Community-Based Behavioural Activation Training (ComBAT) for Depression in Adolescents: Randomised Controlled Trial (RCT) with Economic and Process Evaluations

Short title: ComBAT for Depression Randomised Controlled Trial

Chief Investigator: Professor Lina Gega

Sponsor: Tees, Esk and Wear Valleys NHS Foundation Trust

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- **RESEARCH REFERENCE NUMBERS**

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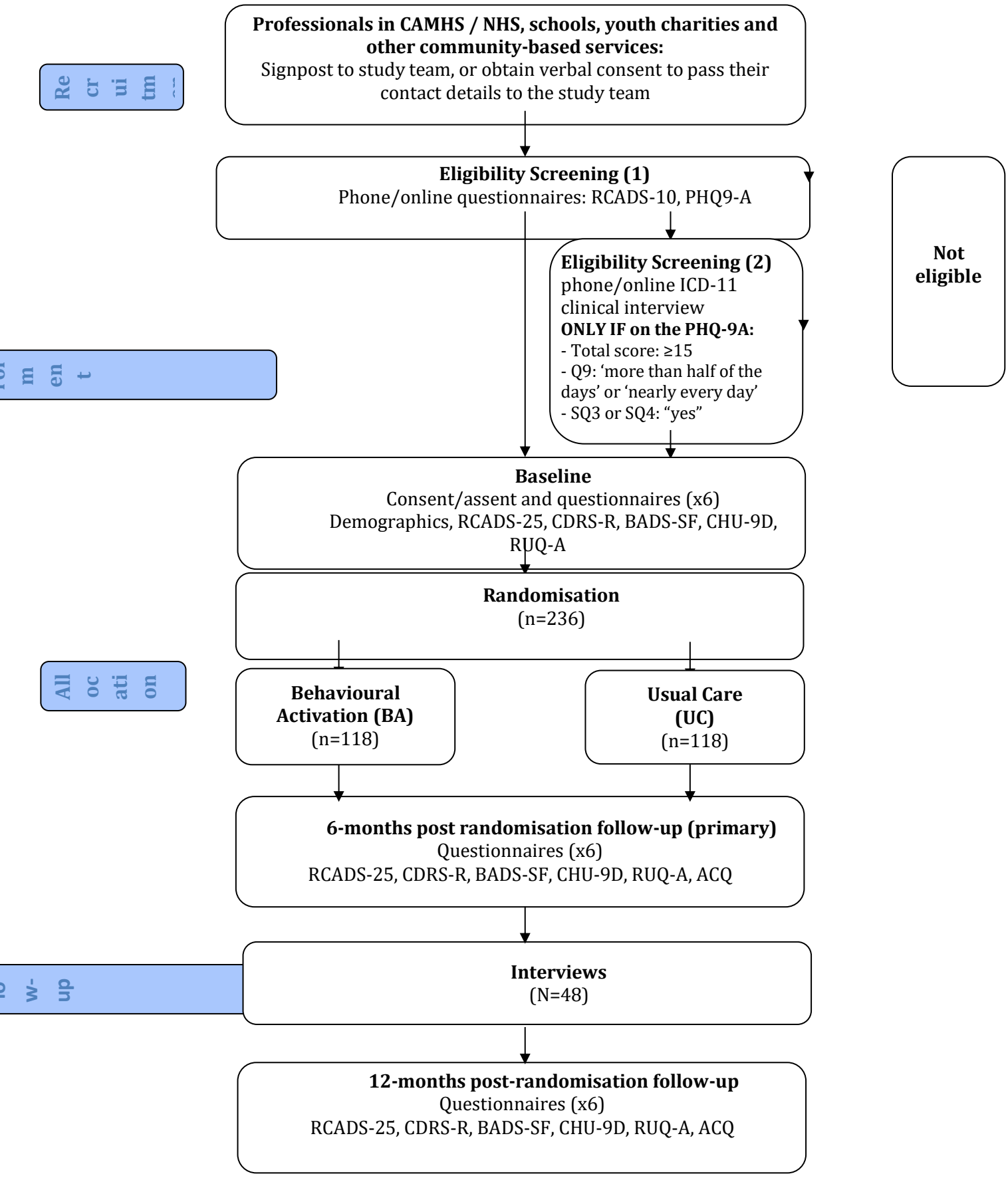
- **STUDY SUMMARY**

Study title	Community-Based Behavioural Activation Training (ComBAT) for Depression in Adolescents: Randomised Controlled Trial (RCT) with Economic and Process Evaluations	
Short title	ComBAT for Depression Randomised Controlled Trial	
Study design	A parallel two-group RCT, with an internal 9-month pilot and embedded phenomenological and ethnographic studies and health economic evaluation	
Participants	Young people aged 12 to 18 years with mild to moderate depression	
Planned sample size	236 young people	
Follow-up duration	6 months and 12 months post-randomisation	
Planned study period	4 years	
	Objectives	**Outcome Measures & Data Collection Tools**
Primary	Estimate the effects of BA on depressive symptoms compared to usual care at 6-months post-randomisation	Revised Child Anxiety and Depression Scale (RCADS) - Brief 25 item version
Secondary	1. Estimate the effects of BA on depressive symptoms compared to usual care at 12 months post-randomisation.	Revised Child Anxiety and Depression Scale (RCADS) - Brief 25 item version
	2. Estimate the effects of BA on the likelihood of diagnosable depression compared to usual care at 6-months and 12-months post-randomisation	Children's Depression Rating Scale-Revised (CDRS-R) (main secondary Outcome)
	3. Estimate uptake and usage of BA by young people in the intervention group.	Review of study screening logs, session monitoring forms and study completion forms.
	4. Compare refusal and dropout rates – and any adverse events - for BA and usual care.	Review of study screening logs, session monitoring forms and study completion forms.
	5. Map what 'usual care' means by summarising therapies and information received as part of usual	Session records for usual care Aspects of Care Questionnaire

	care, in particular any BA-type interventions, in the participating sites.	
	6. Estimate the impact of BA on entry to CAMHS compared to usual care at 6-months and 12-months post-randomisation	Resource Utilisation Questionnaire for Adolescents (RUQ-A)
	7. Capture and compare the experiences of young people and professionals who have used/delivered the BA or usual care.	Interviews with young people and 'exit' interviews with professionals. Embedded ethnographic study
	8. Estimate the costs and consequences of the BA for NHS and non-NHS agencies and undertake a within-trial cost-effectiveness analysis.	Revised Child Anxiety and Depression Scale (RCADS) - Brief 25 item version Child Health Utility-9 Dimensions (CHU-9D) Resource Utilisation Questionnaire for Adolescents (RUQ-A)
	9. Estimate the incremental gains and costs of BA vs usual care in the long-term.	Revised Child Anxiety and Depression Scale (RCADS) Brief 25 item version Child Health Utility-9 Dimensions (CHU-9D) Resource Utilisation Questionnaire for Adolescents (RUQ-A)
	10. Understand how and why ComBAT may work better, or less well, for different adolescent groups and in different community settings.	Demographics questionnaires Behavioural Activation for Depression Scale Short-Form
Intervention	Behavioural Activation (BA)	
Comparator	Usual care	
Method of delivery	Both groups will be supported by professionals based within schools, third sector organisations or NHS services such as CAMHS. Staff groups delivering treatments for ComBAT will include school counsellors, family support workers, emotional literacy support assistants, wellbeing practitioners, social workers, youth workers, counsellors and family advisors.	

STUDY FLOWCHART



ABBREVIATIONS

ACQ	Aspects of Care Questionnaire
BA	Behavioural Activation
BADS-SF	Behavioural Activation for Depression Scale Short-Form
CAMHS	Child and Adolescent Mental Health Services
CBT	Cognitive Behavioural Therapy
CCA	Cost-Consequence Analysis
CCG	Clinical Commissioning Group
CDRS-R	Children's Depression Rating Scale-Revised
CEAC	Cost Effectiveness Acceptability Curves
CHU-9D	Child Health Utility-9 Dimensions
ComBAT	Community-based Behavioural Activation Training
CWP	Children's Wellbeing Practitioner
CYP IAPT	Children and Young People's Improving Access to Psychological Therapies
DfE	Department for Education
DHSC	Department of Health & Social Care
DIRUM	Database of Instruments for Resource Use Measurement
DMEC	Data Management and Ethics Committee
GDPR	General Data Protection Regulation
HRA	Health Research Authority
IAPT	Improving Access to Psychological Therapies
ICER	Incremental Cost-Effectiveness Ratio
IPT	Interpersonal Therapy
ITAX	Intervention Taxonomy
LA	Local Authorities
MAR	Missing At Random
MHSDS	Mental Health Services Dataset
MID	Minimal Important Difference
MOOC	Massive Open Online courses
NDST	Non-Directive Supportive Therapy
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
PPI	Patient and Public Involvement
PSC	Programme Steering Committee
QALY	Quality-Adjusted Life Years
RAG	Red-Amber-Green (rating for internal pilot)
RCADS-D10	Revised Children's Anxiety and Depression Scale: Depression subscale
RCADS-SF25	Revised Children's Anxiety and Depression Scale (25-items)
RCI	Reliable Change Index
RCT	Randomised Controlled Trial
REC	Research Ethics Committee
RUQ-A	Resource Utilisation Questionnaire for Adolescents
SAE	Serious Adverse Event
SAP	Statistical Analysis Plan
SOP	Standard Operating Procedure
SPA	Single Point of Access
SQ	Supplementary Questions

TEWV	Tees Esk and Wear Valleys NHS Foundation Trust
WHO	World Health Organisation
YTU	York Trials Unit

1. BACKGROUND

It is expected that depression will be the most burdensome disease in the world by the year 2030 (World Health Organisation (WHO), 2008). Globally, depression is the fourth leading cause of illness and disability among adolescents aged 15-19 years and fifteenth for those aged 10-14 years (WHO, 2021). Yearly prevalence rates are estimated to be from 7.1% to 19.4% across 11 European countries (Balazs et al, 2012) and 13.3% in the US (in the year 2017) with a strong female preponderance (20% female, 6.8% male) (National Institute of Mental Health, 2019). In the UK, The Millennium Cohort Study (Patalay & Fitzsimons, 2017) found that almost one in four girls (24%) and one in ten boys (9%) at age 14 self-reported high levels of depressive symptoms; with two-thirds of them likely to have diagnosable depression. Key symptoms of depression in young people include sadness and irritability, loss of interest and pleasure, persistent fatigue or lack of energy, loss of confidence, trouble with concentration and sleep, and changes in appetite. Depression is more likely to be under-diagnosed and under-treated in adolescents than in adults, because symptoms are dismissed as being a normal mood variation and reactivity often seen in adolescence (Thapar et al, 2012).

In the UK, Child and Adolescent Mental Health Services (CAMHS) provide evidence-based psychological interventions for young people with depression as part of their stepped care model (National Institute of Health and Care Excellence, NICE, 2019). These include watchful waiting, antidepressant medication, digital/group/individual cognitive behaviour therapy (CBT), interpersonal therapy (IPT), non-directive supportive therapy (NDST), family therapy, brief psychosocial intervention or psychodynamic psychotherapy. Increasing demand and limited resources create waiting lists and high entry thresholds for CAMHS (Crenna-Jennings & Hutchinson, 2020), so many young people with mild to moderate depression do not receive timely clinical interventions.

