Reducing Anhedonia in Major Depressive Disorder with Future Event Specificity Training (FEST):

A Randomized Controlled Trial

Hallford, D. J. ^{1,4}, Rusanov, D. ¹, Yeow, J. J. E. ¹, Austin, D. W. ¹, D'Argembeau, A. ², Fuller-Tyszkiewicz, M. ¹, Raes, F. ³,

¹ School of Psychology, 1 Gheringhap Street, Deakin University, Geelong, Victoria 3220, Melbourne, Australia

² Psychology and Neuroscience of Cognition Research Unit, Department of Psychology, University of Liège, Belgium

³ Faculty of Psychology and Educational Sciences, KU Leuven, Tiensestraat 102, Box 3712, 3000 Leuven, Belgium

⁴ Corresponding Author, School of Psychology, Deakin University, 221 Burwood Hwy, Burwood, Victoria 3125, Melbourne, Australia, Phone: + 61 3 9251 7777, Email,

david.hallford@deakin.edu.au

Abstract

Objective: Improving future thinking may be one means to reduce anhedonia, particularly in Major Depressive Disorder (MDD) in which future thinking is impaired. The current study therefore examined whether enhancing future thinking is a viable method of reducing anhedonia in MDD.

Methods: Participants ($N=177$; 80.8% women; M age=43.7, $SD=11.8$) with a current depressive episode including anhedonia and high symptom severity were randomized to a Future Event Specificity Training (FEST) program or wait-list control. Future thinking characteristics, anhedonia-related variables, and other clinical outcomes were assessed at baseline, one- and three-month follow-up.

Results: The FEST group showed significantly improved future thinking characteristics compared to the control group, as expected. Relative to the control group, FEST was also associated with a reduced likelihood of anhedonia (35.1% vs 61.1%, $p = .015$), improvements on other anhedonia-related variables such as anticipatory ($d = 0.63$, $p = .004$) and anticipated pleasure ($d = 0.77$, $p < .001$), and desirable clinical outcomes such as less people meeting criteria for MDD (37.8% vs 64.8%, $p = .011$), lower symptom severity ($d = 0.41$, $p = .048$), higher behavioural activation ($d = 0.71$, $p = .001$) and improved global functioning ($d = 0.52$, $p = .017$). Changes in future thinking characteristics were found to mediate the effect of FEST on anhedonia.

Conclusions: Future thinking can be enhanced in MDD, and this leads to a substantially reduced likelihood of anhedonia, other significant clinical effects and functional gains. Future research might examine FEST's effects on other diagnostic groups with anhedonia and the utility of FEST as an adjunct to other treatments.

Keywords: future thinking; depression; mental imagery; specificity; anhedonia; anticipatory pleasure.

Major depressive disorder (MDD) is a prevalent and highly impactful mental illness (World Health Organisation, 2021). Although evidence-based treatments for MDD are available, their efficacy is variable, and they are not effective for substantial numbers of people. Research indicates that even with frontline treatment, such as antidepressants or psychological therapy, around 40-50% of people will not recover from an episode (Cuijpers et al., 2014; Cuijpers, Karyotaki, et al., 2020; Cuijpers, Stringaris, et al., 2020; Levkovitz et al., 2011) and up to 30% may not recover even after several treatments (Warden et al., 2007). Among people that do recover, 40-50% will relapse within several years (Sim et al., 2016; Steinert et al., 2014). Clearly, current approaches to MDD leave significant levels of non-responsive and recurring illness, with associated personal, societal, and financial burden (Kessler, 2012).

Targeting cardinal symptoms that are less likely to improve in currently available treatments is one strategic way to improve outcomes in MDD (Holmes et al., 2018). One such significant symptom is anhedonia, which is common in MDD (Shankman et al., 2014) and refers to a difficulty in experiencing pleasure and interest, and general down-regulation of positive affect. Without perceiving reward or pleasure, people can become demotivated, withdrawn, and hopeless. Indeed, anhedonia has significant impact on quality of life and day-to-day functioning (Vinckier et al., 2017), including work, education, socialising and leisure, and increases suicidality independently of other symptoms (Ducasse et al., 2018). Unfortunately, current treatments may not alleviate anhedonia as successfully as other aspects of depression (Dunn et al., 2020), and untreated anhedonia uniquely predicts poorer prognosis in MDD (McMakin et al., 2012; Uher et al., 2012). Anhedonia therefore poses a pernicious threat to wellbeing by having unique impacts on functioning, being treatment-resistant, and increasing relapse risk. To break through the impasse of suboptimal treatment outcomes in MDD, new and effective ways of targeting and alleviating anhedonia are indicated.

One potentially effective way of treating anhedonia is through enhancing the ability to imagine future events. Effortful future thinking can help us to realistically simulate and ‘pre-

experience' events (Kahneman & Tversky, 2013), giving rise to anticipatory emotions that motivate us to engage in rewarding, meaningful behaviours that maintain good mental health (Ji et al., 2021; Renner et al., 2019; Schacter et al., 2017). Consistent with established deficits in autobiographical memory recall (Barry et al., 2021), MDD is associated with difficulty imagining future events in ways that are specific, detailed, and accompanied by emotionally evocative mental imagery (Gamble et al., 2019; Hallford et al., 2018; MacLeod et al., 1997; MacLeod & Salaminiou, 2001; Morina et al., 2011). Crucially, these characteristics have been linked to reduced anticipation of pleasure in MDD when thinking about future events (Hallford, Barry, et al., 2020; Hallford, Sharma, et al., 2020; Hallford & Sharma, 2019). This lack of anticipation of pleasure is a key dimension of anhedonia, and a proximal influence on motivation and intention to engage in rewarding and goal-directed behaviour (Engel et al., 2013; Ji et al., 2021; Renner et al., 2019; Sherdell et al., 2012). Difficulty anticipating positive events in conjunction with a reduced experience of reward may then give rise to other factors that maintain dysfunction, such as generalized hopelessness about having positive experiences and outcomes for oneself in the future (MacLeod et al., 2005; O'Connor et al., 2000). Indeed, people with clinical depression have relatively low expectations that personally relevant positive future events are plausible and likely to occur (Hallford, Barry, et al., 2020).

Recently, we have tested and validated a brief intervention designed to improve characteristics of future thinking associated with the ability to anticipate and experience pleasure (Hallford, Yeow, et al., 2020). This intervention, called Future Event Specificity Training (FEST), involves two group-based sessions of training to improve the simulation of specific (i.e., spatiotemporally located) future events, as well as associated detail and the use of mental imagery. The use of the term 'specificity' in the title is a reference to Memory Specificity Training (MeST), from which FEST was inspired (Raes et al., 2009). However, specificity is only one focus of FEST. Participants are guided within specific future thinking to generate rich detail, as well as to use mental imagery and accentuate feelings that are associated with imagined future events. The results

from an initial community sample study showed large, controlled effects on future thinking specificity, detail, and imagery at follow-up (Hallford, Yeow, et al., 2020). Further, it increased the anticipation of pleasure from future events, and the feeling of pleasure when thinking about future events (anticipatory pleasure). Participants also reported more perceived control over the events and appraised them as more likely to occur in the future. These effects even generalised to positive future events that were not personally generated. This study established the feasibility, acceptability, and potential outcomes of FEST for training in future thinking. It also provided further evidence that when future events are simulated in ways that are specific, rich in detail, and draw on mental imagery, they are appraised as being more realistic and within one's control.

Based on this initial trial of FEST and increasing evidence that programs that focus on improving specificity, detail, and imagery in autobiographical thinking can have clinically meaningful impacts on depressive symptoms (Barry et al., 2019; Blackwell et al., 2015; Hallford, Austin, Takano, Fuller-Tyszkiewicz, et al., 2021; Lang et al., 2012; Pile et al., 2021), we proposed to examine the effects of FEST in MDD. Several recent studies have evaluated effects of future thinking training in similar, overlapping ways. For example, Pile et al. (Pile et al., 2021) examined an intervention package containing components of positive future imagery training combined with other memory retrieval and rescripting exercises among adolescents with elevated depressive symptoms. Small to moderate, but non-significant, changes in future thinking detail were found. There were effects on depressive symptoms, but as the package had multiple components, and no clear effect on future thinking, the clinical outcomes cannot be clearly attributed to future thinking. Blackwell et al. (2015) examined the effects of computer-assisted repeated positive mental imagery in adults with major depression. They did not find group differences in the vividness of positive future imagery, nor in depressive symptoms overall. However, exploratory analyses indicated there were changes in anhedonia, with high levels of vividness in mental imagery associated with changes in depressive symptoms. Hallford, Sharma, et al. (2020) reported on a randomized start-point case series trial in adults with MDD showing that brief future thinking activities through the

day can increase detail and imagery, as well as anticipatory pleasure. An earlier study combining components of training in past and future thinking in people with schizophrenia showed increases in future thinking specificity, although notably no effect on depressive symptoms (Blairy et al., 2008). The components of this training related to future thinking were repurposed and expanded in a subsequent study, again in people with schizophrenia (Chen et al., 2020). The aforementioned findings were replicated, with an increase in future thinking specificity, but no changes in self-reported depressive symptoms. Finally, recent studies in non-clinical samples have shown that using guided mental imagery for future events increases anticipatory pleasure, anticipated pleasure, and anticipated reward for those events (Hallford, Farrell, et al., 2020; Ji et al., 2021; Renner et al., 2019).

