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The authors declare that they have no competing interests.

Author contributions

Jeffrey Lambert conducted developed the intervention and prepared the manuscript. All authors contributed to study design and authors read and approved the final manuscript.

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Abstract

Increasing physical activity in people with depression may have the dual benefit of targeting mental and physical health outcomes (Faulkner & Taylor, 2012). This paper describes the development and theoretical framework for a web-based behavioural activation (BA) intervention, which specifically promotes physical activity (eMotion). The Centre for eHealth Research and Disease Management (CeHReS) roadmap (van Gemert-Pijnen et al., 2011) was used to guide the process of adapting an existing face to face intervention based on BA and physical activity (BAcPAc) (Farrand et al., 2014) to be used in an online context. The CeHReS roadmap promotes active stakeholder involvement and helped to ensure that key user needs were being catered to along the developmental process. Details about the background of the intervention are provided, including the theoretical framework. A detailed description of how eMotion was operationalised (in line with TIDieR guidelines (Hoffmann et al., 2014)) is also provided. eMotion aims to offer person-centred support through optimising engagement in web-based support, building on the previous BAcPAc trial.

Background

Physical activity is one of the most effective behaviours for improving and maintaining physical health (Das & Horton, 2016). Randomised controlled trials (RCTs) have also shown physical activity to be as effective as cognitive behavioural therapy (CBT) and antidepressants for managing depression (Cooney et al., 2013; Rebar et al., 2015). A recent critical appraisal also suggested that a previous Cochrane systematic review may have even underestimated the therapeutic benefits of physical activity (Ekkekakis, 2015). Mediators for the effect of physical activity on mood include psychological (e.g. self-efficacy) and physiological (e.g. thermogenic, endorphin, monoamine) pathways (Craft & Perna, 2004). Increasing physical activity in people with depression may, therefore have the dual benefit of targeting mental and physical health outcomes with a lower likelihood of side effects (Faulkner & Taylor, 2012).

However, promoting physical activity in populations with depression is challenging (Faulkner & Taylor, 2009). Behavioural avoidance is a key symptom associated with depression (Ottenbreit & Dobson, 2004) and RCT's evaluating the effect of exercise on depression have shown substantial drop out and poor adherence rates (Cooney et al., 2013). Depression is also a determinant of sedentary behaviour (Vancampfort et al., 2014) and is associated with lower perceived control (Hemmis et al., 2015) and lower levels of self-efficacy (Bauman et al., 2012; Vancampfort et al., 2014).

Behavioural activation (BA) may present an opportunity to promote physical activity to people with depression who are less active than the general population (Farrand et al., 2014). BA is an evidence-based psychological therapy which attempts to reduce depression by increasing activity (Lejuez, Hopko, & Hopko, 2001). Employing established action-planning and problem-solving behaviour change techniques (BCT's) (Michie et al., 2013), BA helps people to identify and schedule (contextually relevant) behaviours which provide positive reinforcement (Hopko, Lejuez, LePage, Hopko, & McNeil, 2003). However, despite the encouragement of 'positive' behaviours, there is no evidence to suggest that current

versions of BA (or any other psychological therapy) specifically target or increase physical activity (Cuijpers, De Wit, & Taylor, 2014). Using BA to promote physical activity gradually could, therefore, overcome the challenge of engaging those who are less active and provide additional mood and health-enhancing benefits (Farrand et al., 2014). The combined BA and Physical Activity (BAcPAc) intervention specifically aimed to promote physical activity, within a BA framework (Farrand et al., 2014). However, the pilot RCT of BAcPAc experienced a number of difficulties relating to recruitment, trial procedures and provider drift due to biases towards other treatments (e.g. cognitive restructuring) (Pentecost et al., 2015).

Web-based interventions have shown promise in reducing depressive symptoms (Nyström et al., 2017; Rebar et al., 2016; Rosenbaum, Newby, Steel, Andrews, & Ward, 2015) and promoting physical activity (Webb, Joseph, Yardley, & Michie, 2010) and may overcome the difficulties experienced by the BAcPAc trial (Pentecost et al., 2015). Up to 50% of people with mild to moderate depression do not seek help in primary care due to negative beliefs about treatment, social stigma and identity conflict (i.e. the desire to protect one's identity from the threat of depressive symptoms) (Farmer, Farrand, & O'Mahen, 2012). Web-based interventions can be delivered directly to the community, overcoming barriers to recruitment and could help to reduce the treatment gap by providing anonymity, ease of access and flexibility. Web-based interventions can also have standardised and fixed treatment content, reducing issues with provider drift (Watkins et al., 2016). The UK Medical Research Council (MRC) guidance (Craig et al., 2008) recommend that theory and evidence be used to develop complex interventions to ensure they have the best chance of success.

The aims of this paper are to:

1. Describe the development and theoretical framework for a web-based intervention which delivers BA, adapted to specifically promote physical activity (eMotion).

2. Describe the process of operationalising the theoretical framework into a web-based platform.
3. Provide a description of eMotion.

Development and theoretical framework for eMotion

Rationale for Behavioural Activation and Physical Activity

BA emerged from a component analysis which found that the behavioural element of CBT was just as effective as the full package of CBT for reducing depression (Jacobson, Martell, & Dimidjian, 2001). Various models of BA exist, however, all are based on a behavioural formulation of depression (Jacobson et al., 2001). One such model aims to reduce depressive symptoms by decreasing behavioural avoidance and increasing activities that provide positive reinforcement (Farrand et al., 2014; Richards, 2010). The basic conceptual foundation for BA is that depressed mood is the result of a lack of exposure to response-contingent reinforcement, or an increase in punishment for 'healthy' behaviours (e.g. physical activity) (Richards, 2010). People with depression often stop engaging in activities they previously enjoyed (e.g. meeting friends) as they are perceived as too difficult (Jacobson et al., 2001). Avoiding such activities, therefore, provides a sense of immediate relief which is then negatively reinforced. People with depression can also experience less pleasure or achievement that comes from engaging in positive activities (anhedonia), resulting in reduced positive reinforcement (Jacobson et al., 2001). Depression can, therefore, be conceptualised as the product of a cycle of reduced positive reinforcement and increased negative reinforcement (Richards, 2010). BA helps people to break this cycle and increase their exposure to sources of positive reinforcement (Lejuez et al., 2001) and "act their way out of depression". This is in contrast to the "thinking (and acting) your way out" approach represented by contemporary cognitive behavioural therapies (Jacobson et al., 2001). As such, BA is often considered a more parsimonious approach. The model of BA

used in the BAcPAc (Farrand et al., 2014) study, aimed to alleviate depression by promoting behaviours that are perceived by people to be routine (e.g. shopping for food, walking the dog), pleasurable (e.g. seeing friends, going to the cinema) or necessary (paying bills, taking children to school), to help people identify contextually relevant positive behaviours in their own life. This rationale was then extended in BAcPAc by encouraging the consideration of physical activity as part of the persons selection of behavioural strategies (Farrand et al., 2014) on the grounds that physical activity may offer an added benefit for relieving depression. BAcPAc adapted the existing BA protocol currently delivered in the Increased Access to Psychological Therapies Service (Richards, 2010) using focus groups and intervention mapping methods (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011) to deconstruct BA and rebuild it with a focus on physical activity.

