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A mixed-method randomised controlled feasibility trial of digital CBT and emotion regulation skills training for employees in the workplace (REST)

T. R. Moukhtarian[1*], S. Fletcher[1], L. Walasek[2], C. Kershaw[1], K. Patel[3], A. L. Hurley-Wallace[4], S. Russell[5], G. Daly[6], N. K. Y. Tang[2], C. T. Toro[1] and C. Meyer[1,7]

Abstract

Background and aim Digital interventions for depression and anxiety can be as effective as face-to-face therapy. One in six workers experience some form of mental health problems, making the workplace a potential avenue to deliver mental health interventions as part of a stepped care model. This study aimed to assess the acceptability, feasibility, and preliminary efficacy of a digital cognitive behavioural therapy (dCBT) on depression and anxiety for employees in the workplace.

Methods A mixed-methods evaluation of employees allocated to dCBT (n=25), or a waitlist control group (n=27) was used to assess five feasibility objectives related to recruitment of employers and employees, engagement, study procedure and preliminary efficacy of the intervention. Quantitative outcome measures and qualitative interviews at 8 weeks post-randomisation were used. Quantitative outcomes were also assessed within subject at 3-, 6-, and 12-month follow-up. Qualitative data was analysed using thematic and framework analysis in Nvivo, whilst quantitative outcomes were analysed using mixed effect linear models between and within subject in R and SPSS.

Results Thirty-Three businesses agreed to facilitate the delivery of three trials run by the University of Warwick in their workplaces. 52 participants consented into the REST trial. Adherence/usage of participants of the treatment platform was just over 50% across the whole sample. There was a reduction in depression and anxiety symptoms post-intervention and at follow-up timepoints across all participants and over time although there were no statistically significant between group differences. High acceptability and satisfaction of the intervention were reported by participants based on qualitative interview data at post-intervention.

Conclusions Results from this feasibility study suggests that the dCBT programme (REST) was acceptable and shows improvement in depression and anxiety symptoms, albeit not over and above the treatment effects in the control group. Recruitment of participants and engagement with the intervention made the feasibility of the delivery

*Correspondence:
T. R. Moukhtarian
talar.moukhtarian@warwick.ac.uk
Full list of author information is available at the end of the article

somewhat challenging. With better recruitment promotion and engagement strategies, as well as implementing the learnings from the feasibility trial, a fully powered study can inform the efficacy of the REST intervention.

Trial registration The study is registered in the BMC Springer Nature ISRCTN registry ISRCTN31161020 (registered on 08/06/2021).

Keywords Digital CBT, Emotion Regulation, Employee Wellbeing, Workplace, Feasibility

Background

Digital interventions for depression and anxiety can be as effective as face-to-face therapy [1]. This extends stepped care models of mental health provision to individuals not requiring high intensity therapy by trained psychologists, or those with subthreshold symptoms. Digital interventions also have the benefit of reducing cost and burden on NHS services, reducing wait-times and increasing accessibility [2, 3].

One potential avenue into these stepped care models is through the workplace, considering that one in six workers experience some form of mental health problems [4], which may or may not be as a result of their workplace environment. Furthermore, workers who experience anxious or depressive disorders are significantly less likely to remain in employment than their healthy counterparts [5]. The high prevalence of mental illnesses in the workplace contributes to increased rates of absenteeism, which rose to 2.2% in 2021 from a record low of 1.8% in 2020 [6], presenteeism (working with reduced productivity), and reduced overall productivity in the workplace [7]. These figures contributed to an estimated £56 billion/year of economic loss in 2020-2021 in the UK [8], around £10 billion higher than the figures reported in 2020. The UK Labour Force Survey reported that stress, depression and anxiety accounted for the majority of days lost in 2021, with an average 18.6 days lost per person due to these conditions [9]. For depression and anxiety disorders specifically, the World Health Organisation estimates the cost to global economy to be $1 trillion each year [10]. However, on the flip side, Deloitte's report shows high returns on investment in workplace-based mental health interventions with return of £5 for every £1 invested [11], supporting the notion of utilising workplaces as a promising avenue for preventative population level mental health interventions.

Cognitive Behavioural Therapy (CBT) is an evidenced-based psychological therapy, drawing on cognitive and behavioural theory to drive changes in thoughts, behaviour and mood. Implementation of CBT and digital CBT (dCBT) in workplace settings can improve mental health, and reduce incidence of clinical levels of depressive and anxious disorders [12, 13]. Meta-analyses of workplace interventions for depressive and anxious disorders show a significant standardised mean difference of 0.12, demonstrating small but significant treatment effects [14]. A large randomised controlled trial demonstrated that dCBT had significant effects in treating employees with major depressive episodes [15]. Furthermore, dCBT in the workplace improved depression symptoms with small but significant effect sizes, and promoted work engagement amongst sub-clinical workers without a diagnosed mental health condition [16].

This study aimed to provide preliminary data on delivering dCBT to employees with mild to severe depression or anxiety symptoms in the workplace. Adopting a mixed-method approach, the study aimed to demonstrate the feasibility, acceptability, and participants' subjective experiences of delivering the Reducing Stress in the Workplace (REST) intervention via the workplace. Preliminary treatment effectiveness was also assessed using measures of mental health (e.g. anxiety and depression), wellbeing and work engagement.

Methods

The trial is registered as a multi-centre, mixed-method controlled feasibility trial (ISRCTN31161020), with a 1 to 1 allocation ratio to receive the intervention or be in a waitlist control group. A simple randomisation generator was used, and allocation was carried out by a member of the research team (KP) not directly involved in the recruitment or assessment processes. All quantitative outcomes were assessed using participant self-report questionnaires on the online Qualtrics platform and administered at baseline (T1), week 8/end of treatment (T2) and at short and long-term follow ups, at months two (T3), six (T4) and 12 (T5) from end of intervention. The datasets generated from the current study is stored in a publicly available repository, the Open Science Framework (OSF) (https://osf.io/v8c5j/).

For qualitative interviews, participants were invited to take part in an online videoconferencing interview over Microsoft Teams with researchers from the University of Warwick. Interviews were audio-recorded using OBS studio and subsequently transcribed by a third-party University approved company), and were not returned to participants for comments or correction, due to study timeline constraints. Qualitative interviews were conducted using a semi-structured interview schedule (see Appendix 1 in the supplementary), consisting of open-ended questions and suggested prompts. The interview

schedule was pre-piloted between members of the research team.

