

The Effects of Positive Prospective Imagery on Emotion, Motivation, Future Self-Continuity, and Behavioural Engagement.

by

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If time-travel were real and projecting ourselves backwards and forwards through time was not just an incredible feature of our minds, I might head back to 2015 with some sage words of advice for my past self who decided to complete two consecutive doctoral degrees over the course of 7 years, with the second beginning during a worldwide pandemic and requiring a move to London. This doctorate has been, at times, a demanding journey, and I must therefore extend my heartfelt thanks to those who helped me along the way.

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Table of Contents

<i>Lay Summary</i>	6
<i>Chapter 1. The Effects of Positive Prospective Imagery on Emotion, Motivation, Future Self-Continuity and Behavioural Engagement.</i>	10
Abstract	10
Introduction	11
Methods	23
Results	31
Discussion	43
<i>Chapter 2. Does imagining the future reduce depressive symptoms in adults? A systematic review of prospection-based interventions.</i>	52
Abstract	52
Introduction	53
Methods	59
Results	63
Discussion	84
<i>Chapter 3. Integration, Impact and Dissemination</i>	90
Integration	90
Impact	96
Dissemination	99
<i>References</i>	101
<i>Appendices</i>	116
Appendix A Ethics application	116
Appendix B Participant information sheet	120
Appendix C Consent form	124
Appendix D Demographics sheet	125
Appendix E Event Selection Instructions and Activity Ratings	126

Appendix F Imagery-led Instructions	128
Appendix G Imagery-Led Questions	129
Appendix H Verbal-led Instructions	130
Appendix I Verbal-led Questions	131
Appendix J Manipulation Checks	132
Appendix K Follow-up Email (Behavioural Engagement and Enjoyment Ratings)	133
Appendix L Debrief	134
Appendix M Search Strings for Systematic Review.....	135
Appendix N Items from Downs & Black Checklist (1998) for Quality Assessment	135

List of Tables

<i>Table 1 Participant characteristics by condition.....</i>	<i>32</i>
<i>Table 2 Means and standard deviations of baseline, Time 1 and manipulation check measures and comparisons across conditions.....</i>	<i>33</i>
<i>Table 3 Means and standard deviations of Time 2 and 3 measures and change scores by condition</i>	<i>35</i>
<i>Table 4 Zero order correlations between depression, use of imagery or verbal processing, and change scores of key outcome variables.....</i>	<i>39</i>
<i>Table 5 Moderating effects of depression on behavioural intention change (elaborated events).....</i>	<i>40</i>
<i>Table 6 Conditional effects of condition on behavioural intention at values of depression....</i>	<i>41</i>
<i>Table 7 Characteristics of included studies.....</i>	<i>71</i>
<i>Table 8 Measures of depression used in included studies and treatment effect sizes of reviewed RCT and quasi-experimental studies.....</i>	<i>77</i>
<i>Table 9 Scores on each item of the Downs & Black (1998) checklist of for each RCT/QED study.....</i>	<i>81</i>
<i>Table 10 Quality assessment of reviewed studies using SCED and comparison against WWC Evidence Standards.....</i>	<i>83</i>

List of Figures

<i>Figure 1 Study procedure flowchart.....</i>	<i>30</i>
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Figure 2 Mean anticipated pleasure ratings for elaborated events (and SE bars) by Time and Condition.....36

Figure 3 Mean behavioural intention ratings (and SE bars) by Time and Condition.....37

Figure 4 Moderating effect of depression on the relationship between condition and behavioural intention change for elaborated events42

Figure 5 PRISMA flow diagram63

Lay Summary

Background

Have you ever imagined that one day you would achieve an important goal? For example, getting the job you have always wanted or marrying the person you love. How did imagining the future make you feel? Our ability to imagine the future is important because it acts as a map, helping us to plan ahead and make the best decisions to get us where we need to go. Imagining the future can also influence our emotions, altering how we feel in the present and helping us to predict how something will make us feel in the future.

The overall aim of this research was to investigate the possible benefits of imagining a positive future. It consists of two parts. The first part is a study that looks at how imagining positive future events impacts on emotion, motivation, how people feel about their future selves, and their tendency to take part in rewarding activities, compared to thinking about the future in a more verbal way (using words). The second part of this research is a review of previously existing studies that have investigated whether asking people to imagine a positive future can reduce depressive symptoms.

Empirical study

Introduction

In our study, we hoped to compare the effects of imagining positive future events to thinking in words about the future, to find out whether these different ways of thinking about the future impact differently on how people feel in the present, how people predict they will feel in the future, how they feel about their future selves, and their motivation to take part in rewarding events. In this study, we also wanted to find out whether people feel more motivated to take part in rewarding future events after imagining them because imagining the future changes how people feel about their future self. We also hoped to find out who might

benefit less from imagining positive future events. For example, people experiencing depression, who can find it harder to imagine a positive future.

Methods

68 university students took part in the study. They completed questionnaires that assessed how they were feeling in the present moment and how close they felt to their future self. They also completed a depression questionnaire. They were then asked to think of 10 events or activities they would like to do over the next two-weeks. They rated how enjoyable they thought these events would be, and how motivated they were to take part in them. Then, they were asked to think in more detail about two events. People in one group (the imagery group) were asked to build up an image of the events in their mind. People in a second group (the verbal group) were asked to think about the events in words, focusing on the personal importance of the event. After this, they completed the same questionnaires asking how they were feeling and how close they felt to their future selves. They again rated how enjoyable they thought the 10 events would be and how motivated they felt to take part in the events. Two weeks later, they were asked if the events had happened.

Findings

We did not find much difference between thinking about the future in images and words. Unlike previous studies, we did not find that imagining the future changed how people felt in the present, how they expected to feel in the future, or how they felt about their future selves. Unexpectedly, we found that thinking in words about the personal importance of future events was better at increasing motivation than imagery. Neither group were more likely to take part in enjoyable future activities. Our study found that people who felt more depressed experienced less change in motivation after imagining the future. The findings suggest that

thinking in words about the importance of future events might lead people to feel more motivated to take part in rewarding events.

Systematic review

Introduction

Previous reviews of existing studies have found that imagining a positive future makes people feel more positive in the present. However, to the best of our knowledge, a review has not yet been carried out to see whether imagining the future can reduce depression symptoms. This review aimed to look at evidence that imagining the future improves depression in adults.

Methods

A systematic search of the literature was carried out to see whether imagining the future can reduce symptoms of depression in adults. We found 15 studies that met inclusion criteria. Each study was examined in detail so that similarities and differences between studies could be determined, and to find out whether the study found a reduction in depression symptoms.

Findings

We found that studies used different types of tasks to get people to imagine the future. Some studies asked people to imagine a future where they have achieved all their goals. Other studies asked people to imagine positive future events that happen at specific times and places. Overall, 10 studies showed that future imagery led to reductions in depressive symptoms. However, the quality of the reviewed studies was limited, meaning results should be interpreted carefully.

Integration, Impact, and Dissemination

The study and review both looked at the possible benefits of imagining the future. Although the review found some evidence to suggest that imagining the future can make people feel less depressed, the findings of our study suggest that imagining the future does not always affect how people feel. This might be because our experiment did not ask people to focus on positive parts of their images.

The findings of the review and empirical study suggest that imagining a positive future can sometimes help people to feel better, but other times may be unhelpful. Further research will be needed to understand why this might be and to understand when imagining a positive future might be unhelpful or even harmful. Additionally, the findings of our study suggest that thinking in words about the personal importance of positive future events might increase motivation more than imagery. The findings of this thesis could help to create more effective future interventions aimed at improving motivation.

A summary of findings will be shared with people who took part in the study. They have also been presented to trainee clinical psychologists as part of an annual research forum. Findings may also be published in appropriate academic journals and presented at relevant conferences.

Chapter 1. The Effects of Positive Prospective Imagery on Emotion, Motivation, Future Self-Continuity and Behavioural Engagement.

Abstract

Prospective imagery allows us to envision future events and their emotional consequences. Positive future imagery may act as a “*motivational amplifier*” by influencing how people feel in the present and how they expect to feel in the future. The primary aim of this study was to determine whether prospective imagery promotes positive affect, anticipated pleasure, motivation, and behavioural engagement more than verbal-semantic processing of future events. The study also sought to explore the mediating role of changes in future self-continuity in the relationship between imagery and motivation, and whether depressive symptoms moderate the relationship between imagery and key outcomes. A sample of 68 participants (91% female, M age = 19.7, SD = 1.95) nominated 10 future events they would like to engage in over the next two weeks and were then randomly assigned to engage in imagery ($n = 33$), or to think in words about the meaning and significance ($n = 35$), of two nominated events. After two-weeks, participants were asked if they engaged in the events. Results showed little difference between the two conditions with regards to affect and future self-continuity. Unexpectedly, verbal-semantic processing of future events led to significantly greater intention to engage in rewarding events than imagery. This increase in intention did not translate to greater behavioural engagement. Depression moderated the relationship between prospective imagery and intention, such that participants with elevated depressive symptoms experienced less change in behavioural intention following imagery. These findings provide preliminary evidence to suggest that verbal-semantic processing of future events may, in some circumstances, promote motivation more than prospective imagery. Results may also indicate that, in the absence of instructions to focus on positive aspects of

future events or to engage in detailed imagery, depression may act as a barrier for interventions aimed at promoting motivation through targeting future-oriented imagery.

Introduction

Prospective mental imagery

Mental imagery involves the internal representation of perceptual information in the absence of direct external stimuli (Kosslyn et al., 2001; Pearson et al., 2015). Akin to a weak form of perception, mental imagery is often colloquially referred to as “*the mind’s eye*” but can involve any sensory modality (Kosslyn et al., 2001). Mental imagery is distinct from other more symbolic forms of cognition such as linguistic or verbal-based thought (Holmes & Mathews, 2005).

Prospective mental imagery pertains to imagery-based mental representations of future events, typically those that are autobiographical (personal) and specific in time and place (Gilbert & Wilson, 2007; Schacter et al., 2007). Just as it is possible to re-experience past events through episodic memory, prospective imagery involves projecting one’s self into the future to pre-experience hypothetical events and their emotional consequences (Atance & O’Neill, 2001). In the literature, various terminologies are used to refer to this ability, including *episodic future thinking* (Atance & O’Neill, 2001), *episodic simulation* (Schacter et al., 2008; Szpunar et al., 2014) and *episodic foresight* (Hudson et al., 2011).

Prospective imagery enables other forms of future-oriented cognition. Planning the steps to achieve a desired outcome or making a prediction about an event will involve imagining or simulating possible events and their outcomes (Szpunar et al., 2014). Consequently, across the literature, prospective imagery is widely considered to be an adaptive process with a range of functions, including promoting future-oriented decision

making, problem-solving, and emotion regulation (see Schacter et al., 2017; Suddendorf et al., 2018).

Positive mental imagery and affect

Mental imagery appears to have a “*special*” or unique relationship with emotion (Holmes & Mathews, 2005). Studies have demonstrated that positive mental imagery promotes positive affect more than thinking in words about the meaning (verbal-semantic processing) of the same positive material (Holmes et al., 2006, 2009; Nelis et al., 2012). In contrast to imagery, verbal-semantic processing of positive material, which involves a more analytical and verbal thinking style focused on meanings, causes and consequences (Nelis et al., 2015), has been found to reduce positive affect in some studies (Holmes et al., 2006, 2009). One possible explanation for this adverse effect of verbal processing on positive affect is that verbal processing may lead individuals to draw comparisons between positive material and their current situations, which may be more difficult when thinking in an image-based way (Holmes et al., 2009; Markman & McMullen, 2003).

Several complementary mechanisms have been proposed for this observed relationship between mental imagery and emotion. Firstly, it has been proposed that sensory cues have a direct connection to basic emotional processing systems in the brain, which evolved before the development of language (Holmes & Mathews, 2010). Imagery, by mimicking external sensory stimuli, might therefore activate these same systems more rapidly than verbal or linguistic representations of the same information. Secondly, mental imagery has been found to activate areas of the brain that would be recruited during corresponding forms of perception; for example, visual imagery has been found to activate areas of the visual cortex (Kosslyn & Thompson, 2003). If imagery contains emotional elements, then systems involved in processing emotional information are likely to be activated in a similar manner to when a real-world emotional experience is being processed (Holmes & Mathews,

2010). An additional proposed mechanism is that imagery, including prospective imagery, is generated by drawing on elements from autobiographical memory (Conway & Pleydell-Pearce, 2000; Schacter et al., 2007). Mental imagery might therefore contain emotional content linked to these previously experienced events.

Most studies examining the relationship between positive mental images and emotion have employed the ambiguous scenarios paradigm (Mathews & Mackintosh, 2000), in which participants are instructed to imagine emotionally ambiguous scenarios that resolve positively (e.g Blackwell & Holmes, 2010; Holmes et al., 2006). This paradigm has been developed as an intervention (Cognitive Bias Modification for Interpretation, CBM-I) to reduce negative interpretation bias as participants learn to interpret new ambiguous scenarios in more positive ways (see Fodor et al., 2020). It has been proposed that the process of resolving ambiguous scenarios recruits future-directed cognition (Murphy et al., 2017). However, the scenarios presented in these studies tend to be written in present-tense, are standardised across participants, and participants are not explicitly instructed to project themselves into the future to pre-experience the event (Namaky et al., 2021). Studies using this paradigm arguably differ from studies that explicitly instruct participants to engage in future-oriented imagery and in which participants imagine specific and personal future events. Therefore, we cannot assume that findings from studies of general or non-prospective positive mental images apply to positive *prospective* mental imagery.

Delineating between current and anticipated affect

Prior to outlining research that explores the links between positive prospective imagery and affect, it is important to first make a conceptual distinction between *current* affect and *anticipated* affect. Current affect, a term often used synonymously with mood or state affect (Watson & Tellegen, 1985), can be understood as one's dominant affective state at any given

time (Russell & Barrett, 1999). Watson and Tellegen (1985) outline two orthogonal dimensions of affect: Positive affect, or the extent to which one feels enthusiastic, excited, and alert rather than drowsy and sluggish, and negative affect, or the extent to which one feels hostile, nervous and fearful rather than calm and relaxed.

Anticipatory affect refers to how one feels *when thinking about a future event* and anticipated affect refers to how someone *expects they will feel* when a future event occurs (Baumgartner et al., 2008). Current and anticipatory affect are conceptually very similar, and some studies have treated them as synonymous (Ji et al., 2021). Research on positive non-prospective mental images focuses on current affect, typically assessed using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988; e.g. Holmes et al., 2006; Nelis et al., 2012), while research on positive prospective imagery has focused on anticipatory and anticipated pleasure, typically using single-item scales (e.g. Hallford et al., 2020a; Ji et al., 2021; Renner et al., 2019).

Prospective mental imagery, current affect, and anticipated affect

Our understanding of whether positive prospective imagery promotes positive *current* affect, and whether this relationship is as “special” to prospective imagery as it is for non-prospective imagery, is somewhat limited. From a theoretical perspective, future-oriented imagery is thought to influence affect by facilitating the pre-experiencing of hypothetical outcomes and their emotional consequences (Gilbert & Wilson, 2007). In line with this, there is some evidence to suggest that imagining a positive future can influence both how one feels in the present, and how one expects to feel in the future.

With regards to current affect, findings from a recent meta-analysis suggest that imagining a positive future promotes positive current affect (Schubert et al., 2020). However, these findings were limited to studies of the *Best Possible Self* intervention (BPS; King,

2001), a positive psychology intervention that does not explicitly instruct participants to generate specific future events but rather guides individuals to imagine a future in which they have “accomplished their life goals” and to then describe the image (King, 2001). While this is still a form of prospective imagery, the current study is interested in how imagery of personal and specific future events influences current affect.

To our knowledge, only one study has looked at how imagining positive, personal and specific future events influences current affect and, moreover, have compared this to thinking about the future in a more verbal or linguistic way. In their study, Ji et al., (2021) asked participants to nominate two positive future events they would like to engage in and instructed participants to schedule these over the course of one-week. Participants in an imagery condition were then guided to imagine engaging in their chosen events. Participants in a “verbal-reasoning” condition were instructed to think about benefits of, and reasons to engage in, their chosen events. A third control condition (“Scheduling-only” condition) selected and scheduled future events and engaged in a filler task. Positive and negative affect (“*How emotionally positive/negative do you feel right now?*”) were rated on single-item scales of 0-100 before and after engaging in the allocated task. Consistent with previous studies of positive imagery, results showed an increase in positive current affect in the imagery condition compared to the verbal condition. Verbal processing of positive future events did not appear to lead to a decrease in positive affect, in contrast to findings from the literature on non-prospective mental imagery (e.g. Holmes et al., 2006; 2009).

While studies investigating the relationship between prospective mental imagery and current affect are limited, more research has investigated how imagining positive, personal, and specific future events influences anticipated affect. Findings suggest that positive prospective imagery can increase how much pleasure individuals expect they will experience from future events (Hallford et al., 2022; Hallford, et al., 2020a; Renner et al., 2019).

However, only Ji et al., (2021) have compared whether positive prospective imagery influences anticipated pleasure more than thinking about the future in a verbal or linguistic way. They found that both prospective imagery and verbal-reasoning about future events led to significantly increased anticipated pleasure compared to the participants who only scheduled their nominated activities (Ji et al., 2021). That is, thinking analytically about the benefits of engaging in rewarding events was found to be as effective for increasing anticipated pleasure as imagery.

As noted by Holmes et al., (2009), there are different types of verbal processing. The verbal-reasoning condition used by Ji et al., (2021) may have led participants to think more generally or abstractly about the benefits of certain rewarding behaviours (e.g. *“exercise is good for staying healthy”*) rather than thinking about the meaning or significance (verbal-semantic processing; Holmes & Mathews, 2005) such events would have for them personally in the future (e.g. *“If I go to the gym to exercise, I will feel better about my health”*). To the extent that verbal processing might have adverse effects on current affect because of verbal comparisons, it may be that thinking in a more verbal-semantic way about one’s future would elicit greater comparisons than verbal-reasoning about the general benefits of future events. One of the aims of the present study was to explore whether positive prospective imagery increases current positive affect and anticipated pleasure more than verbal-semantic processing of future events. Additionally, we aimed to examine whether, as in studies of non-prospective mental imagery (Holmes et al., 2006; 2009), verbal-semantic processing of future events might lead to a deterioration in positive affect and, potentially, a reduction in anticipated pleasure.

Prospective mental imagery, behavioural intention, and behavioural engagement

The question of whether prospective imagery can promote current and anticipated positive affect is of relevance, as this may have implications for increasing intention to engage in and actual engagement in rewarding behaviour (Baumgartner et al., 2008; Hallford et al., 2020a). It has been proposed that positive prospective imagery may act as a “*motivational amplifier*” by increasing how much pleasure an individual expects to feel in the future, and how much pleasure they feel in-the-moment (Ji et al., 2021; Renner et al., 2019). Studies have indeed demonstrated that, compared to no-imagery controls, engaging in prospective imagery leads to significant increases in motivation and behavioural engagement (Ji et al., 2021; Renner et al., 2019). However, it should be noted that others have failed to find significant changes in intention following prospective imagery, although the authors noted this may have been due to high initial ratings of intention, resulting in a ceiling effect (Hallford et al., 2020a).