The Current Study

The current study was a pre-registered, randomized-controlled trial design that aimed to provide a comprehensive test of whether future thinking characteristics can be enhanced in people with MDD, and if this produces effects on anhedonia. People with a current depressive episode, and who also endorsed experiencing anhedonia as part of this diagnosis, were randomized to receive FEST or to a wait-list control group. In this evaluation, we assessed the variables that FEST sought to train, which included specificity, detail, and imagery of future events, as well as fluency in generating future events (i.e., how many events people could generate in a given time period). We also assessed whether training in future thinking specificity would have crossover effects onto the ability to retrieve specific autobiographical memories. In relation to anhedonia, we assessed whether people continued to meet the DSM-5 Major Depressive Episode (MDE) criterion for anhedonia (American Psychiatric Association, 2013) following FEST, as well as changes in trait measures of anticipatory pleasure and consummatory pleasure (i.e., experiencing in-the-moment pleasure), and reported state anticipated and anticipatory pleasure when generating personally-relevant future events. Broader clinical outcomes were also assessed in the form of how many people met criteria for an MDE, symptom severity, behavioural activation and global assessment of

functioning (GAF). The use of cognitive reappraisal was also assessed as an outcome measure. It was reasoned that, if there was improvement in future thinking, this may provide further psychological resources with which people could use to regulate their emotional states (e.g., to look forward to things, or imagine a future state that might evoke a difference and less negative emotional state). It was hypothesised that, relative to a control group, FEST would significantly enhance future thinking characteristics, have significant effects on anhedonia-related variables (lower rates of anhedonia, increased anticipatory, anticipated and consummatory pleasure), and have significant effects on clinical outcomes (higher remission, lower symptoms, higher behavioural activation and functioning).

Methods

The study was approved by the Deakin University Human Research Ethics Committee, and in accordance with the provisions of the World Medical Association Declaration of Helsinki. All methodology was pre-registered on 20/7/2020 with the Australian New Zealand Clinical Trials Registry (ACTRN12620000754943). Journal Article Reporting Standards for Quantitative Research in Psychology were followed (Appelbaum et al., 2018), as were CONSORT guidelines for randomized controlled experiments (Schulz et al., 2010□).

Study Design

A pre-registered online, randomized-controlled trial design was used with a two (condition: FEST vs. waitlist) x three (time-point: baseline, one-month, three-month follow-up) factorial-design. Participants were allocated using simple 1:1 randomization by computer. All outcome measures were administered at all time-points.

Future Event Specificity Training (FEST). The training program was group-based, conducted over videoconferencing software, and comprised two sessions, each of 90 minutes duration. A total of 14 groups were run, ranging in size from 3 to 8 participants. The sessions were conducted by two researchers, both with a bachelor's degree and honours in psychology, and one with experience delivering FEST in the initial validation study of FEST. They were supervised by

the first author, a registered clinical psychologist. The training was adapted for use in a clinical depression population from the previous manualised version used in a community sample (Hallford, Yeow, et al., 2020). Both manuals are open access and available online (<https://osf.io/mq6y3/>). The corresponding author of this study can be contacted for latest information on implementation.

The first session involved psychoeducation about future thinking and its functions, the interplay of depressive psychopathology and future thinking, and distinguishing between general and specific EFT. The facilitators provided examples of generating specific, detailed, and imagery-rich episodic future thoughts in response to cue words. Participants then practised this exercise using positively and neutrally-valenced cue words to generate future events that either would happen or could reasonably happen. They were asked to generate details relevant to the future event (e.g., sensorial and scene details, actions, people, thoughts, feelings etc.), using mental imagery and imagining events from a first-person perspective to increase the sense of pre-experiencing (D'Argembeau & van der Linden, 2012). The future thoughts that were generated were discussed in the group, with facilitators and other group members providing feedback. Once specific future thoughts were generated, participants were given more time to elaborate on them with further episodic detail. It was impressed upon participants that future thoughts need not necessarily involve a high-arousal type of positive emotion, like joy or excitement, but could also be low-arousal, like calmness or contentment. At the end of the session, participants were encouraged to complete a homework task over the next week consisting of practice cue words and providing a daily future thought of something that would or could happen the following day.

The second session commenced with a review of session one and of the homework task. Some further psychoeducation was provided on general and specific future thinking and prospective emotions and their function (with a focus on anticipated and anticipatory pleasure). Participants then practised generating two distinct episodic future thoughts to single cue words in order to improve divergent thinking in relation to future events. Throughout they were encouraged to focus on the emotions they expected to experience in those imagined future events. The participants were

encouraged to complete another homework task that was comparable to the first but required participants to generate two specific episodic future thoughts per word. The program finished with a discussion about how bringing future thinking under conscious control more often might be helpful in their lives, such as in planning, goal setting, and building motivation.

Participants and recruitment

Recruitment occurred from July 2020 to December 2020 via advertising on Facebook and ceased when the required sample size had been reached. The inclusion criteria, assessed through self-report, were: (i) 18-65 years of age; (ii) residing in Australia; (iii) English-speaking; (iv) current diagnosis of a Major Depressive Episode using the Electronic Psychological Assessment System (e-PASS, see below; Nguyen et al., 2015), and must meet the anhedonia criterion as indicated by endorsement of “more days than not” or “every day” on the anhedonia item (*Over the last TWO WEEKS or more, please indicate how often you felt much less interested in or much less able to enjoy most activities*); and (v) internet access on their laptop or desk computer. The exclusion criteria, also assessed through self-report, were neurodevelopmental disorders (intellectual disability or autism spectrum disorder specifically). No other mental health disorders were excluded. Participants were asked at each time-point whether they were receiving mental health support, and what type, but this was neither an inclusion nor exclusion criterion.

Measures

MDE Diagnosis. MDE diagnostic status was assessed using the Electronic Psychological Assessment System (e-PASS; Nguyen et al., 2015). The e-PASS is an online, self-report clinical assessment system with 11 questions corresponding to the frequency of MDE symptoms over the last two weeks concordant with the Diagnostic and Statistical Manual of Mental Health Disorders, 5th edition (American Psychiatric Association, 2013). Items are answered using a scale from 0 (*not at all*) to 4 (*every day*), with one item for severity using a scale from 0 (*no interference/distress*) to 8 (*extremely significant interference/distress*). In concordance with DSM criteria, an algorithm is used to score the e-PASS whereby if five symptoms occur either *more days than not* or *every day*, at least

one of these is mood or anhedonia, and participants score ≥ 3 for interference/distress they are categorized as experiencing an MDE. An e-PASS diagnosis corresponds well with the Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998; Nguyen et al., 2015). To assess this in the current study, participants who screened as eligible and could be contacted by phone were assessed for a current MDE using the MINI. In total, 207 of the 215 participants that were interviewed met criteria on the MINI. This concordance of 96.2% with the MINI for MDE diagnosis indicates the e-PASS has strong criterion validity in this sample as a diagnostic tool, which is also consistent with high concordance reported in a previous study in youth with MDD (91.9%; Hallford, Austin, Takano, Fuller-Tyszkiewicz, et al., 2021).

Future thinking characteristics. The Episodic Future Thinking Test (Hallford, Takano, et al., 2020) was used to assess the effects of FEST on future thinking characteristics of specificity, detail, and the use of mental imagery. Participants were presented with 10 cue words; five positively-valenced and five neutrally-valenced, in alternating order. For each cue word, participants were asked to describe an event or activity related to or inspired by the cue word that was either planned to happen, or hypothetically could happen, in their future. They were instructed that this was to be something specific that would occur in the space of one day, and something they would be personally involved in. No time limit was given. Participants were asked to provide as many details as possible and provide a different event/activity for each cue word. Two examples of specific EFTs were provided for the words *pleasure* and *table* on a separate webpage to the instructions. Three sets of cues were used in total to facilitate counterbalancing across the time-points. Twenty of these were taken from the original EFT-T word sets (see Hallford et al., 2019), and an additional 10 were added using the same method of balancing the frequency of word use, emotional valence, and intensity as in the original item selection. Two co-authors (D.R. & J.J.E.Y.) coded a subset of 15% (280 total) of cue word responses as either 1 (specific) or 0 (non-specific) while blinded to condition and inter-rater reliability was found to be acceptable (Cohen's kappa = .90). The remaining responses were coded by author (D.R.) while blinded to condition. Inspection

of the written responses indicated that they were sensical in nature, and there were no repeated responses. Omissions or expressed failures to generate future events to a cue word were marked as non-specific (e.g., “I couldn’t think of anything”). Scores were summed for each participant to generate an overall EFT specificity score, and the internal reliability was acceptable (MacDonald’s $w = .77$). After providing each future event, participants provided ratings of phenomenological characteristics on response scales from 1 (*Not at All*) to 9 (*Very Much So*), which were averaged across the future events. These assessed the perceived detail (“How vivid and detailed is your thought of this event/activity?”, $w = .71$), the use of mental imagery (“How much did you find yourself thinking in pictures/mental images about this activity?”, $w = .81$), perceived control (“How easy would it be to do this event/activity?”, $w = .86$), and perceived likelihood of occurrence (“How likely is it that this event/activity will happen?”, $w = .74$).

To assess the fluency of thinking of future events, the Future Thinking Task (FTT) was used (MacLeod et al., 1993). This FTT version required participants to think of positive future experiences, things they were looking forward to, in three time periods (next week, next year and next 5-10 years). The time periods were presented one at a time in that order. Participants had one minute on the web page to generate as many responses as possible. Two authors (D.R. & J.J.E.Y.) counted the number of valid future events in a subset of 33% of participants responses (169 items) while blinded to condition. Inter-rater reliability was found to be acceptable (intra-class correlation coefficient = .89), whereby author D.R. coded the remaining responses blind to condition. Previous studies looking at the different time periods have almost always found no differential effects relating to time periods (MacLeod et al., 1997). Therefore, the total number of responses given in each of the three time periods were averaged together (minus any repeated responses across time periods) providing final scores of future thinking fluency for positive events ($w = 0.77$).