Interviewers' characteristics

The team of researchers conducting interviews and involved in subsequent qualitative coding and analyses consisted of six researchers with academic and/or clinical backgrounds in psychology. Three members of the team hold PhDs (AHW, KP, TM) and three members of the team hold masters-level qualifications in psychology (ST, AP, and TJ). Two members of the interviewing/coding team had no prior relation to the study (AP, TJ). Four members of the research team were active members of the study, yet none had direct relationship with any of the participants as the study was fully self-guided. Interviews required additional written and verbal consent, signed electronically by the interviewee, and returned by email prior to attending the interview. Further verbal consent was recorded at the beginning of each interview, and signed-off individually for each participant, by the interviewer. For additional information on consenting procedures, refer to the published trial protocol [17].

Participants

Participants were recruited from small, medium and large organisations across the Midlands region of England, and were eligible if they were aged 18 or over, able to give informed consent, English speaking, in employment, with a score of > 4 on the General Anxiety Disorder-7 (GAD-7) or Patient Health Questionnaire-9 (PHQ-9) and < 8 on the Insomnia Severity Index[1] (ISI). For a full list of inclusion and exclusion criteria, refer to the published trial protocol [17]. All procedures involving human subjects were approved by the University of Warwick Biomedical and Research Ethics Committee (BSREC 45/20-21). All participants provided full informed consent before enrolling in the trial.

For the process evaluation interviews, participants were randomly selected from those who had completed the intervention (from both treatment and control arms) and consented to be contacted about follow-up interviews. Participants who had consented to be contacted for a post-intervention interview were sent an email invitation. If there was no response, a follow-up email was sent one week later. No additional attempts were made if there was still no reply. In cases where a participant did not respond, another participant from the same cohort was randomly chosen to be invited from those who had not yet been contacted.

Measures

To examine the feasibility (recruitment and engagement) and acceptability of the intervention, we explored five objectives:

Objective 1: Assess the willingness of organisations to participate in a trial by monitoring organisational traffic into the trial across four identified stages: (1) initial contact, (2) introductory meeting, (3) further engagement, and (4) verbal agreement.

Objective 2: Assess the willingness of employees to participate in a trial by exploring employee/participants traffic into the trial (through both employer and social media advertising pathways) across five stages: (1) expression of interest, (2) screening questionnaire completion, (3) invitation to trial, (4) consent to trial and randomisation (baseline measures), and (5) end of intervention outcome measures completion. The number of participants at the expression of interest and baseline stages was reported across employment sectors.

Objective 3: Evaluate participant adherence/usage of the treatment platform through participants' use of the dCBT intervention platform by reporting the percentage of content completed and the total amount of time in hours spent on the platform over the 8 weeks study period.

Objective 4: Evaluate the impact of the intervention on quantitative outcome measures between group at post-intervention (week 8) and within group across all short and long-term timepoints.

Statistical analyses were conducted in SPSS (v.26) and R to investigate the impact of the intervention on quantitative secondary outcome measures such as symptom severity of depression and anxiety, wellbeing, quality of life, insomnia, as well job satisfaction and work productivity. For a full list of measures and description of their psychometric properties, see the study protocol [17]. Descriptive statistics for outcome measures and summary statistics were calculated. Differences by treatment group in baseline demographics and secondary outcomes were analysed with *t*-tests for continuous variables and Chi-square tests for categorical variables, or their non-parametric equivalents. We then took two approaches to analyse the quantitative outcomes.

First, using a case complete approach (i.e. including subjects with data at T1 and T2), we fitted a linear mixed effects model for the quantitative outcome measures, with the inclusion of treatment allocation and categorical timepoint (i.e., baseline and end of treatment) as fixed effects, and an interaction term between timepoint and allocation. The model also included a random intercept

[1] We used the Insomnia Severity Index to differentiate REST from other trials being conducted at the same time within the INWORK programme, one of which was an intervention targeting insomnia symptoms with scores of >7 as inclusion criteria. This criterion was used to ensure that there is no population overlap between the two trials.

for each participant. Results are presented with 95% CIs and 2-sided *p* values.

At 8 weeks, the waitlist control group received the intervention, without further allocation of a control group from that point onwards. For intention-to-treat (ITT) analysis, mixed effect generalised linear mixed models (GLMMs) were used to analyse within-subject outcome measure data for the whole sample (irrespective of initial allocation). This approach accounts for missing data and adjusts for non-linear relationships between time and the variables of interest. GLMM also corrects for correlations between different repeated measures timepoints [18].

Effect sizes were calculated as the ratio between the mean group difference ('wk8-wk0'Intervention-'wk8-wk0'Control) and the pooled standard deviation of differences (SD) (also known as the standardised difference). No adjustments for multiple comparisons were made.

Objective 5: Explore the acceptability, barriers, and facilitators to engage in the intervention as well as impact on engagement and symptom or behaviour change based on participants subjective experiences through semi-structured qualitative interviews. Interview recordings were analysed using inductive data-driven thematic and framework analysis [19, 20] to identify the barriers and facilitators of change (i.e., what helped or prevented participants from implementing aspects of the programme and hindered or facilitated potential behavioural, emotional and cognitive changes).

Intervention

REST is an 8-week web-based self-guided cognitive behavioural therapy (CBT) based programme for stress, depression, and anxiety, comprised of cognitive and behavioural components, and adoption of emotion regulation skills based on the Berking, Wupperman [21] treatment manual. Multimedia interactive content focused on goal setting, thought and emotions monitoring (through a diary), behavioural activation, challenging unhelpful thoughts and cognitive restructuring (for detailed list of weekly content, refer to the REST protocol [17]. See Fig. 1 for weekly intervention content.

Results

Assessment of feasibility

Recruitment

Objective 1- Wwillingness of employers to participate in the trial REST was one of three pilot trials under the INWORK umbrella, conducted as part of the Mental Health and Productivity Pilot Programme (MHPP). The MHPP programme is a collaboration of experts working together to provide mental health support and resources to Midlands' business communities and their employees, which is evidence-based, affordable and sustainable. A total of 301 businesses from the Midlands region were contacted as part of the wider programme, of which 104 businesses agreed to an initial introductory meeting during which the trials, confidentiality and recruitment through standard business communications (e.g emails and newsletters) were explained. This led to 48 businesses requesting more information about recruitment and the different categories of data collected through the study. Of the 48 businesses, 33 formally agreed to become a partner in the trials.