In a 2017 Green Paper, the Department of Health & Social Care (DHSC) and the Department for Education (DfE) in England put forward plans for the provision of school-led interventions for children and young people experiencing mild to moderate mental health problems to prevent their escalation to a point where higher intensity interventions are needed. Due to this, schools, as well as other community-based settings are increasingly involved in mental health care provision. Historically, the delivery of evidence-based interventions in schools and community settings has been limited. In a cross-sectional survey of UK primary and secondary schools (n=736), Vostanis et al. (2013) reported that most settings delivered locally developed interventions with only a third using evidence-based practices and only a few staff receiving specialist training. The pastoral care provided in these settings (e.g. discussion, consultation, relaxation) provides emotional support to young people, but is often not sufficient to reduce symptoms and change the trajectory of depression.

BA is a recommended treatment approach for adults experiencing depression (NICE, 2016) following its effective delivery with this population but does not currently feature in any national (NICE, 2019) or international (WHO, 2017) recommendations for depression in young people. However, BA's focus on withdrawal, inactivity and avoidance, which are common symptoms of depression in young people may make it suitable for this group also. In addition, as demonstrated within adult services (e.g. Ekers et al, 2011, Richards et al, 2016) it may have important resource implications and be a

potential cost-saving alternative therapy within CAMHS. BA provides a leaner and less-resource intensive alternative to several established psychological therapies (e.g. CBT, IPT) owing to its requirement of fewer sessions and shorter training. Furthermore, BA can be delivered within a variety of settings and by professionals of different levels of expertise (McCauley et al., 2016a) including non-specialists outside clinical services (Ekers et al 2011, 2014; Richards et al, 2016). BA's brevity is also important in the context of young people, because drop-out from therapy can range for 16-75% for young people and the briefer the intervention, the more likely it is they will adhere to it and complete it (De Haan et al, 2013).

Although most research has focused upon the delivery of BA with adult populations, recent years have seen increased focus upon its use with young people, providing preliminary support in this context. Martin and Oliver (2019) conducted a meta-analysis of 4 BA-focused Randomised Controlled Trials (RCT) and reported a large effect in favour of BA vs. controls (1 active intervention, 1 signposting and 2 no treatment) with a pooled standardized mean difference of -0.7 (95% CI -1.20 to -0.20). An earlier meta-analysis (Tindall et al, 2017) pooled together 3 RCTs, including an unpublished PhD thesis (Stark, 1985), and favoured BA over its comparators (-4.2) but with a wider confidence interval (95% CI -8.25, -0.09).

Several studies have also examined the delivery of BA with young people experiencing depression. This work has included two single-group pilot studies conducted within the UK, one delivered in CAMHS (Pass et al., 2017) and one in secondary schools (Pass et al., 2018). The CAMHS pilot showed promising results with 20 young people, whereas the one in secondary schools had no outcome data or any information about the impact of the intervention on the participating young people. This study did however find BA to be considered acceptable by young people, parents and school staff and found high treatment adherence, providing preliminary support for delivering BA within school settings. McCauley et al. (2016b) conducted an RCT with the largest total sample of young people than any other similar intervention. The RCT was conducted in the US with 60 young people (aged 12 to 18 years) with major depressive disorder who received either 14 sessions of therapist-delivered BA (delivered over 12-weeks) or "gold standard" evidence-based therapy (e.g. CBT or IPT) at a university hospital. Both groups showed large and similar improvement in depression and functioning, mediated by increased activation and reduced avoidance.

As part of their work McCauley et al (2016a) produced a manual to support the delivery of their BA known as 'Behavioral Activation with Adolescents: A Clinicians Guide'. The manual provides a session-by-session guide for clinicians and includes handouts for young people and parents. This manual has the best published evidence in terms of the feasibility, acceptability and clinical outcomes of BA for young people to date. Owing to this, our wider research team have adapted and used McCauley et al's (2016a) BA manual in three feasibility studies conducted to examine its delivery within UK young person populations.

The first, the Body and Mind study (Arnott et al, 2020) examined the delivery of BA with young people who were overweight/obese and had clinical depression. The study, conducted in a school setting, recruited 8 young people (aged 13 to 15 years) who all received manualised BA either immediately or after 4 to 6 weeks as a wait-list control

group. Support was provided by a research assistant who had no clinical or therapy qualifications but who received appropriate BA training and supervision. BA took place weekly and the number of sessions ranged from 8 to 11 (with a maximum of 12). Scores showed a large change in a positive direction for depressive symptoms and functioning for the 7/8 participants for whom we had follow-up data; 5/7 young people were depression-free after the intervention (below the cut-off score for remission). An embedded qualitative study, comprising exit interviews with 7 young people and their parents reflected high satisfaction with BA, but highlighted difficulties with scheduling weekly appointments in schools (e.g. during school hours or school holidays). This led to frustration with the disruption in the flow of the intervention. Parents found it difficult to take an active role in BA due to other commitments, despite being perceived as the 'gatekeepers', who held the power to restrict or provide opportunities for the young person to carry out BA.

The BAY-F study (Kitchen, 2018) recruited 7 young people (aged 12 to 18 years) with depression from GP surgeries by two general nurse practitioners who received training to deliver up to 12 one-hour weekly BA sessions. Four (4) participants completed all BA sessions and reported lower depression scores at follow-up and high satisfaction. The remaining 3 participants stopped attending after the first three BA sessions and did not complete follow-up outcome measures. Informal feedback from the two nurse practitioners (who routinely saw all young people at the GP surgery outside the study) suggested that young people dropped out because their mood improved and no longer wanted to be part of the study. For the young people who completed the intervention, the nurses reported that they observed rapid improvements in depressive symptoms early on. One of the difficulties highlighted by the nurses was that the one-hour BA sessions did not fit with their usual 20-minute appointment slots, so they had to accommodate the research in their own time. The nurses also identified the need for greater flexibility within the manual to better tailor the intervention to each young person. Feedback from young people indicated difficulties in commuting to the GP practice, both in terms of time around their other commitments (i.e. college, school, social), and financially.

The Buddy Study (Kitchen et al, 2020) is the only known European RCT of BA with young people to date. Twenty-two (22) young people (aged 12 to 17 years) with major depressive disorder were recruited from CAMHS and randomised 1:1 to either 8 sessions of manualised BA or usual care. At 3 months post-randomisation, 7/11 BA participants and 8/11 usual care participants gave follow-up data; of those, 4/7 BA participants no longer met criteria for major depressive disorder compared to 1/8 participants in the usual care group. The number of completed BA sessions was high (mean 5.7; median 7 out of the total 8). There was a large change in a positive direction for the BA group but not for usual care, assessed by visual comparisons of mean scores on measures on depression, self-esteem and functioning. No adverse events were reported. An embedded qualitative study, carried out with 6 young people, 5 of their parents and 6 CAMHS professionals demonstrated overwhelming support for the weekly mode of BA delivery. However, concern was expressed about the need for greater flexibility in the number of BA sessions because of the complexity of need (including comorbidities) in young people who are under the care of CAMHS.

2. RATIONALE

Neither a fully powered RCT nor an economic evaluation of BA with young people have been conducted in the UK or elsewhere to-date. Furthermore, UK-based feasibility studies, case reports and small RCTs have been predominantly conducted within specialist clinical services. To deliver and evaluate BA beyond specialist clinical services, we have developed, and road-tested through a feasibility study, a standardised BA package for use within schools and third sector organisations for young people experiencing mild to moderate depression. Our mission is to enable schools and third sector organisations, in addition to NHS services, to deliver a clinically informed intervention for young people at the earliest opportunity. A fully powered RCT will evaluate its effectiveness, cost-effectiveness and acceptability compared to usual care.

3. OBJECTIVES AND OUTCOME MEASURES/ENDPOINTS

3.1. Aims and Objectives

ComBAT has four aims:

- Deliver standardised BA in community settings, such as schools and youth centres.
- Evaluate the effectiveness of BA against usual care and its acceptability for adolescents who use it and for professionals who support it.
- Assess whether ComBAT offers better value for money than usual care immediately after the intervention and long-term.
- Explore factors that contribute to the successful delivery and benefits of BA, as well as any drawbacks or unintended consequences from it, within and across specific adolescent groups and community settings.

3.1.1 Primary objective

To estimate the effects of BA on depressive symptoms compared to usual care at 6 months post-randomisation.

3.1.2 Secondary objectives

1. Estimate the effects of BA on depressive symptoms compared to usual care at 12 months post-randomisation.
2. Estimate the effects of BA on the likelihood of diagnosable depression compared to usual care at 6-months and 12-months post-randomisation.
3. Estimate uptake and usage of BA by young people in the intervention group.
4. Compare refusal and dropout rates – and any adverse events - for BA and usual care.
5. Map what 'usual care' means by summarising therapies and information received as part of usual care, in particular any BA-type interventions, in the participating sites.
6. Estimate the impact of BA on entry to CAMHS, compared to usual care, at 6-months and 12-months post-randomisation.
7. Capture and compare the experiences of young people and professionals who have used/delivered the BA or usual care.
8. Estimate the costs and consequences of the BA for NHS and non-NHS agencies and undertake a within-trial cost-effectiveness analysis.
9. Estimate the incremental gains and costs with BA vs usual care in the long-term.

10. Understand how and why ComBAT may work better, or less well, for different adolescent groups and in different community settings.

3.2. Internal Pilot

An internal pilot RCT will run for 9 months; at the end of the internal pilot, we will apply a red-amber-green (RAG) rating to assess whether the RCT can recruit and retain young people at the required rate and that it can be safely delivered within the timeframe and resources available. The criteria for a "green" rating will be:

1. Achieve one-fifth of our overall recruitment sample size within the first third of our recruitment period (as per Herbert, Julious & Goodacre, 2019). As our recruitment period is 27 months, the first third of this will be our 9-month internal pilot. Therefore, one-fifth of our overall recruitment target of n=236 equates to n=47 participants by the end of the internal pilot.

2. Complete 80% follow-ups at 6 months for participants recruited in the first 3 months of the study (N.B. we specify first 3 months of the study to enable the 6-month follow-up by month 10 which is the end of the internal pilot).

3. Have no reported 'serious adverse events' (as described in section 7.6) as a direct result of the BA or the research process for participants in either randomised group.

If any of the above criteria for a green rating are not met at the end of the pilot, the Programme Steering Committee (PSC) and the Sponsor will advise as to whether the study should go to an 'amber' or 'red' rating depending on the margin of difference between our intended and achieved targets, while also taking into account any exceptional circumstances in the pilot sites. For example, if the recruitment and follow-up targets are below 70% the study may go to 'red' rating and may be stopped if the circumstances that led to the low recruitment or follow-up rates cannot be mitigated.

The PSC will also review reports of any adverse events and advise as to whether the study needs to stop ('red rating') (e.g. if the events are serious and related to the research or the intervention), or whether we need to change our standard operating procedures or appoint a Data Management and Ethics Committee (DMEC) to monitor the study for the remaining duration ('amber rating').

3.3. Outcome and end points

A range of data collection tools will be used throughout this RCT to screen participants and to gather data to inform our primary and secondary objectives. Measures will be administered to young person participants by a trained researcher at baseline, 6 months post-randomisation and 12 months post-randomisation. All measures and their time-points of completion are presented in Table 1.