Memory specificity was assessed using the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986). As per the traditional AMT instructions, a definition of a specific autobiographical memory was given along with some examples of specific memories. Ten cue

words were then presented: five positively and five negatively-valenced, one at a time, alternating in emotional valence. No time limit was given for responses. Three sets of cues were used for counterbalancing, taken from previous trials of computerized memory specificity training (c-MeST; Hallford, Austin, Takano, Fuller-Tyszkiewicz, et al., 2021). Two authors (D.R. & J.J.E.Y.) coded a subset of 15% (280 total) of responses from participants as either 1 (specific) or 0 (non-specific) while blinded to condition and inter-rater reliability was found to be acceptable (Cohen's kappa = .88). The number of specific responses at each time-point were summed (range 0 – 10). In the current study the internal reliability for specificity scores was acceptable (MacDonald's $\omega = .73$)

Anhedonia-Related Variables

The anhedonia criterion on the e-PASS was used to assess whether people were anhedonic (“Over the last two weeks or more, please indicate how often you felt much less interested in or much less able to enjoy most activities”) using a 4-point scale (1 = *Not at all*, 2 = *Some days*, 3 = *More days than not*, 4 = *Everyday*). Scores of 3 or 4 indicated clinically-significant anhedonia. All participants met this criterion at baseline as part of the inclusion criteria, and the proportions were calculated in each group for people still meeting this criterion at the one and three-month follow-ups.

To assess trait anticipatory and consummatory pleasure, the Temporal Experience of Pleasure Scales (TEPS; Gard et al., 2006) were used. The TEPS comprises 18 self-report items referring to pleasure in looking forward to future experiences (anticipatory pleasure) and in-the-moment pleasure of experiences (consummatory pleasure) using responses scales from 0 (*Very false for me*) to 6 (*Very true for me*). The two-factor structure of the TEPS has been validated for online use in populations with MDD (Hallford & Austin, 2021), and consistent with these findings one reverse-scored item from the anticipatory subscale was removed. The scores for items in each subscale were averaged to create an overall score. The internal reliability in the current study was acceptable (anticipatory pleasure: $\omega = .83$, consummatory pleasure: $\omega = .80$).

To assess state anticipatory and anticipated pleasure, two single-item response scales were

completed following the generation of each future event on the EFT-T, one referring to anticipatory pleasure (“How pleasurable/enjoyable is it to just think about doing this event/activity?”, $w = .75$) and the other to anticipated pleasure (“How pleasurable/enjoyable do you think it will be to do this event/activity?”, $w = .77$). Anticipatory and anticipated pleasure were assessed as distinct constructs given their conceptual differences (Baumgartner et al., 2008) and empirical distinction in their associations with behavioural intentions and phenomenological characteristics of EFT (Barsics et al., 2016; Baumgartner et al., 2008). The items were taken from previous studies examining prospective emotions in clinical (Hallford, Barry, et al., 2020; Hallford, Sharma, et al., 2020) and non-clinical samples (Hallford, Yeow, et al., 2020) where they have demonstrated convergent, divergent, and construct validity.

Clinical Variables

Depressive Symptoms. The Patient Health Questionnaire-9 (PHQ-9; Spitzer et al., 1999) was used to assess depressive symptom severity. The PHQ-9 consists of nine items corresponding to DSM-5 symptom criteria for an MDE. Rating scales from 0 (*Not at all*) to 3 (*Nearly every day*) indicate frequency of symptoms in the last two weeks and scores are summed to provide a total (range 0 – 27; MacDonald’s $w = .83$). The PHQ has previously demonstrated excellent validity and reliability (Kroenke et al., 2010).

Cognitive Reappraisal. Reported use of cognitive reappraisal, reinterpreting an emotion-eliciting situation in a way that alters its meaning, was assessed using this subscale from the psychometrically robust Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). Six self-report items are completed, using a 0 (*Strongly Disagree*) to 7 (*Strongly Agree*) scale and averaged for an overall score. Internal reliability in this study was good (MacDonald’s $w = .87$).

Behavioural Activation. The Behavioural Activation for Depression Scale (BADS; Kanter et al., 2007) was used to assess goal-directed behavioural activation and avoidance behaviours that are hypothesised to underlie depression. Participants respond to 25 items on a 0 (*Not at all*) to 6 (*Completely*) scale to indicate how the items describe their last week. The items relate to activation,

rumination/avoidance, work, school, and social functioning, and were averaged to create an overall activation score. The BADS is a psychometrically robust scale in depressed samples (Fuhr et al., 2016; Kanter et al., 2007). Internal reliability in this study was good (MacDonald's $w = .90$).

Global Assessment of Functioning (GAF). A self-report version of the Global Assessment of Functioning scale (Association, 1994) was used to assess psychological, social and occupational functioning. The self-report version has good to excellent agreement with ratings from global functioning in psychiatric samples from independent ratings through interview (Bodlund et al., 1994) and treating professionals (Ramirez et al., 2008). Participants use a slider to find a position on a scale from 0-100 that best describes their functioning over the last week, with each a description provided at each 10-point mark along the slider with content consistent with descriptors used in the interviewer rated GAF (e.g., 50-41: Serious symptoms [e.g., suicidal ideation, severe obsessions] OR any serious impairment in social, work, or school functioning [e.g., no friends, unable to keep a job]).

Participant perceptions and attitudes towards the training. A series of response scales rated from 1 to 7 were used to assess participants' perception and attitudes towards the future thinking training in terms of how easy they found it to understand, how helpful they thought it was, whether it was long enough, whether they would recommend it to others, and whether the facilitator feedback on future thinking was accurate and helpful. Responses indicating disagreement (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Somewhat Disagree*) were combined to form a disagreement index, and responses indicating agreement (5 = *Somewhat Agree*, 6 = *Agree*, and 7 = *Strongly Agree*) were combined to indicate an agreement index. A response of 4 indicated neither agreement nor disagreement.

Sample Size Calculation

The sample size was calculated under the following assumptions: (1) at least moderate to large group differences (Cohen's $d = .70$) between the FEST and control group on the primary outcome of anhedonia-related variables and future thinking characteristics, based on our FEST trial

(Hallford, Yeow, et al., 2020); (2) power set at .80; and (3) alpha set at .05 (two-tailed). Based on these parameters, G*Power version 3.1 (Faul et al., 2007) indicated that at least 35 participants would be needed in each group. Given participants were recruited online, and this is known to be associated with high dropout rates (Melville et al., 2010), we aimed to substantially oversample at baseline.

Data Analysis Plan

Author M.F. conducted the main analyses while blind to participants' group allocation and the study's aims and hypotheses. The analyses followed the principles of intention-to-treat (ITT), with individuals retained in the group they were randomized to. Full information maximum likelihood estimation was used, meaning that all available, fully completed measures at each time-point were used to estimate inferential statistics. In cases where measures were partially complete the following rules were used: 1) When more than 50% of a participant's responses to a measure was missing, that measure was omitted for that participant at that time-point.; 2) Where less than 50% of items from a measure were incomplete, expectation maximisation was used on the individual item level to replace missing responses. Pre-processing was conducted in IBM SPSS 26.0 (IBM Corp., 2019). Main analyses were conducted in Mplus Version 8.3 (Muthén & Muthén, 2017). To assess group differences in the proportion of people who met the anhedonia criterion and MDE diagnosis on the e-PASS, chi-square tests were used. Group differences for continuous variables at follow-up time-points were tested with linear mixed effects models, with main effects for time (dummy coded at each follow-up time-point relative to baseline) and group (intervention vs control), random effects for time as dummy variables clustered within individuals, and time x group interactions to assess hypotheses about changes based on group. An unstructured variance-covariance matrix was used for random effects, and no issues of non-convergence due to high correlation among the random effects were observed. Mediation analyses were conducted using the PROCESS macro (Bolin, 2014). To assess whether changes in future thinking characteristics mediated the effect of FEST on meeting the anhedonia criterion, a series of logistic regression

mediation models were conducted. The model used group allocation as the IV (FEST coded as 1 and the control group coded as 0), residualized change scores of the future thinking characteristic as the mediator, and the dichotomous variable of meeting criteria for anhedonia on the e-PASS as the DV (meeting criteria for anhedonia coded as 1 and not meeting anhedonia criteria as 0). Mediation effects were calculated using percentile bootstrap 95% confidence intervals with 5000 samples, whereby intervals that did not cross over zero indicated significant effects at the $p < .05$ level.

Figure 1 shows the proposed mediation model.

Procedure

Participants completed the informed consent and screening questions online and were followed up with a phone call during which the MINI was administered. They were then randomized to a group and provided with a link to complete the baseline survey. All surveys were completed online, and the presentation of the EFT-T, AMT, and FTT was randomized for each participant at each time-point to mitigate against order effects. If allocated to the FEST group, participants commenced within a week of completing the baseline survey and completed the two sessions spaced one week apart. They were sent links to the one and three-month follow-ups. Those in the control group were invited to complete the one and three-month follow-ups at the corresponding time-points following completion of the baseline survey. Email reminders and follow-up phone calls were used to encourage completion of follow-ups. Ongoing involvement in the study was at the participant's discretion and no compensation was offered. FEST was offered to participants in the control group following cessation of the study.