Consistent with the “*motivational amplifier*” hypothesis, preliminary evidence suggests that the relationship between prospective imagery and intention is mediated by changes in current positive affect (Ji et al., 2021). In other words, imagining positive or rewarding future events makes people feel more positive in the present, and this appears to increase their intention to engage in rewarding events. However, further replication of this finding is needed.

Theoretically, the notion that prospective imagery might increase intention by modifying positive affect appears to be consistent with existing models of motivation. For example, Ajzen’s (1991) Theory of Planned Behaviour proposes that an individual’s attitudes toward a behaviour, in addition to subjective norms and perceived behavioural control, determine intention to engage in a behaviour. Imagining one’s self engaging in a future behaviour (such as spending time with friends or going for a pleasant walk) increases how

rewarding an event is perceived to be (Ji et al., 2021; Renner et al., 2019), thus their attitudes toward the behaviour are altered and they experience an increase intention to engage in the behaviour. It is also possible that engaging in prospective imagery increases perceived behavioural control or other factors, such as competence and autonomy, which are crucial predictors of motivation according to Self-Determination Theory (Ryan & Deci, 2000). The focus of this study, however, will be on the links between prospective imagery, affect and intention.

Evidence for a *unique* relationship between positive prospective imagery, intention, and behavioural engagement requires further examination. Ji et al., (2021) found that participants who imagined future events subsequently engaged in more rewarding behaviours than those who focused on the benefits and reasons to engage in positive events. However, both imagery and verbal-reasoning appeared to increase motivation. It is unclear whether thinking in words about the personal meaning and significance of future events would be equally as effective as prospective imagery for promoting motivation. This is a question the current study seeks to answer.

Future self-continuity

As stated above, changes in positive affect appear to mediate the relationship between positive prospective imagery and subsequent increases in behavioural intention (Ji et al., 2021). Other potential mediators of this relationship have yet to be explored. One possibility is that engaging in prospective imagery enhances the degree to which individuals feel connected to their future selves, known in the literature as future self-continuity (Hershfield et al., 2009). Theoretically, the more connected one feels to their future self, the more inclined they will be to act in ways that benefit the future self. In contrast, if the future-self is

perceived as disconnected, this will motivate individuals to make myopic choices that benefit only the present-self (Hershfield, 2011).

Studies have indeed shown that greater future self-continuity is associated with greater consideration of future consequences (Adelman et al., 2017) and reduced discounting of future rewards (Bartels & Rips, 2010; Urminsky, 2017). Moreover, increasing how connected individuals feel to their future selves has been shown to increase intention to engage in ethical behaviour (Simić et al., 2021; van Gelder et al., 2013) and actual engagement in positive behaviours such as exercise (Rutchick et al., 2018).

Engaging in prospective imagery has been shown to increase future self-continuity (Blouin-Hudon & Pychyl, 2017; Sun et al., 2023). In their study, Sun et al., (2023) found that imagining a positive future (*“imagine in as much detail as possible what you think your ideal future will be like in 5 years...”*) led participants to feel more connected to their future selves than imagining an undesirable future, and changes in future self-continuity mediated the relationship between imagery and intertemporal decision making. That is, participants who imagined a positive future were less likely to discount larger later rewards for smaller immediate rewards, and this was explained by increases in how close they felt to their future selves. Positive prospective imagery may promote future self-continuity by increasing the vividness with which one conceptualises their future self (Blouin-Hudon & Pychyl, 2017), or by reducing the perceived psychological distance between one’s present and future self (Sun et al., 2023). It seems plausible then that the observed increases in motivation in previous studies of prospective imagery (e.g. Ji et al., 2021; Renner et al., 2019) may stem from increases in how connected participants feel to their future selves. Therefore, a further aim of the present study was to examine whether the relationship between positive prospective imagery and behavioural intention is mediated by changes in future-self continuity.

Depression

The final aim of the current study was to explore the role played by depression in the relationship between prospective imagery, intention, and behavioural engagement.

Depression is characterised by deficits in positive mental imagery (Holmes et al., 2016).

Individuals scoring high on measures of depressive symptoms find it more challenging to generate positive future events (MacLeod et al., 1997), and when imagining positive future events, do so with reduced vividness (Morina et al., 2011) and specificity (Gamble et al., 2019). Impoverished vividness or specificity during prospective imagery may be, in part, to blame for the reduced anticipated pleasure observed in those with high depressive symptoms (Wu et al., 2017) and may also partially explain reduced motivation to engage in rewarding behaviour (Roepke & Seligman, 2016; Treadway & Zald, 2011). Without being able to vividly imagine potentially rewarding future events, individuals with elevated depressive symptoms may predict they will feel less pleasure were these events to occur and may experience less pleasure in the present; they may subsequently feel less motivation to pursue these events. Therefore, it is possible that depressive symptoms moderate the effect of prospective imagery on current and anticipated affect, future self-continuity, behavioural intention, and engagement. This was an additional question the current study sought to answer.

Present study

The present study aimed to build on findings from Renner et al., (2019) and Ji et al., (2021), which provided preliminary evidence to suggest that positive prospective imagery can promote positive current affect, anticipated pleasure, behavioural intention, and engagement in rewarding behaviours, and that the motivational effect of imagery is explained by increases in positive current affect. The primary aim of the current study was to determine whether

positive prospective imagery exhibits a *unique* relationship with these outcomes by comparing imagery to a novel verbal-semantic condition drawn from the work on non-prospective mental imagery (Nelis et al., 2015). Moreover, we aimed to determine whether changes in future self-continuity mediate the relationship between future imagery and intention, and whether depression moderates the effects of positive prospective imagery.

Participants completed a baseline measure of depressive symptoms and initial measures of current affect and future self-continuity. They were then asked to nominate 10 future events they would like to engage in over the next two weeks and completed ratings of anticipated pleasure and behavioural intention. Participants were randomly assigned to engage in imagery or to think in words about the meaning and significance of two nominated events. They then completed post measures of current affect, future self-continuity, anticipated pleasure, and behavioural intention. After two weeks, they were contacted to determine if they engaged in their nominated events.

Hypotheses

1. Positive prospective imagery will increase positive current affect, anticipated pleasure, future self-continuity, behavioural intention, and engagement more than verbal-semantic processing of future events.
2. Verbal-semantic processing of future events will lead to a reduction in positive affect and a reduction in anticipated pleasure.
3. Increases in positive current affect and future self-continuity will mediate the relationship between positive prospective imagery and behavioural intention.
4. Depressive symptoms will moderate the relationship between positive prospective imagery and key outcomes, such that those with elevated depressive symptoms will benefit less from engaging in prospective imagery.

Methods

Study Design

The present study used a 2 x 3 mixed design with one between-groups factor (Condition: Imagery-led vs. verbal-led) and one within-groups factor (Time: Baseline, post-manipulation, and two-week follow-up).

Power Analysis

An a priori power analysis was conducted using G*Power version 3.1.9.7 for sample size estimation, based on data from Ji et al., (2021), which compared prospective imagery with verbal-reasoning on pre and post current positive affect and motivation ratings. Effect sizes in this study were medium ($d = .54$ and $.41$ respectively) using Cohen's (1988) criteria. With an alpha level of $.05$ and power = $.80$, the minimum sample size needed to detect a medium effect size is $N = 34$ for a mixed ANOVA. Recent understanding of interaction effects suggests four times this sample size is needed to power examining an interaction effect (Fleiss, 2011). Given time constraints, the decision was made to double the required sample, resulting in a required sample size of 68 (34 in each group).

Following data collection, the decision was made to analyse differences between the two conditions on key outcomes using ANCOVA, controlling for Time 1 scores. This is because ANCOVA has been recommended when pre-treatment measures are equal in expectation across groups and due to increased power to detect an effect (Connell et al., 2017). A post-hoc power analysis was therefore also conducted to determine whether we had enough power to detect a medium effect size with the current sample size. With an alpha level of $.05$ and a sample size of 68, the power to detect a medium effect size ($f = .25$, Cohen 1988) was 0.52 for an ANCOVA.

Participants and recruitment

A total of 70 participants signed up for the study from the Psychology undergraduate credit pool at RHUL (see *Table 1* for participant characteristics). However, two participants who had been assigned to the imagery-led condition did not attend their scheduled testing session. Therefore, the total sample consisted of 68 participants (M age = 19.7, SD = 1.95, 91% female), with 33 participants allocated to the imagery-led condition and 35 participants to the verbal-led condition. Recruitment and data collection took place over a three-month period between December 2022 to February 2023.

Measures

Baseline measures

Temporal Experiences of Pleasure Scale (TEPS; Gard et al., 2006). An 18-item scale that assesses individual differences in the general ability to experience pleasure thinking about future events (e.g. “*When something exciting is coming up in my life, I really look forward to it*”) and pleasure when experiencing events (e.g. “*I enjoy taking a deep breath of fresh air when I walk outside*”). Items are rated on a scale ranging from 1 (“very false for me”) to 6 (“very true for me”). Scores range from 18 to 108. The TEPS has shown good internal consistency, test-retest reliability, and convergent and divergent validity (Gard et al., 2006). Internal consistency for the present sample was acceptable (Cronbach’s α = .73).

Plymouth Sensory Imagery Questionnaire (PSI-Q; Andrade et al., 2014). The PSI-Q consists of seven sets of five items used to assess individual differences in the vividness of mental imagery across seven different sensory modalities (vision, sound, smell, taste, touch, bodily sensations, emotions; e.g. “*Imagine the appearance of a friend you know well*”, “*Imagine the smell of a stuffy room*”). Items are rated on an 11-point scale ranging from 0 (“no image at all”) to 10 (“image as clear and vivid as real life”). Scores across the seven sets

were summed and an average taken. The PSI-Q has shown good internal consistency, test-retest reliability, and construct validity (Andrade et al., 2014). Internal consistency for the present sample was good (Cronbach's $\alpha = .91$).

Depression, Anxiety and Stress Scale – Depression subscale (DASS-D; Lovibond & Lovibond, 1995). The 7-item self-report subscale from the DASS-21 short-form was used to assess for the presence of depressive symptoms. Examples of items include “*I felt that life was meaningless*” and “*I felt I had nothing to look forward to*”. Items are rated on a scale from 0 (“*did not apply to me at all*”) to 3 (“*applied to me very much or most of the time*”), with scores ranging from 0 to 21. Good psychometric properties have been found previously (Antony et al., 1998). Internal consistency for the present sample was good (Cronbach's $\alpha = .87$).

Pre and Post measures (Time 1 and Time 2)

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The 20-item PANAS consists of a 10-item positive affect scale and 10-item negative affect scale. Participants are provided with a list of 20 adjectives (e.g. “*Interested*”, “*Afraid*”) and asked to rate the degree to which they feel each emotion in the present moment on a scale from 1 (“*not at all*”) to 5 (“*extremely*”). Items are summed for each 10-item scale. Studies have shown good internal consistency and discriminant validity (Díaz-García et al., 2020). Internal consistency of the 20-item PANAS for the present sample across Time 1 and Time 2 was good (Cronbach's $\alpha = .91$).

Future self-continuity scale (Hershfield et al., 2009). Two single-item scales representing 7 Euler circles overlapping to various degrees. Participants indicate which overlapping circles best represents the similarity and connectedness between their present and future self in 5

years' time. An average across the two items is taken. Internal consistency in the current sample was acceptable (Cronbach's α across Time 1 and Time 2 = .79).

Event ratings

Single-item scales to assess for anticipated pleasure and behavioural intention for participants' 10 nominated events were taken from Hallford et al., (2020a). Event ratings were elicited after participants nominated the 10 events (Time 1), and again after the elaboration phase (Time 2).

Anticipated pleasure. One item ("*How pleasant/enjoyable do you think it will be to do this activity*") rated on a scale from 1 ("*Not at all*") to 9 ("*Very much so*").

Behavioural intention. One item ("*How likely is it you will do this activity?*"), rated on a scale from 1 ("*Not at all*") to 9 ("*Very much so*").

Manipulation check

To serve as a manipulation check, participants were asked to rate, using a 1-9 Likert scale their 1) use of imagery/verbal processing ("*How much did you find yourself visualising in your mind's eye what it was like to experience these events*" / "*How much did you find yourself thinking in words about this event*") and 2) perceived difficulty of the task.

Follow up measure (Time 3)

Behavioural engagement. A single item for each event provided by the participant during the testing session ("*Did you take part in this event/activity*") with a dichotomous response (Yes/No). The number of unelaborated and elaborated events engaged in were summed separately. Where participants indicated they had taken part in the event/activity, but on a different day or at a different time, this was coded as them having taken part in the activity.

Experienced Pleasure. A single item (“*If yes, please rate how pleasurable/enjoyable you found the event*”) for each engaged in event/activity, rated on a scale from 1 (“*Not at all*”) to 9 (“*Very much so*”).

Piloting

Prior to recruitment for this study, a small pilot was carried out with seven doctoral students at RHUL, with the following aims:

- Determining whether is it feasible for participants to generate ten specific and rewarding future events/activities.
- Determining how long it would take participants to generate ten specific and rewarding future events/activities.
- Determining whether participants provide events that have high behavioural intention ratings (which could result in a ceiling effect).
- How long does it take for participants to generate ten events and elaborate two events?

Participants tended to provide events they knew were likely to happen (Average baseline rating of behavioural intention for all events = 7.5). Therefore, the instructions for nominating events changed from “*We would like you to think of ten events or activities that might occur in the next two weeks, which you are looking forward to*” to “*We would like you to think of ten events or activities that you would like to do and would enjoy doing over the next two weeks*”.

Although participants reported finding it challenging to think of 10 events or activities that they would enjoy doing, six out of seven participants were able to generate all 10 events.

The procedure of generating ten events and elaborating the two events with the lowest intention ratings took a maximum of 20 minutes for the pilot participants.

Procedure

A summary of the study's procedure can be found in *Figure 1* below. Participants signed up for the study via an online experiment management system and chose a timeslot to attend an in-lab testing session. Participants were randomly allocated to either the imagery-led or verbal-led condition by computer prior to the testing session. After providing written and informed consent, participants completed the three baseline-only measures: TEPS (Gard et al., 2006), PSI-Q (Andrade et al., 2014), and the DASS-D (Lovibond & Lovibond, 1995). Participants then completed the Time 1 ratings of current affect (PANAS; Watson et al., 1988), and future self-continuity (Hershfield et al., 2009).

Using an adapted version of the Future Thinking Task (MacLeod & Byrne, 1996), participants were asked to provide 10 specific (i.e. occurring at a particular time/location) events or activities that they would like to engage in and would enjoy doing over the following two weeks (see *Appendix E*). A range of categories (work/school/socialising etc.) and examples were provided (e.g. going for lunch with a friend at a specific café on Friday afternoon). After nominating 10 events, participants then provided Time 1 ratings of anticipated pleasure and behavioural intention for each event. The two events with the lowest ratings of behavioural intention were selected for further elaboration.

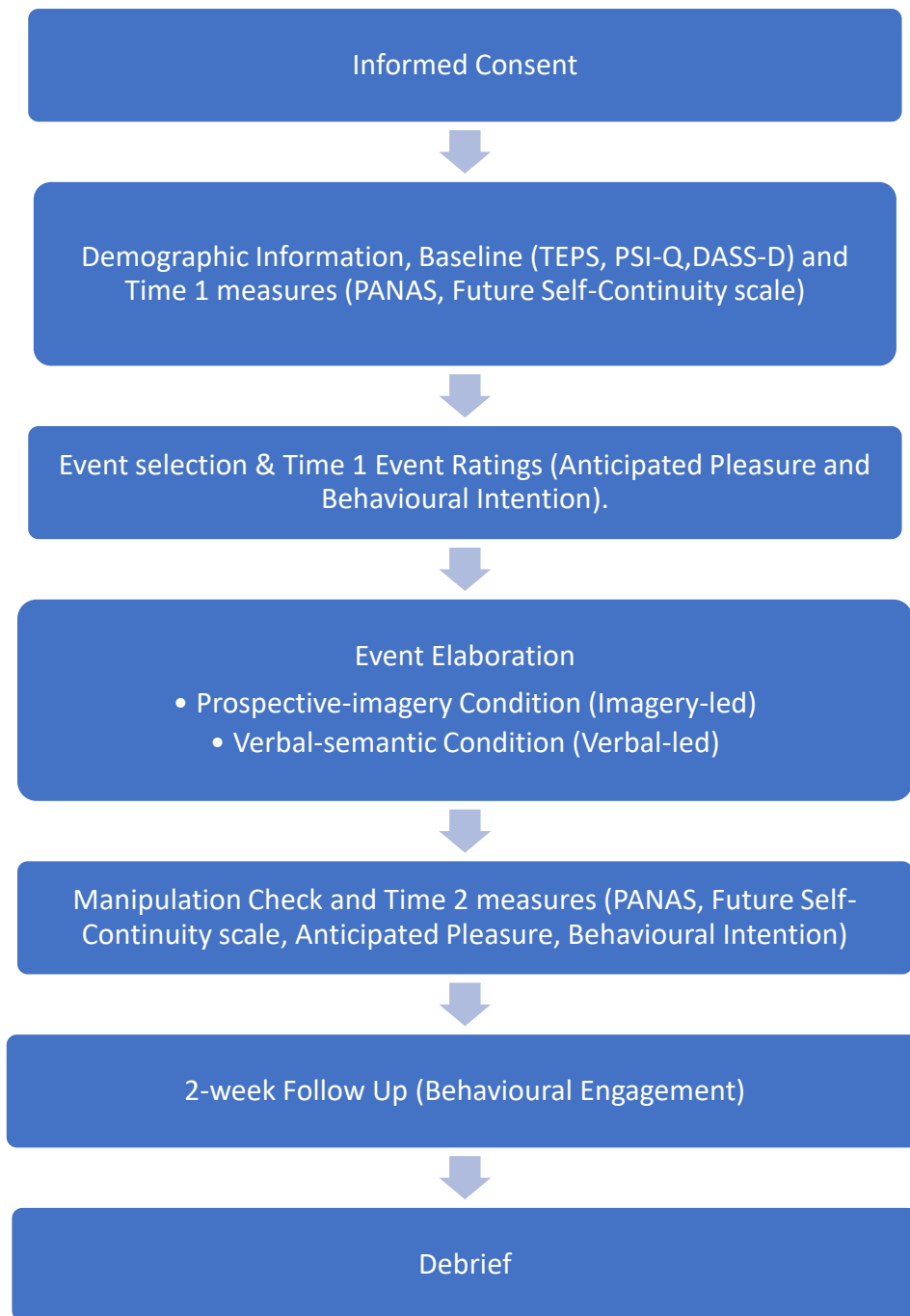
Instructions for the elaboration task were adapted from Nelis et al., (2015). Those in the imagery-led condition were provided with verbal instructions to build up a detailed image of the event in their mind, as if they were really experiencing it (see *Appendix F*). Participants were provided with further written questions (see *Appendix G*), such as “*What can you see?*” and “*What is happening around you?*” to aid them in visualising the contextual and sensory

details of the event. Participants in the verbal-led condition were provided with verbal instructions to think about the event in words (see *Appendix H*), and to concentrate on meanings and significance. They were provided with further written questions (see *Appendix I*), such as “*What might cause this event to happen?*” and “*What might this event say about you?*”. Participants in both groups were given one minute to think about the first event in more detail using the questions as a guide. They were then instructed to write a description of what they were thinking about. This process was then repeated for the second event.