Objective 2 - willingness of employees to participate in the trial/data completeness Participant recruitment took place over 9 months, from April 2021 until January 2022 through two channels: (i) the MHPP businesses (assessed as per objective 1) and (ii) through direct recruitment via

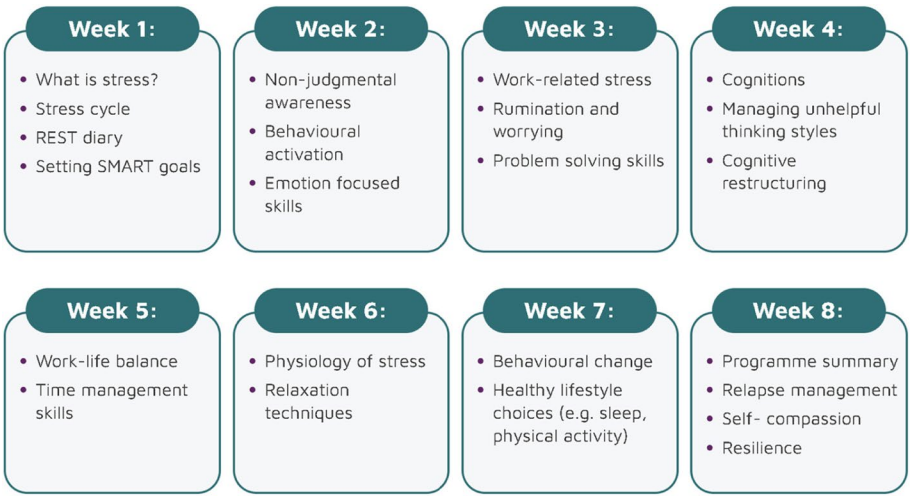

Fig.1 REST intervention weekly content

online social media (e.g., Twitter, LinkedIn and paid ads on Facebook) and print (e.g., leaflets and flyers in public and retail settings) advertisements. Individuals who expressed interest through the latter pathway were from the wider working community in the Midlands region.

Nine hundred two workers across both pathways expressed an initial interest to take part in one of the INWORK trials. Around 60% proceeded to complete the eligibility screening questionnaires, and of those, 14% were eligible and invited to enrol in REST. 71% of those eligible consented to the trial and provided baseline measures. Table 1 shows the participant numbers per sector recruited at expression of interest stage and enrolled in trial (i.e. baseline responses). Figure 2 shows the numbers of participants at each stage in the process, from initial expression of interest until final follow-up timepoint at 12 months (T5) post intervention completion.

Engagement

Objective 3: Adherence/usage of participants of the treatment platform Of the 52 enrolled participants, 7 (only one of which was initially in the treatment arm) did not engage at all with the digital platform, despite weekly email reminders to log in. Of the remaining 45, 17 had an adherence/engagement above 87% completing nearly all required topics over the 8 weeks period. Of the remaining 28 participants, 11 had an adherence ranging 50-78%, 10 with an adherence ranging 20-48%, and 7 with the lowest engagement of less than 12%. The sample initially allocated to the intervention group completed on average Mean=54.40% (SD=34.84) of the content, compared to a lower rate seen in those initially allocated to the control groups Mean=50.18% (SD=41.62). However, the groups did not significantly differ in percentage of content completion $U = 367.50$, $p = .581$.

Objective 4: Impact of the intervention on quantitative outcome measures Baseline Mean and SD for demographic, secondary outcomes and summary statistics (t-tests and chi-square tests for continuous and categorical variables respectively or their non-parametric equivalents) are summarised in Table 2 for control and intervention groups. There were no significant differences between the groups at baseline for any variables ($p > 0.05$).

Outcome assessments

Whilst estimates of significance are presented below, summary statistics of the data are of more importance as the aim is to assess the feasibility of the study and look for variability in the outcome measures to power a future larger RCT.

Linear mixed effect models were run on the study's secondary outcomes taking a case completeness approach (i.e. excluding those who did not provide end-of-intervention questionnaires measures at week 8) assessing

Table 1 Participant numbers per sector

Sector	Expressions of Interest ($N = 897$)[a]	Baseline responses ($N = 53$)
Accommodation & food services	1	1
Agriculture, forestry and fishing	1	0
Arts, entertainment and recreation	25	3
Business administration & support services	31	1
Education	378	23
Finance & insurance	1	0
Information and communication	47	1
Manufacturing	19	0
Professional, scientific and technical activities	42	4
Public administration & defence	171	12
Retail	18	0
Self-employed	1	0
Transport & storage (including postal)	17	1
Unspecified	236	1
Health & social care	44	6

[a] The REST trial shared a common expression of interest process with two additional trials, under the umbrella of the INWORK programme (see protocols: Moukhtarian et al., 2022; Patel et al., 2022; Jadhakhan et al., 2023)