Results

Participant flow and characteristics

In total, 1,549 individuals attempted screening for the study. Of these, 1372 were excluded as ineligible or could not be followed up, and 177 in total were randomized to a group and provided some baseline data (see Figure 2 for CONSORT flowchart). Table 1 shows the demographic characteristics. The average age of participants was early to mid 40s and most were female. The

groups did not significantly differ on demographic characteristics. To assess potential baseline factors that might have affected whether participants dropped out by the three-month follow-up, and whether this differed between groups, a series of factorial ANOVAs (group by dropout) were conducted. Participants who dropped out had higher mean depressive symptoms at baseline than completers ($M = 20.2$ vs. 18.6 , $F[1,169] = 5.2$, $p = .024$, partial eta squared = 0.03), however, this did not differ by group as indicated by a non-significant interaction effect ($F[1, 169] = 0.5$, $p = .468$, partial eta squared < 0.01). There were no differences in the characteristics of those who dropped out by three-months, or interactions with groups, on baseline future thinking characteristics or demographic variables (all $ps > .05$). However, those that were receiving some kind of mental health support at baseline were more likely to stay in the study until the three-month follow-up (89% vs. 75.5% , $F[1,173] = 8.3$, $p = .004$, partial eta squared = 0.046), with no interaction with group ($F[1, 173] = 1.4$, $p = .230$, partial eta squared < 0.01).

At baseline, most participants were receiving some form of mental health support (82.5%) with no difference between groups in these proportions ($\chi^2[1] = 1.7$, $p = .193$). Most participants were receiving psychological therapy or counselling (78.9%) with no significant difference between the groups, ($\chi^2[1] = 0.03$, $p = .850$), and more than half were on antidepressant treatment (63.8%), again with no difference between the groups, ($\chi^2[1] = 1.0$, $p = .314$). Smaller proportions of participants reported taking other medications for mental health such as quetiapine or benzodiazepines (30.9%), engaging in group therapy (10.5%), or had “other” supports (13.6%), with no group differences, all ($\chi^2[1] < 0.7$, $ps > .409$). At the three-month follow-up, these proportions were similar, with 85.7% receiving some form of support with no difference between groups ($\chi^2[1] = 1.9$, $p = .163$), and no other differences between specific forms of support being received (all $\chi^2[1] < 2.7$, $p > .103$): psychological therapy or counselling (74.4%), antidepressants (61.5%), other medications for mental health (26.9%), group therapy (6.4%), or “other” supports (15.4%).

Outcomes

Future thinking characteristics. As indicated in Table 2, EFT specificity, detail, and imagery was significantly higher in the FEST group at both follow-ups, with moderate to large effect sizes. Future thinking fluency trended towards an effect for higher scores in the FEST group at one and three-month follow-up. At the three-month follow-up, the scores indicated non-trivial effects in favour of the FEST group that marginally missed statistical significance. Those in the FEST group also reported a stronger sense of perceived control over positive future events and likelihood that they could happen, with moderate to large effects at both follow-ups, relative to the control group. For memory specificity, the results indicated moderate sized group differences, in favour of the FEST group, that trended towards statistical significance.

Anhedonia-related Variables. At the one-month follow-up, there were significantly fewer participants in the FEST group that met criteria for anhedonia relative to the control group (35.4% vs. 62.7%, 17/48 vs 37/59 participants), $\chi^2[1] = 7.8, p = .005$. At the three-month follow-up these proportions were almost identical, with the findings again indicating there were fewer participants in the FEST group that met criteria for anhedonia relative to the control group (35.1% vs 61.1%, 13/37 vs. 33/54 participants), $\chi^2[1] = 5.9, p = .015$.

As indicated in Table 3, for state anticipatory and anticipated pleasure, assessed through ratings of self-generated future events, small but non-significant differences favouring the FEST group were observed at one-month. At the three-month follow-up there were moderate to large group differences indicating higher anticipatory and anticipated pleasure in the FEST group. For trait anticipatory pleasure, participants in the FEST group reported significantly higher scores at the one-month follow-up, but these were marginally non-significant at the three-month follow-up. For trait consummatory pleasure, moderate to large significant group differences favouring the FEST group were observed at one and three-month follow-ups.

Clinical outcomes. At the one-month follow-up, there were fewer participants in the FEST group that met criteria for MDD relative to the control group, but this was not statistically significant (40.4% vs. 50.8%, 19/47 vs 30/59 participants), $\chi^2(1) = 1.1, p = .285$. However, at the

three-month follow-up there were significantly fewer participants in the FEST group that met criteria for MDD relative to the control group (37.8% vs 64.8%, 14/37 vs. 35/54 participants), $\chi^2(1) = 6.4, p = .011$. As indicated in Table 4, for depressive symptoms there were small to moderate group differences indicating lower symptoms in the FEST group, which were non-significant at the one-month follow-up and became statistically significant at the three-month follow-up. To further characterise these changes, a reliable change index was calculated as a change of 5.37 points on the PHQ using the full sample baseline standard deviation of 4.70 and internal reliability of the depression scale (0.83) (Christensen & Mendoza, 1986; Jacobson & Truax, 1991). Using this index, in the FEST group 48.6% of participants reliably decreased in symptoms by the three-month follow-up, while 51.4% did not reliably change and 0% increased. In the control group only 28.3% reliably decreased, 64.1% did not reliably change and 7.6% increased. No group differences were found for cognitive reappraisal at either time-point, although the group differences favouring FEST were small to moderate, and therefore non-trivial, at the three-month time-point. On the measures of functioning, participants indicated moderate to large differences on behavioural activation and global functioning at the one-month and three-month follow-ups, indicative of improved functioning following the intervention.

Mediation Analyses

A total of six models were conducted, assessing whether changes from baseline to three-month follow-up for future thinking specificity, detail, imagery, fluency, perceived control, and perceived likelihood mediated the effect of group on the e-PASS anhedonia criterion. For models assessing changes in specificity, imagery, and fluency, the direct and indirect effects were in the expected direction, but confidence intervals for the indirect effects crossed over zero and therefore were considered non-significant (see Supplementary Materials for non-significant mediation models). For future thinking detail, perceived control, and perceived likelihood, all pathways were in the expected direction and there were significant indirect effects, indicating that FEST predicted a lower likelihood of meeting the anhedonia criteria at three-month follow-up through changes over

time in ratings of detail in future thinking, perceived control over future events, and the perceived likelihood that future events would occur. Figure 3 shows the mediation models and results of bootstrapped regression analyses. An exploratory parallel mediation model was then conducted including detail, perceived control, and perceived likelihood as mediators. Bootstrapped estimates indicated there was no direct effect from group to anhedonia ($b = -0.34$ [SE = 0.64], 95%CI -1.65, 0.93), there was an independent indirect effect through perceived control ($b = -0.82$ [SE = 0.41], 95%CI -1.795, -0.16), but not through detail ($b = -0.11$ [SE = 0.35], 95%CI -0.82, 0.58) or perceived likelihood ($b = -0.25$ [SE = 0.40], 95%CI -1.02, 0.58).

FEST Participant Evaluation

Fifty people in the FEST group completed the evaluation questions at the one-month follow-up. Almost all participants agreed the intervention was easy to understand (92.2% agreed, 5.9% disagreed, 1.9% unsure). The vast majority reported it was helpful (74.5% agreed, 13.7% disagreed, 11.8% unsure), found the feedback from facilitators accurate and helpful (80.4% agreed, 3.9% disagreed, 15.7% unsure) and would recommend it to other people (72.5% agreed, 9.8% disagreed, 17.6% unsure). Only half of participants thought it was long enough (51% agreed, 31.4% disagreed, 17.6% unsure).

Discussion

This randomised controlled study evaluated the effects of a training in future thinking program (FEST) in a sample of people meeting criteria for a depressive episode (MDE). At follow-up, participants in the FEST group, relative to the control group, reported higher specificity, detail, mental imagery, perceived control and likelihood of occurrence for future events, and there was evidence of a trend for improved fluency in future thinking. People in the FEST group were less likely to meet the anhedonia criterion at follow-up. Evidence for other changes on anhedonia-related measures were also observed, including increased anticipatory and anticipated pleasure when generating personally-relevant future events, higher trait consummatory pleasure, and clear trend for higher trait anticipatory pleasure. Broader clinical effects were also noted at the three-

month follow-up, including fewer people in the FEST group meeting criteria for a depressive episode, lower symptom severity, increased behavioural activation, and improved global functioning.

Impairments in characteristics of future thinking in major depression, such as specificity, detail, mental imagery, and fluency have been well documented now (Gamble et al., 2019; Hallford et al., 2018; Holmes et al., 2016; MacLeod et al., 1997; MacLeod & Salaminiou, 2001; Morina et al., 2011) however, few studies to date have examined specific effects of concerted training on this thought process, and fewer have examined how these effects might disrupt depressive pathology. This study extends on preliminary findings of the efficacy of FEST in a community sample (Hallford, Yeow, et al., 2020) to show that several aspects of future thinking can be trained and improved among people meeting criteria for an MDE. The effects on memory specificity were meaningful in size, but only approached, rather than reached, statistical significance. This suggests that training in future thinking may produce transfer effects onto memory specificity, but these effects may be smaller than on future specificity and a higher “dose” of training might be needed to observe statistically significant changes.