Following elaboration, participants completed the manipulation checks, rating their use of imagery and verbal processing during the task, and how difficult they found the task. Participants then completed the Time 2 measures of current affect (PANAS), future-self continuity, anticipated pleasure, and behavioural intention.

Two weeks after the in-person testing session, participants were sent an email with a document attached that contained the participant’s ten nominated events and further questions (see *Appendix K*). Participants were asked to indicate whether they engaged in the events they nominated. Participants were also asked to rate how much pleasure they experienced during events they engaged in. After returning their responses, participants were sent a debrief sheet by email.

Figure 1 Study procedure flowchart



Results

Normality and data transformations

For assessing normality, Z-Skew scores > 2.58 ($p < .01$) were taken to indicate significant skew (Ghasemi & Zahediasl, 2012). Negative affect (Time 1) scores were significantly positively skewed in both the imagery-led (Z-skew = 6.57, $p < .01$) and verbal-led conditions (Z-Skew = 11.09, $p < .01$). Reciprocal transformation reduced skew to within a normal range for the imagery-led (Z-skew = -1.72, $p > .01$) and verbal-led conditions (Z-Skew = -1.73, $p > .01$). Negative affect (Time 2) scores were also significantly positively skewed in both the imagery-led (Z-skew = 6.99, $p < .01$) and verbal-led conditions (Z-skew = 4.29, $p < .01$). Again, reciprocal transformation reduced skew to within a normal range for the imagery-led (Z-Skew = -2.60, $p > .01$) and verbal-led conditions (Z-Skew = -2.00, $p > .01$).

Participant characteristics

There was no significant difference in age ($t(64) = .24$, $p = .81$), gender ($X^2(1) = .61$, $p = .44$), ethnicity ($X^2(4) = .70$, $p = .95$), or first language ($X^2(1) = .76$, $p = .39$) across the two groups (see *Table 1* for Ms and SDs). All participants completed Time 3 measures.

Table 1 Participant characteristics by condition

	Condition		Significance <i>p</i>
	Imagery-led (<i>n</i> = 33)	Verbal-led (<i>n</i> = 35)	
Age, <i>M</i> (<i>SD</i>)	19.78 (1.82)	19.67 (2.08)	.81
<i>Gender, n (%)</i>			
Female	31 (93.9)	31 (88.6)	.44
Male	2 (6.1)	4 (11.4)	
<i>Ethnicity, n (%)</i>			
White	20 (60.6)	22 (62.9)	.95
Black, Black British, Caribbean, or African	2 (6.1)	1 (2.9)	
Asian or Asian British	6 (18.2)	6 (17.1)	
Mixed or Multiple Ethnic groups	4 (12.1)	4 (11.4)	
Other ethnic group	1 (3)	2 (5.7)	
<i>First language, n (%)</i>			
English	24 (72.7)	22 (62.9)	.39
Language other than English	9 (27.3)	13 (37.1)	

Comparing Baseline and Time 1 Measures

As shown in *Table 2* participants across the two conditions did not differ significantly with respect to trait anticipatory pleasure ($t(66) = .23, p = .82$), PSIQ ($t(66) = 1.38, p = .17$), or depressive symptoms ($t(66) = .06, p = .95$). Participants in both conditions had similar levels

of positive affect ($t(66) = .40, p = .69$), negative affect ($t(66) = .40, p = .69$), and future self-continuity ($t(66) = .59, p = .55$) at Time 1. Participants in both conditions had similar Time 1 levels of anticipated pleasure for both unelaborated ($t(66) = .76, p = .45$) and elaborated events ($t(66) = -.34, p = .73$) and similar baseline levels of behavioural intention for both unelaborated ($t(66) = .37, p = .71$) and elaborated events ($t(66) = .29, p = .77$).

Table 2 Means and standard deviations of baseline, Time 1 and manipulation check measures and comparisons across conditions

Variable	Condition		Significance <i>p</i>
	Imagery-led (<i>n</i> = 33)	Verbal-led (<i>n</i> = 35)	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
<i>Baseline-only measures</i>			
TEPS	78.15 (10.24)	77.60 (9.80)	.82
PSIQ	6.99 (1.45)	6.58 (.96)	.17
Depression	6.73 (4.52)	6.80 (5.21)	.95
<i>Time 1 Measures</i>			
Positive Affect	28.48 (7.53)	29.17 (6.71)	.69
Negative Affect	14.58 (6.13)	14.80 (5.48)	.87
Future Self-Continuity	4.23 (1.19)	4.07 (.97)	.55
Anticipated Pleasure (<i>Unelaborated</i>)	7.36 (.89)	7.20 (.80)	.45
Anticipated Pleasure (<i>Elaborated</i>)	6.85 (1.23)	6.96 (1.37)	.73
Behavioural Intention (<i>Unelaborated</i>)	7.56 (.82)	7.50 (.64)	.37
Behavioural Intention (<i>Elaborated</i>)	4.59 (1.54)	4.69 (1.13)	.77
<i>Manipulation Checks</i>			
Use of Imagery	7.39 (1.28)	6.54 (1.73)	.012*
Use of Verbal-processing	6.05 (2.21)	6.37 (1.69)	.25
Difficulty of task	4.33 (2.50)	4.80 (2.20)	.21

TEPS = Temporal Experiences of Pleasure Scale; PSIQ = Plymouth Sensory Imagery Questionnaire

NB. Unelaborated events were those that participants nominated but were not selected for elaboration.

Manipulation Checks

As expected, participants in the imagery-led condition reported significantly more use of imagery-based processing during the elaboration task than those in the verbal-led condition, ($t(66) = 2.30, p = .01$; see *Table 2*). However, there was no significant difference in self-reported use of verbal processing between the conditions ($t(66) = .69, p = .25$). The conditions did not significantly differ in how difficult they found the manipulation task ($t(66) = .82, p = .21$).

Affect and future-self continuity

Ms and *SDs* for key variables across the two conditions at Time 2 can be found in *Table 3*. To examine differences between the conditions on scores of positive affect, negative affect, and future self-continuity, three separate ANCOVAs were conducted, with condition as IV, Time 2 scores as DV, and Time 1 scores as a covariate.

After controlling for scores at Time 1, there was no significant effect of condition on negative affect, ($F(1,65) = .33, p = .59$) future self-continuity, ($F(1,65) = .92, p = .34$) or positive affect ($F(1,65) = 3.38, p = .07$). No further exploratory analysis regarding whether future self-continuity mediates the relationship between condition and intention was conducted.

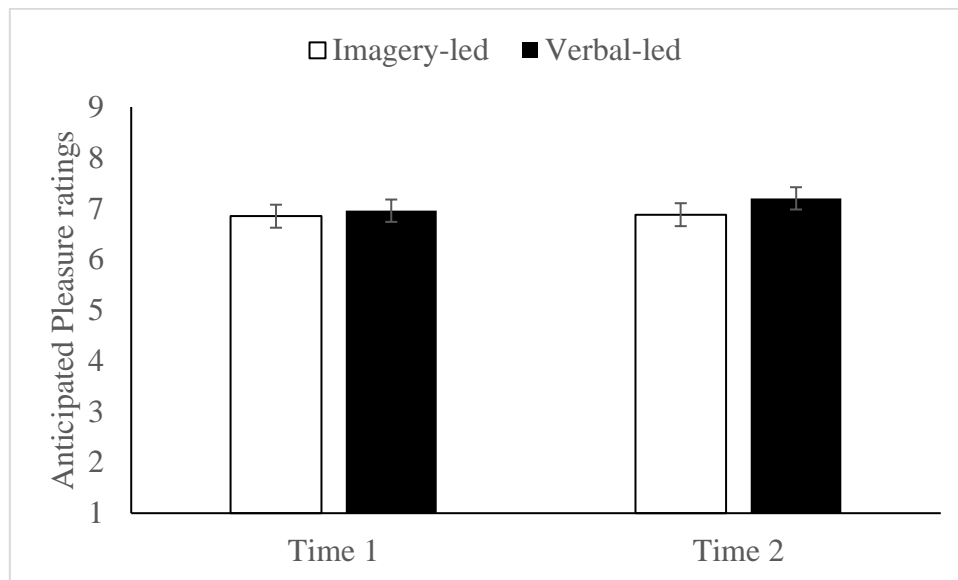
Table 3 Means and standard deviations of Time 2 and 3 measures and change scores by condition

Variable	Condition	
	Imagery-led (<i>n</i> = 33) <i>M</i> (<i>SD</i>)	Verbal-led (<i>n</i> = 35) <i>M</i> (<i>SD</i>)
<i>Time 2 Measures</i>		
Positive Affect	27.67 (8.33)	30.31 (4.86)
Negative Affect	13.67 (5.44)	13.66 (4.86)
Future Self-Continuity	4.18 (1.04)	4.20 (1.22)
Anticipated Pleasure (<i>Unelaborated</i>)	7.35 (.76)	7.26 (.77)
Anticipated Pleasure (<i>Elaborated</i>)	6.89 (1.33)	7.20 (1.27)
Behavioural Intention (<i>Unelaborated</i>)	7.53 (.86)	7.48 (.73)
Behavioural Intention (<i>Elaborated</i>)	5.33 (1.72)	5.96 (1.34)
<i>Time 3 Measures</i>		
Number of events engaged in (<i>Unelaborated</i>)	5.76 (1.37)	5.97 (1.00)
Number of events engaged in (<i>Elaborated</i>)	.91 (.80)	.91 (.71)
Overall experienced pleasure	7.26 (1.03)	7.16 (.69)
<i>Change scores (for exploratory analysis)</i>		
Positive Affect	-.02 (.07)	.01 (.07)
Negative Affect	-.03 (.09)	-.04 (.10)
Behavioural Intention (<i>Elaborated</i>)	.07 (.14)	.12 (.11)
Anticipated pleasure (<i>Elaborated</i>)	.00 (.06)	.02 (.09)
Future self-continuity	-.001 (.08)	.008 (.10)

Anticipated pleasure

Mean anticipated pleasure ratings for elaborated events across time and condition are shown in *Figure 2*. To investigate differences between the conditions on scores of anticipated pleasure for elaborated events, a one-way ANCOVA was conducted with condition as IV, Time 2 scores as DV, and Time 1 scores as a covariate. After controlling for Time 1 scores, there was no significant main effect of condition ($F(1,65) = 1.25, p = .27$).

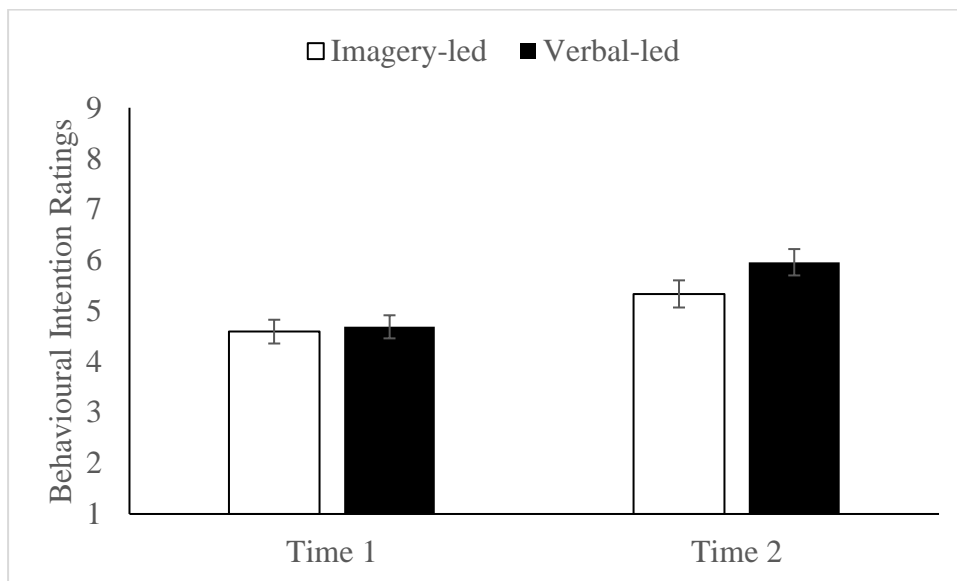
Figure 2 Mean anticipated pleasure ratings for elaborated events (and SE bars) by Time and Condition



Behavioural intention

Figure 3 illustrates mean behavioural intention ratings for elaborated events across time and condition. To investigate differences between the conditions on scores of behavioural intention for elaborated events, a one-way ANCOVA was conducted. After controlling for behavioural intention at Time 1, a significant main effect of condition was found ($F(1,65) = 4.14, p = .046$). Contrary to our hypotheses, LSD adjusted post-hoc comparisons showed the verbal-led group reported greater behavioural intention at Time 2 than the imagery-led group ($p = .046$).

Figure 3 Mean behavioural intention ratings (and SE bars) by Time and Condition



Behavioural engagement

There was no significant difference between the two conditions on the number of elaborated events engaged in at two-week follow up, ($t(65) = .014, p = .99$).

Exploratory analysis

Exploring the moderating role of depression

To test the hypothesis that depression moderates the relationship between prospective mental imagery and changes in key outcomes, change scores for positive and negative affect, future self-continuity, and ratings of behavioural and anticipated pleasure for elaborated events were calculated by subtracting Time 1 scores from Time 2 scores and dividing by the sum of Time 1 and Time 2 scores. Change scores for negative affect were calculated using non-transformed Time 1 and Time 2 scores and normality was re-assessed. The change score was not significantly skewed (Z -Skew scores $< 2.58, p > .01$).

A positive change score indicates an increase in scores between Time 1 and Time 2, while a negative change score indicates a decrease in scores between Time 1 and Time 2. Means and standard deviations for change scores can be found in *Table 3*.

Table 4 shows zero-order correlations between change scores, depression and use of imagery and verbal processing during the elaboration task. Positive affect change and depression were negatively associated ($r(68) = -.26, p = .032$), such that those with higher levels of depression experienced less change in positive affect between Time 1 and Time 2. Depression was not significantly associated with changes in negative affect, future self-continuity, behavioural intention for elaborated events, or anticipated pleasure for elaborated events.

Independent T-Tests found the two conditions did not differ significantly on negative affect change ($t(66) = .47, p = .32$), future self-continuity change ($t(66) = .41, p = .34$), or anticipated pleasure change for elaborated events ($t(66) = 1.05, p = .15$). The conditions did not significantly differ in behavioural intention change for elaborated events ($t(66) = 1.04, p = .06$). However, the verbal-led condition showed significantly greater increases in positive affect between Time 1 and Time 2 ($t(66) = 1.70, p = .047$).

Table 4 Zero order correlations between depression, use of imagery or verbal processing, and change scores of key outcome variables

	Depression	PA change	NA change	Future self-continuity change	BI change (elaborated events)	AP change (Elaborated events)	Use of Imagery	Use of Verbal
Depression	-							
PA change	-.26*	-						
NA change	.003	-.46**	-					
Future self-continuity change	.98	<.001		-				
BI change (Elaborated events)	.01	.13	.13	.15	-			
AP change (Elaborated events)	-.13	.31*	.06	.23	.25*			
Use of Imagery	.29	.01	.63	.44	.04	-		
Use of Verbal	-.20	.30*	.03	-.09	.25*			
	.09	.01	.78	.44	.04			
	.08	-.28*	-.08	-.14	-.35*	-.05		
	.54	.02	.53	.28	.004	.72	-	
	-.19	.04	-.10	.19	.02	-.23	-.21	
	.13	.75	.42	.13	.89	.06	.08	-

AP = Anticipated Pleasure; BI = Behavioural Intention; PA = Positive Affect; NA = Negative Affect

* *p* significant at < .05 level

As the two conditions were found to significantly differ with respect to behavioural intention for elaborated events (based on ANCOVA) and in positive affect (based on change scores), separate moderation analyses were conducted according to the procedure of PROCESS macro model 1 for SPSS (Hayes, 2022) to examine whether depression moderated the relationship between condition and behavioural intention change for elaborated events and the relationship between condition and positive affect change. Bootstrap was used for verification, the confidence interval was 95%, and the number of samples was 5000.

In a model that included condition as IV (0 = Verbal, 1 = Imagery), depression as a moderator, and positive affect change as DV, it was found that the relationship between condition and positive affect was not significant ($\beta = -.03, p = .08$). The interaction between condition and depression was also not significant ($p = .90$), indicating depression did not significantly moderate the effect of condition on positive affect change.

In a separate model that included condition as IV (0 = Verbal, 1 = Imagery), depression as a moderator, and behavioural intention change for elaborated events as DV, the relationship between condition and behavioural intention change was not significant ($p = .10$). As shown in *Table 5*, there was, however, a significant interaction effect between condition and depression on behavioural intention change for elaborated events. The confidence interval of the bootstrap did not include 0 [-.026, -.002], demonstrating that depression significantly moderated the relationship between condition and behavioural intention change for elaborated events.

Table 5 Moderating effects of depression on behavioural intention change (elaborated events)

DV: Behavioural Intention Change (elaborated events)							
	β	SE	t	p	F	R ²	Adjusted R ²
Condition	-.05	.03	-1.69	.10	3.13	.38	.13

Depression	-.004	.003	-1.45	.15
Condition x Depression	-.01	.00	-2.30*	.03

*Significant at $p < .05$ level

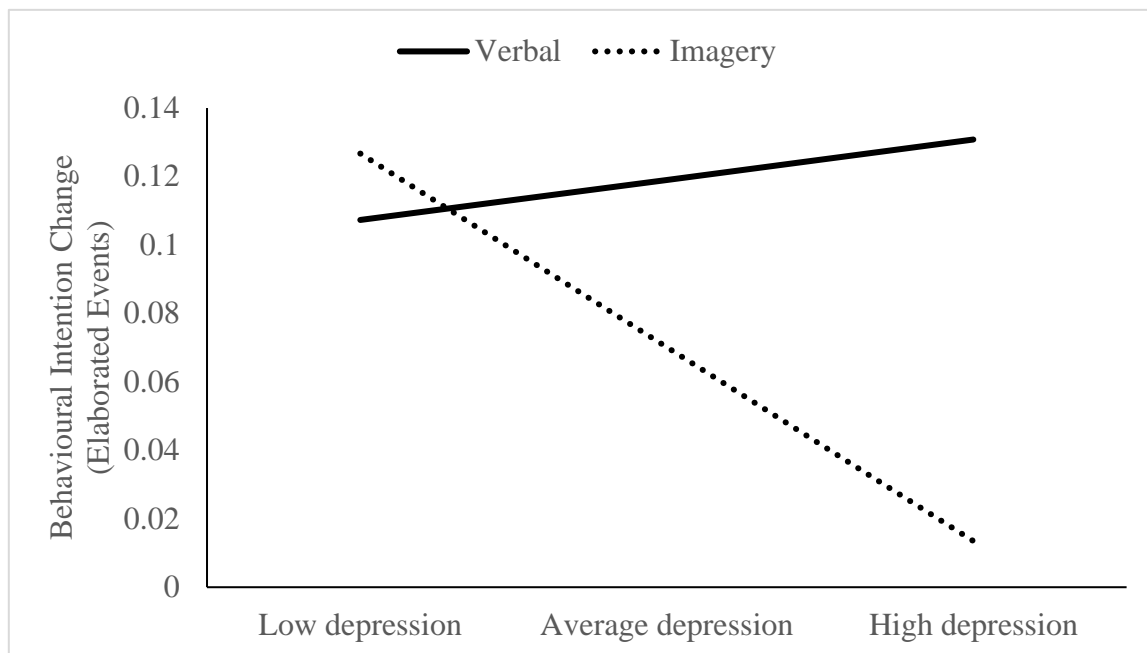
The conditional effects of condition on behavioural intention change for elaborated events according to levels of depression were next analysed. Results are shown in *Table 6*. Depressive symptoms are given at three conditions (1 SD above and below the mean and the mean). At low levels of depression, there was no significant relationship between condition and intention change. At higher levels of depression, a significant ($p = .006$) negative relationship between condition and behavioural intention change is observed. These results are further visualised in *Figure 4*. As is shown, higher scores of depression were associated with less behavioural intention change for the imagery-led group.