Self-determination theory and logic model of eMotion

Encouraging people to engage in, and maintain physical activity is challenging (Taylor & Faulkner, 2014). Interventions should be guided by theory and evidence (Foster, Hillsdon, Thorogood, Kaur, & Wedatilake, 2005) and by employing BCTs with known efficacy (Michie et al., 2013). Self-determination theory (SDT) (Deci & Ryan, 2000) posits that both behaviour and wellbeing are consequences of intrinsic motivation (the inherent pleasure of performing a behaviour) that comes from the satisfaction of core psychological needs. These psychological needs are autonomy (feeling like one's behaviour can be self-determined and can make a difference in key outcomes (e.g. sense of well-being)), competence (feeling a sense of mastery or skills development) and relatedness (feeling that the behaviour is accepted and approved of /supported by others). Fulfilment of these needs is considered essential for psychological growth and wellbeing, as well as for the initiation and maintenance of behaviour (Deci & Ryan, 2000). Intrinsic forms of motivation have been associated with adoption and maintenance of physical activity (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). A recent review also proposed that interventions that focussed on patient preference could lead to more sustainable changes in physical activity (and mood) by

enhancing autonomy, as well as by focusing on more sustainable, intrinsically motivated changes (Nyström, Neely, & Hassmén, 2015). Although BA promotes behaviour change as part of its rationale (Farrand et al., 2014; Richards, 2010), it lacks a clear underlying theory of behaviour change. The dual focus of motivation and wellbeing, therefore, made SDT well placed to guide the process of adding a physical activity focus to BA (Deci & Ryan, 2000) (Figure 1).

Using Intervention mapping to adapt BA

The process of deconstructing BA in BAcPAc was first described in Farrand et al., (2014), and has been built on in the present study. The process involved first identifying the overall behavioural objective in the existing BA protocol (Richards, 2010) (i.e. engage in routine, pleasurable and necessary activities) followed by the learning objectives (e.g. participants understand the rationale for BA) (Farrand et al., 2014; Richards, 2010). The associated theoretical determinant outlined by SDT was then paired with each learning objective (e.g. increased understanding of the BA rationale supports autonomous/intrinsically generated motivation). Each learning objective identified in the BA protocol was then complemented with a learning objective related to physical activity (e.g. participants understand the rationale for physical activity) (Table 1). Learning objectives were informed by previous studies which have used SDT to develop behaviour interventions targeting physical activity or depression (Haase, Taylor, Fox, Thorp, & Lewis, 2010; Kinnafick, Thøgersen-Ntoumani, & Duda, 2016). Once all the learning objectives had been identified for both categories of behaviour, they were matched with relevant BCTs (Michie et al., 2013) to facilitate transparency and replicability (Table 4) (e.g. for the learning objective 'participants understand the rationale for physical activity' the BCT 'provide information about emotional consequences' was used).

Framework for development of the online platform

Using the Centre for eHealth Research and Disease Management (CeHreS) Roadmap

BAcPAc was designed to be delivered as a written self-help intervention, supported by a mental health workforce, specifically trained to support low-intensity CBT self-help interventions (Farrand et al., 2014). Web-based interventions are often developed without any consideration of the interaction between the user and technology, which may have implications for participant engagement and outcomes (van Gemert-Pijnen et al., 2011). The Centre for eHealth Research and Disease Management (CeHRes) roadmap provide a holistic process for developing intervention content in the system with which it will be delivered (e.g. online) with a focus on stakeholder engagement (e.g. patient public involvement (PPI)). Based on principles of persuasive technologies (i.e. the use of technology to change attitudes and behaviour) (Chatterjee & Price, 2009), and human centred design (i.e. how the technology fits the needs of the end user) (Maguire, 2001), the CeHReS roadmap is intended to improve the uptake and impact of eHealth technologies. The CeHRes roadmap is a holistic approach and has five key iterative stages which are: contextual enquiry, value specification, design, operationalisation and summative evaluation. This provided a useful guide to understand and address the key issues when adapting BAcPAc for use in an online setting. For the purposes of the present paper, only the first three stages are relevant as they fit well within the 'development' phase outlined in the MRC framework (Craig et al., 2008). The contextual enquiry involved gathering information from intended users and literature to see how the proposed technology might fit into their daily routines. The value specification built on the contextual enquiry and involved key stakeholders making decisions about the key values and features that should be included in the intervention. The design stage involved constructing an initial prototype of the technology based on the previous two stages and gaining feedback on system design quality, intervention quality and service quality.

Contextual Enquiry

Method.

The contextual enquiry involved understanding of the context for delivering interventions (in this case, a web-based intervention for people with depression). As such, it was important to know about predictors of uptake, adherence and effectiveness of web-based interventions relating to physical activity promotion and depression research. To address these aims, we conducted a structured literature search (and narrative synthesis), which was then supplemented with patient public involvement (PPI) (i.e. people with depression) and consultations with experts in the field. The findings from these diverse sources were integrated using a triangulation protocol (O'Cathain, Murphy, & Nicholl, 2010). Triangulation can be adopted in the interpretation phase of research when different data sets have been collected and analysed separately helping to build a fuller picture, while giving weight to more robust findings.

Structured Literature Search.

A literature search of the databases PsycINFO, PsycARTICLES, MEDLINE, Embase and Google Scholar, was undertaken for all studies published in English. Searches involved identifying systematic reviews and meta-analyses published in the last ten years which reviewed trials evaluating web-based physical activity interventions for depression, web-based psychological interventions for depression or web-based behavioural interventions promoting physical activity. Search terms included variations of the terms 'web delivered' 'depression' 'physical activity' and 'systematic review' (full search in supplementary file 1). Citation searches were performed on key reviews and experts in the field were consulted. Selected reviews were then included based on the following criteria: (1) they were systemic reviews or meta-analyses evaluating trials; (2) they reviewed web-delivered interventions promoting physical activity and/or reducing depression; (3) included adults aged 18 or over; (5) were published in the last ten years. Studies were excluded if they looked at any other

mode of delivery (e.g. app based). All reviews were checked over by study authors for relevant information that could inform development.

Patient, public involvement (PPI)

The contextual enquiry, value specification and design stage were all complemented with ongoing input from a PPI group of twelve people with lived experience of depression (The Lived Experience Group). The involvement of PPI is recommended for all stages of health research (including the intervention development stage) and has been adopted by previous researchers when developing interventions targeting physical activity promotion and/or depression (Farrand et al., 2014; Greaves et al., 2016; Haase, Taylor, Fox, Thorp, & Lewis, 2010; Kelders, Pots, Oskam, Bohlmeijer, & van Gemert-Pijnen, 2013). The Lived Experience Group is based at the University of Exeter and work closely with the Mood Disorders Centre to provide consultation on research studies and ensure end-user needs are being met. A brief topic guide was produced to ensure key questions were covered; these included: "general thoughts on web-based treatments for low mood", "previous experiences of online treatments for low mood" and "expected needs". Four separate individuals (recruited opportunistically through personal and professional networks) who have experienced depression were also consulted with to provide informal feedback on the first version of the intervention.