Central to the purpose of FEST, less people met criteria for anhedonia at follow-up relative to the control group. In addition, there were changes on a trait measure of consummatory pleasure, and effects on anticipated pleasure and predictions of pleasure (affective forecasting) of future events. Therefore, FEST caused participants to perceive future events as more pleasurable, and to experience stronger positive affect when thinking about them. These findings provide evidence that targeting the autobiographical processes of future thinking can reduce anhedonia pathology that contributes to poorer wellbeing in depression (Ducasse et al., 2018; Vinckier et al., 2017). Crucially then, there was evidence for the proposed mechanism of effect, with changes in future thinking detail, perceived control, and perceived likelihood of events mediating reductions in anhedonia at follow-up. Previous studies suggest that improvements in the perceived control and likelihood of personally-relevant future events might be particularly important in affecting depressive pathology,

given they relate to information about self-efficacy and plausibility that might be used to appraise whether or not someone will actually engage in a behaviour (Armitage & Conner, 2001; Brown et al., 2002). The parallel mediation model provided strongest support for perceived control and its indirect effects on anhedonia. Although pathways for other future thinking characteristics in this parallel mediation model, and single mediation tests of specificity, imagery, and verbal fluency, were in the expected directions, they did not reach statistical significance. This may be due to there being relatively smaller changes on these characteristics, relative to those that were significant mediators. It is important to acknowledge that there was limited statistical power in these analyses to detect significant indirect effect sizes. The current findings suggest that future studies with larger samples or methods of generating larger effects, such as increasing the length of training, may find that other characteristics of future thinking also mediate effects on anhedonia.

Turning to other clinical variables, the remission rate in FEST was substantially higher than the control group. Around 65% of people in the FEST group no longer met criteria for an MDE compared to 35% in the control group, the latter of which is consistent with average remission rates in care-as-usual control groups (Cuijpers et al., 2014). Relatedly, reductions in symptom severity were also larger in the FEST group. The effects observed on behavioural activation and the global functioning measure complement these findings and show that people in the FEST group were reporting clinically-meaningful improvements in goal-directed behaviour and psychological, social and occupational functioning at follow-up.

The participants reported finding FEST to be easy to understand and helpful and would recommend it to others. Around half of the participants did not agree that it was long enough. Given that FEST had previously been validated in a community sample (Hallford, Yeow, et al., 2020), the same short two-session format was retained for this study. However, it seems that at least some participants may be receptive to additional sessions, which may help to strengthen the effects on future thinking variables, and potentially produce more mediated effects on the remission of anhedonia also.

Limitations and Future Directions

This study provides evidence for the efficacy of FEST in the context of MDD among adults who meet the anhedonia criterion. One important step forward for this research, and other studies that target autobiographical thinking as a means of improving mental health, are comparator groups that can control for so-called common factors or certain generalizable processes. In the case of FEST, this might be autobiographical thinking relating to the recent present or past. Although the current study showed evidence for specific mechanisms of change of FEST through mediation effects, it is important to further distinguish this from other factors that might not be specific. Recent research examining future thinking in delay discounting has adopted such comparator groups (O'Donnell et al., 2017; Stein et al., 2016; Sze et al., 2017), albeit in controlled laboratory experiments or short-term studies in which the generalizability to a clinical context is not clear. Another important consideration is whether this training in voluntary, effortful future thinking would have effects on characteristics of involuntary, spontaneous future thinking. If, as suggested by Cole and Kvavilashvili (2021), spontaneous, future thoughts are “pre-made” or iterations of previously constructed future events, then improvements in purposeful future thinking might be expected to also affect spontaneous, involuntary future thinking. That being said, research indicates that the same impairments in deliberate future thinking characteristics, such as in specificity or vividness, may not be observed in spontaneous future thinking in depression (Ji et al., 2019; Watson et al., 2013).

Despite the overall positive evaluation of FEST, there were many dropouts from baseline to follow-ups, although notably this is common in online interventions (Melville et al., 2010). Dropout was higher among those with more severe symptoms, although this did not differ across the groups, and participants that remained in the study were still on average high in symptom severity. Co-morbid disorders were not assessed in the current study, and it may be that this moderates the effects of FEST on future thinking and anhedonia. Indeed, future thinking is impaired in other disorders (Hallford et al., 2018), and anhedonia is not limited to depression (American Psychiatric

Association, 2013; Hallford & Sharma, 2019). Although these limitations affect how the findings may be generalized, they could be broadly applicable to people that meet criteria for MDD and anhedonia. Although many participants reported receiving mental health support, we did not verify this beyond self-report. The longevity of the observed effects is unknown past the three-month follow-up, and research could investigate if these effects are maintained over time.

Training in future thinking may have benefits for people with other mental health issues; particularly where there are issues with anhedonia and positive affect in general. FEST, or other future thinking training programs, might be examined as an adjunct to evidence-based behavioural activation treatment (Ekers et al., 2014) or integrated as a specific focus of the treatment prior to, or concurrent with, activity scheduling. Another option could be to add sessions to FEST that specifically support people to generate personal (values-based) goals or rewarding activities and engage in future thinking for simulating the process and outcome of these behaviours. Similar interventions targeting autobiographical thinking, namely Memory Specificity Training, have recently been computerized and automatized in an easily accessible online form (i.e., c-MeST; Takano et al., 2017). Two clinical trials have now shown that c-MeST can reduce depressive symptoms in those with an MDE (Hallford, Austin, Takano, Fuller-Tyszkiewicz, et al., 2021; Hallford, Austin, Takano, Yeow, et al., 2021), and this format may be one option for FEST in the future also. As discussed above, residual anhedonia is a risk factor in the relapse of an MDE (McMakin et al., 2012; Uher et al., 2012), and therefore examining the value of FEST as a relapse prevention approach in people with this risk profile may be worthwhile.

In conclusion, training in future thinking among people with a current MDE and meeting the anhedonia criteria can enhance subjective and objectively related aspects of future thinking. The training also has effects in reducing anhedonia, which appear to be mediated by at least some of the changes in future thinking characteristics. Further, broader clinical effects can be observed, including in remission rates, symptoms, and psychosocial functioning. Targeting future thinking appears to be a mechanism through which to disrupt depressive pathology.

Authorship

D.J.H developed the initial study concept and oversaw the study. D.J.H., D.W., F.R. and A.D. contributed to the study design. Recruitment, training, and data collection were performed by D.R. and J.J.E.Y. M.F.-T. performed the main data analysis. D.J.H. drafted the paper with all authors providing revisions. All authors approved the final version of the paper for submission.

Funding statement

This research was funded through an Alfred Deakin Postdoctoral Research Fellowship.

Conflict of Interest

The author(s) have no conflicts of interest to declare.

References

- American Psychiatric Association. (2013). American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders Fifth Edition. In *Arlington*.
- Appelbaum, M., Cooper, H., Kline, R. B., Mayo-Wilson, E., Nezu, A. M., & Rao, S. M. (2018). Journal article reporting standards for quantitative research in psychology: The APA publications and Communications Board task force report. *American Psychologist*, 73(1). <https://doi.org/10.1037/amp0000191>
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40(4). <https://doi.org/10.1348/014466601164939>
- Association, A. P. (1994). Diagnostic and statistical manual IV. *Washington DC: American Psychiatric ...*, 1998.
- Barry, T. J., Hallford, D. J., & Takano, K. (2021). Autobiographical Memory Impairments as a Transdiagnostic Feature of Mental Illness: A meta-analytic review of investigations into autobiographical memory specificity and overgenerality amongst people with psychiatric diagnoses. *Psychological Bulletin*.
- Barry, T. J., Sze, W. Y., & Raes, F. (2019). A meta-analysis and systematic review of Memory Specificity Training (MeST) in the treatment of emotional disorders. *Behaviour Research and Therapy*, 116. <https://doi.org/10.1016/j.brat.2019.02.001>
- Barsics, C., van der Linden, M., & D'Argembeau, A. (2016). Frequency, characteristics, and perceived functions of emotional future thinking in daily life. *Quarterly Journal of Experimental Psychology*, 69(2). <https://doi.org/10.1080/17470218.2015.1051560>
- Baumgartner, H., Pieters, R., & Bagozzi, R. P. (2008). Future-oriented emotions: Conceptualization and behavioral effects. *European Journal of Social Psychology*, 38(4). <https://doi.org/10.1002/ejsp.467>
- Blackwell, S. E., Browning, M., Mathews, A., Pictet, A., Welch, J., Davies, J., Watson, P., Geddes, J. R., & Holmes, E. A. (2015). Positive imagery-based cognitive bias modification as a web-

- based treatment tool for depressed adults: A randomized controlled trial. *Clinical Psychological Science*, 3(1). <https://doi.org/10.1177/2167702614560746>
- Blairy, S., Neumann, A., Nutthals, F., Pierret, L., Collet, D., & Philippot, P. (2008). Improvements in autobiographical memory in schizophrenia patients after a cognitive intervention: A preliminary study. *Psychopathology*, 41(6). <https://doi.org/10.1159/000155217>
- Bodlund, O., Kullgren, G., Ekselius, L., Lindström, E., & von Knorring, L. (1994). Axis V—Global Assessment of Functioning Scale: Evaluation of a self-report version. *Acta Psychiatrica Scandinavica*, 90(5). <https://doi.org/10.1111/j.1600-0447.1994.tb01604.x>
- Bolin, J. H. (2014). Hayes, Andrew F. (2013). Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. New York, NY: The Guilford Press. *Journal of Educational Measurement*, 51(3). <https://doi.org/10.1111/jedm.12050>
- Brown, G. P., MacLeod, A. K., Tata, P., & Goddard, L. (2002). Worry and the simulation of future outcomes. *Anxiety, Stress and Coping*, 15(1). <https://doi.org/10.1080/10615800290007254>
- Chen, G. fang, Luo, H. yue, Wu, G., Zhou, C., Wang, K., Feng, K., Xiao, Z. wen, Huang, J. jing, Gan, J. chun, Zhao, P., Liu, P. Z., & Wang, Y. (2020). Improving Mental Time Travel in Schizophrenia: Do Remembering the Past and Imagining the Future Make a Difference? *Cognitive Therapy and Research*, 44(5). <https://doi.org/10.1007/s10608-020-10083-7>
- Christensen, L., & Mendoza, J. L. (1986). A method of assessing change in a single subject: An alteration of the RC index. In *Behavior Therapy* (Vol. 17, Issue 3). [https://doi.org/10.1016/S0005-7894\(86\)80060-0](https://doi.org/10.1016/S0005-7894(86)80060-0)
- Cole, S., & Kvavilashvili, L. (2021). Spontaneous and deliberate future thinking: a dual process account. In *Psychological Research* (Vol. 85, Issue 2). <https://doi.org/10.1007/s00426-019-01262-7>
- Cuijpers, P., Karyotaki, E., Eckshtain, D., Ng, M. Y., Corteselli, K. A., Noma, H., Quero, S., & Weisz, J. R. (2020). Psychotherapy for Depression across Different Age Groups: A Systematic Review and Meta-analysis. In *JAMA Psychiatry* (Vol. 77, Issue 7).