Table 6 Conditional effects of condition on behavioural intention at values of depression

Depression	Effect	SE	<i>t</i>	<i>p</i>	LLCI	ULCI
-4.85 (Low)	.02	.04	.47	.64	-.06	.10
0 (Average)	-.49	.03	-1.69	.096	-.11	.009
4.85 (High)	-.12	.04	-2.82	.006**	-.20	-.03

**significant at $p < .01$ level; LLCI = lower bound within the 95% confidence interval; ULCI = upper bound within the 95% confidence interval

Figure 4 Moderating effect of depression on the relationship between condition and behavioural intention change for elaborated events



Discussion

This study primarily aimed to investigate whether prospective mental imagery can promote positive current affect, anticipated pleasure, motivation, and behavioural engagement more than verbal-semantic processing of future events. Contrary to our hypotheses, engaging in imagery of specific, positive, and personal future events did not lead to significantly greater increases in positive affect, anticipated pleasure, intention to engage in or actual engagement in rewarding events compared to thinking in words about the meaning and significance of future events. In fact, with regards to change scores, results showed that there was a greater increase in positive affect between Time 1 and Time 2 in the verbal-led condition. Moreover, the verbal-led condition reported significantly greater ratings of intention at Time 2. A caveat here is that the observed increase in intention did not translate to greater engagement in nominated events after two weeks.

This study also aimed to examine whether changes in future self-continuity might mediate the relationship between prospective imagery and motivation, and whether depression moderates the relationship between prospective imagery and key outcomes. The results show little change in future self-continuity in either condition. However, in line with our hypotheses, depression was found to be a significant moderator of the effect of condition on behavioural intention, such that when depressive symptoms were high, imagery led to less change in intention to engage in rewarding events.

In light of previous research, these findings are surprising for two reasons. Firstly, prospective imagery, compared to verbal-semantic processing, did not lead to a significantly greater increases in any of the hypothesised outcomes. Overall, there was little change following the prospective imagery condition. This is in contrast to studies of non-prospective mental imagery, which show that positive images promotes positive affect more than verbal-

semantic based processing of positive material (Holmes et al., 2006, 2009; Holmes & Mathews, 2005) and that prospective mental imagery leads to greater increases in anticipated pleasure, motivation and behavioural engagement compared to no-imagery controls (Hallford et al., 2020a; Ji et al., 2021; Renner et al., 2019).

A second reason these findings are unexpected pertains to the effects of verbal-semantic processing. Verbal-semantic processing did not lead to a deterioration in positive affect, as has been found in studies of non-prospective imagery (Holmes et al., 2006, 2009; Holmes & Mathews, 2005). In fact, thinking in words about the meaning of future events was found to promote behavioural intention more than prospective imagery. Although unexpected, our finding is somewhat consistent with Ji et al., (2021), who found that participants who engaged in prospective imagery and those who thought about the benefits and reasons to engage in rewarding events (verbal-reasoning) both showed greater increases in behavioural intention than no-imagery controls. The slight difference in findings between our studies (our verbal condition outperformed the imagery condition while theirs performed equally as well) suggests that different forms of verbal processing may have differential effects on motivation. Additionally, these findings suggest that verbal or linguistic processing of future events, whether thinking in words about the personal meaning and significance of rewarding future events (verbal-semantic) or thinking about the benefits and reasons to engage in rewarding future events more generally (verbal-reasoning) is not as deleterious as one might expect from the literature on non-prospective mental imagery. Surprisingly, our findings provide preliminary evidence to suggest that thinking in words about the meaning and significance of future events might encourage motivation.

It is unclear why exactly prospective imagery failed to show any advantage over verbal-semantic processing of future events. The findings do not appear to be explainable by baseline differences in vividness of daily imagery, and the imagery-led group did

significantly differ from the verbal-led group in their self-reported use of imagery during the elaboration task. One possible reason is that the mental images participants were generating during the task were not adequately vivid or detailed. The vividness and detail with which individuals imagine the future relates to how likely they judge events to be (Boland et al., 2018), how pleasurable they expect them to be, and how much pleasure they experience when thinking about the events (Hallford et al., 2020b). It is possible then that the lack of change observed in the imagery-led group was due to participants engaging in less vivid prospection. As we did not ask participants to rate the vividness with which they imagined events during the elaboration task, it is difficult to say whether this may have been the case.

It may also be that participants in the imagery-led condition benefitted less than expected because they were not guided to focus on positive aspects of the imagined events. For example, Ji et al., (2021) guided participants to think about positive emotions they might experience during future events, while Renner et al., (2019) instructed participants to resolve their images in a positive way and to focus on positive aspects of the image. In the current study, participants were not guided to focus on positive aspects of their images. Additionally, elaborated events were chosen based on lower baseline behavioural intention ratings, to reduce the chances of a ceiling effect (Hallford et al., 2020a). As a result, elaborated events were also lower in baseline anticipated pleasure compared to unelaborated events. If the future events that participants were being guided to imagine were ones that they felt less motivated to engage in and which they anticipated to be less pleasurable, then in the absence of instructions to focus on positive aspects of the event, participants may have instead focused on less rewarding aspects of the image (e.g. how effortful it might be), resulting in little change in positive affect and anticipated pleasure. It is difficult to test this hypothesis without having asked participants to rate the valence of their imagery. It could be important for future studies to investigate whether instructions to focus on the positive aspects of future-

oriented imagery lead to greater increases in affect, motivation, and behaviour than instructions that do not, as this may have important implications for the design of future interventions aimed at promoting motivation by targeting prospective imagery. It may be that it is only when participants are instructed to focus on positive aspects of their future-oriented images that they show subsequent improvements in emotion and motivation.

Why participants appeared to benefit from thinking in words about the meaning and significance of future events is also unclear, when previous research has suggested that verbal processing of positive material may be disadvantageous (Holmes et al., 2009). One possible explanation concerns the instructions provided to participants in the verbal-led group. A question to help participants with the elaboration task in the verbal-led condition was “*What might cause this event to happen?*”. It is possible that this led participants in the verbal-led condition to engage in a degree of planning; that is, to consider the steps they might need to follow for this event to occur (Szpunar et al., 2014). There is evidence to suggest that imagining a desired outcome may not be as effective for encouraging action as imagining the steps to achieve a desired outcome (Pham & Taylor, 1999). Although the two conditions significantly differed in the amount of imagery used, the verbal-led group still reported moderate levels of imagery-use during the elaboration task. It is possible then that the verbal-led group were imagining the event they would like to engage in while also reflecting on the steps they might need to take to get there, as prompted by the task instructions. This may explain why the verbal-led condition led to a greater increase in motivation than focusing purely on building an image of the event.

Unfortunately, it is difficult to tease apart whether the effect on motivation observed here is due to verbal-semantic processing alone given that participants in this condition still reported high levels of imagery use. As stated above, it may be that participants in this condition were using a combination of imagery and verbal-semantic processing. It is possible

that a combination of positive prospective imagery and verbal-semantic processing is necessary for verbal-processing to lead to motivational change. Future studies may seek to investigate the potential benefits of adding verbal-semantic processing to existing paradigms designed to promote positive prospective imagery that have found effects for motivation (e.g. Renner et al., 2019) to determine whether thinking in words about meaning and significance can enhance the effects of positive prospective imagery. As will be discussed in more detail below, it will also be important for future research to seek ways to further differentiate between imagery and verbal conditions to allow for more confident conclusions about the differential effects of these two processing styles.

A notable finding in the current study is that depression moderated the relationship between prospective imagery and motivation. In participants with elevated depression levels, there was less intention change following prospective imagery. Individuals with high depressive symptoms tend to imagine the future with reduced vividness (Holmes et al., 2008; Morina et al., 2011; Stöber, 2000) and reduced specificity (see Hallford et al., 2018). As stated earlier, the more vivid and detailed an individual can imagine the future determines how likely they think that event is, and how much anticipatory and anticipated pleasure they experience (Boland et al., 2018; Hallford et al., 2020a). In turn, reduced anticipatory and anticipated pleasure may lead to less motivation (Hallford et al., 2021; Ji et al., 2021; Renner et al., 2019). Thus, it is possible that those in the imagery condition with elevated depressive symptoms might have struggled to engage in vivid prospective imagery and therefore experienced less of a change in motivation following the elaboration phase. It is also possible that, in the absence of instructions to focus on the positive aspects of the image, depressed individuals were more likely to focus on less rewarding aspects of the event. However, without a measure of vividness or valence of imagery, this is purely speculation and requires further examination.

The finding that depressive symptoms moderated the relationship between imagery and intention has implications for the design of future interventions aimed at increasing motivation and behavioural engagement in depression through targeting future-oriented imagery. Studies have found that training to engage in vivid and specific prospective imagery can improve the quality of propection in depressed individuals (Hallford, et al., 2020b; Szpunar & Schacter, 2013), which can lead to subsequent increases in anticipatory and anticipated pleasure as well as increased behavioural activation (Hallford et al., 2022). The difference between these interventions and the current study are instructions that encourage participants to repeatedly generate detailed and specific accounts of future events, and to focus on the positive aspects of the event. Thus, it seems that to benefit from imagery interventions, it may be important to guide depressed individuals explicitly to engage in the construction of detailed, vivid and positive images.

Although this study failed to find that increased intention in the verbal-led condition resulted in subsequent increased behavioural engagement, this may be because the current study did not include a scheduling component (i.e. an activity diary). Previous similar studies that have reported a significant increase in behavioural engagement following prospective imagery have had participants schedule their nominated activities (Ji et al., 2021; Renner et al., 2019). This may suggest that scheduling nominated activities is an important component of prospective imagery interventions aimed at improving behavioural engagement.

Limitations

There are several limitations to consider with regards to the current study. First, although the imagery-led group reported significantly greater uses of imagery during the elaboration task, both groups reported using similar levels of verbal processing. Moreover, as already discussed, the verbal-led group still reported using moderate levels of imagery during the

elaboration task. It is therefore difficult to draw confident conclusions about the effects of imagery versus verbal-semantic processing. As noted by Ji et al., (2021), future research should seek to increase differences between these imagery and verbal conditions, for example by using secondary tasks, such as engaging visuo-spatial working memory in the verbal condition to reduce imagery use, and using a verbal working memory task in the imagery-led condition to reduce use of verbal processing (Lau-Zhu et al., 2017). A second limitation is that participants were instructed to choose two events with the lowest behavioural intention, to avoid possible ceiling effects. However, this means that these events may have been less motivating or rewarding to participants, potentially limiting the effects of both conditions.

Another limitation concerns the study sample, which consisted of a self-selected, mostly female student sample that received credits for their participation. Further research should seek to address the limitations in sample representativeness within this study. Additionally, observed effect sizes in this study ranged from small ($\eta_p^2 = .01$) to medium ($\eta_p^2 = .06$). The study may have been underpowered to detect small to medium effect sizes so further replication with larger samples are needed.

Finally, one aim of the current study was to examine if changes in future self-continuity explain engagement in rewarding behaviours following prospective imagery. However, neither group showed significant increases in future self-continuity following elaboration. It may be that asking participants to think about their future selves in five years was too temporally distant given that participants were focusing on events due to occur within the next two weeks. This may have led to floor effects, with most participants indicating disconnection with their future self. Had participants been asked about their future self in two weeks' time, when the future events were expected to occur, a greater change in future self-continuity may have been found. Alternatively, this may be too short a temporal distance, and could potentially have led to a ceiling effect with most participants indicating

high self-continuity. An alternate measure of future self-continuity may be worthy of consideration in future studies, such as the Future Self Continuity Questionnaire (Sokol & Serper, 2020).

Conclusion

In summary, the main aim of this study was to determine whether prospective imagery exerts unique effects on current affect, anticipated pleasure, behavioural intention, and engagement in rewarding behaviours. Contrary to expectations, prospective imagery showed no advantage over thinking in words about the meaning and significance of future events. This may be because participants in the imagery-led condition were not generating adequately vivid or detailed images, or because instructions did not guide participants to focus on positive aspects of the image. Moreover, participants in the verbal-led condition reported greater increases in behavioural intention than the imagery-led condition. Increases in intention did not translate to greater behavioural engagement compared to prospective imagery at two-week follow up. A novel finding within this study was that depression moderated the effects of prospective imagery on intention, such that those with elevated depressive symptoms reported less change in intention following imagery. An additional aim of this study was to investigate whether changes in how connected individuals feel to their future selves mediates the relationship between imagery and motivation. However, overall, there was little change in future self-continuity in either condition following elaboration.

The findings of the current study provide preliminary evidence to suggest that, in some circumstances, verbal-semantic processing of future events may promote motivation more than engaging in future-oriented imagery. As the verbal-led condition still reported high levels of imagery use, it may be that verbal-semantic processing in combination with imagery has advantages over imagery alone. Future studies may seek to investigate the effects of

adding a verbal-semantic processing component to existing positive imagery interventions, and to examine whether asking participants to focus on positive aspects of future images is necessary for prospective imagery to promote motivation. That those with high levels of depression benefitted less from imagery with respect to motivation change suggests that elevated depressive symptoms could act as a barrier for interventions using prospective imagery. Instructions that prompt participants to construct vivid, detailed, and positive imagery may help to mitigate the effects of depression. Further replication will be needed to address several limitations identified in this study, such as the high use of imagery observed in the verbal-led group and sample representativeness.

Chapter 2. Does imagining the future reduce depressive symptoms in adults? A systematic review of prospection-based interventions.

Abstract

Deficits in the ability to imagine a vivid and positive future may contribute to and exacerbate depression. Interventions targeting impoverished prospective imagery might therefore improve prospection and be of benefit in the treatment of depression. To date, no study has reviewed the literature to assess the overall effectiveness of prospection in reducing depressive symptoms in adults. A systematic review was conducted to determine whether prospection-based interventions reduce depressive symptoms in adults. Fifteen studies were found eligible for inclusion following a search of five databases. Quality of randomised and non-randomised studies was assessed using the Checklist for Measuring Study Quality (Downs & Black, 1998) and quality of single-case design studies was assessed using What Works Clearinghouse guidance (Kratochwill et al., 2010). Overall, ten studies found a significant reduction in depressive symptoms following positive prospective imagery, with calculated effect sizes ranging from small to medium. However, the quality of included studies was limited due to sample representativeness, use of self-report measures of depression, and lack of detailed reporting of study procedures. Two single-case design studies failed to meet minimum design standards. It is recommended that future research explores factors that might improve the effectiveness of prospection-based interventions, as well as possible mediating factors, such as changes in negative expectations about the future. Moreover, studies should seek to investigate potential adverse effects of positive prospection. Further research with improved reporting of study procedures and more diverse samples would provide more robust evidence for the effects of prospection on depression, potentially leading to new and innovative interventions.

Introduction

Depression

Major depressive disorder (MDD), characterised by low mood and a loss of interest or pleasure in previously rewarding activities, affects approximately 300 million people globally (World Health Organization, 2017). Cognitive and physical symptoms, including appetite changes, sleep difficulties, poor concentration, and, in some individuals, recurrent thoughts of death and suicide, must cause clinically significant levels of distress or impairment to meet diagnostic criteria (American Psychological Association, 2013). MDD is associated with increased mortality and adverse social and economic outcomes (Kessler, 2012). Yet, despite the development of various pharmacological and psychological interventions, there has been no reduction in the global prevalence or burden of depression (Patel et al., 2016). In fact, researchers have noted a substantial increase in prevalence and burden of depression due to the COVID-19 pandemic (COVID-19 Mental Disorders Collaborators, 2021).

One challenge for developing treatments for depression is its heterogenous nature, with symptoms varying across individuals (Strunk & Sasso, 2017). Approximately 35-50% of those who meet criteria for MDD will not respond to treatment (Cuijpers et al., 2014; Hollon et al., 2002). Clearly, there is a need to identify common underlying processes contributing to depression to develop innovative and effective treatments.

Prospection and depression

In Beck's cognitive model (Beck et al., 1979), a negative or pessimistic view of the future is a central feature of depression. Various authors agree that an inability to envision a positive and hopeful future may be both a cause and consequence of depression (Abramson et al., 1989; Renner et al., 2021; Roepke & Seligman, 2016). Consistent with this view is a

substantial degree of research demonstrating that depression is associated with various deficits in future-directed thinking.

When asked to think of possible events that might occur in the future using a verbal fluency paradigm, individuals experiencing depression find it more challenging to list possible positive events than anxious individuals and non-depressed controls (Bjärehed et al., 2010; MacLeod et al., 1997; MacLeod & Byrne, 1996; Macleod & Salaminiou, 2001). In addition to reduced positive expectations about the future, studies using the Prospective Imagery Task (*PIT*, based on Williams et al., 1996; Stöber, 2000), in which participants are asked to form mental images of hypothetical future events (“*You will make good friendships*”), have found that depressed individuals imagine the future with reduced vividness (Holmes et al., 2008; Morina et al., 2011; Stöber, 2000). These findings are consistent with studies using a cue-word paradigm, where participants are asked to form images of future events in response to cue words. Results from studies using this paradigm confirm that depression is associated with reduced contextual detail and specificity when thinking about positive future events (see Hallford et al., 2018). Individuals experiencing depression also tend to overestimate the likelihood of negative events (Beck et al., 2006; Strunk et al., 2006), and believe they have less control over the occurrence of future goals (Dickson et al., 2011).