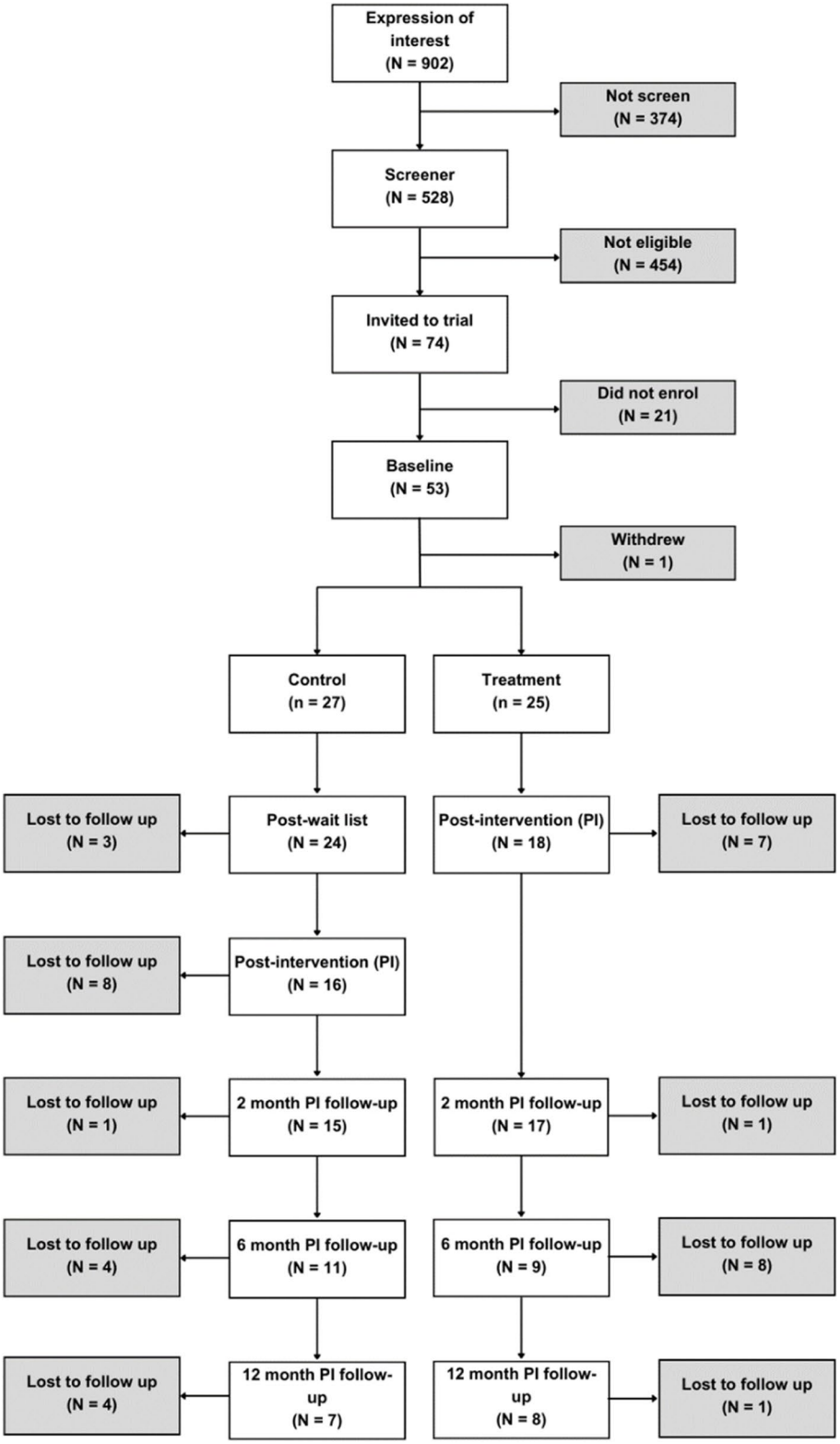

Fig. 2 CONSORT diagram from expression of interest till final follow-up outcome measure collection

Table 2 Descriptive statistics for outcome measures and summary statistics

Variables	Treatment M (SD) (*n*= 25)	Control M (SD) (*n*= 27)	Significance tests for group differences at baseline
Demographics			
Age, y	39.52 (11.85)	43.74 (11.11)	t(49.01) = 1.32, *p*=0.192
Sex, No. (%)			X^2 = 0.42, *p*=0.515
Women	22 (88.00)	22 (81.48)	
Men	3 (12.00)	5 (18.52)	
Ethnicity, No. (%)			X^2 = 3.11, *p*=0.375
White	23 (92.00)	26 (96.30)	
Black	1 (4.00)	0 (0.00)	
Asian	0 (0.00)	1 (3.70)	
Mixed	1 (4.00)	0 (0.00)	
Relationship status, No. (%)			X^2 = 4.62, *p*=0.328
Married	11 (44.00)	14 (51.85)	
Co-habiting	5 (20.00)	7 (25.93)	
Separated	0 (0.00)	2 (7.41)	
Single	6 (24.00)	3 (11.11)	
Other	3 (12.00)	1 (3.70)	
Hours of work	36.92 (5.71)	34.22 (7.73)	t(47.74) = -1.33, *p*=0.157
Education level, No. (%)			X^2 = 5.93, *p*=0.313
Doctorate	1 (4.00)	2 (7.41)	
Masters	6 (24.00)	6 (22.22)	
Bachelor	14 (56.00)	10 (37.04)	
Secondary school	3 (12.00)	2 (7.41)	
Some diploma	0 (0.00)	3 (11.11)	
Other qualification	1 (4.00)	4 (14.81)	
Income No. (%)			X^2 = 5.92, *p*=0.315
£10,000-£29,999	8 (32.00)	3 (11.11)	
£30,000-£49,999	8 (32.00)	8 (29.63)	
£50,000-£69,999	4 (16.00)	5 (18.52)	
£70,000-£89,999	2 (8.00)	8 (29.63)	
£90,000-£109,999	2 (8.00)	2 (7.41)	
£110,000-£149,999	1 (4.00)	1 (3.70)	
Secondary outcomes			
Insomnia (ISI)	7.92 (3.34)	6.96 (3.58)	t(50.00) = -1.00, *p*=0.323
Depression (PHQ-9)	8.32 (4.21)	8.44 (3.67)	t(47.82) = 0.11, *p*=0.91
Anxiety (GAD-7)	8.28 (4.88)	9.30 (3.93)	*U* = 273.00, *p*=0.236
Work productivity (WPAI)			
WPAI-WTM	0.65 (1.82)	0.73[a] (3.49)	*U* = 339.00, *p*=0.609
WPAI-IWW	30.40 (21.31)	31.85 (26.17)	*U* = 342.50, *p*=0.926
WPAI-OWI	30.92 (21.09)	31.04[a] (25.17)	*U* = 334.50, *p*=0.857
WPAI-AI	32.80 (21.89)	37.78 (26.65)	*U* = 301.00, *p*=0.500
Job satisfaction (IJSS)	2.83[b] (0.32)	2.98[c] (0.41)	t(20.97) = 1.05, *p*=0.307
Well-being (WEMWBS)	41.60 (7.71)	39.96 (7.51)	t(49.45) = -0.77. *p*=0.442
Quality of life (EQ-5D-5L)			
EQ-5D-5L: Overall health score	71.40 (19.17)	73.70 (14.95)	*U* = 308.000, *p*=0.588

Abbreviations: *ISI* Insomnia Severity Index, *PHQ-9* Patient Health Questionnaire- 9, *GAD-7* Generalised Anxiety Disorders -7, *WPAI* Work Productivity and Impairment Questionnaire, *WTM* Work Time Missed, *IWW* Impairment Whilst Working, *OWI* Overall Work Impairment, *AI* Activity Impairment, *IJSS* Indiana Job Satisfaction Scale, *WEMWBS* Warwick-Edinburgh Mental Wellbeing Scales, *EQ5D* European Quality Of Life-5 Dimensions

Mean values are presented with standard deviations in parentheses unless otherwise specified. Test statistics results are from *t* tests or non-parametric Mann-Whitney U tests for continuous variables, and Pearson $\chi 2$ tests for categorical variables

[a] *N*=26

[b] *N*=13

[c] *N*=12

change from baseline to 8 weeks between the waitlist control and intervention groups. Linear mixed effects models showed no significant differences in depression (F(1,40)= 2.82, $p = 0.101$) and anxiety (F(1, 40)= 2.14, p=0.151), measured on the PHQ-9 and GAD-7 respectively, between treatment allocation, timepoint (i.e., baseline and end of treatment), and 'timepoint x allocation' interaction. There was a significant interaction observed for the insomnia symptoms measured by the ISI (F(1,40)= 5.18, $p = 0.028$), however, post-hoc findings for differences between groups were not significant.