Table 1: Outcome measures and timepoints of completion

Measure	Time-point completed	Completed by
Revised Children's Anxiety and Depression Scale (RCADS) - Depression Subscale 10 items	Screening	Participant
Patient Health Questionnaire –Modified for Adolescents (PHQ-9A)	Screening	Participant
Demographics Questionnaire (Young person)	Baseline	Participant
Demographic Questionnaire (Professional)	Baseline	Professional
Revised Children's Anxiety and Depression Scale (RCADS) – Brief Version - 25 items	Baseline	Participant
	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Children's Depression Rating Scale-Revised (CDRS-R)	Baseline	Participant
	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Behavioural Activation for Depression Scale (BADS) – Short Form	Baseline	Participant
	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Child Health Utility-9 Dimensions (CHU-9D)	Baseline	Participant
	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Resource Utilisation Questionnaire for Adolescents (RUQ-A)	Baseline	Participant
	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Aspects of Care Questionnaire (ACQ)	6 months post-randomisation	Participant
	12 months post-randomisation	Participant
Session Record for Usual Care	Session-by-session	Professional
Session Record for BA	Session-by-session	Professional
Participant Communication Log	Throughout	Professional
Behavioural Activation Fidelity Checklist	Throughout	Clinical Supervisor
Usual Care Contamination Checklist	Throughout	Clinical Supervisor

Demographics questionnaires

- Young People

On entry to the study, participating young people will be asked to complete a short demographic questionnaire to obtain information about their age, sex, ethnicity, religion, family circumstances (who they live with) and education or work.

- Professionals

All professionals involved in the delivery of treatment for the trial will be asked to complete a short demographic questionnaire hosted on the Qualtrics platform when they start working on the RCT. This will capture information about their professional role, grade, organisation, years in service, age range, sex and previous experience of BA (if any).

Revised Children's Anxiety and Depression Scale (RCADS) – Brief Version (Chorpita et al., 2005)

The RCADS brief version is a 25-item questionnaire that assesses children's depression and anxiety; it is a condensed version of the original 47-item (Chorpita et al., 2000) and has been validated as a self-completed outcome measure for 8-to-18-year-olds. Both versions of the RCADS have sub-scales that capture symptoms in 6 domains: one domain relates to depression and five to anxiety problems (generalised anxiety disorder, panic disorder, obsessive compulsive disorder, separation anxiety disorder and social anxiety). All items are rated on a 4-point Likert-scale from 0 to 3, where 0 = Never, 1 = Sometimes, 2 = Often, and 3 = Always. Raw scores are transformed into t-scores by matching the raw score to its corresponding age and gender normed t-scores (available on the measure's website https://www.childfirst.ucla.edu/resources/). Higher t-scores denote greater clinical need. Clinical cut-offs for the t-scores are: 0-64 non-clinical range, 65-69 borderline clinical range, and ≥70 clinical range.

The RCADS depression sub-scale includes the following 10 items: *1. I feel sad or empty; 2. Nothing is much fun anymore; 3. I have trouble sleeping; 4. I have problems with my appetite; 5. I have no energy for things; 6. I cannot think clearly; 7. I feel worthless; 8. I feel like I don't want to move; 9. I am tired a lot; 10. I feel restless.* The depression sub-scale is the same on both the 25-item and the 47-item versions of the RCADS. The sub-scale has the same clinical cut-off that indicates borderline or diagnosable depression as the overall scale (i.e. 0-64 non-clinical range, 65-69 borderline clinical range, and ≥70 clinical range) and has a high correlation with other depression-specific scales like the Children's Depression Inventory (de Ross et al, 2002). Based on the UK's national dataset of Children and Young People's Improving Access to Psychological Therapies (CYP IAPT) data, the Reliable Change Index (RCI), i.e. the amount scores have to change between a first and a last time point for the change to be considered reliable, for the child-reported RCADS depression sub-scale is 17.73 (for the T-scores) (Wolpert et al, 2016).

The 15 remaining items of the RCADS brief version relate to five anxiety problems. For example, generalised anxiety disorder: "I worry that something awful will happen to someone in my family"; panic disorder: "I am afraid of being in crowded places (like

shopping centers, the movies, buses, busy playgrounds); social anxiety: "I worry what other people think of me"; separation anxiety; " I feel scared if I have to sleep on my own"; obsessive compulsive disorder: "I have to do some things in just the right way to stop bad things from happening".

The RCADS is a nationally recommended outcome measure as part of the Mental Health Services Dataset (MHSDS) in the UK. It is routinely collected by CAMHS/CYP IAPT practitioners and CWPs in clinical services with children and young people and it is used by commissioners for service evaluation and benchmarking. This means that our findings can be interpreted in the context of UK national datasets for our population. The RCADS is more sensitive to change compared to other measures (Wolpert, Cheng, Deighton, 2015), so it is particularly useful as an outcome measure of an intervention's effectiveness.

Patient Health Questionnaire 9 items Modified for Adolescents (PHQ-9A) (Johnson, Harris, Spitzer & Williams, *2002)*

The PHQ-9A is a self-administered questionnaire that screens for the presence and severity of depression based on DSM-IV. It comprises 9 items relating to symptoms of depression and asks how much each symptom has bothered the young person over the preceding two weeks. The responses 'not at all', 'several days', 'more than half of the days' or 'nearly every day' have scores 0, 1, 2 and 3 respectively. The PHQ-9A asks four supplementary questions (SQs). The first two SQs are about depression symptoms in the past year, and impact on life (how difficult symptoms of low mood have made completion of day-to-day activities). The third supplementary question (SQ3) asks about suicidal thoughts in the last month (yes/no) and the fourth (SQ4) asks about previous suicide attempts at any point in their life (yes/no).

We will use the PHQ-9A to screen for depression severity and suicide risk. An indication of depression severity is based on the total score of summing up the scores of responses to the 9 questionnaire items. Recommended cut-offs for depression severity are: scores 0-4 = no or minimal depression; 5-9 = mild depression; 10-14 = moderate depression; 15-19 = moderately severe depression; 20-27 = severe depression. Suicide risk will be captured from questions 9, SQ3 and SQ4 in the PHQ-9A. Risk increases if the responses to item 9 ('Thoughts that you would be better off dead or of hurting yourself in some way') are "more than half-days" or "nearly every day". Risk also increases if the response is "yes" to SQ3 (Has there been a time in the past month when you have had serious thoughts about ending your life?) and the response is "yes" to SQ4 (Have you EVER, in your WHOLE LIFE, tried to kill yourself or made a suicide attempt?).

If a young person scores 15 or above in the sum of the 9 items (indicating severe depression), or responds "more than half-days" or "nearly every day" on question 9 and/or yes to SQ3 and SQ4, they will be invited to speak with a clinical member of the ComBAT team to confirm their eligibility for entry to the study, or be signposted to other services as necessary. We have introduced the PHQ-9A, because the RCADS and CDRS-R do not have severity cut-offs, but are more established in identifying the likelihood of clinical depression for young people.

The PHQ-9 is a well-established screening tool for depression in the NHS, especially in primary care, for people over 18 years. The PHQ-9 version for adolescents (PHQ-9A) has been validated in one study (Richardson et al., 2010), which found that its sensitivity and specificity is similar to those for adult populations; however, the cut-off scores are slightly higher for adolescents than adults so that we don't have high false positive rates as a result of the high rate of subthreshold depressive symptoms, adjustment disorders and significant overlap of symptoms between mental health conditions in younger people.

Children's Depression Rating Scale-Revised (CDRS-R) (Poznanski & Mokros, 1996)

This 17-item researcher-administered interview is widely used in clinical research trials to assess severity of, and change in, symptoms of depression in children and adolescents. The CDRS-R covers seventeen symptom areas, including dysfunction relating to schoolwork, interpersonal relationships, psychosomatic complaints, and other thoughts and feelings commonly experienced by depressed young people. The researcher who conducts the interview scores each item on a scale from 1 to 5 or 1 to 7, yielding a total score between 17 and 113, with higher scores denoting more depressive symptoms. Scores ≥40 indicate diagnosable depression (Mayes et al 2010), whereas a score between 35 and 40 is interpreted as emerging or early depression (Plener et al, 2012). We will use the scale's continuous scores in our main analysis for this outcome. We will carry out a secondary analysis by grouping the participants in 2 categories according to the scale's interpretation of cut-off scores (no depression vs. diagnosable depression).

Behavioural Activation for Depression Scale- Short Form (BADS-SF) (Kanter et al, 2012)

The BADS-SF is a 9-item questionnaire, based on the longer, 25-item BADS (Kanter et al, 2007; Manos et al, 2011) that measures levels of activity on 2 sub-scales: activation (goal-directed action and completion of scheduled activities) and avoidance (procrastination rather than active problem solving). The BADS-SF consists of 9 questions, each rated based on the previous week on a seven-point scale ranging from 0 (not at all) to 6 (completely); higher scores represent increased behavioural activation. Total scores on the BADS-SF range from 0 to 54. We will use the BADS-SF to monitor self-reported activity and avoidance. Although the scale has not been validated with an adolescent population, we will use it as there are no alternative similar tools to help us explore behavioural activation as a mediator for changes in depression symptoms.

Child Health Utility-9 Dimensions (CHU-9D) (Stevens, 2010)

We will use the CHU-9D (Stevens, 2010) to derive health gain in quality-adjusted life years (QALYs). The questionnaire consists of 9 domains, each with 5 statements (scored 1–5) that will assess the young person's functioning "today" across domains of worry, sadness, pain, tiredness, annoyance, school, sleep, daily routine and activities. For example: 1= I don't feel sad today, 2=I feel a little bit sad today, 3=I feel a bit sad today, 4=I feel quite sad today, 5=I feel very sad today. The responses under the 9 domains can be taken together as a description of the young person's "health state" using a descriptive system that combines all responses across all items (e.g. 11232152). Different utility weights were assigned to each level of each domain. Different combinations of responses across the 9 dimensions therefore result in different health states that have a utility value

on a 0–1 scale, where 1 is perfect health and 0 is equivalent to being dead. The UK young people valuation set will be used to derive the utility values (Stevens, 2012).

Resource Utilisation Questionnaire for Adolescents (RUQ-A) (bespoke)

We developed a Resource Utilisation Questionnaire for self-completion by adolescents (RUQ-A). Its purpose is to collect information about use of healthcare and other resources by each young person over the previous 6 months which will be used for the economic evaluation. We have conducted a literature search (including the Database of Instruments for Resource Use Measurement - DIRUM - database) for questionnaires previously used in economic evaluations in this population. In addition to the literature search, the RUQ-A was informed by previous RUQs developed by our team for mental health interventions with young people. The RUQ-A has been reviewed by PPI representatives and has been administered as part of our feasibility study. It was then revised based on the feedback.

Aspects of Care Questionnaire (Bespoke)

We developed the Aspects of Care Questionnaire that has 8 items to help assess contamination, i.e. where an individual randomised to usual care has inadvertently or deliberately received elements of BA. The items are 8 statements that correspond to both general activities that may have taken place within both treatment arms as well as BA-specific activities. The general items include: "I had an opportunity to talk about my current problems/general life"; "I learned a little bit more about low mood"; "I know the name of the person who gave me support during ComBAT"; "I learned about ways to help me to deal with my low mood. The BA-specific activities are: "I completed a diagram that included things and people that I value in my life"; "I scheduled pleasures and necessary tasks/routines on a weekly calendar"; "I wrote down things I did for pleasure and necessary tasks/routines on a weekly calendar"'; "I gave a PAC score (Pleasure, Achievement and Connection) to activities I completed on a weekly calendar". Responses to each item are: 'yes, 'no' or 'I don't know'. Participants in the intervention group would be expected to answer 'yes' to the BA-specific activites whereas participants randomised to usual care would be expected to answer "no" or 'I don't know'.

- **4. STUDY DESIGN**

We will conduct a parallel two-group RCT, with an internal 9-month pilot (described in section 3.2) to compare the effectiveness of BA against usual care. Nested within the study will be a phenomenological study (described in section 10) to examine the acceptability of BA, an ethnographic study (described in section 11) to investigate how BA has been delivered in different sites and an economic evaluation (as described in section 12) of BA's cost-effectiveness relative to usual care.