<https://doi.org/10.1001/jamapsychiatry.2020.0164>

Cuijpers, P., Karyotaki, E., Weitz, E., Andersson, G., Hollon, S. D., & van Straten, A. (2014). The effects of psychotherapies for major depression in adults on remission, recovery and improvement: A meta-analysis. In *Journal of Affective Disorders* (Vol. 159).

<https://doi.org/10.1016/j.jad.2014.02.026>

Cuijpers, P., Stringaris, A., & Wolpert, M. (2020). Treatment outcomes for depression: challenges and opportunities. In *The Lancet Psychiatry* (Vol. 7, Issue 11). [https://doi.org/10.1016/S2215-0366\(20\)30036-5](https://doi.org/10.1016/S2215-0366(20)30036-5)

D'Argembeau, A., & van der Linden, M. (2012). Predicting the phenomenology of episodic future thoughts. *Consciousness and Cognition*, 21(3). <https://doi.org/10.1016/j.concog.2012.05.004>

Ducasse, D., Loas, G., Dassa, D., Gramaglia, C., Zeppegno, P., Guillaume, S., Oli, E., & Courtet, P. (2018). Anhedonia is associated with suicidal ideation independently of depression: A meta-analysis. *Depression and Anxiety*, 35(5). <https://doi.org/10.1002/da.22709>

Dunn, B. D., German, R. E., Khazanov, G., Xu, C., Hollon, S. D., & DeRubeis, R. J. (2020). Changes in Positive and Negative Affect During Pharmacological Treatment and Cognitive Therapy for Major Depressive Disorder: A Secondary Analysis of Two Randomized Controlled Trials. *Clinical Psychological Science*, 8(1).

<https://doi.org/10.1177/2167702619863427>

Ekers, D., Webster, L., van Straten, A., Cuijpers, P., Richards, D., & Gilbody, S. (2014). Behavioural activation for depression; An update of meta-analysis of effectiveness and subgroup analysis. *PLoS ONE*, 9(6). <https://doi.org/10.1371/journal.pone.0100100>

Engel, M., Fritzsche, A., & Lincoln, T. M. (2013). Anticipatory pleasure and approach motivation in schizophrenia-like negative symptoms. *Psychiatry Research*, 210(2).

<https://doi.org/10.1016/j.psychres.2013.07.025>

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3.1 manual. *Behavioral Research Methods*, 39(2).

- Fuhr, K., Hautzinger, M., Krisch, K., Berking, M., & Ebert, D. D. (2016). Validation of the Behavioral Activation for Depression Scale (BADs) - Psychometric properties of the long and short form. *Comprehensive Psychiatry*, 66. <https://doi.org/10.1016/j.comppsy.2016.02.004>
- Gamble, B., Moreau, D., Tippet, L. J., & Addis, D. R. (2019). Specificity of Future Thinking in Depression: A Meta-Analysis. *Perspectives on Psychological Science*, 14(5). <https://doi.org/10.1177/1745691619851784>
- Gard, D. E., Gard, M. G., Kring, A. M., & John, O. P. (2006). Anticipatory and consummatory components of the experience of pleasure: A scale development study. *Journal of Research in Personality*, 40(6). <https://doi.org/10.1016/j.jrp.2005.11.001>
- Gross, J. J., & John, O. P. (2003). Individual Differences in Two Emotion Regulation Processes: Implications for Affect, Relationships, and Well-Being. *Journal of Personality and Social Psychology*, 85(2). <https://doi.org/10.1037/0022-3514.85.2.348>
- Hallford, D. J., & Austin, D. W. (2021). Wanting and Liking: Testing the Factor Structure of The Temporal Experience of Pleasure Scale in Major Depression and Community Samples. *Assessment*. <https://doi.org/10.1177/1073191121998767>
- Hallford, D. J., Austin, D. W., Takano, K., Fuller-Tyszkiewicz, M., & Raes, F. (2021). Computerized Memory Specificity Training (c-MeST) for major depression: A randomised controlled trial. *Behaviour Research and Therapy*, 136. <https://doi.org/10.1016/j.brat.2020.103783>
- Hallford, D. J., Austin, D. W., Takano, K., & Raes, F. (2018). Psychopathology and episodic future thinking: A systematic review and meta-analysis of specificity and episodic detail. *Behaviour Research and Therapy*, 102. <https://doi.org/10.1016/j.brat.2018.01.003>
- Hallford, D. J., Austin, D. W., Takano, K., Yeow, J. J., Rusanov, D., Fuller-Tyszkiewicz, M., & Raes, F. (2021). Improving Usual Care Outcomes in Major Depression in Youth by Targeting Memory Specificity: A Randomized Controlled Trial of Adjunct Computerised Memory Specificity Training (c-MeST). In *Preprint*.

- Hallford, D. J., Barry, T. J., Austin, D. W., Raes, F., Takano, K., & Klein, B. (2020). Impairments in episodic future thinking for positive events and anticipatory pleasure in major depression. *Journal of Affective Disorders*, 260. <https://doi.org/10.1016/j.jad.2019.09.039>
- Hallford, D. J., Farrell, H., & Lynch, E. (2020). Increasing Anticipated and Anticipatory Pleasure Through Episodic Thinking. *Emotion*. <https://doi.org/10.1037/emo0000765>
- Hallford, D. J., & Sharma, M. K. (2019). Anticipatory pleasure for future experiences in schizophrenia spectrum disorders and major depression: A systematic review and meta-analysis. *British Journal of Clinical Psychology*, 58(4). <https://doi.org/10.1111/bjc.12218>
- Hallford, D. J., Sharma, M. K., & Austin, D. W. (2020). Increasing Anticipatory Pleasure in Major Depression through Enhancing Episodic Future Thinking: a Randomized Single-Case Series Trial. *Journal of Psychopathology and Behavioral Assessment*, 42(4). <https://doi.org/10.1007/s10862-020-09820-9>
- Hallford, D. J., Takano, K., Raes, F., & Austin, D. W. (2020). Psychometric Evaluation of an Episodic Future Thinking Variant of the Autobiographical Memory Test - Episodic Future Thinking-Test (EFT-T). *European Journal of Psychological Assessment*, 36(4). <https://doi.org/10.1027/1015-5759/a000536>
- Hallford, D. J., Yeow, J. J. E., Fountas, G., Herrick, C. A., Raes, F., & D'Argembeau, A. (2020). Changing the future: An initial test of Future Specificity Training (FeST). *Behaviour Research and Therapy*, 131. <https://doi.org/10.1016/j.brat.2020.103638>
- Holmes, E. A., Blackwell, S. E., Burnett Heyes, S., Renner, F., & Raes, F. (2016). Mental Imagery in Depression: Phenomenology, Potential Mechanisms, and Treatment Implications. *Annual Review of Clinical Psychology*, 12. <https://doi.org/10.1146/annurev-clinpsy-021815-092925>
- Holmes, E. A., Ghaderi, A., Harmer, C. J., Ramchandani, P. G., Cuijpers, P., Morrison, A. P., Roiser, J. P., Bockting, C. L. H., O'Connor, R. C., Shafran, R., Moulds, M. L., & Craske, M. G. (2018). The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. In *The Lancet Psychiatry* (Vol. 5, Issue 3). <https://doi.org/10.1016/S2215->

0366(17)30513-8

IBM Corp. (2019). IBM SPSS Statistics for Windows, Version 26.0. In 2019.

Jacobson, N. S., & Truax, P. (1991). Clinical Significance: A Statistical Approach to Defining Meaningful Change in Psychotherapy Research. *Journal of Consulting and Clinical Psychology*, 59(1). <https://doi.org/10.1037/0022-006X.59.1.12>

Ji, J. L., Geiles, D., & Saulsman, L. M. (2021). Mental imagery-based episodic simulation amplifies motivation and behavioural engagement in planned reward activities. *Behaviour Research and Therapy*, 145. <https://doi.org/10.1016/j.brat.2021.103947>

Ji, J. L., Holmes, E. A., MacLeod, C., & Murphy, F. C. (2019). Spontaneous cognition in dysphoria: reduced positive bias in imagining the future. *Psychological Research*, 83(4). <https://doi.org/10.1007/s00426-018-1071-y>

Kahneman, D., & Tversky, A. (2013). The simulation heuristic. In *Judgment under Uncertainty*. <https://doi.org/10.1017/cbo9780511809477.015>

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

Kessler, R. C. (2012). The Cost of Depression NIH Public Access. *Psychiatric Clinics of North America*, 35(1).

Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2010). The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: A systematic review. *General Hospital Psychiatry*, 32(4). <https://doi.org/10.1016/j.genhosppsych.2010.03.006>

Lang, T. J., Blackwell, S. E., Harmer, C. J., Davison, P., & Holmes, E. A. (2012). Cognitive Bias Modification Using Mental Imagery for Depression: Developing a Novel Computerized Intervention to Change Negative Thinking Styles. *European Journal of Personality*, 26(2). <https://doi.org/10.1002/per.855>

- Levkovitz, Y., Tedeschini, E., & Papakostas, G. I. (2011). Efficacy of antidepressants for dysthymia: A meta-analysis of placebo-controlled randomized trials. *Journal of Clinical Psychiatry*, 72(4). <https://doi.org/10.4088/JCP.09m05949blu>
- MacLeod, A. K., Rose, G. S., & Williams, J. M. G. (1993). Components of hopelessness about the future in parasuicide. *Cognitive Therapy and Research*, 17(5). <https://doi.org/10.1007/BF01173056>
- MacLeod, A. K., & Salaminiou, E. (2001). Reduced positive future-thinking in depression: Cognitive and affective factors. *Cognition and Emotion*, 15(1). <https://doi.org/10.1080/02699930125776>
- MacLeod, A. K., Tata, P., Kentish, J., & Jacobsen, H. (1997). Retrospective and Prospective Cognitions in Anxiety and Depression. *Cognition and Emotion*, 11(4). <https://doi.org/10.1080/026999397379881>
- MacLeod, A. K., Tata, P., Tyrer, P., Schmidt, U., Davidson, K., Thompson, S., Airlie, J., Baxter, S., Byford, S., Byrne, G., Cameron, S., Caplan, R., Catalan, J., Cooper, S., Ferguson, C., Kim, L., Freeman, C., Frost, S., Godley, J., ... Wessely, S. (2005). Hopelessness and positive and negative future thinking in parasuicide. *British Journal of Clinical Psychology*, 44(4). <https://doi.org/10.1348/014466505X35704>
- McMakin, D. L., Olino, T. M., Porta, G., Dietz, L. J., Emslie, G., Clarke, G., Wagner, K. D., Asarnow, J. R., Ryan, N. D., Birmaher, B., Shamseddeen, W., Mayes, T., Kennard, B., Spirito, A., Keller, M., Lynch, F. L., Dickerson, J. F., & Brent, D. A. (2012). Anhedonia predicts poorer recovery among youth with selective serotonin reuptake inhibitor treatment-resistant depression. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51(4). <https://doi.org/10.1016/j.jaac.2012.01.011>
- Melville, K. M., Casey, L. M., & Kavanagh, D. J. (2010). Dropout from internet-based treatment for psychological disorders. *British Journal of Clinical Psychology*, 49(4). <https://doi.org/10.1348/014466509X472138>

- Morina, N., Deeprose, C., Pusowski, C., Schmid, M., & Holmes, E. A. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of Anxiety Disorders*, 25(8). <https://doi.org/10.1016/j.janxdis.2011.06.012>
- Muthén, L. K., & Muthén, B. O. (2017). Mplus User's Guide. Eighth Edition. *Los Angeles, CA: Muthén & Muthén.*
- Nguyen, D. P., Klein, B., Meyer, D., Austin, D. W., & Abbott, J. A. M. (2015). The diagnostic validity and reliability of an internet-based clinical assessment program for mental disorders. *Journal of Medical Internet Research*, 17(9). <https://doi.org/10.2196/jmir.4195>
- O'Connor, R. C., Connery, H., & Cheyne, W. M. (2000). Hopelessness: The role of depression, future directed thinking and cognitive vulnerability. *Psychology, Health and Medicine*, 5(2). <https://doi.org/10.1080/713690188>
- O'Donnell, S., Oluyomi Daniel, T., & Epstein, L. H. (2017). Does goal relevant episodic future thinking amplify the effect on delay discounting? *Consciousness and Cognition*, 51. <https://doi.org/10.1016/j.concog.2017.02.014>
- Pile, V., Smith, P., Leamy, M., Oliver, A., Bennett, E., Blackwell, S. E., Meiser-Stedman, R., Stringer, D., Dunn, B. D., Holmes, E. A., & Lau, J. Y. F. (2021). A feasibility randomised controlled trial of a brief early intervention for adolescent depression that targets emotional mental images and memory specificity (IMAGINE). *Behaviour Research and Therapy*, 143. <https://doi.org/10.1016/j.brat.2021.103876>
- Raes, F., Williams, J. M. G., & Hermans, D. (2009). Reducing cognitive vulnerability to depression: A preliminary investigation of MEemory Specificity Training (MEST) in inpatients with depressive symptomatology. *Journal of Behavior Therapy and Experimental Psychiatry*, 40(1). <https://doi.org/10.1016/j.jbtep.2008.03.001>
- Ramirez, A., Ekselius, L., & Ramklint, M. (2008). Axis V - Global Assessment of Functioning Scale (GAF), further evaluation of the self-report version. *European Psychiatry*, 23(8). <https://doi.org/10.1016/j.eurpsy.2008.05.001>

- Renner, F., Murphy, F. C., Ji, J. L., Manly, T., & Holmes, E. A. (2019). Mental imagery as a “motivational amplifier” to promote activities. *Behaviour Research and Therapy*, 114. <https://doi.org/10.1016/j.brat.2019.02.002>
- Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic future thinking: mechanisms and functions. In *Current Opinion in Behavioral Sciences* (Vol. 17). <https://doi.org/10.1016/j.cobeha.2017.06.002>
- Schulz, K. F., Altman, D. G., & Moher, D. (2010). CONSORT 2010 statement: Updated guidelines for reporting parallel group randomized trials. In *Annals of Internal Medicine* (Vol. 152, Issue 11). <https://doi.org/10.7326/0003-4819-152-11-201006010-00232>
- Shankman, S. A., Katz, A. C., DeLizza, A. A., Sarapas, C., Gorka, S. M., & Campbell, M. L. (2014). The different facets of anhedonia and their associations with different psychopathologies. In *Anhedonia: A Comprehensive Handbook Volume I: Conceptual Issues and Neurobiological Advances*. https://doi.org/10.1007/978-94-017-8591-4_1
- Sheehan, D. v., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, 59(SUPPL. 20).
- Sherdell, L., Waugh, C. E., & Gotlib, I. H. (2012). Anticipatory pleasure predicts motivation for reward in major depression. *Journal of Abnormal Psychology*, 121(1). <https://doi.org/10.1037/a0024945>
- Sim, K., Lau, W. K., Sim, J., Sum, M. Y., & Baldessarini, R. J. (2016). Prevention of relapse and recurrence in adults with major depressive disorder: Systematic review and meta-analyses of controlled trials. In *International Journal of Neuropsychopharmacology* (Vol. 19, Issue 2). <https://doi.org/10.1093/ijnp/pyv076>
- Spitzer, R. L., Kroenke, K., & Williams, J. B. W. (1999). Validation and utility of a self-report version of PRIME-MD: The PHQ Primary Care Study. *Journal of the American Medical*

Association, 282(18). <https://doi.org/10.1001/jama.282.18.1737>

Stein, J. S., Wilson, A. G., Koffarnus, M. N., Daniel, T. O., Epstein, L. H., & Bickel, W. K. (2016).

Unstuck in time: episodic future thinking reduces delay discounting and cigarette smoking.

Psychopharmacology, 233(21–22). <https://doi.org/10.1007/s00213-016-4410-y>

Steinert, C., Hofmann, M., Kruse, J., & Leichsenring, F. (2014). Relapse rates after psychotherapy

for depression - Stable long-term effects? A meta-analysis. In *Journal of Affective Disorders*

(Vol. 168). <https://doi.org/10.1016/j.jad.2014.06.043>

Sze, Y. Y., Stein, J. S., Bickel, W. K., Paluch, R. A., & Epstein, L. H. (2017). Bleak Present, Bright

Future: Online Episodic Future Thinking, Scarcity, Delay Discounting, and Food Demand.

Clinical Psychological Science, 5(4). <https://doi.org/10.1177/2167702617696511>

Takano, K., Moriya, J., & Raes, F. (2017). Lost in distractors: Reduced Autobiographical Memory

Specificity and dispersed activation spreading over distractors in working memory. *Behaviour*

Research and Therapy, 94. <https://doi.org/10.1016/j.brat.2017.04.005>

Uher, R., Perlis, R. H., Henigsberg, N., Zobel, A., Rietschel, M., Mors, O., Hauser, J., Dernovsek,

M. Z., Souery, D., Bajs, M., Maier, W., Aitchison, K. J., Farmer, A., & McGuffin, P. (2012).

Depression symptom dimensions as predictors of antidepressant treatment outcome:

Replicable evidence for interest-activity symptoms. *Psychological Medicine*, 42(5).

<https://doi.org/10.1017/S0033291711001905>

Vinckier, F., Gourion, D., & Mouchabac, S. (2017). Anhedonia predicts poor psychosocial

functioning: Results from a large cohort of patients treated for major depressive disorder by

general practitioners. *European Psychiatry*, 44. <https://doi.org/10.1016/j.eurpsy.2017.02.485>

Warden, D., Rush, A. J., Trivedi, M. H., Fava, M., & Wisniewski, S. R. (2007). The STAR*D

project results: A comprehensive review of findings. In *Current Psychiatry Reports* (Vol. 9,

Issue 6). <https://doi.org/10.1007/s11920-007-0061-3>

Watson, L. A., Berntsen, D., Kuyken, W., & Watkins, E. R. (2013). Involuntary and voluntary

autobiographical memory specificity as a function of depression. *Journal of Behavior Therapy*

and Experimental Psychiatry, 44(1). <https://doi.org/10.1016/j.jbtep.2012.06.001>

Williams, J. M. G., & Broadbent, K. (1986). Autobiographical Memory in Suicide Attempters.