Consultation with experts in the field.

Collaborators with expertise in behaviour change (**), physical activity and mental health (**,**), behavioural activation for depression (**) were part of the supervisory team. To acquire expertise in web-based interventions for mental health, a further collaborator (**) was approached, who has expertise and years of experience in web-based cognitive behavioural interventions for depression. These collaborators also provided feedback on the first version of the intervention.

Results.

Reviews identified

Our structured literature search identified a range of relevant systematic reviews which provided data on features that might enhance the effectiveness and engagement of web-based interventions targeting depression or promoting physical activity (Alkhaldi et al., 2016; Andersson & Cuijpers, 2009; Brouwer et al., 2011; Coull & Morris, 2011; Cowpertwait & Clarke, 2013; Davies, Morriss, & Glazebrook, 2014; Donkin et al., 2011; Farrand & Woodford, 2013; Gellatly et al., 2007; Grist & Cavanagh, 2013; Maher et al., 2014; Musiat & Tarrier, 2014; Richards & Richardson, 2012; Waller & Gilbody, 2009; Webb, Joseph, Yardley, & Michie, 2010; Wildeboer, Kelders, & van Gemert-Pijnen, 2016).

Need for Support in interventions for depression.

Systematic reviews indicated a strong need for support. One review identified 34 RCTs evaluating the effect self-help interventions compared to waiting list (n = 23), usual care (n = 11) or attention placebo (n=5) control groups for the management of depressive symptoms (Gellatly et al., 2007). RCT's using a guided model (defined as inclusion of a therapist (professional or paraprofessional) delivered by either phone, face to face or email) reported a higher effect size for depression (.80) than those which were 'pure' self-help (no support of any kind) (.06). Another review examined 24 RCTs and 17 open trials evaluating the effect computer-based treatments compared to control for the management of depression (Richards & Richardson, 2012). When compared with control, for interventions that provided no support (n = 9), the mean post-treatment effect was .36, for interventions with administrative support (n = 5) the mean post-treatment effect was .58 and for studies, with therapist support (n = 7) the mean post-treatment effect was .78. A similar pattern was also observed for dropout rates (74%, 38.4% and 28% respectively) (Richards & Richardson, 2012). Another systematic review and meta-analysis (Farrand & Woodford, 2013) looked at the effectiveness of support of 38 RCTs of written self-help cognitive behavioural therapy

(CBT). Findings from this review indicated that self-help CBT (for a range of mental health conditions) yielded a medium effect size, but did not significantly vary based on whether they were self-administered (no specific rationale, overview or support provided at any time with contact restricted to the research team regarding non-process issues) (.42), had minimal; contact (provided with a rationale for the use of self-help or the materials overviewed which may also include regular check-ins regarding progress but without any focus upon process issues) (.55), or were fully guided (initial support session in which a rationale and overview of the materials are provided, alongside regularly scheduled support sessions during which progress is discussed alongside an additional discussion of process issues) (.53). Another review found a moderate mean post-treatment effect for professionally supported treatments (.61) and a small post-treatment effect for unsupported treatments (.25) (Andersson & Cuijpers, 2009). Finally, another review found that web-based interventions with human support had larger effect sizes (.48) that self-guided (.32). However only small differences were found between the type of human support, with human support involving full engagement in client treatments (0.57) and simply feedback on progress (0.47) yielding similar effects (Cowpertwait & Clarke, 2013). The theme of support was reinforced by PPI and expert consultation, with stakeholders mentioning that access to support either via telephone or over email would help to keep them motivated to engage with the intervention. However, some members of the PPI group stated that support could also add an element of pressure and discourage them from staying with the study if not handled appropriately.

Need for Support in interventions promoting physical activity.

The need for support was also salient in interventions promoting physical activity, although the effects appeared smaller than interventions for depression. A systematic review of 85 web-based interventions for behaviour change (20 of which included physical activity) (Webb et al., 2010) found that access to an advisor via the telephone had small effects on behaviour change (.29). In a systemic review of predictors of dropout and adherence to online interventions (Beatty & Binnion, 2016), 6 out of 9 of the included studies found that

having in-person guidance or therapist support was associated with increased adherence. Other reviews also found that increased counsellor support (e.g. email, phone contact, or counsellor led chat sessions) (Brouwer et al., 2011; Kelders et al., 2012) or technology-based strategies (e.g. prompts) (Alkhaldi et al., 2016) were associated with increased engagement with web-based interventions promoting behaviour change

Use of theoretical models in interventions for depression.

The use of theoretical models to guide intervention development was a theme observed from the literature and expert consultation, but not PPI input. The review by Gellatly et al., (2007) found that interventions based on theoretical models resembling CBT yielded a higher effect size (.61) for depression than those that were purely psychoeducational in nature (.11) when compared to control (usual care, waiting list or attention placebo).

Use of theoretical models in interventions promoting physical activity.

For physical activity, the review by Webb et al., (2010) found that increased use of theory (i.e. Social Cognitive Theory (SCT), the Transtheoretical model (TTM) and the Theory of Planned Behaviour (TTB)) was positively associated with effect sizes for a range of health behaviours. Although no direct reference to SDT was mentioned in the review, many of these theories have overlapping constructs. Furthermore, (as previously stated) interventions based on SDT have been shown to improve the adoption and maintenance of physical activity (Teixeira et al., 2012). As such, the review by Webb et al, (2010) provided us with confidence in the utility of using SDT in a web-based context. Webb at al., (2010) also found that BCTs associated with effectiveness included stress management, communication skills training, coping planning, facilitating social comparisons, goal setting, action planning, and feedback on performance. Another review found that the inclusion of education components was a significant moderator of physical activity change yielding higher effects sizes (.20) than interventions without (.08) (Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012). Consultation from experts in the field of online physical

activity and depression interventions also supported the idea of using theory and BCTs to guide intervention development and provide a more robust, conceptually integrated and replicable intervention.

Use of persuasive design features in interventions for depression.

One review found that the inclusion of persuasive design features (e.g. tunnelling, tailoring or reminders) was associated with effectiveness of web-based interventions for depression (Wildeboer et al., 2016). Reviews also found that interventions that included reminders had larger effect sizes (.49) than those without (.24) (Cowpertwait & Clarke, 2013) and that interventions that included reminders and prompts had higher engagement than interventions that did not (Alkhaldi et al., 2016).

Use of persuasive design features in interventions promoting physical activity.

Webb et al., (2010) found that automated feedback via emails had small effects on behaviour change (.18) with the inclusion of text message support yielding the largest effects (.81).

User Friendliness.