- **5. STUDY SETTINGS**

The study will be conducted within a variety of services responsible for providing support to young people with mild to moderate depression. These may include NHS services such as CAMHS, school-based or other community-based services. These sites will be involved in the identification of study participants and will be the locations for intervention delivery.

- **6. PARTICIPANT ELIGIBILITY CRITERIA**

6.1. Inclusion criteria

Young people will be eligible for the study if they:

1. Are aged 12-18 years at the date of consent.

2. Score ≥65 on the depression subscale (10-items) of the Brief Revised Children's Anxiety and Depression Scale (RCADS) (this is the standardised cut-off by which elevated symptoms of depression warrant further assessment and potential intervention).

3. Scores <15 on the PHQ-9A or answers 'more than half of the days' or 'nearly every day' to question 9 of the PHQ-9A or answers "yes" to either SQ3 or SQ4 of the PHQ-9A.

4. Provide consent, or assent along with their parent's consent (if applicable), to participate in the study.

6.2. Exclusion criteria

Young people will <u>not</u> be eligible for the study if they:

1. have severe depression or an increased risk of suicide, assessed with an interview by a clinical member of the ComBAT team. The assessment interview will only be carried out if the young person scores ≥15 on the PHQ-9A, <u>or</u> answers 'more than half of the days' or 'nearly every day' to question 9 of the PHQ-9A, <u>or</u> answers "yes" to either SQ3 or SQ4 of the PHQ-9A.

2. meet criteria for secondary care (tier 3/high intensity therapy), other than risk of suicide or severity of the depressive symptoms, such as a learning disability or complex comorbid conditions, confirmed through a discussion with the referrer and the local secondary care team.

3. cannot speak English and do not have a carer or other designated adult to translate the intervention and research materials, and to translate conversations during sessions with a professional.

- **7. STUDY PROCEDURES**

7.1. Recruitment

We will recruit participants through two main pathways: a) schools and third sector organisations; and b) NHS services including CAMHS

(a) Schools and third sector organisations

Different schools have different arrangements for assessing and helping young people with depression, but usually there are key points of contact (gatekeepers) within each school and across clusters of schools within each area. We will approach these gatekeepers and ask them to identify any young people who they feel may be suitable and interested in participating. We will also work with the gatekeepers to promote active recruitment by raising awareness about the trial to pupils and parent groups (e.g. governors, parent-teacher associations) and among their colleagues.

(b) NHS

NHS services, including CAMHS and IAPT CYP or lifelong services, will be invited to both promote the RCT and assist with identifying young people who may be suitable and interested in participating. ComBAT team members will attend regular team meetings in these locations to remind professionals of the study and its inclusion criteria and will ask team secretaries to send study information to all professionals who may be able to support recruitment. Some NHS Trusts have an embedded single point of access (SPA) where assessments and signposting of referrals are carried out by trained staff. We will work with any SPA gatekeepers based within any of our recruiting NHS services to capture referrals as they emerge.

Any gatekeeper who identifies a young person as potentially suitable for participation will be asked to provide them with a study information pack. This will include participant information sheets (ones for young people and ones for parents/guardians (as appropriate)) an expression of interest form, a copy of the depression subscale from the Revised Children's Anxiety and Depression Scale (RCADS) – Brief version (Ebesutani et al., 2012) and a copy of the Patient Health Questionnaire Modified for Adolescents (Johnson et al., 2002) (PHQ-9A). Having read the study information, if a young person is interested in taking part in the research, they will be asked to return a completed copy of the expression of interest form to the research team (either directly or via the person who gave them the study information) as well as their completed brief RCADS questions and the PHQ-9A. The RCADS depression sub-scale comprises 10 items that assess children's depression and is included in both the 25-item and 47-item versions of the RCADS. The PHQ-9A is a self-administered measure used to screen for depression (both the RCADS and the PHQ-9A are described in further detail in section 3.3).

On receipt of an expression of interest form, the research team will determine whether a young person is eligible for participation by reviewing the scores on the RCADS depression subscale and the PHQ-9A. Anyone attaining a score of ≥65 on the RCADS depression subscale and ≤14 on the PHQ-9A will be eligible for study entry. In the event that a young person scores 15 or over on the PHQ-9A and/or answers either of the items relating to suicidal thoughts or suicidal attempts in the affirmative, they will be invited to attend a second eligibility assessment. This assessment will be conducted by a clinical member of the research team online, via video conferencing, or face-to-face at a mutually convenient location, depending on participant preference. At this meeting the researcher will discuss the responses to the PHQ-9A with the young person and ascertain whether they feel that the young person may be experiencing severe depression and therefore eligible for secondary care within CAMHS. If severe depression is suspected, the young person will not be eligible for the study and a referral for support into CAMHS will be advised to both the young person and their parent/guardian (if applicable).

If eligible, a researcher will contact the young person and their parent/guardian (if applicable) and arrange a suitable time to conduct a baseline visit with them. Baseline visits may be held online, via video conferencing, or face-to-face at a mutually convenient location, depending on participant preference. Any young person expressing interest in the study but not meeting the eligibility criteria will be contacted and informed of this. All data collected from those not eligible will be securely destroyed and will not be included in any study analyses. All baseline visits will be arranged ensuring that participants (and parent/guardians) have had at least 24 hours to decide whether to take part in the research after receiving study information.

7.2. Informed consent

At the baseline visit the researcher will reiterate the trial aims, discuss what participation entails and answer any questions young people and/or their parents have regarding the research. If happy to proceed, informed consent/assent will be obtained from young people and parents/guardians (where applicable). The consent process will vary depending upon the age of the young person.

Young people aged 12 to 15 years

Young people aged 12 to 15 years will be required to complete an assent form, alongside their parents consenting for them to be able to take part in the trial. As part of this, a parent/guardian will be required to confirm that they will support their son/daughter during their time in the trial.

Young people aged 16 to 18 years

Young people aged 16 to 18 years will be required to complete a consent form to participate in the trial. Whilst parental consent will not be required, young people will be reminded that involving parents in the completion of BA may provide a useful form of additional support during their participation (e.g. in supporting activation attempts). Whether 16- to 18-year-old participants choose to involve parents in the completion of BA is based upon individual choice.

During the consent process, all participants will be asked for the contact details of their GP but the GP will not be contacted unless there is a reason to do so (e.g. medication) and with permission from the young person or the parent/guardian as appropriate before the GP is contacted.

7.3. Procedure

Following informed consent/assent the young person participant will complete a series of standardised measures with a trained researcher. These will include: demographic questionnaire, RCADS, CDRS-R, BADS-SF, CHU-9D, RUQ-A (for questionnaire descriptions see section 3.3). On completion of the baseline measures, participants will be randomised to either receive BA or usual care. A member of the research team will inform the participant (and their parent/guardian, if applicable) as well as the supporting professional of the randomisation outcome. Treatment sessions (as necessary) will be

arranged by the supporting professional who will liaise with the young person and, if appropriate, their parent/guardian. The researcher will arrange follow-up meetings both 6 and 12 months from the point of randomisation and will keep in contact with the young person before these meetings as needed.

7.4 Randomisation

Young people will be randomised in 1:1 ratio to either BA or usual care using simple randomisation. Randomisation will be implemented using a web-based system designed and developed by the data management team at York Trials Unit (YTU). The allocation sequence will be generated by a YTU statistician and embedded into the randomisation system.

7.5 Blinding

All research assistants (RAs collecting data at the 6-month follow-up (primary endpoint)) will be "blind" to (unaware of) participant group allocation. To minimise instances of "unblinding", RAs will NOT: be informed of, or involved in group allocation, organising therapy sessions; completing SAE forms, access allocation information in the study's database. The RAs will remind each participant at the beginning of their 6-month follow-up meeting not to give away what they did or who they saw as part of their involvement in the ComBAT project. If an RA becomes unblinded prior to the 6-month follow-up point, a different RA will conduct the 6-month follow-up with that participant where possible. Following data collection at the 6-month follow-up point (primary endpoint), the RA will be unblinded to treatment allocation. This will enable RAs to arrange, and complete, interviews with a sub-set of participants as part of the embedded phenomenological study (described in section 10). The study's statisticians and health economists will be aware of group allocation during data analysis.

7.6 Monitoring and reporting Adverse Events (AE) and Serious Adverse Events (SAE)

Throughout the research, any adverse events (e.g. distress, misunderstandings, deteriorating mental state) will be monitored closely by the research team and the professionals delivering trial interventions. All events suspected to be related to a trial treatment or research procedure will be recorded using an adverse events form. All adverse events will be assessed for severity and will be recorded as a serious adverse event if it:

- Requires hospitalisation (or prolongation of existing hospitalisation), including any A&E attendance.
- Is a life-threatening risk.
- Results in serious deterioration in mental state: (Participant is unable to continue in trial as determined by their GP or a ComBAT Study Clinician/Clinical Supervisor).
- Results in persistent or significant disability or incapacity.
- Results in death.
- Is otherwise considered medically significant.

The Chief Investigator will review any serious adverse events if they arise. Any serious adverse events will be immediately reported to the study sponsor.

- **8. INTERVENTION AND COMPARATOR**

8.1. Intervention: Behavioural Activation

8.1.1 Content

We have developed a bespoke, standardised BA package inspired and informed by published literature, public and patient involvement (PPI) activities and a feasibility study. First, we conducted a systematic literature review of RCTs on the effectiveness of BA which focused on the key therapeutic ingredients included in each version of BA used within the reviewed studies. Second, we have collected all the existing BA manuals, with McCauley et al's (2016b) published BA guide as our starting point, as this is the only BA for which an RCT was conducted with adolescents. Third, we held several focus groups and individual discussions with young people, parents and professionals (as described in section 14). Finally, we have evaluated the delivery of our BA with a small feasibility study, in which young people (12-18 years) used the materials with support from a therapist or youth worker trained in BA.

BA aims to lift young people's mood, energise and motivate them, and restore their interest and pleasure in life through enjoyable, rewarding, purposeful and meaningful activities that counteract avoidance and rumination and become sources of positive reinforcement.

In day-to-day life, activities fulfil different purposes. First, there are things that young people like and want to do (pleasures), such as playing music, exercising, reading, fashion or gaming. Second, there are things that young people have to do, or that they do routinely (necessities), such as preparing food, washing, shopping, working, or caring for a family member or a pet. Third, there are activities that serve a bigger or future purpose, intention or aspiration (goals), such as passing at certain subjects at school, organising a party or getting a job.

It is important that pleasures, necessary routines/tasks and goals connect with what and who is important to each young person and not what others think "should" be important. First, activities should connect with what the young person values and considers important for themselves (their qualities as a person and for their health and self-care), people who matter to the young person (family, friends, other relationships), and things that matter in their world (school/work, hobbies/interests, home/safe space/happy place).

The BA sessions with a professional will guide and support each young person to identify, schedule, complete and monitor pleasures, necessities and goals in day-to-day life that connect with what and who is important to them. These may be things that the young person has stopped doing or doing less, which they can start doing again or more. There may be things that the young person would like to do or things that the young person never thought of doing for which they need help to start. There may be things that they have been doing routinely but no longer enjoy and need to change them in some way.

The young person will keep a diary in which they will make a note of each activity that they complete. Some of these activities will be scheduled and others will be unplanned,

routine or spontaneous. The young person will score enjoyment, achievement and/or connection for each activity on a 0-10 scale (0=no enjoyment/achievement/connection, 10=great enjoyment/achievement/connection). Over the course of the week, activities that score high on enjoyment, achievement and connection are highlighted and encouraged. Activities that score low can be reduced or changed so that they become more enjoyable or rewarding.