GLMM was used with data from all timepoints (baseline, end of intervention (week 8), two, six- and twelve-months follow-up) for all outcome measures. The best fit to the data was a non-linear logarithmic function of time, shown by Log_n time, having the lowest -2 log likelihood score for all variables (see Table 1 in the Supplementary appendix 2 for different time distributions used). The main effect terms were used to demonstrate change over time for each variable (Table 3; Fig. 3). Negative beta values indicate a reduction in scores over the course of each timepoint. Significant changes over time were only found for PHQ-9 scores and WPAI activity impairment (see Fig. 3 in Appendix 3 of the Supplementary for GLMM plots of *logN* for non-significant outcomes). There were moderate effect sizes on the depression and anxiety measures (PHQ-9 and GAD-7 respectively), and small to null effect sizes on the insomnia and all other work-related measures.

Assessment of acceptability

Objective 5: qualitative assessment The process evaluation report adheres to the COREQ reporting guidelines for qualitative research (Appendix 6 in the Supplementary). Recruitment of participants for process evaluation interviews took place from 15th September 2021 (first invites) until 22nd March 2022. Overall, 29 participants were invited to participate, where 16 did not respond, two formally declined with the following reasons- "Just to let you know that I'd prefer not to take part in the interview stage", "I had initially agreed to take part in the interview, but I'm afraid I'm no longer available", and one interview did not record. This resulted in ten participants (five from the initially randomised to the intervention arm group, and the other half from the control group who then received the intervention as well) being interviewed, representing 23.8% of intervention completers (n=42).

Demographic characteristics of those interviewed are presented in Table 4. Interviews lasted for a mean length of 27.99 minutes (range: 19.57 to 41.08 minutes). Participants were given an opportunity to ask any questions once the interview had finished and the recording had been stopped. No interviews were repeated, and field notes were not taken.

Thematic analysis of interview data led to the identification of four interlinking themes (see Fig. 4), summarised with representative quotes below.

Theme: Individual-level impacts from the practical skills and techniques

Overall, participants reported that the CBT approach was very beneficial and resulted in positive changes in multiple areas of their life. Compared to other psychoeducational programmes, practical approaches were more dominant in REST, which was received positively.

> *"I do think they were probably the sort of the difference between sort of other wellbeing things that I've done before, which was sort of more information that's sort of given to you but you don't always know what to sort of do with it. Whereas this course was very like practical-based, giving you tools and things to actually overcome little stresses." – Participant I*

Whilst it was recognised not every technique works for every person, participants mentioned there were several new techniques and takeaways they learned throughout the programme, which aligned with their personal preferences and circumstances. Of particular note, the REST diary, the cognitive reframing exercises and the stepping away strategy often used in Acceptance and Commitment Therapy (ACT), were all highlighted as particularly useful.

> *"it did actually give me some tools that when my brain was racing at night and particularly when kind of anxiety is high, I could use some of the things that I learned to try and quell some of that and to … stop it from spiralling into something a bit more stronger and a bit more serious… I've learned that I can then put into practical sense as well." – Participant F*

Several participants reported how the programme led to improvements in self-awareness and reflection. More specifically, it helped them to identify not only their external sources of stress, but also to become more aware of their own internal stress responses and behaviours. In turn, this helped them to normalise and accept their emotional responses to stressful situations.

> *"It made me realise more than anything that where my main cause of stress was coming from. And, really, what the reason for it was... But I could then see the behaviours that I was … showing were … coming out as stress... So I was able to identify those as well." – Participant D*

Table 3 Results from GLMM analyses and effect sizes (Cohen's d) from baseline to 12-months post intervention for combined sample

	Baseline *N*=52		Post-intervention *N*=42		2-month *N*=32		6-month *N*=20		12-month *N*=15		Generalised Linear Mixed Model				
	M	SD	M	SD	M	SD	M	SD	M	SD	*B* [95% CI]	*f*	*p*	Cohen's *d* (baseline-post-intervention) [95% CI]	Cohen's *d* (post-intervention-12month FU) [95% CI]
PHQ-9	8.38	3.90	7.29	3.44	7.44	4.61	5.45	3.91	6.27	3.63	-1.48 [-2.55, -.21]	7.50	**.007**	.51 [.19, .83]	.25 [-.26, .76]
GAD-7	8.81	4.40	7.43	4.07	8.47	4.87	6.75	4.52	7.87	5.59	-0.81 [-2.05, 0.43]	1.66	.199	.62 [.29, .95]	-.10 [-.60, .41]
ISI	7.42	3.47	7.10	3.72	7.94	4.50	5.75	3.08	5.67	2.94	-0.75 [-1.76, 0.26]	2.13	.146	.05 [-.25, .35]	.12 [-.39, .62]
IJSS	2.90[a]	0.37	2.90[b]	0.34	2.85[c]	0.43	3.13[d]	0.42	3.16[e]	0.45	0.10 [-0.06, 0.26]	1.40	.240	-.16 [-.75, .44]	-.37 [-1.51, .85]
WEMWBS	40.75	7.58	41.98	7.66	41.56	8.63	42.45	8.64	41.53	12.13	0.79 [-1.49, 3.08]	0.47	.495	-.31 [-.62, 0]	.25 [-.27, .76]
WPAI-WTM	0.69[1]	2.77	2.67[2]	8.79	9.41[3]	27.29	5.26[4]	22.94	0.51[5]	1.91	2.95 [-1.20, 7.11]	1.97	.162	-.22 [-.54-.09]	-.28 [-.83-.28]
WPAI-IWW	31.15	23.73	31.67	26.95	25.63	28.50	28.00	26.77	28.00	23.66	-2.89 [-9.93, 4.15]	0.66	.418	.05 [-.25, .36]	-.23 [-.74, .29]
WPAI-OWI	30.99[1]	23.03	33.62[2]	27.96	29.41[3]	30.47	29.47[4]	26.77	30.26[5]	23.46	-0.93 [-8.24, 6.39]	0.06	.802	0 [-.31, .31]	-.11 [-.65, .44]
WPAI-AI	35.38	24.37	35.95	26.97	26.88	24.68	24.00	20.62	25.33	23.56	-7.43 [-14.14, -0.72]	4.79	**.030**	.02 [-.28, .33]	-.15 [-.66, .36]
EQ5D – Overall Health	72.60	16.97	73.50	15.00	73.48[6]	18.37	79.35	13.96	75.73	15.63	2.82 [-1.63, 7.27]	1.56	.213	-.05 [-.36, .25]	.41 [-.12, .93]