Impairments in simulating the future may be linked to similar deficits in re-experiencing the past through episodic memory. It has been proposed that prospective mental imagery is constructed through a process of retrieving and recombining elements from past experiences (Schacter et al., 2007). However, studies have found that suicidal and depressed individuals exhibit overgeneralised episodic memory, recalling memories with reduced detail and specificity (Dickson & Bates, 2006; Williams, 1996; Williams & Broadbent, 1986). Rather than selecting one event that occurs at a specific time and place, they tend to recall

memories that are generic in content, and which summarise a category of events. This difficulty in recalling specific memories is correlated with similar impairments in generating specific future imagery (Dickson & Bates, 2006; Williams, 1996). Moreover, Williams (1996) found that encouraging participants to retrieve specific events from the past resulted in subsequent improvements in the generation of specific future-oriented imagery, suggesting that deficits in memory retrieval underlie impoverished prospection.

That individuals with depression exhibit impairments in their ability to envision a vivid future is of significance, given that simulation of future events is widely considered to be an adaptive process that guides effective decision making, problem-solving and emotion regulation (Suddendorf et al., 2018). With regards to well-being, an impoverished ability to imagine a vivid and positive future is associated with reduced optimism (Blackwell et al., 2013; Ji et al., 2017), which is a predictor of depression (Giltay et al., 2006) and suicidal ideation (Chang et al., 2013). Moreover, a lack of vivid or specific prospective imagery may partially explain why depressed individuals expect and experience less pleasure when thinking about future events (Renner et al., 2021; Wu et al., 2017), potentially resulting in a lack of motivation to engage in rewarding behaviours (Hallford et al., 2020a). Current evidence-based interventions for depression, such as behavioural activation (BA, see Janssen et al., 2021 for a review) emphasise re-engagement in rewarding and meaningful activities to improve depressive symptoms. However, if a depressed individual struggles to vividly imagine what it might be like to engage in a rewarding activity or to simulate the pleasure they might experience, then they will likely lack the motivation to seek this activity out, further perpetuating low mood. Deficits in future imagery might therefore be an important target for intervention in depression.

Prospective imagery as an intervention

If depression is perpetuated or caused by impoverished future imagery and a resulting lack of positive emotion and motivation, then this opens possible avenues for intervention.

Treatments that encourage depressed individuals to imagine vivid and positive future events could potentially lead to improvements in depressive symptomatology.

Studies within the cognitive psychology literature, which tend to use the term “*episodic future thinking*” (EFT) when referring to prospective imagery, have found that repeatedly generating images of specific future events can lead to more detailed future imagery in non-depressed samples (Hallford et al., 2020c; Szpunar & Schacter, 2013). In another study, Boland et al., (2018) asked participants with low to elevated depression levels to repeatedly imagine, as vividly as possible, positive future events in response to cue words. They were then provided with a list of positive and negative events and were asked to rate perceived likelihood and controllability of each event, and the vividness with which they could imagine the event. After engaging in repeated imagery of positive future events, participants rated other positive future events as significantly more likely, controllable, and vivid. Participants rated negative events as less likely to occur and were rated as less vivid following repeated simulation of positive events. These findings were true for participants with both low and elevated depressive symptoms.

Together, these studies suggest that prospection-based interventions improve not only the detail and vividness with which individuals are able to imagine future events, but the expectations and beliefs people hold about the likelihood of positive future events. This potentially has positive consequences for well-being. Consistent with this, Quoidbach et al., (2009) found that engaging in repeated imagery of positive future events led to increases in happiness compared to negative or neutral events. Other studies have shown that imagining

positive and specific future events promotes positive affect in the present, anticipated pleasure, and can boost motivation to engage in rewarding events more than no-imagery controls (Ji et al., 2021; Renner et al., 2019). As already stated, deficits in positive affect, the ability to anticipate reward, and a lack of motivation to engage in rewarding behaviours are key features of depression (Renner et al., 2021). It is plausible then that prospective imagery could be utilised as an intervention to improve depressive symptoms.

Further evidence for the beneficial effects of prospection-based interventions comes from the positive psychology literature. The Best Possible Self intervention (BPS; King 2001) is a writing intervention in which participants are asked to imagine a positive future where they have accomplished all their life goals. Studies using the BPS paradigm have shown increases in positive affect (King, 2001; Peters et al., 2010; Renner et al., 2014), optimism (Peters et al., 2010), and self-esteem (Owens & Patterson, 2013). Moreover, a recent review by Schubert et al., (2020), which primarily reviewed studies using the BPS paradigm to assess the effects of positive prospection, concluded that engaging in positive prospective imagery is effective at promoting positive affect.

Objectives of this review

When considered together, the findings reviewed above suggest that engaging in positive prospective imagery might alter how people think about and imagine the future with positive implications for emotion and motivation. Interventions that involve imagining a positive future may be of use in promoting positive affect, anticipated pleasure, and increased engagement in rewarding behaviour, potentially leading to reductions in depressive symptomatology. To the best of our knowledge, no review has sought to determine whether engaging in prospective mental imagery reduces depressive symptoms. The aim of the current study was therefore to integrate findings from studies employing prospection-based

interventions to determine whether prospective imagery can lead to a reduction in depressive symptomatology.

Methods

The aims and methods of this systematic review were registered with the PROSPERO database (<https://www.crd.york.ac.uk/prospero>, registration number: CRD42022356166).

This review was conducted in line with the PRISMA guidelines for reporting systematic reviews (Liberati et al., 2009).

Search Strategy

Electronic literature searches were conducted in November 2022 using five databases: APAPsychInfo, APAPsychExtra, APAPsychArticles, Medline and Web of science. Future-related terms (“prospective” OR “future” OR “prospection” OR “pre-experienc*” OR "best possible self" OR "possible selves") were combined with terms related to imagination or imagery (“simulation” OR “image*” OR “visuali#ation” OR visuali#e”), terms relating to intervention (“intervention” OR “training” OR “treatment”), and a term pertaining to depression (“depress*”). An additional hand search, involving manual searches of reference lists and bibliographies from key articles, was also conducted.

Eligibility and study selection

This review used the following inclusion criteria: (1) studies employing quantitative or mixed method approaches, (2) peer reviewed journal articles published in English, (3) studies containing explicit instruction to think about the future (*“imagine”*, *“simulate”* etc.), (4) studies involving primarily prospective imagery (defined as >50% of total intervention involves imagining the future), (5) adult study participants (mean sample age > 18 years), (6) studies measuring depressive symptoms at least pre and post-intervention, (7) studies with two or more data points enabling either comparison pre and post intervention, comparison between different groups, or comparison between two different interventions.

Studies were excluded if they were: (1) qualitative design only, (2) cross-sectional design, or (3) published in non-English language. No restriction was placed on the year of publication or type of comparator.

Title and abstract screening were performed by the author only. Full-text screen for eligibility was performed independently by a second reviewer for 50% of texts ($n = 24$). There was moderate agreement between raters ($\kappa = .70$; McHugh, 2012). Disagreements ($n = 3$) were resolved through discussion.

Data extraction and quality assessment

Data were extracted using a predefined data extraction form, including information such as: Authors, year of publication, population recruited from, sample size, sample characteristics, method of measurement of depressive symptoms, and key findings relevant to the review question (see *Table 7*).

Quality assessment was carried out using the Checklist for Measuring Study Quality (Downs & Black, 1998), a rating scale for randomised and non-randomised study designs, as it is ranked in the top six quality assessment tools for systematic reviews (Deeks et al., 2003). The scale consists of 27 items organised into five sections assessing study quality, external validity, study bias, confounding and selection bias and power. All but one of the items are scored on a two-point scale, where 0 indicates *criteria has not been met ('No')* or *it is not possible to determine whether criteria has been met ('Unable to determine')*, and 1 indicates *criteria has been met ('Yes')*. Item 5 is scored on a three-point scale, where 1 indicates *criteria has been partially met ('Partially')*, and 2 indicates *criteria has been met*. Scores are summed, with a higher total score indicating higher quality. The total score is 28, with scores of 26 to 28 defined as *'excellent'*, 20 to 25 as *'good'*, 15 to 19 as *'fair'*, and less than 14 as *'poor'*.

The Single-Case Design Technical Documentation from the What Works

Clearinghouse (WWC) was used to assess the quality of single-case design studies due to its well-defined criteria (Kratochwill et al., 2010; Lobo et al., 2017). The WWC initially advises screening the standard of design, which examines the internal validity of individual studies. Reviewers assign the categories of *Meets Evidence Standards*, *Meets Evidence Standards with Reservations*, and *Does not Meet Evidence Standards* based on four design criteria (see below). If the study meets Evidence Standards (with or without reservation), it is then determined whether the study provides *Strong Evidence*, *Moderate Evidence*, or *No Evidence* using further criteria.

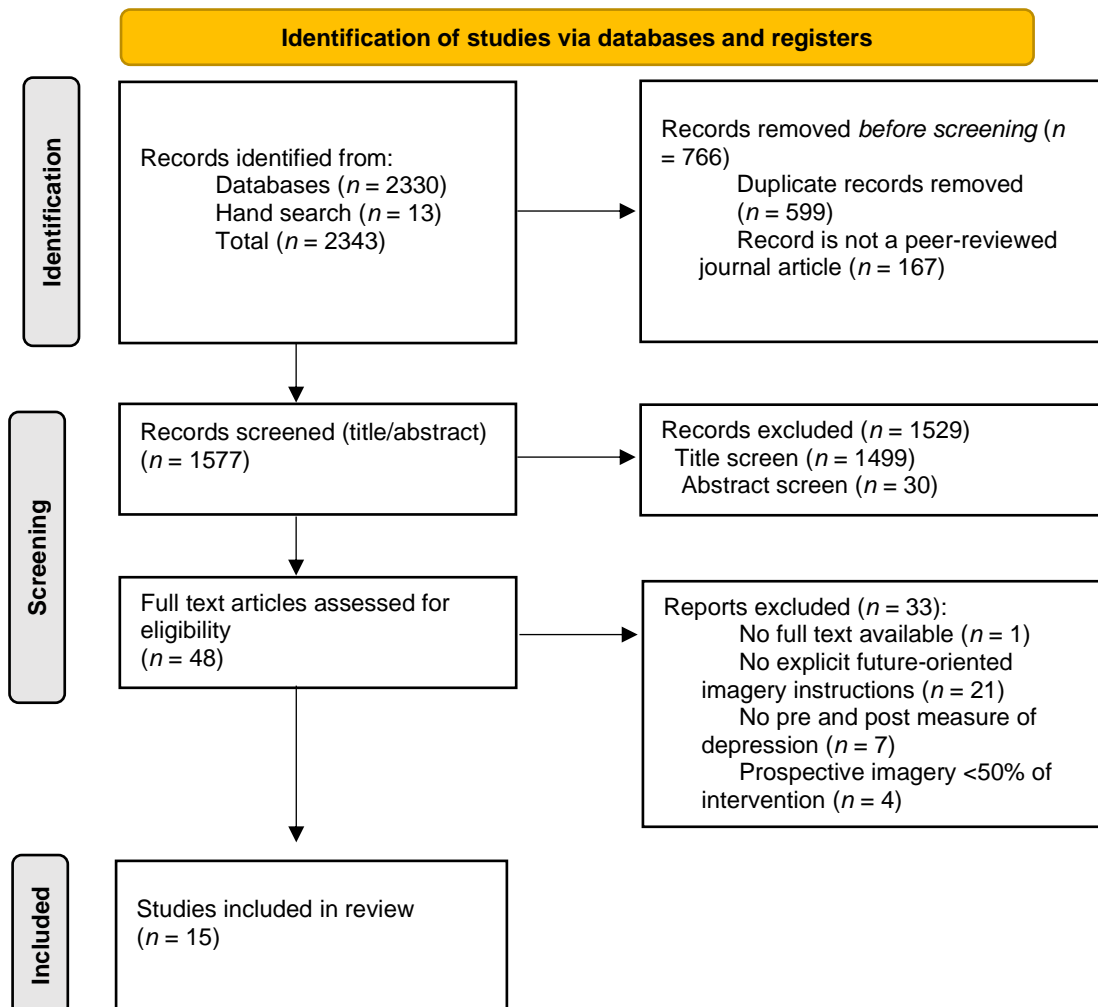
The WWC outlines four design criteria that must be present for a study's design to meet *Evidence Standards*. The first criterion states that the IV must be systematically manipulated with the researcher determining when and how the IV conditions change. Secondly, the outcome variable must be measured systematically over time **by more than one assessor**. The use of self-report only does not meet the WWC standards. Additionally, within this criterion, the study must collect inter-assessor agreement in each phase and on at least 20% of data-points. Thirdly, the study must include at least three attempts to demonstrate an intervention effect at three different time points or with three different phase repetitions. Simple AB designs do not meet this standard. In line with Maggin et al., (2013) these first three criteria were scored using a dichotomous scale (Present, Not Present). If any study was determined not to meet any of these three criteria, the design was classified as not meeting *Evidence Standards*. The fourth criterion outlined by the WWC is that a phase must have a minimum of three data points. This was scored using a trichotomous scale (*Meets Standards* if they provided five or more data points per phase; *Meets Standards with Reservations* if three or more data points per phase; *Does Not Meet Standards* if fewer than three data points per phase; Maggin et al., 2013).

However, neither SCED identified in this review met the first three design criteria (see Results). Thus, in line with the WWC, further analysis of the quality of evidence was not performed. Given the relatively small number of studies identified in this review, the results of both SCEDs have still been reported for the purpose of this review.

Results

The search resulted in 2,330 hits and the additional hand search resulted in 13 hits (see *Figure 5*). After removing duplicates, articles were screened based on title and abstract. Forty-eight full-text articles were then screened for eligibility based on the inclusion and exclusion criteria. In total, 15 studies were considered eligible. All included studies were published in English between 2008 and 2022. A summary of study characteristics of included studies is shown in *Table 7*.

Figure 5 PRISMA flow diagram



Review of interventions

Table 7 presents study characteristics based on extracted data for the 15 eligible papers in this review.

Intervention type

Of the 15 studies reviewed, five types of intervention were identified. These were (1) primarily Best Possible Self (BPS) based interventions ($n = 6$), (2) interventions that implement behavioural activation (BA) protocols with an added prospective imagery component ($n = 3$), (3) episodic future thinking (EFT) based interventions in which participants generate and imagine specific future events or goals ($n = 4$), (4) an adapted Cognitive Bias Modification for Interpretation (CBM-I) paradigm with explicit prospective imagery instructions ($n = 1$) and (5) a combined programme involving the delivery of several prospection-based interventions including the BPS ($n = 1$).

The most used prospection-based intervention across all the studies, including the combined programme, was the BPS ($n = 7$). There was variation in how this intervention was applied. All BPS studies included a written exercise, in which participants were instructed to imagine and write about a positive future in which their goals have been achieved. Only two studies quoted within the text the exact instructions provided to participants for this written exercise (Manthey et al., 2016; Shapira & Mongrain, 2010), so it is not possible to determine whether instructions were similar across studies. Two studies included a dedicated visualisation component in addition to the written component (Enrique et al., 2018; Molinari et al., 2018). These two studies also used “*positive technology*” to facilitate implementation of the BPS intervention, utilising an interactive system called the Book of Life, in which participants could attach multimedia content to their written BPS essay to enrich visualisation. They also used a web-platform called TEO (“Emotional Therapy Online”) for

participants to access this content from home. Out of the BPS studies, these showed the largest effect sizes (see Analysis of Treatment Effect below). It is unclear whether Fischer et al., (2022), who included BPS in their combined programme, employed a visualisation component.

Three studies involved the implementation of BA protocols (i.e. activity selection and scheduling) with an added prospective imagery component. In their study, Renner et al., (2019) had participants nominate six activities they wanted to engage in over the course of one week. Participants scheduled these activities and were then instructed to vividly imagine themselves engaging in the activities. Colombo et al., (2022) asked participants to nominate four activities they would like to engage in. Prior to scheduling the events, participants visualised and virtually experienced the activities through use of VR and guided imagery. Pellas et al., (2022) developed a four-session protocol in which participants planned activities for the following week and engaged in visualisation of one planned activity per session. None of these studies implemented a comparator group of BA-only, making it difficult to determine whether any observed effects are due to the BA protocol alone or the prospective imagery component of the intervention. Additionally, Colombo et al., (2022) did not include a comparator of BA+VR only, meaning it is unclear whether observed effects are due to the VR or guided prospective imagery component of the intervention.

Similar to the BA-based interventions, four studies involved interventions that instructed participants to nominate and then imagine specific future events. However, these studies did not follow a BA protocol. These studies have been categorised in this review as “*EFT based interventions*” as they either cite the literature on “*episodic future thinking*” (EFT) or “*mental time travel*” (MTT), in which participants are asked to generate and imagine specific future events, or they use a cue-word paradigm to elicit the generation of specific events. Dainer-Best et al., (2018) implemented Positive Self-Reference Training

(PSRT). Twice a day, participants were emailed a cue-word and were instructed to imagine themselves engaging in a specific “positive or fun” future event in response to each cue. In their group-based intervention, Chen et al., (2020) asked participants to nominate and imagine possible specific events or goals across four time periods: 1 week, 1 year, 5 years and more than 5 years. Hallford et al., (2020b) employed a much shorter time-frame, instructing participants to nominate and imagine one activity per day that they were looking forward to or could possibly do within 2 hours. Hallford et al., (2022) employed Future Event Specificity Training (FEST). This intervention involved participants first nominating specific future events in response to cue words. Participants then received training to elaborate on the events, through encouraging the generation of sensory and scene details, as well as visualisation of the future events from a first-person perspective.

The final two studies included in this review were of an adapted CBM-I paradigm (Namaky et al., 2021), and a programme which combined several prospection-based interventions (Fischer et al., 2022). In their study, Namaky et al., (2021) instructed participants to imagine themselves in 48 standardised, three-sentence long, explicitly future-oriented scenarios. As in traditional CBM-I procedures, the valence of the scenarios remains ambiguous until the final word, presented as a word fragment, is solved by participants (e.g. “we_1 becomes “well”). It should be noted that the primary aim of this study, like other CBM-I studies, was not to assess the impact of prospective imagery on depressive symptoms, but to determine whether adapted CBM-I can reduce negative interpretation bias. Therefore, they did not include a non-prospective comparator group. Instead, they compared positive future scenarios with neutral future scenarios to assess whether resolving the ambiguity of positive scenarios would lead to the development of a more generalised positive outlook. It is therefore not possible to determine from this study whether positive prospection outperformed present-oriented imagery.

Finally, in their study, Fischer et al (2022) delivered a “prospective coaching programme” that included a BPS-based exercise, an “*Imaginative journey*” exercise in which participants imagine their current situation then imagine achieving a future goal, as well as other exercises not described in detail.

Format of Interventions

Of the six studies using the BPS paradigm (excluding the combined programme), four were web-based (Enrique et al., 2018; Manthey et al., 2016; Molinari et al., 2018; Shapira & Mongrain, 2010). Two web-based studies held initial intervention sessions within a lab (Enrique et al., 2018; Molinari et al., 2018). One study was group-based and conducted face-to-face (Liau et al., 2016), and one was conducted entirely in the lab (Yogo & Fujihara, 2008).