A systematic review of barriers to adherence of online treatments found that factors such as usability and technological problems predicted lack of adherence to a web-based platform (Beatty & Binnion, 2016). Another review found that using the term 'therapy' and coming across patronizing led to people dropping out of web-based depression treatments (Waller & Gilbody, 2009). web-basedThis was also supported by PPI input. Being 'user-friendly' was a theme that came from the literature and all stakeholders. PPI input also indicated that dense heavy to read texts were not desirable and that navigation difficulties could provide barriers to engagement. Furthermore, a 'user-friendly' approach would be beneficial as people with depression often have very low motivation and so there was a need to keep things simple.

Graded progression

PPI input and expert consultations revealed that web-based interventions should provide a graded approach to progression to ensure people are not overwhelmed. Furthermore, they should be flexible, so people can access them in their own time. Finally, a suggestion was made to allow access to existing diary keeping apps. The expert consultation also revealed that adding too much interactivity could over-complicate things, and hinder navigation.

Participant factors.

One review found that participants perceived lack of time of working through online systems was a key reason for drop out (Waller & Gilbody, 2009). The PPI groups also mentioned that they felt that people with depression would be more inclined to access and use an online self-help system if they had come to it out of their own volition as opposed to being referred by a medical practitioner. Expert consultations also supported this statement, feeling that recruiting from a community rather than clinical setting would provide a larger pool of willing participants as they have not already been on long waiting lists for treatment and do not have an expectation of receiving 'face to face' therapy. These statements were also supported by systematic reviews which showed that RCT's comparing web-based depression treatments to control groups, tended to attract larger pools of willing participants and yield higher effect sizes for those recruited from non-clinical (1.02, .66 and .60) as opposed to clinical settings (.31, .22 and .46) (Coull & Morris, 2011; Gellatly et al., 2007; Richards & Richardson, 2012). A meta-analysis of individual patient data also found that people with a lower educational status had a higher dropout rate of online interventions, possibly due to the complexity associated with information technologies and CBT based treatments (Karyotaki et al., 2015).

Value specification and features to enhance engagement

Method.

The value specification involved establishing which values (based on findings from the contextual enquiry) stakeholders (PPI and experts) deemed important. These values were then translated into a specific list of features to enhance engagement which would be included in the design of the intervention.

Results.

Based on the contextual enquiry and consultation with PPI and experts, a list of 'features to enhance engagement' was identified. It was clear from the contextual enquiry that some form of human support was needed to help promote adherence to, and the effect of, web-based interventions. However, the intensity of this support was not clear. After meeting with stakeholders and considering the resource requirements, it was decided that providing administrative support (guiding users to register and work through the intervention, but no clinical engagement or feedback) (Richards & Richardson, 2012) would be a good compromise that might enhance the potential effectiveness of the intervention without being too costly. In order to provide as much support as possible, a researcher contacted all participants who were randomised to either intervention or control group by phone to fully explain the study procedures. Participants randomised to receive the intervention group were also contacted by phone or email during the intervention to provide additional administrative support for using the web-based platform if needed. Administrative support could also potentially be achieved at a lower cost than therapist support in real life settings outside of the context of a trial. Weekly supportive emails were sent to encourage the user to log back in, and audio recordings were used to deliver intervention content in an attempt to enhance the sense of having a therapeutic relationship (simulating involvement of a real person, using natural language, as opposed to text-based instruction). Furthermore, unlockable weekly modules were used to give users a sense of progression (or tunnelling)

through the intervention. The contextual enquiry also revealed that providing 'theoretical underpinning' was important to ensure that theory was being consistently used to guide development, but without making the user experience too complex. An inherent benefit of psychological therapeutic approaches based on BA is their simplicity (potentially making them easier and more cost effective to deliver (Richards et al., 2016). Also, established BCT's (Michie et al., 2013) were employed to enable a transparent and replicable description of the intervention. To keep the intervention as 'user-friendly' as possible, an existing platform (Living Life to the Full), already used to deliver a range of self-help treatments, was adopted (Williams et al., 2013). This helped to minimise the likelihood of technical problems which can occur in newly developed platforms, and also provide a more user-friendly environment due to the previous user testing already used to refine the platform. Finally, we chose to recruit from the community by placing adverts asking if people were experiencing 'low mood' (rather than "depression") to ensure that as higher reach of people with depressive symptoms as possible was achieved. Once approached, participants completed the Patient Health Questionnaire depression scale (PHQ-8) (Kroenke et al., 2009) to ensure participants met study inclusion criteria (>9 on the PHQ-8).

Design

Method.

Usability testing.

The 'design' component of the CeHReS framework involved translating the user requirements of the intervention into a prototype that can be tested by stakeholders. Stakeholders can then feedback to the developers informing iterative intervention development. The design phase of development for eMotion involved usability testing a working prototype of eMotion that aligned with the values and user requirements. This was built and tested with four experts and four members of the PPI group. They were asked to work their way through the system making any comments on a structured feedback form as

they went through. They were also asked to provide comments on the general look and feel of the website. Comments received were ordered by source and then prioritised under the following headings “Must do”, “Should do”, “Could do” and “Won’t do”. This ensured that changes were prioritised based on time and resources.

Design Fidelity.

All theoretical content of the intervention was operationalised with BCTs using the BCT taxonomy v1 (Michie et al., 2013). The BCT taxonomy is an extensive taxonomy of consensually agreed, distinct techniques used in behaviour change interventions which enabled systematic specification of the active ingredients of eMotion. BCTs were selected based on each learning objective (e.g. for the learning objective ‘understand link between physical (in)activity and low mood’ the BCT ‘Information about Emotional Consequences’ was chosen. The presence or absence of BCTs in eMotion was assessed by an independent researcher using a coding manual which contained BCTs from the v1 (Michie et al., 2013). Areas of discrepancy between the rater and the design specification were discussed and changes made to the intervention or the specification document until consensus was agreed. A full description of this innovative design process will be reported elsewhere.

Results.

Usability testing.

Table 3 gives an overview of the key changes made after the usability testing phase. Key changes included; aspects related to content, navigation and interactivity. Due to limited resources, only one iterative phase was possible.

Design Fidelity.

Some areas of discrepancy were found between intended techniques and techniques identified by the coder. This process resulted in changing 12 (out of a possible 221) discrepancies for BCTs targeting just R, P and N activities, 14 (out of a possible 221)

discrepancies for BCTs relating to physical activity. These discrepancies were resolved through discussion, and where appropriate, changes were made to the intervention or specification document. This process was fundamental for increasing the convergence between the intervention description and eMotion.

Operationalisation and summative evaluation

Operationalisation and summative evaluation involve launching the intervention to test out the various organisational and working procedures, evaluating how it is being used and the effects. eMotion is currently the subject of a pilot trial evaluation (trial identifier: NCT03084055), which will help to address further methodological uncertainties relating to the intervention, and trial procedures (e.g. recruitment, attrition, data collection).