Journal of Abnormal Psychology, 95(2). <https://doi.org/10.1037/0021-843X.95.2.144>

World Health Organization (2021). Depression fact sheet. Retrieved on 29th October 2021 from

<http://www.who.int/news-room/fact-sheets/detail/depression>

Figure 1.

Proposed Mediation Model of the Effect of Future Event Specificity Training (FEST) on Anhedonia at Three-Month Follow-Up Through Change in Future Thinking Characteristics

Figure 2.

Participant Flowchart

Figure 3.

Mediation Models Indicating Change in Future Thinking Detail, Perceived Control, and Perceived Likelihood Mediated the Effect of FEST on Anhedonia at Three-Month Follow-Up.

Bootstrapped indirect effect ($a*b$) = -0.47 (SE = 0.25), **95%CI -1.09, -0.10***

Note: Confidence intervals in bold indicate that regression coefficients are significant at the $p < .05$ level.

Table 1*Characteristics of Participants*

Characteristic	Full Sample	Control	FEST Group	Statistics
Age	43.7 (<i>SD</i> = 11.8)	44.9 (<i>SD</i> = 12.1)	42.5 (<i>SD</i> = 11.4)	$t = 1.3, p = .171$
Number of Females	143 (80.8%)	67 (79.8%)	76 (81.7%)	$\chi^2 = 0.1, p = .947$
Highest Level of Education				$\chi^2 = 2.3, p = .501$
High School	24 (13%)	10 (11.9%)	14 (15.1%)	
Diploma	68 (37.3%)	29 (34.5%)	39 (41.9%)	
Undergraduate Degree	56 (30.3%)	31 (36.9%)	25 (26.9%)	
Postgraduate Degree	29 (15.7%)	14 (16.7%)	15 (16.1%)	
Currently Studying	43 (23.2%)	18 (21.4%)	25 (26.9%)	$\chi^2 = 0.7, p = .398$
Employed	101 (57.1%)	44 (52.4%)	57 (61.3%)	$\chi^2 = 2.5, p = .279$
Ethnicity				$\chi^2 = 0.8, p = .843$
Caucasian/White European	155 (87.6%)	72 (85.5%)	83 (89.2%)	
Asian	8 (4.3%)	5 (6%)	3 (3.2%)	
African	0 (0%)	0 (0.0%)	2 (0.8%)	
Arab/Middle Eastern	4 (2.2%)	2 (2.4%)	2 (2.2%)	
Latino	0 (0%)	1 (0.9%)	0 (0.0%)	
Other	10 (5.4%)	5 (6%)	5 (5.4%)	

Table 2

Outcomes on Future Thinking Characteristics Showing Descriptive Statistics, Adjusted Means, Effect Sizes, and p-values

Outcomes	Control Group		FEST Group		Adjusted difference (c-MeST - control)		
	<i>N</i>	Mean (<i>SD</i>)	<i>N</i>	Mean (<i>SD</i>)	Mean (95% CI)	Cohen's <i>d</i>	<i>p</i> -value
<u>EFT Specificity</u>							
Baseline	74	5.22 (3.00)	91	5.35 (2.63)			
1mth-post	54	5.62 (2.79)	42	6.81 (2.14)	1.15 (0.28, 2.02)	0.53	.009
3mth-post	52	4.62 (3.16)	35	6.22 (2.59)	1.47 (0.37, 2.54)	0.56	.009
<u>EFT detail</u>							
Baseline	74	5.76 (1.65)	89	5.49 (1.71)			
1mth-post	53	5.88 (1.46)	43	6.35 (1.69)	0.96 (0.35, 1.58)	0.62	.002
3mth-post	50	5.79 (1.84)	33	6.78 (1.03)	1.27 (0.72, 1.83)	0.98	<.001
<u>EFT imagery</u>							
Baseline	74	5.96 (1.47)	89	5.97 (1.52)			
1mth-post	53	6.01 (1.57)	43	6.38 (1.97)	1.08 (0.32, 1.83)	0.57	.005
3mth-post	50	5.75 (1.98)	33	6.85 (1.21)	1.29 (0.53, 2.04)	0.73	.001
<u>EFT Fluency</u>							
Baseline	84	10.07 (6.26)	94	11.59 (5.69)			
1mth-post	52	12.26 (5.11)	43	13.95 (7.14)	1.70 (-0.67, 4.07)	0.28	.159
3mth-post	49	11.46 (5.01)	35	13.45 (6.24)	2.20 (-0.11, 4.51)	0.40	.064
<u>EFT Perceived Control</u>							
Baseline	74	5.60 (1.78))	94	5.51 (1.97)			
1mth-post	52	5.02 (1.52)	43	5.83 (1.76)	1.08 (0.32, 1.83)	0.57	.005
3mth-post	50	4.97 (1.72)	35	6.11 (1.47)	1.29 (0.53, 2.04)	0.73	.001
<u>EFT Likelihood</u>							
Baseline	74	6.69 (1.22)	94	6.35 (1.60)			
1mth-post	53	6.22 (1.56)	43	6.67 (1.56)	0.86 (0.13, 1.60)	0.47	.021
3mth-post	50	6.34 (1.46)	35	7.09 (1.11)	1.08 (0.49, 1.66)	0.80	<.001
<u>AMT Specificity</u>							
Baseline	74	5.75 (2.60)	93	6.11 (2.43)			
1mth-post	53	5.78 (2.48)	45	6.71 (2.50)	0.79 (0.04, 1.55)	0.37	.066
3mth-post	52	5.31 (2.88)	35	6.77 (2.40)	0.84 (0.08, 1.59)	0.34	.108

Note. The adjusted difference reflects the group x time interaction

Table 3

Outcomes on Anhedonia-Related Variables Showing Descriptive Statistics, Adjusted Means, Effect Sizes, and p-values

	Control Group		FEST Group		Adjusted difference (c-MeST - control)			
Outcomes	<i>N</i>	Mean (<i>SD</i>)	<i>N</i>	Mean (<i>SD</i>)	Mean (95% CI)	Cohen's <i>d</i>	<i>p</i> -value	
<u>EFT Anticipatory</u>								
<u>Pleasure</u>								
Baseline	74	5.82 (1.44)	89	5.78 (1.53)				
1mth-post	52	6.01 (1.34)	43	6.32 (1.56)	0.45 (-0.20, 1.10)	0.27	.173	
3mth-post	50	5.70 (1.56)	33	6.46 (1.21)	0.92 (0.29, 1.55)	0.63	.004	
<u>EFT Anticipated</u>								
<u>Pleasure</u>								
Baseline	74	5.31 (1.52)	89	5.29 (1.62)				
1mth-post	53	5.66 (1.40)	44	5.88 (1.76)	0.34 (-0.32, 1.00)	0.20	.313	
3mth-post	50	5.26 (1.68)	33	6.23 (1.19)	1.07 (0.47, 1.66)	0.77	<.001	
<u>Trait Anticipatory</u>								
<u>Pleasure</u>								
Baseline	80	2.95 (0.98)	93	3.16 (0.89)				
1mth-post	59	2.94 (0.96)	49	3.46 (0.79)	0.28 (0.04, 0.52)	0.44	.022	
3mth-post	54	2.90 (0.94)	37	3.34 (0.94)	0.25 (-0.01, 0.52)	0.38	.069	
<u>Trait</u>								
<u>Consummatory</u>								
<u>Pleasure</u>								
Baseline	80	3.82 (1.00)	93	3.87 (0.94)				
1mth-post	59	3.73 (1.10)	49	4.32 (0.75)	0.51 (0.24, 0.76)	0.72	<.001	
3mth-post	54	3.73 (1.07)	37	4.19 (0.90)	0.47 (0.14, 0.80)	0.59	.005	

Note. The adjusted difference reflects the group x time interaction

Table 4

Outcomes on Clinical Variables Showing Descriptive Statistics, Adjusted Means, Effect Sizes, and p-values

	Control Group		FEST Group		Adjusted difference (c-MeST - control)		
Outcomes	<i>N</i>	Mean (<i>SD</i>)	<i>N</i>	Mean (<i>SD</i>)	Mean (95% CI)	Cohen's <i>d</i>	<i>p</i> -value
<u>Depressive Symptoms</u>							
Baseline	80	19.47 (4.80)	93	19.36 (4.60)			
1mth-post	59	15.98 (6.44)	43	13.65 (6.60)	1.74 (-0.31, 3.78)	0.31	.100
3mth-post	53	15.77 (5.37)	33	12.14 (6.04)	2.21 (0.02, 4.41)	0.41	.048
<u>Cognitive Reappraisal</u>							
Baseline	70	3.75 (1.29)	93	3.63 (1.07)			
1mth-post	54	3.91 (1.29)	49	4.04 (1.24)	0.10 (-0.31, 0.52)	0.10	.617
3mth-post	48	3.94 (1.14)	37	4.25 (1.19)	0.26 (-0.19, 0.72)	0.24	.263
<u>Behavioural Activation</u>							
Baseline	70	2.36 (0.89)	93	2.12 (0.77)			
1mth-post	51	2.44 (0.96)	44	2.95 (1.15)	0.72 (0.35, 1.08)	0.78	<.001
3mth-post	42	2.44 (0.86)	33	3.14 (1.25)	0.76 (0.33, 1.19)	0.76	.001
<u>Global Assessment of Functioning</u>							
Baseline	70	55.16 (11.99)	92	53.40 (12.10)			
1mth-post	55	53.93 (16.75)	49	62.84 (17.09)	9.95 (4.46, 15.43)	0.71	<.001
3mth-post	48	60.23 (13.45)	37	66.29 (15.67)	6.88 (1.21, 12.55)	0.52	.017

Note. The adjusted difference reflects the group x time interaction