Of the three studies using BA protocols, one was telephone-based (Pellas et al., 2022) and two were lab-based (Colombo et al., 2022; Renner et al., 2019). Of the four solely EFT based studies, one was web-based (Hallford et al., 2020b), two were group-based (Chen et al., 2020; Hallford et al., 2022) and one was conducted online (Dainer-Best et al., 2018). Namaky et al., (2021) conducted their study of adapted CBM-I online, while the combined prospection programme was delivered as a face-to-face group (Fischer et al., 2022).

Facilitators

Of the four group-based studies, two were facilitated by a coach or trainer (Chen et al., 2020; Fischer et al., 2022), and one was facilitated by two researchers (Hallford et al., 2022). The remaining study did not report details of group facilitators (Liau et al., 2016). Of the three studies using BA protocols, two were facilitated by therapists or psychologists (Colombo et al., 2020; Pellas et al., 2022) and one was facilitated by a researcher (Renner et al., 2019). Of the BPS studies that were lab-based or had an initial in-lab session, one was facilitated by a

psychologist (Molinari et al., 2018) and the remaining two studies did not report details of facilitators (Enrique et al., 2018; Yogo & Fujihara, 2008).

Duration of Intervention

Of the BPS studies, the most intensive interventions involved daily practice for 4 weeks (Enrique et al., 2018) and once weekly practice for 8 weeks (Manthey et al., 2016). The least intensive intervention involved two sessions, spaced one month apart (Liau et al., 2016).

The duration of BA-based interventions ranged from a one-off lab session (Renner et al., 2019) to four sessions twice weekly (Colombo et al., 2022). Of the four EFT-based studies, the most intensive interventions involved eight sessions over 4 weeks (Chen et al., 2020) and two events per day over 15 days (Dainer-Best et al., 2018). The least intensive intervention involved two sessions, one week apart (Hallford et al., 2022).

Namaky et al., (2021) delivered their adapted CBM-I intervention in four sessions across two weeks. Fischer et al., (2022) delivered their combined programme in three 3-hour sessions across 3 weeks.

Review of methodology

Research design

In total, twelve of the reviewed studies were RCTs, using random allocation to assign participants across intervention or control conditions (see *Table 7*). One study used a quasi-experimental design, as participants were not randomly allocated across conditions (Fischer et al., 2022). The remaining two studies used single case experimental designs (SCED). Colombo et al., (2020) used a single case multiple baseline design. Hallford et al., (2020b) used a randomised start-point, single case series A-B design.

Three types of control conditions were found in RCTs. These were (1) Waitlist ($n = 3$), (2) Care as usual ($n = 1$), and (3) active controls ($n = 8$). Six of the eight studies that used active controls were BPS studies. Active controls against the BPS included reflecting on activities in the past week or day (Enrique et al., 2018; Liao et al., 2016; Manthey et al., 2016; Molinari et al., 2018), reflecting on early memories (Shapira & Mongrain, 2010), or writing about trivial topics (Yogo & Fujihara, 2008). In their BA-based study, Renner et al., (2019) used a no-imagery, activity-reminder only condition as a comparator. Dainer-Best (2018) compared PRST against a neutral training condition, which involved the imagination of objects and spaces that were neutral in valence and present-oriented.

Follow up assessment

Seven of the 15 reviewed studies conducted follow-up assessments (see *Table 8*). One study assessed changes in symptoms up to two-weeks following training (Dainer-Best et al., 2018). Two studies assessed changes in symptoms up to one-month post-intervention (Fischer et al., 2022; Manthey et al., 2016). Three studies assessed changes up to 3 months post-intervention (Enrique et al., 2018; Hallford et al., 2022; Molinari et al., 2018). Only one study assessed changes in symptoms up to 6 months following completion of the intervention (Shapira & Mongrain, 2010). The remaining reviewed studies assessed outcomes immediately after the intervention.

Measures of Depressive Symptoms

Most reviewed studies ($n = 12$) used a single measure of depression (see *Table 7*). Only three studies used more than one measure of depressive symptoms: Chen et al., (2020) and Hallford et al., (2022) used two measures of depression to assess their EFT-based interventions, while Pellas et al., (2022) used four measures to assess their BA-based intervention. All but one study used self-report measures of depression. Pellas et al., (2022)

assessed presence of depression post-intervention using the Mini International Neuropsychiatric Interview 7.0 (MINI; Sheehan et al., 1998), a clinician administered rating of depression.

Table 7 Characteristics of included studies

Author (Year)	Study design	Population recruited from (Country)	Key Inclusion criteria	Total sample size (n)	Age (M)	Female (%)	Intervention Type Duration & Control	Measure of depression	Summary of results	Quality assessment score
Chen et al., (2020)	RCT	Inpatient sample (China)	Diagnosis of SZ 18 – 55 years 6 years of education or more IQ > 70	80	34.8	22.5	EFT-based (Imagining specific events/goals) 60 mins x 4 weeks (twice a week) & Medication only	BDI HAMD-17	No significant decrease in depression using BDI scores vs. CG. Significant decrease in depression using HAMD scores vs. CG (F(3,76) = 15.46, p <.001, n ² p=.38)	18 'Fair'
Colombo et al., (2020)	SCED (multiple baseline design)	Psychological care centre – (Spain)	Moderate to severe depressive symptoms and low positive affect 18 – 65 years	8	22.9	87.5	BA with VR assisted imagery ? Mins x 2 weeks (twice a week) & N/A	PHQ2	Significant decrease in depression observed in most patients (Data overlap methods).	SCED – see Table 10
Dainer-Best et al., (2018)	RCT	Community sample (USA)	18-45 CES-D > 13	264	26.5	82.7	EFT-based 2 events per day x 15 days & Neutral Present Control	CES-D	No significant decrease in depression vs CG (B = 0.85, p = .55)	22 'Good'
Enrique et al., (2018)	RCT	University sample & staff (Spain)	No psychological disorder 18 – 70 years	81	23.8	65.4	BPS 25 min initial; 5 min x 4 weeks (once a day) & DA	BDI	No significant decrease in depression vs. CG post-intervention or at FU.	20 'Good'
Fischer et al., (2022)	QED	Community sample (Austria)	Mild to moderate impairment in well-being	70	40.4	74.2	Combined programme 3 hours x 3 weeks (once a week) & Waitlist	ADS-K	Significant decrease in depression post-intervention vs. CG (B = 5.53, SE = 1.78, t = 3.11, p = .002, d =.93) No significant difference at FU.	17 'Fair'

Author (Year)	Study design	Population recruited from (Country)	Key Inclusion criteria	Total sample size (n)	Age (M)	Female (%)	Intervention Type Duration & Control	Measure of depression	Summary of results	Quality assessment score
Hallford, et al., (2020b)	SCED (AB design)	Outpatient department – (India)	Current MDD 16 – 65 years Fluent in English	10	24	0	EFT-based <i>Minimum 6 days depending on start point & N/A</i>	DASS - D	No significant decrease in depression from baseline ($d = .07$)	SCED – see Table 10
Hallford et al., (2022)	RCT	Community sample (Australia)	Current MDE and currently experiencing anhedonia 18-65 years	177	43.7	80.8	EFT-based <i>90 minutes x 2 (one week apart) & Waitlist</i>	e-PASS PHQ-9	Significantly fewer participants met MDD criteria at 3-month FU ($X^2(1) = 6.4, p = .01$). Significant decrease in depression using PHQ-9 at 3-month FU vs CG ($p = .048, d = .41$)	22 ‘Good’
Liau et al., (2016)	RCT	University sample (Singapore)	None reported	191	17.8	73.8	BPS <i>20 mins x 2 (one month apart) & Reflect on past week</i>	CES-D	No significant decrease in depression vs. CG	15 ‘Fair’
Manthey et al., (2016)	RCT	University sample & staff (Germany)	None reported	666	33.7	84.1	BPS <i>? mins x 8 weeks (once a week) & Tasks list</i>	STADI – euthymia and dysthymia subscales	Significant decrease in depression vs. CG ($F(1,432) = 3.69, p = .046, n^2 = .02$). No significant difference at FU.	18 ‘Fair’
Molinari et al., (2018)	RCT	Patients at a Rheumatology Unit (Spain)	Dx of Fibromyalgia	80	51.1	100	BPS <i>25 mins initial; 5 mins x 1 month (3 times a week) & Daily activities</i>	BDI	Significant decrease in depression vs. CG ($F(1,68) = 7.45, p < .01, n^2 = .10$) Significantly fewer participants achieved a functional score in depression vs. CG ($X^2(1) = 4.57, p < .05$) No significant difference at FU.	20 ‘Good’
Namaky et al., (2021)	RCT	University undergraduates (USA)	Relatively higher negative interpretation bias	240	20	66.3	Adapted CBM-I (Positive Prospection) <i>? Mins x 2 weeks (twice a week) & Neutral Valence Control</i>	DASS – D	No significant reduction vs CG (NB. CG involved prospection but of neutral valence). Both positive and neutral prospection led to significant reduction in depression ($p = .002$ and $p = .009$ respectively)	19 ‘Fair’

Author (Year)	Study design	Population recruited from (Country)	Key Inclusion criteria	Total sample size (n)	Age (M)	Female (%)	Intervention Type Duration & Control	Measure of depression	Summary of results	Quality assessment score
Pellas et al., (2022)	RCT	Older adult community sample (Sweden)	Clinically significant depressive symptoms >65 years	41	75.6	82.5	Telephone based BA with imagery ? Mins x 4 weeks (once a week) & Waitlist	MADRS-S GDS-15 PHQ9 MINI	Significant decrease in depression using the MADRS-S ($F(2,30,73.64) = 3.71, p = .024, n^2=.10$) vs CG Hedges g reported for GDS-15 ($g = .69$) and PHQ-9 ($g = .58$). No significant decrease in number of participants meeting depression on MINI vs CG.	22 'Good'
Renner et al., (2019)	RCT	Community sample (Germany)	18-65 years	72	36.4	61.1	BA with imagery ? Mins x One session & Activity-reminder only	DASS-D	No significant decrease in depression ($F(1,64) = .39, p = .54, n^2=.006$)	20 'Good'
Shapira & Mongrain (2010)	RCT	Internet sample (Canada)	None reported	1002	34	81.5	BPS ? Mins x 1 week (once a day) & Early memories	CES-D	Significant decrease in depression vs CG ($F(8,370) = 2.15, p = .03, n^2p = .04$). Significant decrease in depression at 1 month ($t(186) = -3.10, p < .001$) and 3 months ($t(186) = -2.93, p < .001$) vs CG.	15 'Fair'
Yogo & Fujihara (2008)	RCT	University undergraduates (Japan)	None reported	104	Not reported	71.1	BPS 20 mins x 3 weeks (once a week) & Trivial writing	10 items from MMS	Significant decrease in depression vs. CG ($F(1,99) = 30.09, p < .01$)	12 'Poor'

ADS-K = General Depression Scale ; BDI = Beck Depression Inventory ; CES-D = Centre for Epidemiological Studies Depression Scale ; DASS-D = Depression Anxiety Stress Scale – Depression subscale ; e-PASS = Electronic Psychological Assessment System ; GDS-15 = 15-item Geriatric Depression Rating Scale ; HAMD-17 = 17-item Hamilton Depression Scale; STADI = State-Trait-Anxiety-Depression Inventory; MADRS-S = Montgomery-Asberg Depression Rating Self-Rating Scale; MINI = Mini International Neuropsychiatric Interview 7.0; PHQ-9 = Patient Health Questionnaire - 9 ; MMS = Multiple Mental States
BA = Behavioural Activation; BPS = Best Possible Self; CBM-I = Cognitive Bias Modification for Interpretation; EFT = Episodic Future Thinking; MDE = Major depressive episode; MDD = major depressive disorder; VR = Virtual Reality

Sample characteristics

Recruitment methods

A variety of recruitment methods were used by the reviewed studies. Most studies ($n = 8$) used advertisements, such as social media posts (Hallford et al., 2022; Manthey et al., 2016; Shapira & Mongrain, 2010), newspapers advertisements (Fischer et al., 2022; Pellas et al., 2022), posters (Colombo et al., 2022), flyers (Manthey et al., 2016), or a mix of advertising methods (Dainer-Best et al., 2018). One study used undergraduates who received credit for taking part (Namaky et al., 2021). Another used a “*community volunteer panel*” but did not include more information about who this panel consisted of (Renner et al., 2019).

Consequently, these studies relied on self-selected samples, potentially limiting external validity.

Three studies identified potential participants through referrals from other professionals. In one group-based study, school administrators identified students who they believed would benefit from the intervention and had motivation to take part (Liau et al., 2016). Again, this potentially limits the external validity of findings. Molinari et al., (2018) received referrals from a rheumatologist. Hallford et al., (2020b) identified potential participants through intake procedures at an outpatient department. Two studies did not report whether any specific recruitment methods were used (Chen et al., 2020; Yogo & Fujihara, 2008).

Eligibility criteria

A range of inclusion criteria were used across the studies. Four studies did not report any specific inclusion criteria. Of the studies that reported inclusion criteria, most ($n = 8$) selected participants based on either (1) presence of depressive symptoms (Colombo et al., 2022; Dainer-Best et al., 2018; Hallford et al., 2022; Hallford et al., 2020b; Pellas et al., 2022) or an

impairment in well-being (Fischer et al., 2022), or (2) presence of another clinical diagnosis, such as fibromyalgia (Molinari et al., 2018) or schizophrenia (Chen et al., 2020).

Of the two remaining studies that reported inclusion criteria, one study selected participants with a relatively higher negative expectancy bias for their study of adapted CBM-I (Namaky et al., 2021), and one study selected based on the absence of psychological disorder (Enrique et al., 2018).

Participant characteristics

Characteristics of participants can be found summarised in *Table 7*. Most ($n = 13$) reviewed studies had predominantly female participants (>65%). The average age of participants included in the studies ranged from 17.8 – 75.6 years. Only two studies reported the ethnicity of recruited participants. Most participants (>70%) in these studies were Caucasian.

Analysis of treatment effect

Overall, 10 of the 15 reviewed studies (66.7%) showed significant reductions in depressive symptoms following prospective imagery, eight of which were RCTs. Of the six studies employing the BPS intervention, four found significant effects when comparing BPS against active and waitlist controls (see *Table 7*). Two of three BA-based studies found significant effects on depressive symptoms when comparing against individuals' own baselines (Colombo et al., 2022) and waitlist controls (Pellas et al., 2022). Two of the four EFT-based studies found significant effects of prospection compared to waitlist controls (Hallford et al., 2022) and treatment as usual (Chen et al., 2020). Namaky et al., (2021) found a significant effect of adapted CBM-I on depressive symptoms compared to neutral prospective imagery. Fischer et al., (2022) found a significant effect of their combined programme compared to waitlist controls.

Analysis of treatment effect sizes for studies using RCT and quasi-experimental designs are presented separately in *Table 8*. To examine treatment effects across the studies, Cohen's d effect sizes were calculated using the online Effect Size Calculator (Wilson & Mason, 2017). It should be noted here that heterogeneity between the reviewed studies means caution should be taken in interpreting differences in effect sizes across interventions. The aim of reporting and analysing effect sizes in this review is not to draw conclusions about which interventions are more effective, but rather to give an overview of existing interventions and estimates of their effectiveness. In line with Cohen, (1992), effect sizes were defined as follows: small ($d \leq 0.20$), moderate ($0.21 \leq d \leq 0.79$) and large ($d \geq 0.80$). Five studies did not provide the necessary data to calculate Cohen's d effect sizes (see *Table 8*). Requests were made to the authors, but the relevant information was not received.

Treatment outcomes varied depending on the type of intervention used. Of the BPS studies using an RCT design and for which effect sizes could be calculated, effect sizes ranged from small ($d = .05$) to moderate ($d = .42$). The two BPS studies with moderate effect sizes used "positive technology" to facilitate implementation of the BPS intervention and involved a focused visualisation component (Enrique et al., 2018; Molinari et al., 2018). Although Enrique et al., (2018) found a moderate effect of BPS, this was not found to be significant. As noted by the authors, it is possible that this is because participants were selected based on absence of a clinical diagnosis, introducing a possible floor effect due to low scores on depressive measures to begin with. As stated earlier, four BPS studies assessed depressive symptoms at follow up. Effect sizes at follow up ranged from small ($d = .05$) to moderate ($d = .57$). Shapira and Mongrain (2010) found moderate effects at 1-month and 3-months post-intervention. Molinari et al., (2018) found moderate effects up to 1-month post-intervention.

Table 8 Measures of depression used in included studies and treatment effect sizes of reviewed RCT and quasi-experimental studies

Author & Year	Measure of depression	Cohens <i>d</i>			
		Post-intervention	1-month follow-up	3-month follow-up	6-month follow-up
RCT designs					
Chen et al., (2020) ^a	BDI	.03			
	HAMD-17	2.60**			
Dainer-Best et al., (2018) ^b	CES-D	Unknown			
Enrique et al., (2018) ^a	BDI	.21*	.12	.08	
Hallford et al., (2022)	PHQ-9	Not assessed	.31*	.41*	
Liau et al., (2016) ^a	CES-D	.14			
Manthey et al., (2016) ^a	STADI	.05	.05		
Molinari et al., (2018)	BDI	.42*	-.18	.36*	
Namaky et al., (2021) ^b	DASS – D	Unknown			
	MADRS-S	.85**			
Pellas et al., (2022) ^a	GDS-15	.69*			
	PHQ9	.58*			
Renner et al., (2019) ^a	DASS - D	Unknown			
Shapira & Mongrain (2010) ^a	CES-D	Unknown	.57*	.54*	Unknown
Yogo & Fujihara (2008) ^b	10 items from MMS	Unknown			
Quasi-experimental design					
Fischer et al., (2022)	ADS-K	-.43*	.00		

ADS-K = General Depression Scale; BDI = Beck Depression Inventory; CES-D = Centre for Epidemiological Studies Depression Scale; DASS-D = Depression Anxiety Stress Scale – Depression subscale; GDS-15 = 15-item Geriatric Depression Rating Scale; HAMD-17 = 17-item Hamilton Depression Scale ; STADI = State-Trait-Anxiety-Depression Inventory (euthymia and dysthymia subscales); MADRS-S = Montgomery-Asberg Depression Rating Self-Rating Scale ; PHQ-9 = Patient Health Questionnaire - 9; MMS = Multiple Mental States *small effect* ($d \leq 0.20$), *medium effect* ($0.21 \leq d \leq 0.79$) (*), and *large effect* ($d \geq 0.80$) (**)

a = Effect size (*d*) not reported in article text and had to be calculated; *b* = Effect size (*d*) not reported and unable to be calculated as Ms and SDs not provided in report. Requests sent to authors.

The remaining three RCTs found effect sizes ranging from moderate to large for their respective prospection interventions. Pellas et al., (2022) found moderate ($d = .58$) to large ($d = .85$) effects for their BA-based intervention with the strength of the effect dependent on the measure used. Hallford et al., (2022) found moderate effects at 1 month and 3 month follow up for their EFT-based intervention ($d = .31 - .41$). Chen et al., (2022) found a large ($d=2.60$) effect for their EFT-based intervention, although this was only true for a clinician-rated measure of depressive symptoms and not a self-report measure. Finally, Fischer et al., (2022) who employed a quasi-experimental design found a moderate ($d = -.43$) effect for their coaching programme that included a combination of prospective interventions.