Intervention description

The following description of eMotion conforms with guidelines (Hoffmann et al., 2014). Table 4 provides a complete structural overview of the eMotion intervention which includes the

Content

eMotion includes 13 modules (1 introduction modules, 8 weekly modules, 1 generic problem-solving module and 3 unlockable modules) (Table 4), consisting of visual content with an audio voiceover triggered when each slide opens. Printable, interactive worksheets and emails are also included, with links to the slides to allow downloading to a personal computer or another device (e.g. tablet or smartphone). To support competence, graded/gradual recovery is promoted, to balance the process of graded activity scheduling, with problem-solving of any setbacks from previous goals. Weekly modules are delivered over 8 weeks, with the introduction and problem-solving modules available upon registration. Each weekly module unlocks once the participant has completed the preceding module to promote a sense of competence and progression through eMotion. In addition, three 'unlockable modules' are made available once the participant has reached weeks 5, 6 and 7 of the programme. Core information relating to BA (identify, grade and plan activities) is front

loaded and delivered in the introduction module and weeks 1 and 2, with the remaining weeks dedicated to promoting structured weekly reflection and goal review. eMotion promotes the idea of day-to-day engagement with the techniques we wished to support (e.g. by using worksheets provided, or by using their own diaries) rather than just spending time on the website. This has been described as 'effective engagement' and has been suggested as a more comprehensive way of promoting and understanding adherence to web-based interventions (Perski, Blandford, West, & Michie, 2016; Ryan, Bergin, & Wells, 2017; Yardley et al., 2016). This is also intended to reinforce a sense of autonomy as participants will hopefully be able to internalise the skills learnt.

Delivery style

eMotion is self-administered with minimal contact support (Farrand & Woodford, 2013). To support autonomy, the participant is provided with a rationale for the use of self-help materials and administrative support to help with registration and technical issues at the beginning and 2 weeks into the intervention. The audio content and support were voiced and provided by the primary intervention developer (JL) who has previous experience of providing coaching support on a web-based weight loss intervention (Dennison et al., 2014). The delivery of eMotion is one-way (i.e. from therapist to client), rather than two directional. Due to its shared conceptual underpinning with SDT (Haase et al., 2010; Vansteenkiste & Sheldon, 2006) an attempt was made to mimic a style congruent with motivational interviewing (Miller & Rollnick, 2002) using audio delivery. Core techniques employed include using collaborative language to support autonomy (e.g. inviting the participant to try different strategies rather than 'telling' them the next steps), and evocation using open-ended questions (e.g. "if you didn't achieve your goals, why do you think that was?"). Setbacks are also normalised to promote competence (e.g. "don't worry if you didn't achieve your goals, this is perfectly normal") and reframed so it suggests that failing to achieve a plan for behaviour change is not a failed week on the programme, but an opportunity to explore ambivalence or challenges about (reasons for and against) increasing the targeted

activity. Through experience and feedback people can then develop a greater understanding about what might or might not work for them. Finally, an empathic, caring tone was adopted throughout to foster a sense of relatedness with eMotion.

Delivery mode

eMotion is delivered on an individual basis using an existing online platform (Living Life to the Full) which delivers the content using a series of audio-visual modules. Participants assigned to eMotion are provided with 'minimal contact' support (Farrand & Woodford, 2013). This support is provided at the beginning and week 2. A dashboard documents the participant's progress through eMotion (i.e. modules completed, time spent on the website).

Discussion

eMotion is a web-based intervention designed to treat depression and simultaneously promote physical activity. The intervention builds on the BAcPAc intervention (Farrand et al., 2014) and was iteratively developed using the CeHReS roadmap (Kelders et al., 2013; van Gemert-Pijnen et al., 2011). eMotion is self-delivered, with minimal facilitation and can be delivered with minimal resources compared with current face-to-face therapies for depression.

Systematic descriptions of psychological interventions are lacking, and this paper provides a clear transparent account of the process of developing the eMotion intervention using theory, evidence and stakeholder engagement. Other development frameworks could have been used, such as intervention mapping (Bartholomew, Parcel, 1998; Bartholomew et al., 2011), and the MRC framework (Craig et al., 2008). However, intervention mapping can be highly technical and prescriptive, requiring considerable resources (Greaves et al., 2016), and the MRC framework is more focused on evaluation as opposed to development (Wight, Wimbush, Jepson, & Doi, 2016). The CeHReS roadmap also has an explicit focus on the fit between the technology and content, which the other frameworks do not offer (Kelders et al., 2013).

The eMotion pilot trial with nested process evaluation will provide feedback on the usage of various intervention components and provide qualitative feedback from service users to inform further refinement of the intervention and trial procedures. Once clearly developed and articulated, it is then planned to evaluate eMotion in a fully powered phase 3 randomised controlled effectiveness and cost-effectiveness trial (Craig et al., 2008).

One limitation of the developmental process was the lack of further iterations during the developmental process. The CeHReS roadmap is intended to involve many iterations (van Gemert-Pijnen et al., 2011) and only one stage of user feedback was obtained during the 'design' stage. However, we felt that one stage of user feedback was sufficient to refine the intervention and test in a pilot trial (trial identifier: NCT03084055) in which further in-depth qualitative feedback relating to the design is being obtained. Another limitation is that evidence from systematic reviews indicates that community recruitment may result in a greater number of willing participants who may be more educated and wealthy than those recruited from clinical settings (Gellatly et al., 2007; Richards & Richardson, 2012). Although yielding larger effects, this could contribute to widening the gap. However, the inverse care law suggests that people who most need access to services often have less opportunity (Tudor Hart, 1971). Furthermore, there is also a significant treatment gap for people in the community not receiving treatment for depression (Kohn, Saxena, Levav, & Saraceno, 2004) possibly explained by a sense of identity conflict or stigma (Farmer et al., 2012). Therefore at a time when a large proportion of the population have access to the internet, the opportunity to extend care via web-based support at the community level is appealing and may help to close the treatment gap.

This development paper will serve as a useful document to ground any future development work made. If the intervention improves outcomes and is deemed effective, this paper can also be used by other researchers to replicate eMotion (along with actual slide and audio content, which is available on request /subject to permissions from the lead author), or to develop similar interventions. The PPI group suggested that apps could prove a good way of

delivery. Furthermore, apps are now becoming more common in interventions for behaviour change and depression (Bakker, Kazantzis, Rickwood, & Rickard, 2016). However, developing an app requires considerable resources, and time (NHS Innovations South East, 2014). Our decision to use the Living Life to the Full program was for pragmatic reasons as it was low cost, and had already been through many previous stages of user testing. As this research progresses, we will consider developing an app for a more accessible version of eMotion.

eMotion aims to offer client centred support through optimising engagement in web-based support, building on a previous similar face to face intervention (BAcPAc) (Farrand et al., 2014). By trying to increase acceptability of eMotion, it is hoped that support to become more physically active may be offered to a wider range of people with low mood in the community, especially those who are least active with lower levels of motivation to engage with structured exercise programmes, especially during periods of low mood.