Abbreviations: *PHQ-9* Patient Health Questionnaire- 9, *GAD-7* Generalised Anxiety Disorders -7, *ISI* Insomnia Severity Index, *IJSS* Indiana Job Satisfaction Scale, *WEMWBS* Warwick-Edinburgh Mental Wellbeing Scales, *WPAI* Work Productivity and Impairment Questionnaire, *WTM* Work Time Missed; IWW, Impairment Whilst Working, *OWI* Overall Work Impairment, *AI* Activity Impairment, *EQ5D* European Quality Of Life-5 Dimensions

[a] *n*=25

[b] *n*=18

[c] *n*=16

[d] n=7

[e] *n*=6

[1] *n*=51

[2] *n*=41

[3] *n*=26

[4] n=19

[5] *n*=14

[6] *n*=23

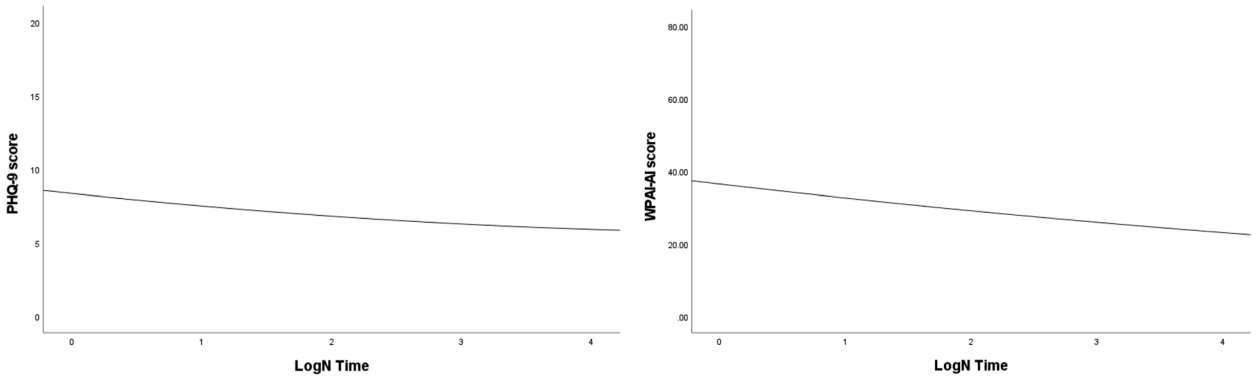

Fig. 3 GLMM outputs for significant outcomes

Although participants acknowledged some stress in life is inevitable, the programme provided them with the skills and techniques to manage their emotions. As touched upon by participant F, these techniques helped to prevent the vicious cycle of stress from spiralling into worsening mental health problems.

> *"My stress levels are high, which I mean let's face it in this world stress levels are high, but the, shall we say, the peaks are less high than they were because I'm making an attempt to stop them getting that high" – Participant A*

In addition to the improvements in awareness and emotion regulation management, participants also noticed positive changes in other areas of their life. For example, some participants experienced improvements in their sleep, whilst others developed an improved sense of self-perception and agency over their life.

> *"I would say I'm better at falling asleep which is a positive for me… and it allowed me to kind of switch up my routine and to think about what sleep routine was before going to bed. And often, I would do things on my phone or scroll through things just to try and get myself to kind of switch off and fall asleep to get overtired almost. But, actually, it kind of gave me different things to think about, to challenge my brain in a different way. So, I would say it improved my sleep to some extent and certainly kind of pushed the worry bunnies away a little bit" – Participant F*

Furthermore, some participants discussed how the programme acted as gateway to speak about mental health more openly and seek support, and noted that their increased awareness and understanding of stress and mental health was particularly beneficial in their managerial position at work, to help them to identify potential signs of stress within their team.

> *"…this is a really good opportunity and actually identifies other things that you could then tap into and … give some of the confidence to speak out a bit more and maybe ask for help in other areas as well." – Participant F*

> *"… going through it, I actually thought .. if I can see, or pick up those signs of stress in others … I could like… reach out to them and just try and you know, start to either make sure they're okay, or try and assist them, by … pointing them to the right place for help" – Participant D*

Most participants discussed utilising the techniques they learnt throughout the programme. Some mentioned they had already integrated them into their daily routines, whereas others referred to their toolbox of techniques they can turn to when needed. Related to this, they also mentioned that participation encouraged future uptake of similar digital psychological intervention programmes.

> *"… a couple of tools that I took out and started put-*

Table 4 Qualitative interview participant demographic characteristics

	Control ($n = 5$)	Treatment ($n = 5$)
Age (*M*, SD)	38.80 (13.18)	36.40 (11.74)
Sex (n, %)		
Female	5 (100%)	4 (80%)
Male	0 (0%)	1 (20%)
Ethnicity (n, %)		
White	5 (100%)	5 (100%)
Income (n, %)		
£10,000-£29,000	0 (0%)	1 (20%)
£30,000-£49,999	1 (20%)	1 (20%)
£50,000-£69,999	2 (40%)	1 (20%)
£70,000-£89,999	2 (40%)	1 (20%)
£90,000-£109,999	0 (0%)	1 (20%)

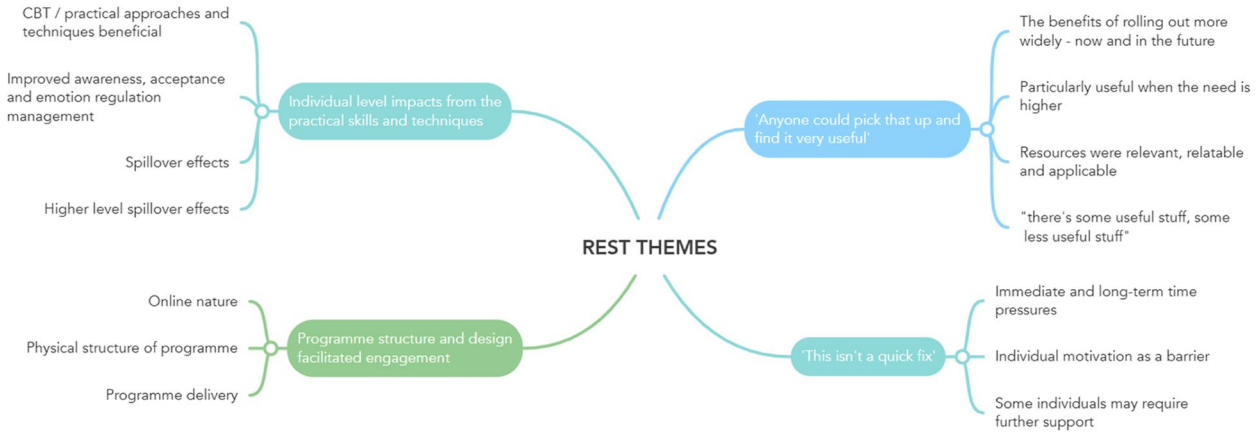

Fig. 4 Interlinking REST themes

ting into practise in my general day-to-day with my own sort of personal journal. And I've been using that pretty steady for a few months now. It does help." – Participant B

"And I probably would do something similar again actually. I'm probably more likely to sign up to something that's digital than I was before." – Participant F

Theme – 'Anyone could pick that up and find it very useful'

As highlighted in the previous subtheme, several participants expressed that they would like for the programme to be rolled out more widely, due to the benefits it could have for so many individuals. Participants discussed how it could be useful for anyone along a broad spectrum of emotion regulation difficulties, from those with general stress and worry to those with diagnosed generalised anxiety or depression. Particularly given the limited capacity and resources existing mental health services have, participants reported how the REST programme could be a good alternative.