Activities that have not been completed can be postponed, cancelled, or changed – depending on the reasons for not being completed (the young person did not consider them important, or they were too difficult or other activities take priority). A graded and stepped approach to activities will help young people overcome obstacles such as hesitation and tiredness that are to be expected with depression. Some activities may actually make young people feel worse or may be harmful, destructive or counterproductive; these need to be identified and reduced/stopped.

The BA programme will be organised in 5 "modules" which can be completed in 5-8 weekly sessions of 30-40 minutes each in a blended model of professional-guided sessions and self-directed activities. A 5-module approach has been used by McCauley et al (2016a) in their published guide (pp. 12-13). The content of these 5 modules is bespoke to ComBAT.

Table 2: Five BA modules in ComBAT

Module	Topics covered
Module 1: Starting Up	• What is depression? • What is behavioural activation? • Emotional rewards or 'positive reinforcement' • The depression cycle. • Behavioural activation: breaking the depression cycle. • Take away activities: Activity monitoring and making the most of good feelings
Module 2: Getting Active	• Reviewing the weekly calendar • Understand what the PAC scores mean. Compare high vs low PAC activities and identify what makes a difference. • Introduction to the "Life Pie": personal areas of importance and values • Turning values into activities: pleasures, necessities and goals across the life pie. • Introduction to activity scheduling • Activity monitoring

Module 3: Building Skills	• Building on activity review
	  o Identify activities with high and low PAC scores
	• Activity scheduling:
	  o Repeat activities with high PAC scores

	○ Introduce pleasures, necessities and goals across more areas of the life pie. ○ Reduce, remove or modify activities with low PAC scores. • Activity monitoring
Module 4: Overcoming Obstacles	• Reviewing the weekly calendar ○ Identify activities with high and low PAC scores ○ Identify non-completed scheduled activities. ○ Identify barriers and problems. ○ Identify harmful or counterproductive activities. • Identify and manage barriers and problem solve. • Mastering activity scheduling: ○ Repeat activities with high PAC scores ○ Introduce new pleasures, necessities and goals for more areas of the life pie. ○ Reduce, remove or modify activities with low PAC scores. ○ Reduce, remove or modify harmful or counterproductive activities. ○ Introduce activities that counteract avoidance, overcome barriers and solve problems.
Module 5: Moving Forward	• Review weekly calendar • Create an activities bank by looking through the previous weekly calendars. • Plan pleasures, necessities and goals to focus on in the next 4 weeks. • Create a relapse prevention plan.

8.2 COMPARATOR: Usual Care

The comparison group in the ComBAT RCT will be usual care. Usual practice for child and adolescent mental health can be widely varied and inconsistent, as we have learnt from the mapping exercise we carried out within our feasibility study and from our experiences of completing similar NIHR-funded studies, including ASPECT (Wright, et al., 2018), I-SOCIALISE (Varley et al., 2019), CCBT (Wright et al., 2017), Young SMILES (Gellatly et al, 2019). Usual care may be no intervention, signposting to alternative sources of support, general discussion, supportive counselling, relaxation, recreation groups, guided self-help or psychological therapies including CBT and IPT.

Professionals who are involved in usual care also vary greatly from one community setting to another: from assistants and support workers (e.g. family support workers, teaching assistants, emotional literacy support workers) to professionals who are trained in counselling, low intensity interventions (e.g. psychological wellbeing practitioners) and specialist high intensity interventions (e.g. CBT therapists, family therapists). This was reflected in our mapping exercise completed within our feasibility study where we

also found much variation in the frequency, and both session number and length of support offered to young people with depression across services.

We will record and monitor what usual care means for each young person recruited into the study. To do this, professionals will complete a session record at each session to outline what approaches they have taken. Where usual care involves signposting young people to external support, professionals will be asked to provide information about this (i.e. where the young person was signposted to).

Like in the delivery of BA, all professionals will be asked to audio record all usual care sessions whenever possible (and applicable), and as part of our embedded ethnographic study (as described in section 11), agree to have a selection of treatment sessions observed by a clinical member of the research team. Informed consent from young person participants (and parent/guardians where applicable) will be sought to enable both of these activities. A random selection of 15% of participants randomised to usual care across different sites will have one treatment session assessed for contamination (see section 8.4) by a clinical member of the research team. A Usual Care Contamination Checklist developed specifically for use in ComBAT will be completed for this purpose. This assessment will be conducted both live, where a session is being observed, or by listening to an audio recording.

When reviewing session content (via session record forms, audio-recordings and live observation) we will particularly look for any aspects of usual care that are similar to BA. Even in sites where BA-type interventions may be included in usual care (such as brief psychosocial support, CBT-informed self-help), we expect that these interventions are sufficiently different to our BA; for example, they are not standardised or do not include key components such as activity scoring.

8.3 Delivery

The trial interventions (both BA and usual care) will be delivered by members of staff based within schools, third sector organisations or NHS services such as CAMHS (depending on where a young person is recruited from). Given that part of our study's rationale is that BA can be disseminated by professionals who are less expensive to employ, we will exclude professionals on or above NHS pay grade 7 (or the non-NHS equivalent) who are usually qualified clinicians. Professionals within schools whose role is to work with young people with mental health and emotional difficulties, and who are below grade 7, include: school counsellors, family support workers, emotional literacy support assistants and school wellbeing practitioners. Counterpart professionals who work within third sector organisations may be social workers, youth workers, counsellors and family advisors. In CAMHs, these may include children's wellbeing practitioners (CWPs).

ComBAT support workers may be a mixture of NHS and non-NHS employees, depending on what organisation is commissioned – and by whom - to provide mental health support in each locality. For example, part of the funding may come from Clinical Commissioning Groups (CCGs), part from local authorities (LAs) and part from the budget owned by a school or charity. Some CCGs/LAs may commission local CAMHS to provide tier 2 services

outside secondary care, others may commission third sector providers and some schools may make arrangements to employ their own mental health support staff. The key differentiator of the ComBAT workforce is that they are not part of CAMHS secondary care.

8.4 Identifying and mitigating contamination

Pathways to, and sources of, contamination

Contamination would occur if young people randomised to usual care receive elements of BA. This may happen for the following reasons:

- At service level: Usual care services offer BA as a standalone intervention or elements of BA as part of another intervention, such as cognitive behaviour therapy.
- At professional/therapist level: Professionals supporting young people in usual care inadvertently or deliberately deliver BA. This can happen if professionals: have previously been trained in BA; received BA training as part of ComBAT and support participants in both BA and usual care arms; access BA resources on their own accord online or publicly available treatment manuals (e.g. prompted by reading about BA in the ComBAT protocol).
- At participant level: Participants randomised to usual care access BA materials.

Preventing contamination

- Most routine services that we will approach do not offer BA at all. We are primarily recruiting services who do not offer BA as usual care; these services assess young people and either signpost them to other services or offer non-BA interventions. For services that do offer BA as usual care, we will only embed ComBAT if alternative options for usual care are available.
- Where possible, sites will identify separate professionals to support BA and usual care. If the same professional delivers both BA and usual care, the BA trainer and supervisor will ask the professional to avoid using any resources, principles or techniques of BA as part of usual care.
- Access to the ComBAT manual alone, previous training, or self-directed learning are not sufficient to deliver BA at a standard that will be considered 'contamination in ComBAT'; this requires training by the research team plus consistent supervision to be able to deliver BA with fidelity.
- A 'Combatination' Information Sheet (CIS) outlining what 'contamination' of usual care is, why it is important to prevent it in ComBAT, how to prevent it, and what to do if it happens. The CIS will be included in the local information pack sent to the participating sites and in the BA training pack for professionals.

Monitoring Contamination

- All professionals will complete a session record for every BA or usual care session. The supervisor will review the completed session records monthly and flag any overlaps between usual care and BA in the session records.
- All professionals will be asked to audio record treatment sessions whenever possible (and applicable). A random selection of session recordings will be assessed for contamination (see section 8.4) by a clinical member of the research team using the Usual Care Contamination Checklist.

- Interviews with professionals and with participants include questions to assess what was included in their usual care practice for the participants whom they supported.
- Participants complete the Aspects of Care Questionnaire, which includes 8 statements that assess whether participants used BA-specific elements, i.e. value-based activities, activity scheduling, activity monitoring and activity scoring: these would be expected to have taken place for the intervention group, but not got the usual care group.
- The ethnographic study will get a snapshot of usual care in the participating sites too.

Addressing Contamination

- We will assess contamination as part of the 9-month internal pilot.
- If contamination is present (or suspected) in a site, the research team will contact the site and discuss ways to mitigate this e.g. identifying alternative professionals to deliver treatment and reconsidering the suitability of the recruiting site for ComBAT.

● 9. STATISTICAL AND DATA ANALYSIS

9.1 Sample Size

The most recent meta-analysis of BA for depression in young people (Martin & Oliver, 2018) reported a large effect size of -0.7 (95% CI -1.20, -0.20). There is no widely accepted minimal important difference (MID) for the RCADS (our primary outcome measure); therefore, we are seeking to obtain an effect size of d=0.5, which is accepted (albeit with criticism) as a universal standard for MID (King 2011, Norman et al 2003) and is an effect size which NICE has previously used as a ballpark for the adoption of interventions (NICE, 2014). A sample size of 172 (86 in each group) will have 90% power to detect an effect size of 0.5 on the RCADS, using a two-group t-test with a 0.05 two-sided significance level. Assuming an average of 5 participants per therapist, an ICC of 0.01 (DE=1.04) and 23% loss to follow-up (mean of drop-out rates 14-32% from 5 existing RCTs on BA), we will aim to recruit 236 young people (118 in each group).

9.2 Statistical Analysis

Analyses will be conducted following intention-to-treat principles and will follow a detailed pre-specified statistical analysis plan.

The flow of individuals through the trial will be reported in a CONSORT diagram, including the number screened (and reasons for ineligibility) and approached for consent (and reasons for non-consent), the number randomised, adherence to allocated treatment, follow-up data completeness and the number of participants included in the primary analysis. Descriptive summaries of continuous data will be given in terms of the non-missing sample size, mean, standard deviation, median, inter-quartile range, minimum and maximum. Descriptive summaries of categorical data will be given in terms of frequencies and proportions. Information on intervention delivery including number and duration of sessions will be summarised descriptively. All outcomes will be summarised descriptively at all timepoints.

The primary outcome (RCADS – brief version) will be analysed using a mixed-effects linear regression model, including all available follow-up time points. The model will adjust for the RCADS at baseline and include as fixed effects: trial arm, arm-by-time

interaction and other important covariates. Random effects will be included to account for the repeated measures within patients and for possible clustering by therapist, patient and therapist (nested within treatment arm). Adjusted mean differences between treatment groups will be presented at each timepoint with an associated 95% confidence interval (CI) and p-value. Different covariance patterns for the repeated measurements will be explored and the most appropriate pattern will be used for the final model. Data will be assumed missing at random.

We will explore potential associations between therapist characteristics and outcomes. If any such associations are found, a sensitivity analysis will be carried out repeating the primary analysis with the addition of any confounding therapist characteristics as fixed effects.

Mediation analyses will be carried out to explore potential mechanisms of action of the intervention on the RCADS.

Continuous secondary outcomes will be analysed in a similar manner to the primary outcome, adjusting for the same fixed and random effects. Binary secondary outcomes will be analysed using a mixed-effects logistic regression model adjusting for the same fixed and random effects as the primary analysis model.

● 10. EMBEDDED PHENOMENOLOGICAL STUDY

10.1. Study design

An embedded phenomenological study will capture and compare the experiences of young people and professionals participating in the RCT as means of assessing the BA's acceptability, but also as a way of understanding some of the contextual, implementation and mechanistic factors that may influence intervention use and outcomes.