Quality Ratings of included studies

Quality assessment scores for each RCT and QED study can be found in *Table 7*. Scores ranged from 12 ('*Poor*') to 22 ('*Good*'). The average quality score was 18.38 (SD = 3.12, '*Fair*'). Mean scores on each item of the Downs and Black (1998) checklist for each reviewed study can be found in *Table 9*. The list of items can be found in *Appendix N*.

Perhaps the most notable area of weakness was sample representativeness. Only three studies used samples that were not self-selected, and two studies did not report how participants were recruited or selected (Chen et al., 2020; Yogo & Fujihara, 2008). To ensure samples are representative of the population from which they are recruited, it is important for studies to consist of the entire source population, an unselected sample of consecutive patients, or a random sample (Downs & Black, 1998). It is also important for studies to report the number of those asked to take part and those who decline, in addition to reporting the distribution of potential confounding factors in these two groups. However, eight of the studies assessed in this review were self-selected samples. These studies lack representativeness as it is not possible to calculate the proportion of those who put themselves

forward for the study and those who did not. It is also not possible to compare whether those who self-selected differed from those who did not.

None of the three studies that used non-self-selected samples provided enough information to determine whether the samples were randomly or consecutively selected from the source population. Moreover, two of these studies stated that participants were identified based on motivation or interest levels (Liau et al., 2016; Molinari et al., 2018), and one did not report how inpatients from a clinic were selected (Chen et al., 2020). Only one of the studies reported the proportion of potential participants asked to take part and those who declined (Molinari et al., 2018), although none of these three studies reported variations in potential confounding factors for those who agreed and declined. It is therefore difficult to determine the representativeness of the sample used in these three studies.

Although most studies stated they were randomised, six studies did not report the method of randomisation and so true randomness was unable to be determined. This is reflected in low scores on this item. There appeared to be little effort to blind participants or assessors/facilitators of the intervention or assignment allocation. However, blinding is notably more difficult for psychological interventions (Juil et al., 2021). Only five studies calculated power and had sufficient power to detect an effect. Only two studies reported whether participants were recruited over the same time period, resulting in low scores on this item. In addition to these areas of weakness, only one study assessed adverse effects (Pellas et al., 2022).

For the two SCED studies, neither study's design met the criteria for *Evidence Standards* and so further quality assessment was not performed in line with WWC guidance (Kratochwill et al., 2010). Both studies failed to meet *Evidence Standards* due to the use of self-report measures. Additionally, Hallford et al., (2020b) failed to meet *Evidence Standards*

due to the use of a simple AB design (the WWC standards require a minimum of four A and B phases). Additionally, depressive symptoms were measured only at baseline, when participants switched phases, and after two weeks, thus failing to meet the criterion that *each* phase must have a minimum of three datapoints. Results from these studies should be interpreted with caution.

Table 9 Scores on each item of the Downs & Black (1998) checklist of for each RCT/QED study.

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Chen et al., (2020)	1	1	1	1	2	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	1	0	0	0	1	1	0
Enrique et al., (2018)	1	1	1	1	1	1	1	0	0	1	0	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0
Dainer-Best et al., (2018)	1	1	1	1	2	1	1	0	1	1	0	0	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1
Fischer et al., (2022)	1	1	1	0	2	1	1	0	0	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	1
Hallford et al., (2022)	1	1	1	1	2	1	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	0	1	1	1
Liau et al., (2016)	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0
Manthey, et al., (2016)	1	1	1	1	2	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	1	0	1
Molinari et al., (2018)	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1
Namaky et al., (2021)	1	1	1	1	2	1	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	0	1	0	1	1	0
Pellas et al., (2022)	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Renner et al., (2019)	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	0	1	0	1	1	1
Shapira & Mongrain (2010)	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	0
Yogo & Fujihara (2008)	1	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0
<i>M</i>	1.00	1.00	1.00	0.92	1.31	1.00	0.92	0.08	0.62	1.00	0.00	0.00	1.00	0.15	0.15	1.00	0.92	1.00	0.46	1.00	1.00	0.15	0.54	0.31	0.62	0.77	0.46
<i>SD</i>	0.00	0.00	0.00	0.28	0.75	0.00	0.28	0.28	0.51	0.00	0.00	0.00	0.00	0.38	0.38	0.00	0.28	0.00	0.52	0.00	0.00	0.38	0.52	0.48	0.51	0.44	0.52

NB. Total quality assessment scores for each study can be found in Table 7

Table 10 Quality assessment of reviewed studies using SCED and comparison against WWC Evidence Standards

Author (Year)	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Conclusion
Colombo et al., (2022)	Present	Not present (self-report measure only)	Present	Meets Standards	<i>Design Does Not Meet Evidence Standards</i>
Hallford et al., (2020b)	Present	Not present (self-report measure only)	Not Present (Simple AB design)	Does Not Meet Standards	<i>Design Does Not Meet Evidence Standards</i>

Discussion

To the best of our knowledge, this review is the first to systematically evaluate findings from studies examining the effects of prospective mental imagery on depressive symptoms. Other reviews have looked at related concepts, such as affect (Schubert et al., 2020), or how training to generate positive non-prospective mental imagery can reduce depressive symptoms (CBM-I; Cristea et al., 2015). Findings from the current review suggest that engaging in positive future-oriented imagery may be a promising intervention to reduce depressive symptoms, with small to medium effect sizes. Overall, the results are consistent with previous systematic reviews showing that positive prospective and non-prospective mental imagery can promote positive affect (Cristea et al., 2015; Schubert et al., 2020). Additionally, the results align with previous reviews focused solely on the BPS intervention, which suggest that this style of prospective imagery is beneficial for positive wellbeing and optimism (Carrillo et al., 2019; Loveday et al., 2016).

It is unclear why exactly imagining a positive future reduces depressive symptoms, although several complementary explanations may be proposed. Firstly, the interventions reviewed here all involved the generation of positive mental images. Participants either imagined (1) a positive future state in which their goals had been achieved (BPS intervention), (2) positive, specific, and personalised future events that might occur (EFT and BA-based interventions), or (3) positive, non-specific and standardised future-oriented scenarios (adapted CBM-I). As stated previously, training individuals to generate non-prospective positive mental imagery can boost positive affect (Holmes et al., 2006, 2009) and reduce depressive symptoms (Blackwell & Holmes, 2010; Torkan et al., 2014; Zhou et al., 2022). It may be that it is the positive valence of imagery generated by participants that leads to subsequent improvements in mood, rather than the future-oriented nature of the imagery. However, it is of note here that Namaky et al., (2021) found that both positive and neutral

prospection significantly reduced depressive symptoms. Further work might seek to explore the moderating effect of the valence of imagined events on depressive symptoms.

Additionally, it may be important to determine whether imagery needs to be future-oriented to confer benefits for mood, perhaps through comparing traditional CBM-I approaches (which are non-prospective) with adapted CBM protocols that include explicitly future-oriented instructions.

Secondly, depression may be driven in part by negative expectations about the future (MacLeod et al., 1997; MacLeod & Byrne, 1996; Roepke & Seligman, 2016). It has been found that the BPS intervention promotes optimism, which is a generalised positive expectation about the future (Carrillo, 2019). Moreover, engaging in prospective imagery can increase the perceived likelihood that positive events will occur (Boland et al., 2018). It may be that engaging in positive prospective imagery counters the negative bias that depressed individuals seem to exhibit when thinking about the future, resulting in more positive expectations. A question for further research to explore is whether changes in negative expectations about the future mediates the relationship between prospective imagery and depression.

Another possible explanation is that engaging in positive prospective imagery reduces anhedonia, which is a core feature of depression (see Renner et al., 2020). Depressed individuals expect positive future events to be less rewarding and experience less pleasure in-the-moment when thinking about positive future events. Prospective imagery can increase both anticipatory and anticipated pleasure (Hallford et al., 2020a; Ji et al., 2021; Renner et al., 2019), potentially because it increases the vividness and specificity with which depressed individuals imagine future events (Hallford et al., 2022). Changes in how rewarding individuals expect future events to be and/or increases in how much pleasure they get from thinking about future events may then have knock-on effects for increasing motivation and

engagement in rewarding behaviours (Ji et al., 2021; Renner et al., 2019). Further research might seek to identify additional factors that could further reduce anhedonia, for example by employing methods that might enhance the vividness of imagery. For example, by using “positive technology” (Enrique et al., 2018; Molinari et al., 2018) or virtual reality (Colombo et al., 2022).

Across the studies investigated in this review, there was variation in the interventions employed to target prospective imagery. Prospection-based interventions varied with regards to whether imagined events were specific vs non-specific, and self-nominated vs standardised. Studies employing the BPS involved imagination of a non-specific positive future state where one’s goals have been achieved, while those implementing EFT and BA-based interventions involved imagination of temporally and locationally specific events. BPS, EFT and BA-based interventions involved imagination of one’s own personal future or future events that were self-nominated, while the adapted CBM-I paradigm involved standardised scenarios presented across participants. Moving forward, research might seek to determine which, if any, of the above factors might enhance the effectiveness of prospective imagery in reducing depressive symptoms. For example, it may be that engaging in imagery of self-nominated, specific future events encourages greater vividness and specificity than imagining non-specific scenarios standardised across participants. To the extent that changes in depressive symptoms are mediated by changes in vividness and specificity, as suggested by Hallford et al., (2022), this might indicate that specific and personal events would more effectively alter depressive symptoms.

Some studies in this review included activity scheduling components (BA-based studies). These studies provide some evidence to suggest that reductions in depressive symptoms are driven partially by increased engagement in rewarding behaviour following prospection. One caveat to this is that these studies did not include an imagery-only

condition. Consequently, any improvements seen in depressive symptoms may simply be due to the BA (activity-scheduling) component of the intervention. Further dismantling work will be needed to determine whether prospective imagery provides any advantage over and above typical BA interventions.

The findings of this review may have implications for theories of depression. Behavioural approaches propose that depression stems from positive reinforcement deprivation (Ferster, 1973; Lewinsohn, 1974; Matthews, 1977). Reduced reward anticipation and a subsequent lack of engagement in rewarding activities may lead to a downward spiral that further exacerbates depressive symptoms (see Renner et al., 2021). As proposed by Renner et al (2021), prospective imagery may work to reverse this downward spiral by increasing reward anticipation, leading to increased motivation to engage in rewarding activities, increased engagement in rewarding activities, and increased positive reinforcement (see Renner et al., 2021). The findings of this review provide preliminary evidence for this idea, but further research will be needed to explore what underpins the relationship between positive prospective imagery and reduced depressive symptoms.

Critique of research and recommendations

The average quality rating for reviewed studies using randomised and non-randomised designs was “fair” (Downs & Black, 1998). Both studies employing a single-case experimental design failed to meet design standards specified by WWC. Studies were limited with regards to sample representativeness, with most studies involving self-selected samples that lacked in gender and ethnic diversity. Additionally, most studies included only one self-report measure of depression, and there was limited follow up. Further replication of findings with larger and more diverse samples is needed, with both self-report and more objective measures of depression and follow up assessment. Future studies in this area would also benefit from improved reporting of study procedures (e.g. recruitment methods,

randomisation methods, whether blinding was attempted), and sample characteristics (i.e. information regarding participant ethnicity).

One additional area that future work might explore is the potential adverse effects of positive future imagery. Only one reviewed study examined potential adverse effects. For example, imagining an overly positive future may lead to pleasant feelings in the short-term, but may act as a form of “fantasy” that distracts individuals from engaging in effortful behaviours to gain a future outcome (Oettingen & Mayer, 2002).

Limitations of review

It is important to consider several limitations of this review. Firstly, due to a small number of studies and heterogeneity across the studies, a meta-analysis was not conducted. Therefore, findings of studies reviewed here should be interpreted with caution. Further replication will allow for more robust analysis of treatment effects and exploration of potential moderators. Secondly, due to time constraints, it was only possible for an independent rater to screen 50% of full texts according to inclusion and exclusion criteria. Results from this showed high rates of agreement. However, abstract screening and quality assessments were conducted by the author only.

An additional limitation relates to the analysis of treatment effect sizes. Although authors of missing data were contacted, only one responded stating they did not have access to raw data. Therefore, effect sizes for five studies could not be calculated. It is also important to note that unpublished studies were not reviewed, potentially increasing the likelihood of publication bias. Finally, there is a large degree of conceptual variation in the future thinking literature. It is possible that relevant publications have been missed.

Conclusion

Overall, this review suggests that positive prospective imagery may be a promising intervention to reduce depressive symptoms, with small to medium effect sizes depending on the type of intervention used. Further research in this area might seek to explore what factors improve the effectiveness of prospection (e.g. positive, specific and personally-relevant future events vs. neutral, non-specific and not personally-relevant future events, or the use of technology in facilitating prospection), and whether changes in negative expectations and predictions about the future mediates the relationship between positive prospective imagery and depression. Further research addressing the limitations noted here would lead to more robust evidence for the role of positive prospection in reducing depression, potentially leading to new and innovative interventions that target depression through future thinking.

Chapter 3. Integration, Impact and Dissemination

This chapter aims to integrate the findings of the empirical project and systematic review. Implications of findings and potential methods of dissemination are outlined and discussed.

Integration

Overall, this thesis aimed to examine the effects of imagining one's future on emotion, motivation, future self-continuity, and behavioural engagement compared to another form of future-oriented cognition, and to investigate whether future-oriented imagery can be harnessed to help those experiencing depression. Thus, a central theme in this thesis pertains to the merit of positive prospective imagery as a tool to promote positive outcomes.

This thesis consists of two parts. Firstly, an empirical study that compared the effects of positive prospective imagery on emotion, future self-continuity, motivation, and behavioural engagement, to thinking about the future using a verbal-semantic processing style. In a way, it was hoped that the findings of the empirical study might replicate and extend the literature on non-prospective mental imagery to imagery involving the future, with the former demonstrating that thinking in images is more effective at changing emotion than thinking in words (Holmes et al., 2009). The empirical study sought to additionally explore the mechanisms underpinning the previously documented relationship between prospective imagery and motivation, and to determine whether higher levels of depressive symptoms might impede the beneficial effects of positive future imagery.

The second component of this thesis is a systematic review that aimed to further examine the positive effects of imagining the future by investigating whether positive future imagery can be utilised as an effective intervention for individuals experiencing depression, which is characterised by deficits in positive emotion, motivation, and engagement in rewarding behaviours.

In light of previous research showing the emotional and motivational effects of positive future imagery (Renner et al., 2019; Ji et al., 2021), it was hypothesised that the empirical study would show a superior effect for future-oriented imagery over verbal-semantic processing and that increases in positive affect and future self-continuity would mediate the relationship between future imagery and motivation. However, we failed to find much change following prospective imagery. Moreover, imagining the future was not more effective at increasing positive emotion, motivation or behavioural engagement compared to thinking in words about the meaning and significance of future events. In fact, a novel finding of the current study is that verbal-semantic processing led to greater increases in motivation than future imagery.

Had our findings been consistent with our hypotheses, they may have helped to shed light on the findings of the systematic review, which showed that positive prospective imagery may be a promising intervention in the reduction of depressive symptoms. The empirical study could have helped to elucidate the mechanisms by which positive prospective imagery improves depressive symptoms, such as through promoting positive current affect, anticipated pleasure, and motivation to engage in rewarding events. However, the results of the study did not replicate previous research and, moreover, ran counter to expectations. Thus, while the review suggests that positive prospective imagery may effectively reduce depressive symptoms, our study seems to suggest that imagining positive future events is not always beneficial. As previously discussed in Chapter 1, it is possible that our study failed to find an effect of future imagery due to a lack of instruction to focus on positive aspects of the image. This may suggest that prospective imagery of positive specific events may only be beneficial if individuals are explicitly guided to focus on positive sensory elements. Moreover, a lack of scheduling component may have contributed to a failure to find an effect of either condition on behavioural engagement. Clearly, there is a need for further research to

understand the conditions under which future imagery exerts an effect on emotion and motivation.

Interestingly, the systematic review identified that little attention has been paid to potential adverse effects of engaging in positive prospective imagery. Similarly, although we did not find an adverse effect of future imagery, the findings of the empirical study seem to suggest that engaging in imagery of positive future events may not always have emotional or motivational effects. Together, these findings further highlight the need for more research to determine when prospective imagery is unhelpful and, perhaps more importantly, when it may be actively harmful. Some research (e.g. Kappes & Oettingen, 2011; Oettingen & Mayer, 2002) has found that simply envisioning an idealised future, or “positive fantasies”, is associated with reduced attainment of desired outcomes. It has been suggested that this is because imagining idealised outcomes, such as the attainment of intimate relationships, desired jobs, or academic success, leads to *reduced* effort investment (Oettingen & Mayer, 2002). It is somewhat difficult to reconcile this line of research with evidence discussed throughout this thesis that shows imagining the future has positive motivational effects (e.g., Ji et al., 2021; Renner et al., 2019). One possibility is that engaging in mental imagery of temporally close and achievable rewarding events promotes motivation, while imagery diminishes motivation for longer term and more complex goals. This may be a potential area for future research to explore. Nonetheless, the findings of this thesis suggest there needs to be greater understanding of the circumstances in which positive prospective imagery promotes positive emotion and motivation, and when future imagery may dampen motivation and effort.

Reflections on the process of undertaking this work

Sample and recruitment

A notable limitation of the empirical study was the use of an undergraduate sample. Due to previous experience with the, oftentimes lengthy, NHS ethics process and well documented challenges associated with recruiting clinical samples (Axén et al., 2021), in addition to an awareness of time constraints and the competing demands of being a trainee psychologist, I must admit that I was hesitant to undertake the empirical project with a clinical sample. I therefore chose to conduct the study with undergraduate students due to ease of access and convenience. However, it is important to acknowledge that this limits the generalisability of findings, given that the sample are self-selected (and so are likely more motivated), received credits for taking part, and likely differ from the general population in important ways (Hanel & Vione, 2016). It is therefore not possible to infer that the same pattern of findings would be observed in a clinical sample of participants experiencing a depressive episode. However, given the discussion above regarding the potential for prospective imagery, under unknown circumstances, to attenuate motivation, it is perhaps for the best that this study was not conducted with a clinical population. As participants with higher depressive symptoms showed less change in intention in the empirical study, it is entirely possible that had the study been conducted with a sample with more elevated depressive symptoms, imagery could have led to a *reduction* in intention. This further highlights the importance of understanding the conditions under which positive prospective imagery leads to positive outcomes and when it might be unhelpful or even harmful.