"I would love to recommend this to people. I kept signing people up. … I think it's amazing. So, I'm sending it around to people. Because I think with counselling and services being so overstretched, something like this is a really good self-guided method and easy to use. I think it's fantastic and I think it should be available longer term to a lot more people." - Participant F

More specifically, it was noted the programme was particularly useful when the need was higher. Around half of the participants reported how the programme "*couldn't have been more timely*," due to the duration of the programme coinciding with a stressful period in their lives. The timing of the programme not only gave participants the opportunity to directly apply their learning, but also helped to prevent what could otherwise have been stress-related sickness absence.

"I valued the time, just to come out and reflect, actually, on how to manage the stress that I was experiencing. It couldn't have been more timely, I think if I hadn't been on it, I probably would have gone off sick." – Participant G

The programme provided real life examples to showcase how participants can apply the techniques and skills to their own lives. Several mentioned these to be so relatable and how they resonated with them and could relate them back to situations in their own lives.

"I could apply it immediately to the situations that I was experiencing… It wasn't like you had to work through a hypothetical crappy example, I could put it immediately into practise and it very much helped." – Participant G

However as mentioned previously, not every technique works for every person and some elements were less relevant than others, due to an incompatibility with an individual's specific situation. Some participants also noted that if they were already familiar with a technique, they did not get quite as much value from those elements of the programme.

"So I'd say there were some weeks where it's a little bit less kind of relevant, but then there were some weeks that it was more relevant, but I would say overall, it was quite interesting. Like even if you found it less relevant, there was still something in there that you could sort of relate to as well.." – Participant I

Theme - Programme structure and design facilitated engagement

Participants reported that multiple elements of the programme design, online structure and delivery facilitated their engagement with it. One of the key components included the staggered release each week, such that there was not an overwhelming amount of content to complete at any one time.

> *"I found the format really easy to use. I liked that it was all broken down into sections. It kind of made it quite manageable to go through. So, I didn't find it too time consuming or anything like that"- Participant H*

Some participants related this staggered release of content to how it aligned with and complemented their learning style.

> *"Having it split up like that so that this week, this is what we're going to look at, next week we'll look at something else… I found quite useful because it did kind of focus the mind on one particular way of looking at things or one particular thing to look at. … it matches the way that I like to look at things, to split things up into smaller chunks and consider them like that."- Participant A*

Participants also reported on how engaging the online platform interface was, relating to the multi-media components and general ease of use and navigation. Participants similarly reported the variation in content as beneficial for individuals with different learning styles.

> *"there's obviously a visual and a text there at the same time, which is always handy. I'm quite of visual person sometimes and… I like to read and see when I'm listening, I'm not great at just listening."- Participant E*

However, some participants noted the programme may be better suited to more technologically minded individuals.

> *"I loved the fact that everything was online, but I know that probably wouldn't work for someone who's not computer-based." – Participant B*

Nevertheless, certain aspects of the programme helped increase accessibility such as the availability of transcripts for all multimedia content, handouts that participants could download and print to use outside of the platform, as well as the use of lay vocabulary used to convey complex psychological concepts.

> *"I also really liked the transcripts because …I know this is more accessibility, but I find sitting through and watching videos more of a task than just reading a transcript. So, I found that really useful that I could just read it at my own pace and kind of move on." – Participant H*

The online nature of the programme also facilitated engagement, due to the flexibility it provided to be completed whenever was best suited. This allowed participants to flex the programme around both their personal and work commitments, particularly given the hybrid working arrangements many were following at the time of their participation.

> *"…it wasn't sort of like a live session, you're more flexible in how you could approach it, which I quite like that flexibility. And especially since I was working from home at the time… I think that flexibility was like really appreciated."- Participant I*

The online nature of the programme also aided privacy and minimised any concerns participants had regarding stigma related to mental health.

> *"But I also think it's a good thing that.. it's online because then you can do it anywhere in private space. Whereas I guess if you have to go and see people or go into a particular building…, you might then feel worse because you might think someone might see me as I'm going. Whereas, there was no one to really know what you're doing. I just incorporated it into my normal working day so no one would know really unless I told them." – Participant F*

Relating to privacy and stigma, the overall delivery structure of the programme facilitated engagement as well. Participants noted that the delivery by independent providers but within the workplace setting where employers acted as gatekeepers and allowed employees take time out-work helped them overcome feelings of guilt looking after their mental health during working hours.

> *"… But because our employer made it quite clear, this is something that we're encouraging you to do, it's something we'd like you to do, so, this is protected time, that you can take the time to do this. And I found that quite helpful."- Participant I*

Theme- 'This isn't a quick fix'

Participants reported that their journey to lowering their stress and improving emotion regulation difficulties was not quick nor straightforward. Participants acknowledged how further effort, repetition and practice of skills and techniques learnt in the programme were required beyond the scope of the programme to achieve optimal results. Particularly given the self-guided nature of the

programme, this meant participants relied on self-motivation to maintain engagement with the programme, which was challenging at times for some.

> *"I think a barrier was probably myself at times because it wasn't necessarily out there as a priority… because it's digital so we don't have anyone being like you need to be here at a certain time so it is all the way down to self-motivation."- Participant F*

> *"if you don't use it you lose it… So that kind of keeping, making time to keep on top of things with this, and to keep my mind kind of like engaged with it, it's something that I need to do. And that's the other thing that I've not had time to kind of like do really."- Participant D*

Time pressures were frequently reported as barriers to both short- and long-term engagement with the programme. Participants mentioned finding it difficult to fill in the REST diary, as they struggled to find time to complete it between their work and personal commitments. Sometimes these time constraints meant participants experienced less emotional or behavioural change than they had initially expected, as they had not had as much time to implement and practice the techniques as they would have liked.