10.2. Participants and sample size

We will invite 20% of all randomised young people (n=48) split equally between arms from both allocation arms (BA and usual care) across all sites to have one-to-one interviews. We will use maximum variation sampling from the cohort of participants who consented to be contacted about the interviews that will be held on the YTU database. We will ensure a spread of participants in terms of age, sex, education/employment, cultural background, depression severity, allocation arm and engagement (e.g. those who completed, dropped out or did not start).

We will also invite professionals who took part in the trial (we will aim for at least one representative from each delivery site) to have an "exit interview" 6 months from the end of trial recruitment or sooner if a site stops recruiting earlier than the trial's recruitment end-date. The final sample size of professionals for the embedded phenomenological study will be determined by data saturation, i.e. the point where no new themes, ideas and concepts emerge from the interviews.

10.3. Recruitment

Young person recruitment

At the baseline visit, young people will indicate in their consent/assent form whether they would be happy to be contacted about taking part in an interview with a member of the research team to discuss the support they have received 6 months after they entered the study. The research team will keep a record of those happy to be contacted and will select a sample, representing different ages, sex, socio-economic background, level of depression, allocation arm, engagement, to participate. Following completion of their 6-month follow-up visit, a member of the research team will invite a sample of participants (and their parents/guardians where appropriate) to an interview after giving them information about it. Participants will have at least 24 hours to decide whether to take part in the interview after receiving the information. After this point, a researcher will contact the participants to discuss any questions, complete an additional consent/assent form and arrange the interview.

Professional recruitment

All professionals who have provided support as part of the RCT will be invited to attend an individual interview with a member of the research team to discuss their experiences of treatment delivery. These "exit interviews" will take place 6 months from the end of trial recruitment or sooner if a site stops recruiting earlier than the trial's recruitment end-date. Professionals will be provided with an information sheet outlining the aims of the interview and what participation will entail. Those interested in taking part will be asked to complete a consent form.

10.4. Procedure

All interviews will be held online using a video conferencing platform approved by the study sponsor. To accommodate the needs of all participants, the option to attend an interview face-to-face or via telephone will be offered in place of video conferencing if preferred or more practical. Any interviews conducted face-to-face will be completed in a mutually convenient location.

All interviews will last up to 60 minutes and will be audio recorded and transcribed verbatim, to which participants would have given permission when signing the assent/consent form. Participants will be reminded that the discussion will be recorded before it starts. All recordings will be transcribed by a sponsor approved transcription company. When the transcriptions have been checked for accuracy by the research team, all audio-recordings will be erased. Interview transcripts will each be given an individual identifier as to maintain participant confidentiality.

The interviews will follow a structured topic guide that will cover 4 topics:

1. ACCEPTABILITY: What the young people/professionals who have used/delivered BA or usual care think helpful/positive/engaging/valuable and hindering/negative/off-putting/futile in the care options they participated in.

2. CONTEXT: Factors that helped young people/professionals make the most of the help available to them and factors that got in the way of getting help/making the most of the help available.

3. IMPLEMENTATION: How young people/professionals used the care they received and what changes they would make to the way it is accessed/delivered.

4. MECHANISMS: How and why depression changed or did not change in young people, and how and why professionals changed their practice over the period of the study or would have liked to change it but did not.

Participants will be reminded of their right to withdraw before the interview. However, any data collected at the point of withdrawal will be included in the analysis as agreed during the consent process.

10.5. Data analysis

We will conduct a template analysis starting with a priori themes under each of the 5 topics of the discussion guide (i.e. acceptability, implementation, context, mechanisms, engagement in mental health research). The themes under the 4 topics will be tentative and may be redefined or removed if they do not prove useful for organising and interpreting the narrative data. Two researchers will conduct initial hierarchical coding by identifying sections of the interview transcripts that appear relevant to our a-priori themes. If the codes correspond to these themes, they will be 'attached' to the relevant sections of the transcripts, otherwise new themes will emerge in addition or instead of the existing themes. We will produce an initial template after coding a sub-set of the data (e.g. a quarter of all transcripts), and will present this template, with example entries, to the wider research team and the PPI advisory groups to confirm its validity, coherence and conceptual relevance. Following modifications, we will produce a final template. All remaining transcripts will be coded and interpreted according to this final template, which will inform a subsequent process evaluation.

10.6. Ethical considerations

Confidentiality of participants and the data obtained during interviews will be maintained throughout. All interview transcripts will be assigned an identifier with no personal information collected and pseudonyms will be used when reporting all results. All recordings will be made using encrypted devices with recordings deleted immediately following transcription. We will also ensure that ground rules are set prior to all interviews whereby we will ask participants to refrain from disclosing any personal or family information. We will follow a structured topic guide and keep discussions focused on the research objectives. All group facilitators will have a health, social care or educational background and relevant DBS checks.

● 11. EMBEDDED ETHNOGRAPHIC STUDY

We will build on an ethnographic approach (Kitchen et al, 2020) to identify facilitators and barriers in the delivery of BA within CAMHS. We will use this approach to understand how our BA has been delivered in different participating sites and to

capture any discrepancies between its intended delivery and its actual delivery. This ethnographic approach will involve focused observation and focused discussion by visiting a site for a certain duration (at least a day). We will visit at least half of the participating sites and ensure representation of different sites in terms of geography (e.g. urban or rural), type of site (e.g. NHS-based, school or third sector organisation) and engagement with the RCT (e.g. actively recruiting site or non-recruiting site, stage of joining the RCT).

We will keep field notes and will audio-record discussions - where possible - for each site. We will keep a record of the number of hours the researcher spent in each site and the types of activities the researcher participated in alongside professionals in that site. We will use an inductive thematic analysis of the text-based data collected from the field notes and the discussion transcripts. The analysis will be led by the researcher who did the site visits and will then be discussed and verified by a second researcher. We will identify key themes under the broad domains of 'facilitators" and 'barriers', but we will mostly generate new themes being led by the data. We will make comparisons between sites and produce a final matrix with the findings across all sites. We will arrange for a feedback visit with each participating site to present our findings (all quotes will be anonymised). We will request feedback on our interpretation of the data and comments for discussion and recommendations that will feed into our process evaluation and generalisation work (as described in section 13).

- **12. ECONOMIC EVALUATION & MODELLING**

The health economic analyses will be conducted following intention-to-treat principles and will follow a pre-specified analysis plan. All costs will be presented in Pound Sterling in the appropriate year, i.e., the year when the major part of RCT is carried out.

12.1 Cost-Consequences & Cost-Effectiveness Analysis

We will record, as the trial proceeds, the activities of professionals and materials used for the BA intervention. These will include costs incurred by the NHS (e.g. delivering training and supervision) and for costs incurred by non-NHS organisations and society in general (e.g. staff costs for delivery, young person or parents' travel costs). The resources required to deliver the BA will be calculated using bottom-up estimation of the time required from professionals, trainers and supervisors, as well as other resources used (e.g. printing of materials).

The RUQ-A will collect participants' use of general health services, including mental health services, in school, the community, from the NHS and private agencies. In the case of private services, the out-of-pocket payments will also be collected. Costs attached to resource utilisation will be obtained from the most up to date version at the time of analysis of publicly available sources of reference costs for health, social care and education (NHS England, NHS Improvement 2019/21; Jones, K. & Burns, 2021).

The effectiveness measures used in the economic evaluation are depressive symptom measured by RCADS (primary outcome), QALYs derived from CHU-9D, and number of days absent from school, training or work (in RUQ-A).

We will carry out a cost-consequences analysis (CCA) due to the multiplicity of stakeholders and the need to present a comprehensive picture of costs and consequences from different perspectives. We will also conduct an incremental cost-effectiveness analysis alongside the CCA. The differences in depression outcomes and costs of BA over and above usual care during the RCT's primary outcome measurement period from baseline to follow-up (6 months) will be estimated using mixed-effects generalised linear regression model following statistical analysis with adjustments made for measures used in CCA. These differences will be used to estimate the cost-effectiveness of our BA vs usual care using incremental cost-effectiveness ratios (ICERs). Underlying uncertainty around the decision to adopt the intervention will be assessed through a non-parametric bootstrap re-sampling technique. Cost effectiveness acceptability curves (CEACs) will be plotted based on the outcomes of the bootstrap iterations (Fenwick et al, 2001).

Missing data pattern will be examined and multiple imputation with chained equation will be used to handling missing data. To assess the impact of missing data, we will conduct a set of analyses following the same approach as mentioned above but using complete cases only, whereby results are analysed only for those participants who had all required data completed. In addition, because multiple imputation assumes missing at random (MAR), we will undertake sensitivity analyses to assess the potential departure from MAR (Faria et al, 2009).

12.2 Modelling Long-Term Value for Money

We will assess the potential lifetime value for money of our BA vs. usual practice beyond the duration of the RCT using a decision analytic model. The decision model will synthesise information on costs and consequences collected in the RCT, and data from external sources on long-term impact of depression in young people on their adult life.

A decision tree will be constructed to incorporate the information from the RCT following the two-arm structure of the trial design. We will then search for existing models of long-term impact of adolescent depression on adult mental health and its effect on non-health outcomes relevant to education and employment. If no existing model is identified or deemed suitable for our purpose, a long-term Markov model will be constructed to project the impact into adulthood, populated with data from secondary sources and published studies. Due to the complexity of the interaction between physical health and mental health and limited by the resources and capacity, we will focus on the long-term mental health impact and not consider physical co-morbidities. The uncertainty of the model will be explored by probabilistic sensitivity analysis and alternative scenarios regarding the key assumptions of the expected effect of the BA.

• 13. PROCESS EVALUATION & GENERALISATION

13.1 Process Evaluation

In line with MRC guidance (Moore et al, 2015), our process evaluation will identify what contextual, implementation and mechanistic factors are important for the BA's future adoption on a large scale in schools and third sector organisations whose remit will be to recognise and help young people with depression. The process evaluation will also unpack the black box of the intervention (Wight et al., 2003), by understanding what –

and how – certain factors relating to our population, the delivery settings, or the intervention itself, can influence ComBAT's outcomes.

To understand how and why the BA may or may not work, our process evaluation will focus on three domains: 1. CONTEXT; 2. IMPLEMENTATION; 3. MECHANISMS. We will use statistical and qualitative analysis of data collected in the trial to inform these three domains. First, we will analyse demographic and clinical data using regression models and sub-group analyses. Second, we will carry out a template analysis of narrative and observational data collected via the interviews conducted with young people and professionals, and the ethnographic study.

CONTEXT. We will explore how factors associated with individual young people and with different delivery settings can influence the BA's usage and outcomes. Regression models and sub-group analyses will evaluate whether and how delivery features (e.g. type of community setting or background of professionals) and young person characteristics (e.g. gender, age, comorbidities) are associated with the number of BA sessions completed and depression symptoms after 6 months. A template analysis will summarise narrative and observational data about personal factors (e.g. exams for young people, affinity to the model by professionals) and circumstances in the wider system that may have influenced the BA's usage and outcomes.

IMPLEMENTATION. We will explore how the BA has been learnt, applied, adapted and accessed from the perspectives of young people and professionals. Data from fidelity checklists will describe how well professionals adhered to the intervention's principles and how well they delivered its techniques. Narrative data will indicate how young people understood and experienced BA and whether they would have liked it to be different in the way it was delivered and accessed. Narrative data from professionals will gather information about how they may have tailored the intervention for young people with different needs and preferences, what they would do differently in the future, or how the resources, training and supervision provided to them helped or hindered the professionals' ability to implement BA.

