://doi.org/10.1007/s11065-009-9125-y

Dimidjian, S., Hollon, S. D., Dobson, K. S., Schmaling, K. B., Kohlenberg, R. J., Addis, M. E., … Jacobson, N. S. (2006). Randomized trial of behavioral activation, cognitive therapy, and antidepressant medication in the acute treatment of adults with major depression. *Journal of Consulting and Clinical Psychology*, *74*(4), 658–670. https://doi.org/10.1037/0022-006X.74.4.658

Fazel, S., Wolf, A., Pillas, D., Lichtenstein, P., & Långström, N. (2014). Suicide, fatal injuries, and other causes of premature mortality in patients with traumatic brain injury. *JAMA Psychiatry*, *71*(3), 326. https://doi.org/10.1001/jamapsychiatry.2013.3935

Hyder, A. A., Wunderlich, C. A., Puvanachandra, P., Gururaj, G., & Kobusingye, O. C. (2007). The impact of traumatic brain injuries : A global perspective. *NeuroRehabilitation*, *22*, 341–353.

Jorge, R. E., Robinson, R. G., Moser, D., Tateno, A., Crespo-Facorro, B., & Arndt, S. (2004). Major depression following traumatic brain injury. *Archives of General Psychiatry*, *61*(61), 42–50.

Kanter, J. W., Manos, R. C., Bowe, W. M., Baruch, D. E., Busch, A. M., & Rusch, L. C. (2010). What is behavioral activation? A review of the empirical literature. *Clinical Psychology Review*, *30*(6), 608–620. https://doi.org/10.1016/j.cpr.2010.04.001

Kanter, J. W., Mulick, P. S., Busch, A. M., Berlin, K. S., & Martell, C. R. (2007). The Behavioral Activation for Depression Scale (BADS): Psychometric properties and factor structure. *Journal of Psychopathology and Behavioral Assessment*, *29*(3), 191–202. https://doi.org/10.1007/s10862-006-9038-5

Lachman, M.E., & Weaver, S.L. (1998a). Sociodemographic variations in the sense of control by domain: Findings from the MacArthur studies of midlife. *Psychology and Aging, 13,* 553 - 562.

Lachman, M.E., & Weaver, S.L. (1998b). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology, 74,* 763 - 773.

Levine, B., Robertson, I. A. N. H., Clare, L., Carter, G., Hong, J., Wilson, B. A., … Stuss, D. T. (2000). Rehabilitation of executive functioning : An experimental – clinical validation of Goal Management Training. *Journal of the Internation*, *6*, 299–312.

Levine, B., Schweizer, T. A., O'Connor, C., Turner, G., Gillingham, S., Stuss, D. T., … Robertson, I. H. (2011). Rehabilitation of executive functioning in patients with frontal lobe brain damage with goal management training. *Frontiers in Human Neuroscience*, *5*(9), 1–9. https://doi.org/10.3389/fnhum.2011.00009

Mazzucchelli, T., Kane, R., & Rees, C. S. (2009). Behavioral activation treatments for depression in adults: A meta-analysis and review. *Clinical Psychology: Science and Practice*, *16*(4), 383–411. https://doi.org/10.1111/j.1468-2850.2009.01178.x

McDonald, S., Tate, R., Togher, L., Bornhofen, C., Long, E., Gertler, P., & Bowen, R. (2008). Social skills treatment for people with severe, chronic acquired brain injuries: A multicenter trial. *Archives of Physical Medicine and Rehabilitation*, *89*, 1648–1659. https://doi.org/10.1016/j.apmr.2008.02.029

Medley, A. R., & Powell, T. (2010). Motivational interviewing to promote self-awareness and engagement in rehabilitation following acquired brain injury: A conceptual review. *Neuropsychological Rehabilitation*, *20*(4), 481–508. https://doi.org/10.1080/09602010903529610

Oddy, M., Cattran, C., & Wood, R. (2008). The development of a measure of motivational changes following acquired brain injury. *Journal of Clinical and Experimental Neuropsychology*, *30*(5), 568–575. https://doi.org/10.1080/13803390701555598

Richards, D. A., Ekers, D., McMillan, D., Taylor, R. S., Byford, S., Warren, F. C., … Finning, K. (2016). Cost and Outcome of Behavioural Activation versus Cognitive Behavioural Therapy for Depression (COBRA): A randomised, controlled, non-inferiority trial. *The Lancet*, *388*(10047), 871–880. https://doi.org/10.1016/S0140-6736(16)31140-0

Roozenbeek, B., Maas, A. I. R., & Menon, D. K. (2013). Changing patterns in the epidemiology of traumatic brain injury. *Nature Reviews Neurology*, *9*(4), 231–236. https://doi.org/10.1038/nrneurol.2013.22

Snaith, R.P., Hamilton, M., Morley, S., Humayan, D., Hargreaves, D., & Trigwell, P. (1995). A scale for the assessment of hedonic tone: The Snaith-Hamilton Pleasure Scale. *British Journal of Psychiatry, 167,* 99 - 103.

Teasell, R., Bayona, N., Marshall, S., Cullen, N., Bayley, M. T., Chundamala, J., … Tu, L. (2007). A systematic review of the rehabilitation of moderate to severe acquired brain injuries. *Brain Injury*, *21*(February), 107–112. https://doi.org/10.1080/02699050701201524

Turner-Stokes, L. (2008). Evidence for the effectiveness of multi-disciplinary rehabilitation following acquired brain injury: A synthesis of two systematic approaches. *Journal of Rehabilitation Medicine*, *40*(1), 691–701. https://doi.org/10.2340/16501977-0265

Waldron, B., Casserly, L. M., & O'Sullivan, C. (2013). Cognitive behavioural therapy for depression and anxiety in adults with acquired brain injury: What works for whom? *Neuropsychological Rehabilitation*, *23*(1), 64–101. https://doi.org/10.1080/09602011.2012.724196

Whelan-Goodinson, R., Ponsford, J., Johnston, L., & Grant, F. (2009). Psychiatric disorders following traumatic brain injury: Their nature and frequency, *24*(5), 324–332.

World Health Organization. (2006). World health statistics 2006. Paris, France.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. Acta Psychiatrica Scandinavica, 67, 361–370. http://dx.doi .org/10.1111/j.1600-0447.1983.tb09716.x