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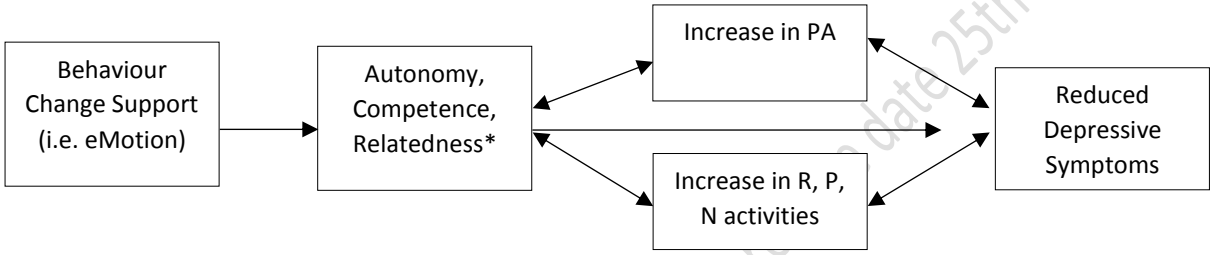
Figure 1. Logic model of eMotion



*Need support

Figure 2. eMotion platform content

Table 1: Behavioural objectives, theoretical determinants and learning objectives for eMotion

Behavioural Objectives	**Autonomy Support**	**Competence Support**	**Relatedness Support**
Engage in Routine (R), Pleasurable (P), Necessary (N) activities	Facilitate self-endorsement by providing a clear and meaningful rationale which includes providing information about the aetiology of depression/low mood, the rationale for BA (which includes reference to interaction of physiological, behavioural cognitive and emotional symptoms), the role of avoidance in maintaining low mood and the idea of R, P, N activities	Support person to understand how their own current lack of activity contributes to low mood and vice versa and provide accurate baseline to evaluate change	Portray empathy to the person by attempting to understand how the person feels (encouraging ongoing engagement with the intervention)
	Support person to gain self-regulatory skills to identify when depression occurs and what the accompanying behaviour was	Support person to organise activities into a hierarchy of most difficult, medium difficulty, easiest. Should include some of each type of R, P, N activity	Promote social support and connectedness by encouraging opportunities for endorsement of R,P,N activities from important others
	Support person to choose their own R, P, N activities – things that they would like to do or try but have stopped doing or not tried since they became depressed	Support person to schedule some activities into their week, using a blank diary to specify a mixture of the easiest R, P, N activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	Promote social support and connectedness by encouraging opportunities to feel a sense of relatedness by participating in similar R,P,N activities to important others
		Foster sense of achievement at completing R,P,N activity	Respect person by acknowledging their own perspective, feelings, and agenda

	Encourage person to reflect on and take ownership their previous week of planned R, P, N activities	Support person to constructively reflect and build on successful completion of R,P,N activity	
	Respect person by acknowledging their own perspective, feelings, and agenda	Support person to reflect constructively on failures of R,P,N activity goals without feeling demotivated	
		Provide person with skills to recognise symptoms of low mood, cueing the planning of R, P, N activities	
Engage in physical activity	Facilitate self-endorsement by providing a clear and meaningful rationale which includes providing information about the link between physical activity and mood, the health benefits of physical activity and how physical activity fits into the BA rationale (e.g. increasing physical activity promotes positive reinforcement)	Support person to gain self-regulatory skills by reflecting on previous week and identifying when their depression occurred and whether they were physically active or not	Portray empathy to the person by attempting to understand how the person feels (encouraging ongoing engagement with the intervention)
	Help person to identify choose physical activities that they would like to do or try but have stopped doing or not tried since they became depressed	Support person to organise activities into a hierarchy of most difficult, medium difficulty, easiest. Should include some type of physical activity.	Promote social support and connectedness by encouraging opportunities for endorsement of physical activities from important others
	Encourage person to reflect on and take ownership of engaging in physical activities	Support person chance of success by helping them to set achievable physical activity	Promote social support and connectedness by encouraging opportunities to feel a sense of relatedness by participating in

		goals	similar physical activities to important others
	Support person to gain self-regulatory skills by reflecting on previous week and identifying when their depression occurred and whether they were physically active or not	Support person to constructively reflect and build on successful completion of physical activity	Respect person by acknowledging their own perspective, feelings, and agenda
	Foster self-regulatory skills by helping person to recognise symptoms of low mood, cueing the planning of physical activities	Support person to reflect constructively on failures of physical activity goals without feeling demotivated	
	Respect person by acknowledging their own perspective, feelings, and agenda	Support competence by providing self-regulatory skills to recognise symptoms of low mood, cueing the planning of physical activities	
		Provide person with the skills to identify different types of physical activity	

Table 2: Key themes identified from the contextual enquiry and user requirements

Theme from contextual enquiry	**Features to enhance engagement**
Support	All participants would be contacted by phone at the beginning of the study to help with registration and to give them an overview of the intervention
	An additional attempt to contact the user would be made via telephone or email to provide any technical, motivational support
	Weekly email supportive email messages would be sent to remind participant's to sign in and review goals
	Audio used to deliver intervention to mimic human support
	Unlockable weekly modules to tunnel participants through intervention
Theoretical Basis	Simple strategies based on BA approach used to guide development
	Behaviour change techniques are fully operationalised in intervention
User friendly	Existing tested platform used
	Access to technical support if participants experience problems
	Avoid use of patronizing language, do not use the term 'therapy'
Graded approach	Promote graded engagement with the intervention
Recruitment	Recruit people from the community rather than referred through primary care

Table 3. Key changes made after user feedback

Comments	**Action Taken**
[1]Acknowledge co-morbid anxiety as potential participants may be deterred thinking it is only relevant for those with depression	Text changed to acknowledge that people with co-morbid anxiety are still able to access system
[1]Use of the word 'worksheet' may be off-putting/daunting as implies 'work'	Unable to change name 'worksheet' as part of a built-in system, so reassured participant's that the term 'worksheet' was not meant in a conventional sense
[1,2]Prompted to 'click on slide' which was not part of platform functionality	Changed to say, 'click to left of slide'
[1]Did not know where to click to get to next slide in module	Added text to ask participants to click on the arrow
[1,2]Didn't expect audio voiceover on eMotion, make this clearer	Put bold text explaining that audio is a key feature, and will need speakers or headphones
[1]Would like an option for a text summary of the slides	Added a summary sheet for each module
[1,2]Lack of interactivity with worksheets, only able to print off	Allowed ability to write on worksheets. Also encouraged printing and using ideas from worksheets in own way (e.g. using own diaries)
[1]Nativation issues on how to return to the main dashboard	Made navigation clearer and simpler
[2]Excessive use of 'OK' when recording voice over	Re-recorded voice over, greater consideration of non-lexical conversation sounds (e.g. ok, hmm)
[2]Clarity of some of the visuals was blurry	Loaded clearer visuals

[2]Repetative unlockable module	Two unlockable modules combined into one

[1]User comment, [2]Expert comment

Table 4: eMotion intervention structure

Learning Objective	Core BCTs	Operational strategy
Introduction		
[2]Believes information being conveyed relating to routine pleasurable and necessary activities	1a. Credible source	**Audio/visual:** Reference experts and research to increase credibility of information presented