MECHANISMS. We will explore potential reasons for why depression changed or did not change in young people, and why professionals in schools and in the third sector did or did not change their practice, over the period of the study. A template analysis of data from the interviews with young people will illustrate what aspects of care young people think contributed to change, or lack of change, in their depression. A separate template analysis of data from the interviews with professionals will identify internal and external factors that account for professionals changing – or not - their practice.

13.2 Generalisation

We will produce a 'logic model' and a 'dark logic model' that link contextual, implementation and mechanistic factors with outcomes and consequences of ComBAT – both intended and unintended –for adolescents, mental health support workers and delivery organisations. We will also produce a generalisation framework for the successful large-scale adoption and use of ComBAT with diverse adolescent populations in different settings.

LOGIC MODEL: Informed by the findings from the RCT and the process evaluation, we will produce a logic model that illustrates the relationships between inputs, mediators/moderators and outputs of the BA at three different levels: young people, professionals and organisations. The model will give an overview of how the outcomes and impacts of the BA are mediated and moderated by contextual, implementation and mechanistic factors associated with elements of the intervention itself, characteristics of individual young people and professionals, and processes within organisations.

DARK-LOGIC MODEL: Informed by the findings from the RCT and the process evaluation, we will produce a 'dark logic model' by illustrating the relationships between resource demands, risk factors and potential unintended consequences of BA for young people, professionals and organisations. For example, we will consider under what circumstances BA may put some young people off using it or make their depression worse; inflate referrals to CAMHS (e.g. increased demand by raising awareness); misrepresent normal mood variations as clinical depression; be misapplied outside clinical services. We will then recommend how these circumstances and factors can be mitigated to prevent or minimise unintended consequences in the future.

GENERALISATION FRAMEWORK: Informed by the logic and dark logic models, we will develop a generalisation framework of facilitators and barriers for the BA's use with diverse young person populations in different community settings. The framework will draw on all feasible and beneficial elements of the BA while preventing replication of any impractical or unhelpful elements. This will be the basis for informing practice guidelines and policy recommendations (e.g. NICE, 2019; WHO, 2017) as to how the BA could be incorporated within routine pathways of care for young people with depression. Young people's mental health is a growing concern in need of practical and resourceful solutions; our programme of work will evaluate a clinical intervention outside conventional service boundaries and identify potential barriers - as well as possible solutions - for its implementation in the community.

● 14. PATIENT AND PUBLIC INVOLVEMENT (PPI)

During our current feasibility work, we have facilitated a series of PPI focus groups with young people (both with and without experience of depression), parents/guardians and professionals supporting young people with depression. Prior to the start of our feasibility work, these stakeholders provided feedback on the intervention materials and research documents (e.g. information leaflets, bespoke outcome measures, etc.) and suggested refinements to ensure they were accessible, engaging and met the needs of those for whom they were designed.

We have also established two expert reference groups (ERGs), one with adolescents who have experience of depression (a combination of early teens and older adolescents) and one with parents/guardians and professionals who have experience of supporting young people with depression. The ERGs will meet at regular intervals during the completion of the RCT and will advise on and/or support the research delivery (e.g. ethics, recruitment, data collection); the interpretation of findings; production of lay summaries; dissemination via social media and other platforms; emerging recommendations for the NHS, schools and youth organisations.

- **15. MONITORING, AUDIT AND INSPECTION**

We will follow trial monitoring and site monitoring procedures in accordance with the standard operating procedures of both the study trials unit (York Trials Unit) and the study sponsor (TEWV). The conduct of the trial will be governed by the Programme Steering Committee (PSC) that has an independent chair, two independent senior academics, and a representative of a public interest/youth organisation. The PSC will meet once a year to monitor progress and protocol adherence and to advise the study team.

- **16. ETHICAL AND REGULATORY CONSIDERATIONS**

16.1. Health Research Authority (HRA) review

Ethical approval in line with NHS Research Ethics Committee (REC) and HRA guidance will be sought for the completion of this trial. Both the REC and HRA will be notified of, and asked to review, any proposed changes to the procedures and/or documentation made during the trial. As no pharmaceutical compounds or medical devices will be used in the study Clinical Trials Authorisation will not be required.

16.2. Ethical considerations

Several ethical issues have been considered to enable the safe running of this trial. First, young people with depression can be vulnerable and may experience distress or worsening symptoms during their participation. All participants entering the trial will be provided with information outlining who to contact if they (or their parent/guardian, if applicable) have any concerns or worsening symptoms during participation. This will include providing individuals with the contact information of their local NHS CAMHS duty clinician service which provides urgent assessments during office hours on weekdays. If a participant feels at risk outside of these hours they will be signposted to the out of hours on-call service provided by consultant psychiatrists which is available 24 hours a day, 7-days per week. In serious situations young people will be directed to present at their local A&E department or call 999. This will be made clear within the participant information sheets and reiterated during the baseline visit with the researcher. Agreement to seek additional support if required will be a requisite of study entry.

During any contact with the research team, if we consider a young person to be at risk we will ask the parent/guardian, and the young person, for permission to liaise with the relevant support services (e.g. social care/child protection/mental health). If the level of risk warrants it, the research team will directly contact the relevant services, having obtained informed consent from the participants before they entered the trial (the consent form will state "risk" as a criterion for breaching confidentiality). During their participation, if a professional feels that the complexity or severity of the depression or other problems warrants more high-intensity treatment, they may decide to discontinue the participant from the research.

Throughout the research, any adverse events (e.g. distress, misunderstandings, deteriorating mental state) will be monitored closely by the research team. We will

encourage all participants to speak to their support workers if they are unhappy about their participation in the research. We will explicitly state in the study information sheets that participants can withdraw from the project at any time and do not have to give a reason. Withdrawal from the research will not impact upon any therapies they may receive now or in the future.

All data collected from participants during the trial will be confidential and will not contain any information that may lead to the identification of an individual. All participants will be assigned with an ID number which will be used on any questionnaires they complete. All ID numbers will be randomly generated and not be based upon any participant identifiable information. All information will be stored securely and adhere to GDPR regulations and the principles of the Data Protection Act (2018) (as described in section 16.3 for more information about data storage).

Finally, as some participants may prefer for their baseline and follow-up assessments to be conducted face-to-face, we will adhere to the University of York's lone worker policy in these instances. This will be adhered to if visits are conducted in non-public locations (e.g. participant homes). This will include enacting a 'buddy system' whereby any researcher conducting a face-to-face visit will inform colleagues of their location, appointment times and expected end time. All researchers will ensure that they inform a colleague of their arrival at a visit and also at their departure.

16.3 Data storage

All data collected during the trial will be stored in accordance with GDPR principles and will adhere to the Data Protection Act 2018 at all times. Physical data will be stored in locked filing cabinets, in a locked office at the University of York and only accessible to members of the immediate research team. Any personally identifiable data will be stored separately from non-identifiable study data. Any electronic data will be password-protected, stored on secure servers at the University of York and only transferred (where necessary) using encrypted and GDPR-compliant methods. All personal data will be destroyed following completion of the trial (due to be February 2026) with study data (e.g. transcripts, questionnaires) archived for ten years as per the requirements of the National Institute for Health Research (NIHR).

● 17. OUTPUTS AND DISSEMINATION

17.1. Intended outputs

We will generate a series of outputs to disseminate our research findings, support the delivery of BA within community settings and inform future research.

These outputs will include:

1. A session-by-session guide for professionals who deliver BA.
2. Materials for young people and their parents who use BA
3. A finalised training package for professionals who will teach and supervise BA.
4. A digital interface for the delivery of BA.

5. A blueprint of BA delivery models (who, when, where, how) across the range of community settings where young people may seek support for depression.
6. A resource utilisation questionnaire for adolescents (RUQ-A), which will capture use of CAMHS and other NHS and non-NHS services, that can be used by other research projects.
7. An economic model for longer-term cost-effectiveness of the BA against usual care.
8. A 'logic model' that links contextual, implementation and mechanistic factors with positive outcomes and consequences of the BA for young people, professionals and delivery organisations.
9. A 'dark logic model' that links contextual, implementation and mechanistic factors with negative/unintended outcomes and consequences of the BA for young people, professionals and delivery organisations.
10. A generalisation framework of how to enable the successful large-scale adoption and use of the BA with diverse young person populations in different settings.
11. Academic publications about the methodological aspects and findings of our research.
12. Non-academic materials for workshops, seminars, podcasts, posters and other digital and physical media, for dissemination.

17.2. Communication with stakeholders and the wider public

Some of the ways in which we plan to inform and engage wider and targeted audiences about the ComBAT programme of research include:

- Using social media (e.g. Twitter and Facebook) to regularly detail the work being undertaken with progress reports.
- Using podcasts, documentaries and MOOCs (Massive Open Online courses) to reach wider public audiences, especially with regards to understanding and recognising depression.
- Participating in creative media exhibitions like Mediale in York and York Festival of Ideas.
- Arranging a series of stakeholder events to present the evolving versions of ComBAT materials and to discuss evaluation results.
- Using the networks of universities, the NHS and the third sector to engage commissioners and service providers.
- Publishing lay summaries and evidence briefings of the project's findings through our partner networks in the NHS, local authorities and the third sector.
- Presenting at national and international conferences for non-governmental organisations, policy makers and those responsible for children and young people's service commissioning and delivery.
- Publishing the results in a variety of scientific journals for different professional groups including mental health, social work and education.

On completion of the project, we will work with our NHS, educational and third sector partners to ensure that ComBAT resources can be accessed freely. The University of York and Tees, Esk and Wear Valleys NHS Trust will work together to carry out dissemination and marketing activities. We will support such activities by continuously applying for impact and innovation funds available to the NHS and Universities. We will approach universities and other organisations that offer training and continuous

professional development (CPD) to psychological wellbeing practitioners and non-health professionals who work with young people, such as social workers, youth workers, teachers, teaching assistants and play therapists, to explore the most appropriate ways of using the BA within their current and future practice.

18. REFERENCES

Arnott, B., Kitchen, C.E.W., Ekers, D., Gega, L. & Tiffin, P. (2020). Behavioural activation for overweight and obese adolescents with low mood delivered in a community setting: feasibility study. *BMJ Paediatrics Open*; 4:e000624. doi: 10.1136/bmjpo-2019-000624

Balazs, J., Miklósi, M., Keresztény, Á., Apter, A., Bobes, J., Brunner, R., Corcoran, P., Cosman, D., Haring, C., Kahn, J.P. and Postuvan, V. (2012). P-259-Prevalence of adolescent depression in Europe. *European Psychiatry*, 27(S1), 1-1.

Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behavior Research and Therapy*, 38, 835-855.

Chorpita, B.F., Moffitt, C.E. & Gray, J. (2005). Psychometric properties of the Revised Child Anxiety and Depression Scale in a clinical sample. *Behaviour Research and Therapy*, 43:309-22.

Crenna-Jennings, W. & Hutchinson, J. (2020). *Access to Child and Adolescent Mental Health Services in 2019.* [Online]. Education Policy Institute. Available from: https://epi.org.uk/wp-content/uploads/2020/01/Access-to-CAMHS-in-2019_EPI.pdf [Accessed 13/07/2021].

De Haan, A.M., Boon, A.E., de Jong, J.T., Hoeve, M. & Vermeiren, R.R. (2013). A meta-analytic review on treatment drop-out in child and adolescent outpatient mental health care. *Clinical Psychology Review*, 33, 698-711.

Department of Health and Social Care and Department for Education. (2017). *Transforming children and young people's mental health provision: a green paper.* [Online] Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664855/Transforming_children_and_young_people_s_mental_health_provision.pdf [Accessed 13/07/2021].

de Ross, R.L., Gullone, E., & Chorpita, B.F. (2002). The Revised Child Anxiety and Depression Scale: A psychometric investigation with Australian youth. *Behaviour Change*, 19, 90–101.