> *"But mentally, I was hoping it would help more than it would, and I'm not saying it didn't, what I haven't had time to do, and.. is actually make time to practice. That's what I was saying about, like look at the techniques, use them to my advantage, find out which ones work for me… And, that's what I haven't got to, and that's, I wouldn't really say that's a reflection on the programme, that's reflection on the fact that … I haven't made time"- Participant D*

In addition, some participants mentioned that further support and guidance whilst completing the programme would have enhanced their experience and increased engagement. This related to participants' desire for more personal support, an opportunity to ask questions on any elements they were unsure of or for further guidance on how to put some of the techniques into practice. Some suggestions included running group sessions, being offered a couple of "face-to-face" sessions with someone, or requesting on-demand guided support on the platform through a chat box to ask a question while completing the content for that week without having to contact the research team by email and wait for a reply, which was an available option already.

> *"I feel like on the site as you're going through the materials, if there was an opportunity to have maybe an open chat with someone or the opportunity to communicate with someone, just in case you get a little lost or you're not quite grasping something or even if you just need someone to talk to about something that you've read—that would be really useful."- Participant B*

Discussion

This mixed-method feasibility study aimed to assess the acceptability, feasibility, and preliminary efficacy of a dCBT (i.e. REST) programme for depression and anxiety for employees in the workplace.

Whilst the recruitment of employers through the wider MHPP programme onboarding was found to be feasible with a good mix of industries and organisation sizes, recruitment of employees into the REST trial specifically was challenging. Within the INWORK programme, REST was one of the trials on offer for depression and anxiety, alongside two other trials (e.g. SLEEP for insomnia and MENTOR for those with an existing mental health diagnosis), all sharing a common funnelled screening process. Mild to severe symptoms on the PHQ-9 and GAD-7 were used as inclusion criteria for both SLEEP and REST trials, with the addition of mild to severe symptoms on the Insomnia Severity Index for SLEEP. However, given the high comorbidity of sleep problems in individuals with depression or anxiety [22], it meant that most eligible participants were offered SLEEP and only those without sleep problems were offered REST, limiting the number of individuals eligible for REST.

Engagement with the online intervention platform was also not high, with just over 50% completion rate of all materials on average across the whole sample. This could be explained by a major area of feedback pertained to the lack of guidance and support throughout the intervention due to its fully self-guided nature. Qualitative data indicated that at times participants felt that some form of human contact could have helped if they had questions or needed to speak to someone. In fact, studies have shown that interventions that include some sort of support (therapist or peer led) have higher rates of engagement and outcomes compared to fully self-guided ones [23, 24]. An improved and future version of REST could include light touch support either through on-demand therapists or networking with other REST users on an anonymous community support platform.

This study also had limited data on platform usage (i.e. analytics) other than overall completion percentage. Research about engagement with online psychological interventions is still in its infancy [24], but understanding the level of engagement of users with digital interventions is crucial in the context of symptom improvement,

as low engagement will prevent such interventions from having their intended reach and impact. Future similar programmes should include more objective analytics data (e.g. day of the week or time of the day with highest engagement, frequency of specific tools used on the platform or time spent on a topic) to understand individual differences of engagement and link them to how they predict symptom improvement.

The process evaluation of the REST trial has helped to identify several strengths which support the preliminary promising impact of the digital intervention, but also some other limitations which will help to improve several elements of the treatment programme. The intervention was overall perceived very positively with considerable emphasis on the interactivity of the online platform. This kept participants interested and possibly minimised further extensive dropouts. Several participants also reported positive feedback on the availability of the materials provided offline through the possibility of downloading them as worksheets that they could re-use at their convenience. Although the intervention was fully self-guided and not tailored to individual needs, the wide range of topics covered as well as the user-friendliness of the platform with relatable examples made it possible for anyone to pick it up and find it useful as participants reported. Nevertheless, it was also acknowledged that the programme wasn't a 'quick fix' and users had to put in time and effort to practice the skills and absorb the psychoeducation learnt to fully benefit from it.

As this was a feasibility study, the statistical differences between the groups were of much less importance than determining variability for a planned larger study [25]. Although the intervention group showed larger reduction of depression and anxiety symptoms at post-treatment compared to the control group, these differences were not statistically significant. Nevertheless, within group analyses showed gradual and slow reduction of depression, anxiety and insomnia scores first at 8 weeks, with a slight increase at 2 months to then be at their lowest at 6 months follow-up. At 12 months, the scores were still lower for both groups compared to pre-intervention at baseline. However, the small sample size limits, the interpretation and generalisability of the data and findings, and therefore should only be used as a guide for future studies replicating or building on learnings.

Conclusions

This mixed-method study's findings provide preliminary support for the implementation of a dCBT intervention through the workplace. Results of this study also show that some improvements can be made to overcome the challenges identified pertaining to the study design and implementation of the treatment programme itself. Although the study was not powered to detect statistically significant differences, the results are promising for a future fully powered trial, looking at the effectiveness and cost-effectiveness of such intervention.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s44247-024-00114-8.

Supplementary Material 1.

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Authors' contributions
CM is principal investigator. CM, NT, LW, CT, KP, and TM were involved in the design of the study. CT, NT and TM led the intervention development. TM and SF drafted the manuscript and CM, NT, LW, CT, TM, SF, GD, SR, KP, AWH and CK revised and approved the final manuscript.

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Availability of data and materials
The datasets generated during and/or analysed during the current study are stored in a publicly available repository, the Open Science Framework (OSF) (https://osf.io/v8c5j/).

Declarations

Ethics approval and consent to participate
All procedures involving human subjects were approved by the University of Warwick Biomedical and Research Ethics Committee (BSREC 45/20-21) and carried out in accordance with relevant guidelines and regulations (e.g. Declaration of Helsinki). All participants provided full informed consent before enrolling in the trial.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Warwick Medical School, Warwick Applied Health, Mental Health and Wellbeing group, University of Warwick, CV4 7HL Coventry, United Kingdom. [2]Department of Psychology, University of Warwick, University Road, CV4 7AL Coventry, United Kingdom. [3]Natwest Group, London, United Kingdom. [4]Musculoskeletal Research Unit, Bristol Medical School, University of Bristol, BS2 8DZ Bristol, United Kingdom. [5]Faculty of Health and Life Sciences, Coventry University, Priory Street, Coventry CV1 5FB, United Kingdom. [6]The British University in Egypt, El Sherouk City, Suez Desert Road, Cairo, Egypt. [7]Coventry and Warwickshire Partnership NHS Trust, Coventry CV6 6NY, United Kingdom.

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