Understand the aetiology of depression/low mood	2a. Information about emotional consequences	**Audio/visual:** Provide explanation about the interaction of physiological, behavioural cognitive and emotional symptoms and the role of avoidance in maintaining low mood. Prompt person to consider their own examples using worksheet. **Worksheet:** Cycle of low mood
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Week 1		
[2]Believes information being conveyed relating to routine pleasurable and necessary activities	1a. Credible source	**Audio/visual:** Reference experts and research to increase credibility of information presented
[2]Believes information being conveyed relating to physical activity	1b. Credible source	**Audio/visual:** Reference experts and research to increase credibility of the idea of using physical activity for low mood
Understand rationale for BA which includes reference to interaction of physiological, behavioural cognitive and emotional symptoms and the role of avoidance in maintaining low mood and the idea of routine, pleasurable and necessary activities	2a. Information about emotional consequences	**Audio/visual**: Provide information about rationale for BA and the idea of routine, pleasurable and necessary activities
[1]Understand how physical activity fits into the BA rationale (e.g. increasing physical activity promotes positive reinforcement)	2b. Information about emotional consequences	**Audio/visual:** Provide information about the particular role of physical activity in Behavioural Activation/in improving mood, and identify and address any misconceptions
[1]Understands the other health benefits of physical activity	3b. Information about health consequences	**Audio/visual**: Provide information about how increasing (physical) activity also has desirable health benefits (e.g. weight loss, reduced risk of disease)
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Understand how own current activity (lack of) contributes to low mood	5a Self-monitoring of behaviour	**Audio/visual**: Ask people to keep a record of their activity and mood over the coming week using worksheet

and vice versa and has accurate baseline to evaluate change	6a. Monitoring of emotional consequences	**Worksheet:** My Starting Point Diary
Week 2		
[2]Believes information being conveyed relating to physical activity	1b. Credible source	**Audio/visual:** Reference experts and research to increase credibility of the idea of using physical activity for low mood
Understand rationale for BA which includes reference to interaction of physiological, behavioural cognitive and emotional symptoms and the role of avoidance in maintaining low mood and the idea of routine, pleasurable and necessary activities	2a. Information about emotional consequences	**Audio/visual**: Provide information about rationale for BA and the idea of routine, pleasurable and necessary activities
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
[2]Understands concepts being conveyed relating to routine pleasurable and necessary activities	4a. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible routine pleasurable and necessary activities
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Able to feel sense of achievement at completing R,P,N activity	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet. **Worksheets:** My next steps diary
Able to identify routine, pleasurable and necessary (or physical) activities (things that they would like to do or try but have stopped doing or not tried since they became depressed) and organise into a hierarchy of difficulty. Should include some of each type of routine, pleasurable and necessary activity	7a. Graded tasks	**Audio/visual**: Prompt identification of routine, pleasurable and necessary (or physical) activities – things that they would like to do or try but have stopped doing or not tried since they became depressed using worksheet **Worksheets:** Identify Activities, Organising Activities
[1]Able to identify and organise activities into a	7b. Graded tasks	**Audio/visual**: Prompt identification of routine, pleasurable and necessary (or

hierarchy of most difficult, medium difficulty, easiest. Should include some type of physical activity.		physical) activities – things that they would like to do or try but have stopped doing or not tried since they became depressed using worksheet **Worksheets:** Identify Activities, Organising Activities
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour) 10a. Problem-solving	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module **Worksheets:** Organising Activities, My next steps diary
Able to reflect on previous week and identify when depression occurs and what the accompanying behaviour was	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine pleasurable and necessary activities and how they linked to mood using worksheet from week 1 **Worksheets:** My starting point diary
[1]Able to reflect on previous week and identify when depression occurs and whether was physically active or not	12b. Review behavioural goal	**Audio/visual**: Prompt review of physical activities and how they linked to mood using My starting point diary worksheet **Worksheets:** My starting point diary
Week 3		
Understand rationale for BA which includes reference to interaction of physiological, behavioural, cognitive and emotional symptoms and the role of avoidance in maintaining low mood and the idea of routine, pleasurable and necessary activities	2a. Information about emotional consequences	**Audio/visual**: Provide information about rationale for BA and the idea of routine, pleasurable and necessary activities
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
Able to link mood to	6a. Monitoring	**Audio/visual**: Ask person to record how they

performing or not performing routine, pleasurable and necessary activities	of emotional consequences	feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour)	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet **Worksheets:** Organising Activities, My next steps diary
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to reflect and build on successful completion of R,P,N activity	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a routine, pleasurable or necessary activity
Week 4		
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Able to self-regulate and consciously take ownership	5a. Self-monitoring of	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to

of (not) achieving routine pleasurable and necessary activities	behaviour	routine, pleasurable and necessary activities using worksheet **Worksheets:** My next steps diary
Able to link mood to performing or not performing routine, pleasurable and necessary activities	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity using worksheet **Worksheets:** My next steps diary
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour)	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet **Worksheets:** Organising Activities, My next steps diary
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to reflect and build on successful completion of	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a

R,P,N activity		routine, pleasurable or necessary activity
[1]Able to reflect and build on successful completion of physical activity	14b. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a physical activity
Week 5 (Unlocks 'Moving on with physical activity)		
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Able to self-regulate and consciously take ownership of (not) achieving routine pleasurable and necessary activities	5a. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to routine, pleasurable and necessary activities using worksheet **Worksheets:** My next steps diary
Able to link mood to performing or not performing routine, pleasurable and necessary activities	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity using worksheet **Worksheets:** My next steps diary
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour)	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet

		Worksheets: Organising Activities, My next steps diary
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to reflect and build on successful completion of R,P,N activity	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a routine, pleasurable or necessary activity
[1]Able to reflect and build on successful completion of physical activity	14b. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a physical activity
Week 6 (Unlocks 'Monitoring your physical activity')		
[2]Understands concepts being conveyed relating to routine pleasurable and necessary activities	4a. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible routine pleasurable and necessary activities
Able to self-regulate and consciously take ownership of (not) achieving routine pleasurable and necessary activities	5a. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to routine, pleasurable and necessary activities using worksheet **Worksheets:** My next steps diary
Able to link mood to performing or not performing routine, pleasurable and necessary activities	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity using worksheet **Worksheets:** My next steps diary
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet

		Worksheets: Organising Activities,
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour)	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet **Worksheets:** Organising Activities, My next steps diary
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to reflect and build on successful completion of R,P,N activity	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a routine, pleasurable or necessary activity
[1]Able to reflect and build on successful completion of physical activity	14b. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a physical activity
Week 7 (Unlocks 'Increasing your physical activity')		
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
Able to self-regulate and consciously take ownership of (not) achieving routine pleasurable and necessary activities	5a. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to routine, pleasurable and necessary activities using worksheet **Worksheets:** My next steps diary
Able to link mood to performing or not performing routine, pleasurable and necessary activities	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity using worksheet