Ebesutani, C., Reise, S. P., Chorpita, B. F., Ale, C., Regan, J., Young, J., ... & Weisz, J. R. (2012). The Revised Child Anxiety and Depression Scale-Short Version: scale reduction via exploratory bifactor modeling of the broad anxiety factor. *Psychological Assessment*, 24(4), 833.

Ekers, D., Webster, L., Van Straten, A., Cuijpers, P., Richards, D. & Gilbody, S. (2014). Behavioural Activation for depression: An update of a meta-analysis of effectiveness and sub-group analysis. *PLoS One*, 19(6), e100100.

Ekers, D., Richards, D., McMillan, D., Bland, J. M. & Gilbody, S. (2011) Behavioural activation delivered by the non-specialist: phase II randomised controlled trial. *British Journal of Psychiatry*, 198(1), 66-72.

Faria R, Gomes M, Epstein D, et al. A guide to handling missing data in cost-effectiveness analysis conducted within randomised controlled trials. PharmacoEconomics. 2014;32(12):1157-70.

Fenwick, E., Claxton, K., & Sculpher, M. (2001). Representing uncertainty: the role of cost-effectiveness acceptability curves*. Health Economics*, 10(8), 779-787.

Gellatly, J., Bee, P., Kolade, A., Hunter, D., Gega, L., Callender, C., Hope, H. & Abel, K.M. (2019). Developing an intervention to improve the health related quality of life in children and young people with serious parental mental illness. *Frontiers in Psychiatry*, 10, 155, doi: 10.3389/fpsyt.2019.00155

Herbert, E., Julious, S. A., & Goodacre, S. (2019). Progression criteria in trials with an internal pilot: an audit of publicly funded randomised controlled trials. *Trials*, 20(1), 1-9.

Johnson, J.G., Harris, E.S., Spitzer, R.L & Williams, J.B. (2002). The patient health questionnaire for adolescents: validation of an instrument for the assessment of mental disorders among adolescent primary care patients. *Journal of Adolescent Health*, 30(3):196-204.

Jones, K. & Burns, A. (2021). *Unit Costs of Health and Social Care 2021, Personal Social Services Research Unit.* University of Kent, Canterbury. Available from: https://kar.kent.ac.uk/92342/19/Unit%20Costs%20Report%202021%20-%20Final%20version%20for%20publication.pdf [Accessed 26.04.2022].

Kanter, J. W., Mulick, P. S., Busch, A. M., Berlin, K. S., & Martell, C. R. (2012). Behavioral Activation for Depression Scale (BADS) (Long and Short Form). Measurement Instrument Database for the Social Science. Available from: www.midss.ie [Accessed 17/02/2022].

Kanter, J.W., Manos, R.C., Bowe, W.M., Baruch, D.E., Busch, A.M. & Rusch, L.C. (2010). What is behavioral activation? *Clinical Psychology Review*, 30, 608-20.

Kitchen, C. E., Tiffin, P. A., Lewis, S., Gega, L. & Ekers, D. (2020). Innovations in Practice: A randomised controlled feasibility trial of Behavioural Activation as a treatment for young people with depression. *Child and Adolescent Mental Health*, 26(3): 290-295.

KITCHEN, C.E.W. (2018). *The Feasibility and Acceptability of a Behavioural Activation Intervention for Young People with Depression in Child and Adolescent Mental Health Services.* Unpublished: Durham University. PhD Thesis.

Martin, F. & Oliver, T. (2019). Behavioral activation for children and adolescents: a systematic review of progress and promise. *European Child & Adolescent Psychiatry*, 28(4),427-441.

Mayes, T.L., Bernstein, I.H., Haley, C.L., Kennard, B.D. & Emslie, G.J. (2010). Psychometric properties of the Children's Depression Rating Scale – Revised in adolescents. *Journal of Child and Adolescent Psychopharmacology*, 20(6), 513-516.

McCauley, E., Schloredt, K.A., Gudmundsen, G.R., Martell, C.R. & Dimidjian, S. (2016a). *Behavioral activation with adolescents: A clinician's guide.* New York: Guilford Press.

McCauley, E., Gudmundsen, G., Schloredt, K., Martell, C. Rhew, I., Hubley, S. & Dimidjian, S. (2016b). The Adolescent Behavioral Activation Program: Adapting Behavioral Activation as a Treatment for Depression in Adolescence. *Journal of Clinical Child & Adolescent Psychology*, 45(3), 291-304.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., ... & Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *BMJ,* 350:h1258 doi:10.1136/bmj.h1258.

NHS England, NHS Improvement. National Cost Collection 2019/20. 2021 June. https://www.england.nhs.uk/national-cost-collection/#nccdata2. [Accessed 13.07.2021].

National Institute for Health and Care Excellence (2019). NG134: *Depression in children and young people: Identification and management.* NICE guideline 25 June 2019. [Online]. Available from: https://www.nice.org.uk/guidance/ng134 [Accessed 13/07/2021].

National Institute for Health and Care Excellence (2009). *Depression in adults: Recognition and management.* Clinical guideline, 28 October 2009. Available from: http://www.nice.org.uk/guidance/cg90. [Accessed 13/07/2021].

National Institute for Mental Health (2019) *Major Depression: Prevalence of Major Depressive Episode Among Adolescents.* Available from https://www.nimh.nih.gov/health/statistics/major-depression.[Accessed 08/08/2021]

Pass, L., Sancho, M., Brett, S., Jones, M.& Reynolds, S. (2018). Brief Behavioural Activation (Brief BA) in secondary schools: a feasibility study examining acceptability and practical considerations. *Educational and Child Psychology*, 35(2), 10-20.

Pass, L., Lejuez, C. W. & Reynolds, S. (2017). Brief Behavioural Activation (Brief BA) for Adolescent Depression: A Pilot Study. *Behavioural and Cognitive Psychotherapy*, 1-13.

Patalay, P. & Fitzsimons, E. (2017). *Mental ill-health among children of the new century: trends across childhood with a focus on age 14.* London: Centre for Longitudinal Studies, 1-6. Available from: https://cls.ucl.ac.uk/wp-content/uploads/2017/11/Briefing-paper-mental-ill-health-among-children-of-the-new-century-September-20-2017.pdf [Accessed 26/04/2022].

Plener, P.L., Grieb, J., Spröber, N., Straub, J., Schneider, A., Keller, F. & Kölch, M.G. (2012). Convergence of children's depression rating scale-revised scores and clinical diagnosis in rating adolescent depressive symptomatology. *Mental Illness*, 4(1), 29-31.

Poznanski, E.O. & Mokros, H.B. (1996). Children's Depression Rating Scale-Revised Manual. Los Angeles: Western Psychological Services.

Richards, D. A., Ekers, D., McMillan, D., Taylor, R. S., Byford, S., Warren, F. C. et al. (2016). Cost and Outcome of Behavioural Activation versus Cognitive Behavioural Therapy for Depression (COBRA): a randomised, controlled, non-inferiority trial. *The Lancet*, 27, 388(10047), 871-80.

Richardson, L. P., McCauley, E., Grossman, D. C., McCarty, C. A., Richards, J., Russo, J. E., ... & Katon, W. (2010). Evaluation of the Patient Health Questionnaire-9 Item for detecting major depression among adolescents. *Pediatrics,* 126(6), 1117-1123.

Stark, K.D. (1985). A comparison of the relative efficacy of self-control therapy and behaviour therapy for the reduction of depression in children. (Unpublished doctoral dissertation). University of Wisconsin, Madison, WI.

Stevens KJ. Working with children to develop dimensions for a preference-based, generic, pediatric, health-related quality-of-life measure. Qual Health Res. 2010;20(3):340-51.

Stevens K. Valuation of the Child Health Utility 9D Index. PharmacoEconomics. 2012;30(8):729-47.

Thapar, A., Collishaw, S., Pine, D.S. & Thapar, A.K. (2012). Depression in adolescence. *The Lancet,* 379, 1056–67.

Tindall, L., Mikocka-Walus, A., McMillan, D., Wright, B., Hewitt, C. & Gascoyne, S. (2017). Is Behavioural Activation effective in the treatment of depression in young people? A Systematic Review and Meta-analysis. *Psychology and Psychotherapy: Theory, Research and Practice*, 90(4), 770-796.

Varley, D., Wright, B., Cooper, C., Marshall, D., Biggs, K., Ali, S., Chater, T., Coates, E., Gilbody, S., Gomez de la Cuesta, G., Kingsley, E., Le Couteur, A,. McKelvey A., Shepard, N. & Teare, D. (2019). Investigating Social Competence and Isolation in children with Autism taking part in LEGO-based therapy clubs in school environments (I-SOCIALISE): Study protocol. *BMJ Open*, 9(5), 1-9. Available from: https://bmjopen.bmj.com/content/9/5/e030471 [Accessed 26/04/2022].

Vostanis, P., Humphrey, N., Fitzgerald, N., Deighton, J. & Wolpert, M. (2013). How do schools promote emotional well-being among their pupils? Findings from a national scoping survey of mental health provision in English schools. *Child and Adolescent Mental Health*, 18(3), 151-157.

Wight, D. & Obasi, A. (2003). Unpacking the black box: the importance of process data to explain outcomes. In: Stephenson, J.M., Imrie, J. & Bonell, C. (eds.). *Effective Sexual Health*

Interventions: Issues in Experimental Evaluation. Series: Oxford medical publications. Oxford University Press: Oxford, UK, 151-166. ISBN 9780198508496.

Wolpert, M., Jacob, J., Napoleone, E., Whale, A., Calderon, A., & Edbrooke-Childs, J. (2016). *Child- and Parent-reported Outcomes and Experience from Child and Young People's Mental Health Services 2011–2015.* London: CAMHS Press. Available from: https://www.corc.uk.net/media/1544/0505207_corc-report_for-web.pdf [Accessed 26/04/2022].

Wolpert, M., Cheng, H. & Deighton, J. (2015). Measurement Issues: Review of four patient reported outcome measures: SDQ, RCADS, C/ORS and GBO – their strengths and limitations for clinical use and service evaluation. *Child and Adolescent Mental Health*, 20: 63-70. Available from: https://doi.org/10.1111/camh.12065 [Accessed 08/08/2021].

World Health Organisation (2021) *Adolescent Mental Health: Emotional Disorders.* Available from: https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health. [Accessed 08/08/2021].

World Health Organization (2008). The Global Burden of Disease: 2004 Update. Geneva: World Health Organisation. Available from: https://apps.who.int/iris/bitstream/handle/10665/43942/9789241563710_eng.pdf?sequence=1&isAllowed=y [Accessed 26/04/2022]

Wright, B., Tindall, L., Littlewood, E., Allgar, V., Abeles, P., Trépel, D. & Ali, S. (2017). Computerised cognitive-behavioural therapy for depression in adolescents: feasibility results and 4-month outcomes of a UK randomised controlled trial. *BMJ Open*, 6:e012834. doi:10.1136/bmjopen-201601283.

Wright, B.D., Cooper, C., Scott, A.J., Tindall, L., Ali, S., Bee, P., Biggs, K., Breckman, T., Davis Iii, TE., Gega, L., Hargate, RJ., Lee, E., Lovell, K., Marshall, D., McMillan, D., Teare, MD., Wilson, J. (2018). Clinical and cost-effectiveness of one-session treatment (OST) versus multisession cognitive-behavioural therapy (CBT) for specific phobias in children: protocol for a non-inferiority randomised controlled trial, *BMJ Open*, 8 (8) e025031. Available from: https://doi.org/10.1136/bmjopen-2018-025031 [Accessed 26/04/2022].