		Worksheets: My next steps diary
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
Able to schedule some activities into their week, using a blank diary to specify a mixture of the easiest routine, pleasurable and necessary activities. Activities should be detailed precisely: what, where, when, and who with. Small and regular activities are better in the early stages	8a. Action planning 9a. Goal setting (behaviour)	**Audio/visual**: Prompt planning the performance of the routine pleasurable necessary or physical activities ranked as easy on the 'Organising Activities' worksheet for a particular time on a certain day of the week using the worksheet. Agree on a goal to achieve the routine pleasurable necessary or physical activity ranked as easy on the 'Organising Activities' worksheet using the worksheet **Worksheets:** Organising Activities, My next steps diary
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to reflect and build on successful completion of R,P,N activity	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a routine, pleasurable or necessary activity
[1]Able to reflect and build on successful completion of physical activity	14b. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a physical activity
Week 8		
Understand rationale for BA which includes reference to interaction of physiological, behavioural cognitive and emotional symptoms and the role of avoidance in maintaining low mood and the idea of routine,	2a. Information about emotional consequences	**Audio/visual**: Provide information about rationale for BA and the idea of routine, pleasurable and necessary activities

pleasurable and necessary activities		
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
[1]Understands the other health benefits of physical activity	3b. Information about health consequences	**Audio/visual**: Provide information about how increasing (physical) activity also has desirable health benefits (e.g. weight loss, reduced risk of disease)
Able to self-regulate and consciously take ownership of (not) achieving routine pleasurable and necessary activities	5a. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to routine, pleasurable and necessary activities using worksheet **Worksheets:** My next steps diary
Able to link mood to performing or not performing routine, pleasurable and necessary activities	6a. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) activity using worksheet **Worksheets:** My next steps diary
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity using worksheet **Worksheets:** My next steps diary
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual:** Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheets:** Organising Activities,
Able to reflect constructively on failures of R,P,N activity goals without feeling demotivated	10a. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
Able to reflect on and take ownership their previous week of planned activities	12a. Review behavioural goal	**Audio/visual**: Prompt review of routine, pleasurable and necessary activities and how they linked to mood in the 'My next steps diary' using worksheet **Worksheets:** Reviewing My Activities
Able to recognise symptoms of low mood, cueing the planning of routine, pleasurable and necessary activities	13a. Internal prompts/cues	**Audio/visual**: Prompt person to recognise when feeling down to cue being active using worksheet **Worksheet:** Low Mood Alarm
Able to reflect and build on successful completion of R,P,N activity	14a. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a routine, pleasurable or necessary activity

[1]Able to reflect and build on successful completion of physical activity	14b. Social reward	**Audio/visual:** Congratulate the person for each day they achieved their goal of doing a physical activity
Moving on with physical activity (unlocked after week 5)		
[2]Believes information being conveyed relating to physical activity	1b. Credible source	**Audio/visual:** Reference experts and research to increase credibility of the idea of using physical activity for low mood
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
[1]Understands the other health benefits of physical activity	3b. Information about health consequences	**Audio/visual**: Provide information about how increasing (physical) activity also has desirable health benefits (e.g. weight loss, reduced risk of disease)
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual**: Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet **Worksheet:** Thinking about physical activity, My next steps diary
[1]Able to schedule routine pleasurable and necessary activities precisely (i.e. what, where, when, and who with) Small and regular activities are better in the early stages	8b. Action planning	**Audio/visual**: Prompt planning the performance of physical activities ranked as easy on the 'Thinking about physical activity' worksheet for a particular time on a certain day of the week using the worksheet **Worksheet:** Thinking about physical activity, My next steps diary
[1]Able to set a goal in relation to an intention to achieve a routine pleasurable and necessary activity	9b. Goal setting (behaviour)	**Audio/visual**: Agree on a goal to achieve physical activity ranked as easy on the 'Thinking about physical activity' worksheet using the worksheet **Worksheet:** Thinking about physical activity, My next steps diary
[1]Able to reflect constructively on failures of physical activity goals without feeling demotivated	10b. Problem-solving	**Audio/visual:** Prompt the identification of barriers preventing them from finding an easy activity by going to the problem-solving module
[1]Able to identify different types of physical activity	17b. Instruction on	**Audio/visual**: Providing information about how to be more physically active using the

	how to perform a behaviour	(Frequency, Intensity, Time, Type) FITT principle
Monitoring your physical activity (unlocked after week 6)		
[1]Understand link between physical (in)activity and low mood	2b. Information about emotional consequences	**Audio/visual:** Provide explanation about how physical activity and low mood are linked through psychological and physiological mechanisms
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
[1]Able to self-regulate and consciously take ownership of (not) physical activity	5b. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to physical activity using worksheet
[1]Able to link mood to performing or not performing physical activity	6b. Monitoring of emotional consequences	**Audio/visual**: Ask person to record how they feel after performing (not performing) physical activity
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks	**Audio/visual**: Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed
[1]Able to schedule routine pleasurable and necessary activities precisely (i.e. what, where, when, and who with) Small and regular activities are better in the early stages	8b. Action planning	**Audio/visual**: Prompt planning the performance of physical activities ranked as easy on the 'Thinking about physical activity' worksheet for a particular time on a certain day of the week using the worksheet
[1]Able to link mood to performing or not performing physical activity	11b. Behavioural experiments	**Audio/visual**: Asking person to do some physical activity rather than be sedentary and to note whether they feel better or worse **Worksheet:** Monitoring physical activity
Increasing your physical activity (unlocked after week 7)		
[1]Understands the other health benefits of physical activity	3b. Information about health consequences	**Audio/visual**: Provide information about how increasing (physical) activity also has desirable health benefits (e.g. weight loss, reduced risk of disease)
[2]Understands concepts being conveyed relating to physical activity	4b. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible physical activities
[1]Able to self-regulate and consciously take ownership of (not) physical activity	5b. Self-monitoring of behaviour	**Audio/visual**: Ask person to record whether or not they achieve their goals relating to physical activity using worksheet
[1]Able to select easier, harder or the same physical activities based on previous	7b. Graded tasks	**Audio/visual**: Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable,

week		until behaviour is performed
[1]Able to identify different types of physical activity	17b. Instruction on how to perform a behaviour	**Audio/visual**: Providing information about how to be more physically active using the (Frequency, Intensity, Time, Type) FITT principle
Problem Solving		
[2]Understands concepts being conveyed relating to routine pleasurable and necessary activities	4a. Demonstration of the Behaviour	**Audio/visual:** Provide images demonstrating possible routine pleasurable and necessary activities
Able to select easier, harder or the same routine pleasurable and necessary activities based on previous week	7a. Graded tasks 10a. Problem Solving	**Audio/visual:** Prompt the setting of easy-to-perform routine pleasurable and necessary activities, making them increasingly difficult, but achievable, until behaviour is performed using worksheet Prompt person to identify barriers preventing them from starting a new routine, pleasurable or necessary activity using worksheet **Worksheet:** Breaking down activities
[1]Able to select easier, harder or the same physical activities based on previous week	7b. Graded tasks 10b. Problem Solving	**Audio/visual**: Prompt the setting of easy-to-perform physical activities, making them increasingly difficult, but achievable, until behaviour is performed Prompt person to identify barriers preventing them from starting a new physical activity using worksheet **Worksheet:** Breaking down activities

[1]Tageted at physical activity [2]Promoting engagement