Study design

When initially designing the empirical project, I hoped to follow a similar procedure to previous studies that elicited a small number of future events and then instructed participants

to imagine all events (e.g. Hallford et al., 2020a; Ji et al., 2021; Renner et al., 2019). In the initial procedure, I planned to elicit four future events and have participants elaborate all events. However, the procedure was changed to elicit a larger number of events (10) with participants elaborating two events. This change in design was based on previous findings by Hallford, et al., (2020a), who elicited five future events/activities but identified potential ceiling effects due to high initial ratings of motivation. It was decided that participants would be asked to generate 10 events they would like to engage in with the hopes that this would provide a range of events with high and low intention ratings. Having participants elaborate all 10 events would likely have been too time burdensome. Therefore, the decision was made to elaborate on two events (as in Ji et al., 2021), selecting those events with the lowest intention ratings for elaboration. Again, this decision was made to reduce the likelihood of ceiling effects. Piloting was then undertaken to determine how long this would take and whether participants found it challenging to generate 10 positive events.

Anecdotally, it was noted that participants appeared to be initially disheartened when presented with this task, anticipating that they would find it challenging. Although all participants were able to generate 10 specific future events they were looking forward to, some participants found this task more challenging and time-consuming than others. While purely speculative, it is possible that asking participants to provide what appeared to be perceived by them as a large number of positive future events could have impacted on how participants were feeling, which in turn may have influenced the effect of the two conditions on emotion.

As discussed in Chapter 1, one potential explanation for the lack of findings regarding the imagery-led condition is that participants in this condition might not have been engaging in adequately vivid imagery or were not focusing on positive aspects of their generated images. However, we did not take a measure of self-reported valence or vividness. While participants

did provide written descriptions following elaboration, it would have been challenging to design a coding scheme and to code 66 descriptions for valence and vividness due to time constraints.

Language

It is often noted that in the literature on future-oriented cognition, there is a range of terminologies stemming from different lines of research into how we think and feel about the future (McCue et al., 2019; Schubert et al., 2020). This has often been a source of frustration for me, as there is substantial conceptual overlap and terminological confusion. It may be surprising then that instead of using a more commonly used term (such as “*episodic simulation*” or “*episodic future thinking*”), I chose to use the term “*prospective mental imagery*” throughout this thesis. I did this as the initial idea for this thesis developed from reading the literature on general mental imagery. I noted that much of this research, despite often using terms like “*future thinking*” and “*prospective*” in their titles, employed a paradigm (CBM-I) that used present tense scenarios that were standardised across participants and were not explicitly instructing participants to project themselves into the future. I chose to use the term “*prospective mental imagery*” as my initial aim in designing this project was to extend the literature on general mental imagery (or non-prospective mental imagery) to see if the findings would be similar for future-oriented mental imagery. An important aim for future research may be to begin streamlining the terminology used in studies, as terminological differences may lead to studies being missed in future systematic reviews.

The temporal focus of therapy

In my dual role as a researcher and trainee clinical psychologist, I have found myself reflecting on my own clinical practice and how discussions in therapy are often focused on

the past or present. I wonder if this is because the future is inherently uncertain and therefore potentially anxiety provoking for both therapists and their clients. I wonder if there is concern amongst therapists that talking about the future with depressed or anxious individuals may lead them to feel worse. Indeed, Schubert et al., (2021) found that imagining a negative future can increase negative affect. Encouragingly, however, the systematic review suggests it may be important for individuals to envision a positive future, while the empirical project suggests it may be beneficial to engage in verbal-semantic discussions about rewarding future events. As already noted, it will be important for future research to identify when prospective imagery might be unhelpful, to reduce the potential for adverse outcomes. However, the evidence so far suggests that imagining positive, specific events can have positive outcomes, and the current study suggests reflecting on the importance and significance of positive future events may promote motivation.

It should be noted that therapeutic approaches that focus on the future do exist. For example, future-oriented psychotherapy (Melges, 1972). As described by Melges (1972), this is a therapeutic approach that supports individuals to choose personal goals and encourages them to develop and rehearse plans to achieve those goals. Similarly, future directed therapy supports individuals to think about how their thoughts and behaviours influence the achievement of future goals (Vilhauer et al., 2012). However, the extent to which these approaches utilise prospective imagery is unclear. Perhaps, with more robust evidence and a better understanding of underlying mechanisms, engaging in imagery of a positive future may become more common practice amongst mental health professionals in the coming years.

Impact

A key finding of the empirical project was that thinking in words about the meaning and significance of future events may promote motivation to engage in rewarding events more

than imagery. Although not quite significant, the verbal-led condition also reported greater change in positive affect. These novel findings were somewhat unexpected given that verbal-semantic processing of positive material has been found in previous studies to diminish positive affect (e.g. Holmes et al., 2009). Importantly, these findings may have theoretical and clinical implications.

Holmes et al., (2009) proposed that reduced positive affect following verbal-semantic processing may be because verbal or linguistic processing is more likely to trigger negative verbal comparisons. That we did not find verbal-semantic processing to be deleterious for affect, suggests that thinking in words about the meaning and significance of future events does not trigger comparative thinking, at least not in a non-clinical sample. This is consistent with a previous study that found verbal-semantic processing of past events had no effect on positive affect, but a verbal-comparison condition in which participants were instructed to compare the present to the past led to reduced positive affect (Nelis et al., 2015). This is supportive of the suggestion that not all verbal processing styles yield negative emotional effects (Holmes et al., 2009). It is possible that a verbal-semantic condition designed to encourage participants to draw comparisons between the present and nominated positive future events may be deleterious for affect. This could be an area for future research to explore.

With regards to clinical implications, the finding that verbal-semantic processing showed a trend to promote positive affect and significantly increased motivation more than imagery suggests that generating positive meanings about the future can be used to promote positive feelings in the present and motivation to engage in rewarding events. However, it should be noted that this condition also reported use of imagery during the elaboration task. Therefore, it may be that it is the combination of imagery and verbal-semantic processing that leads to motivational effects. If this is true, then interventions recruiting prospective imagery

might be made more effective by adding a verbal-semantic component. As shown by the systematic review, various prospection-based paradigms have already been developed, which have shown promise for reducing depressive symptoms. It is possible that adding a verbal-semantic component to these interventions, which would invite individuals to reflect on the meaning and significance of positive future events while also engaging in imagery, might have additional benefits for emotion and motivation.

It is somewhat reassuring that verbal-semantic processing did not lead to adverse effects, given that we are likely to be engaging in verbal-semantic discussions with service users about their future goals in our clinical practice. However, further research will be needed to determine whether pure verbal-processing of future events in the absence of imagery, would show a similar pattern of findings. Additionally, future research should seek to determine the mechanisms underpinning the relationship between verbal-semantic processing of future events and motivation. For example, whether verbal-semantic processing initiates a degree of planning or process simulation.

That prospective imagery showed no improvements in the current study while the systematic review found some reduction in depression also has clinical implications for the design of interventions. As already discussed, the difference between previous studies that show positive effects of prospective imagery on emotion, motivation and behavioural engagement have contained instructions to focus on positive aspects of imagery (Renner et al., 2019; Ji et al., 2021), which our study did not. This may be an important finding as it suggests that interventions that fail to explicitly direct individuals to attend to positive elements of imagined future events might subsequently fail to show positive outcomes.

An additional novel result in the current study is that depression moderated the relationship between prospective imagery and intention change. This may be because

individuals experiencing depression show deficits in their ability to engage in vivid and specific future imagery. This finding has clinical implications, as it suggests that individuals experiencing depression may, in some circumstances, benefit less from interventions targeting future-oriented imagery. Promisingly, however, studies have shown that impoverished prospective imagery in those experiencing elevated depressive symptoms can be overcome through repeated simulation of positive specific future events (e.g. Boland et al., 2018; Hallford et al., 2022). Moreover, improvements in the quality of imagery correlates with increases in positive affect and anticipated pleasure following prospective imagery (Hallford et al., 2022). Thus, future interventions aiming to promote positive emotion and motivation through utilising positive prospective imagery may benefit from including a training component designed to improve an individual's ability to generate specific and vivid future imagery through repeated simulation.

Dissemination

Following the completion of this thesis, findings will be disseminated in the following ways. Firstly, participants who took part in the empirical study and who agreed to be contacted will be provided with a lay summary of the aims, findings and implications of the results. Secondly, findings could be presented at a conference in the form of a poster or oral presentation. For example, the DCP conference or the International Conference on Positive Psychology and Wellbeing. Findings have already been presented at an academic forum to clinical psychology doctoral trainees and course staff at Royal Holloway University of London.

Another possible avenue for dissemination would be to publish in a peer-reviewed journal. Previous studies of positive prospective imagery on emotion and motivation have been published in *Behaviour Research and Therapy* (Hallford et al., 2020a; Ji et al., 2021)

and Cognitive Research and Therapy (Hallford et al., 2022). Given that the systematic review took the form of a narrative review, it is likely that the findings will be subject to meta-analysis.

Finally, the thesis will be uploaded to Pure, Royal Holloway University of London's research system. This will allow other researchers interested in prospective imagery to access and critically review the findings. It is hoped that the findings of this thesis will prompt further research aimed at examining the mechanisms underpinning the effect of verbal-semantic processing on motivation and to determine how prospective imagery can best be harnessed to enhance emotion and motivation change.

References

- Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review*, *96*, 358–372.
<https://doi.org/10.1037/0033-295X.96.2.358>
- Adelman, R. M., Herrmann, S. D., Bodford, J. E., Barbour, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. (2017). Feeling Closer to the Future Self and Doing Better: Temporal Psychological Mechanisms Underlying Academic Performance. *Journal of Personality*, *85*, 398–408
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.. <https://doi.org/10.1111/jopy.12248>
- American Psychological Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders*. DSM Library.
<https://dsm.psychiatryonline.org/doi/book/10.1176/appi.books.9780890425596>
- Andrade, J., May, J., Deeprase, C., Baugh, S.-J., & Ganis, G. (2014). Assessing vividness of mental imagery: The Plymouth Sensory Imagery Questionnaire. *British Journal of Psychology (London, England: 1953)*, *105*, 547–563. <https://doi.org/10.1111/bjop.12050>
- Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological Assessment*, *10*, 176–181. <https://doi.org/10.1037/1040-3590.10.2.176>
- Atance, C. M., & O’Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences*, *5*, 533–539. [https://doi.org/10.1016/s1364-6613\(00\)01804-0](https://doi.org/10.1016/s1364-6613(00)01804-0)
- Axén, I., Brämberg, E. B., Bakken, A. G., & Kwak, L. (2021). Recruiting in intervention studies: Challenges and solutions. *BMJ Open*, *11*, e044702. <https://doi.org/10.1136/bmjopen-2020-044702>
- Bartels, D. M., & Rips, L. J. (2010). Psychological connectedness and intertemporal choice. *Journal of Experimental Psychology: General*, *139*, 49–69. <https://doi.org/10.1037/a0018062>
- Baumgartner, H., Pieters, R., & Bagozzi, R. P. (2008). Future-oriented emotions: Conceptualization and behavioral effects. *European Journal of Social Psychology*, *38*, 685–696. <https://doi.org/10.1002/ejsp.467>

- Beck, A. T., Wenzel, A., Riskind, J. H., Brown, G., & Steer, R. A. (2006). Specificity of Hopelessness about Resolving Life Problems: Another Test of the Cognitive Model of Depression. *Cognitive Therapy and Research*, *30*, 773–781. <https://doi.org/10.1007/s10608-006-9081-2>
- Bjärehed, J., Sarkohi, A., & Andersson, G. (2010). Less positive or more negative? Future-directed thinking in mild to moderate depression. *Cognitive Behaviour Therapy*, *39*, 37–45. <https://doi.org/10.1080/16506070902966926>
- Blackwell, S. E., & Holmes, E. (2010). Modifying interpretation and imagination in clinical depression: A single case series using cognitive bias modification. *Applied Cognitive Psychology*, *24*, 338–350. <https://doi.org/10.1002/acp.1680>
- Blackwell, S. E., Rius-Ottenheim, N., Schulte-van Maaren, Y. W. M., Carlier, I. V. E., Middelkoop, V. D., Zitman, F. G., Spinhoven, P., Holmes, E., & Giltay, E. J. (2013). Optimism and mental imagery: A possible cognitive marker to promote well-being? *Psychiatry Research*, *206*, 56–61. <https://doi.org/10.1016/j.psychres.2012.09.047>
- Blouin-Hudon, E. C., & Pychyl, T. A. (2017). A mental imagery intervention to increase future self-continuity and reduce procrastination. *Applied Psychology: An International Review*, *66*, 326–352. <https://doi.org/10.1111/apps.12088>
- Boland, J., Riggs, K. J., & Anderson, R. J. (2018). A brighter future: The effect of positive episodic simulation on future predictions in non-depressed, moderately dysphoric & highly dysphoric individuals. *Behaviour Research and Therapy*, *100*, 7–16. <https://doi.org/10.1016/j.brat.2017.10.010>
- Carrillo, A., Rubio-Aparicio, M., Molinari, G., Enrique, Á., Sánchez-Meca, J., & Baños, R. M. (2019). Effects of the Best Possible Self intervention: A systematic review and meta-analysis. *PLOS ONE*, *14*, e0222386. <https://doi.org/10.1371/journal.pone.0222386>
- Chang, E. C., Yu, E. A., Lee, J. Y., Hirsch, J. K., Kupfermann, Y., & Kahle, E. R. (2013). An Examination of Optimism/Pessimism and Suicide Risk in Primary Care Patients: Does Belief in a Changeable Future Make a Difference? *Cognitive Therapy and Research*, *37*, 796–804. <https://doi.org/10.1007/s10608-012-9505-0>
- Chen, G., Luo, H., Wu, G., Zhou, C., Wang, K., Feng, K., Xiao, Z., Huang, J., Gan, J., 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, 893–905. psych. <https://doi.org/10.1007/s10608-020-10083-7>

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155–159. <https://doi.org/10.1037/0033-2909.112.1.155>

Colombo, D., Suso-Ribera, C., Ortigosa-Beltrán, I., Fernández-Álvarez, J., García-Palacios, A., & Botella, C. (2022). Behavioral Activation through Virtual Reality for Depression: A Single Case Experimental Design with Multiple Baselines. *Journal of Clinical Medicine*, 11. cmedm. <https://doi.org/10.3390/jcm11051262>

Connell, N., Dai, L., Jiang, Y., Speiser, J., Ward, R., Wei, W., Carroll, R., & Gebregziabher, M. (2017). Methods for Analysis of Pre-Post Data in Clinical Research: A Comparison of Five Common Methods. *Journal of Biometrics & Biostatistics*, 08. <https://doi.org/10.4172/2155-6180.1000334>

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107, 261–288. <https://doi.org/10.1037/0033-295x.107.2.261>

COVID-19 Mental Disorders Collaborators. (2021). *Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic—The Lancet*. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(21\)02143-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)02143-7/fulltext)

Cristea, I. A., Kok, R. N., & Cuijpers, P. (2015). Efficacy of cognitive bias modification interventions in anxiety and depression: Meta-analysis. *British Journal of Psychiatry*, 206, 7–16. <https://doi.org/10.1192/bjp.bp.114.146761>

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. *Journal of Affective Disorders*, 159, 118–126. <https://doi.org/10.1016/j.jad.2014.02.026>

Dainer-Best, J., Shumake, J., & Beevers, C. (2018). Positive imagery training increases positive self-referent cognition in depression. *BEHAVIOUR RESEARCH AND THERAPY*, 111, 72–83. <https://doi.org/10.1016/j.brat.2018.09.010>

Deeks, J. J., Dinnes, J., D'Amico, R., Sowden, A. J., Sakarovitch, C., Song, F., Petticrew, M., Altman, D. G., International Stroke Trial Collaborative Group, & European Carotid Surgery Trial Collaborative Group. (2003). Evaluating non-randomised intervention studies. *Health Technology Assessment (Winchester, England)*, 7, iii–x, 1–173.

<https://doi.org/10.3310/hta7270>

Díaz-García, A., González-Robles, A., Mor, S., Mira, A., Quero, S., García-Palacios, A., Baños, R. M., & Botella, C. (2020). Positive and Negative Affect Schedule (PANAS): Psychometric properties of the online Spanish version in a clinical sample with emotional disorders. *BMC Psychiatry*, 20, 56. <https://doi.org/10.1186/s12888-020-2472-1>

Dickson, J. M., & Bates, G. W. (2006). Autobiographical memories and views of the future: In relation to dysphoria. *International Journal of Psychology*, 41, 107–116.

<https://doi.org/10.1080/00207590500188025>

Dickson, J. M., Moberly, N. J., & Kinderman, P. (2011). Depressed people are not less motivated by personal goals but are more pessimistic about attaining them. *Journal of Abnormal Psychology*, 120, 975–980. <https://doi.org/10.1037/a0023665>

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology and Community Health*, 52, 377–384.

Enrique, Á., Bretón-López, J., Molinari, G., Baños, R. M., & Botella, C. (2018). Efficacy of an adaptation of the best possible self intervention implemented through positive technology: A randomized control trial. *Applied Research in Quality of Life*. psych.

<https://doi.org/10.1007/s11482-017-9552-5>

Ferster, C. B. (1973). A functional analysis of depression. *American psychologist*, 28(10), 857.

Fischer, E., Glashauser, A., & Laireiter, A.-R. (2022). Development and Evaluation of a Prospective Group Coaching Program: Increasing Well-Being and Openness to the Future in a Subclinical Sample. *Journal of Happiness Studies*. <https://doi.org/10.1007/s10902-022-00561-y>

Fleiss, J. L. (2011). *Design and Analysis of Clinical Experiments*. John Wiley & Sons.

Fodor, L. A., Georgescu, R., Cuijpers, P., Szamoskozi, Ş., David, D., Furukawa, T. A., & Cristea, I. A. (2020). Efficacy of cognitive bias modification interventions in anxiety and

depressive disorders: A systematic review and network meta-analysis. *The Lancet Psychiatry*, 7, 506–514. [https://doi.org/10.1016/S2215-0366\(20\)30130-9](https://doi.org/10.1016/S2215-0366(20)30130-9)

Gamble, B., Moreau, D., Tippett, L. J., & Addis, D. R. (2019). Specificity of Future Thinking in Depression: A Meta-Analysis. *Perspectives on Psychological Science*, 14, 816–834. <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, 1086–1102. <https://doi.org/10.1016/j.jrp.2005.11.001>

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, 10, 486–489. <https://doi.org/10.5812/ijem.3505>

Gilbert, D. T., & Wilson, T. D. (2007). Propection: Experiencing the future. *Science*, 317, 1351–1354. <https://doi.org/10.1126/science.1144161>

Giltay, E. J., Zitman, F. G., & Kromhout, D. (2006). Dispositional optimism and the risk of depressive symptoms during 15 years of follow-up: The Zutphen Elderly Study. *Journal of Affective Disorders*, 91, 45–52. <https://doi.org/10.1016/j.jad.2005.12.027>

Hallford, D., 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, 42–51. <https://doi.org/10.1016/j.brat.2018.01.003>

Hallford, D., Farrell, H., & Lynch, E. (2020a). Increasing anticipated and anticipatory pleasure through episodic thinking. *Emotion*. <https://doi.org/10.1037/emo0000765>

Hallford, D., Rusanov, D., Yeow, J., Austin, D., D'Argembeau, A., Fuller-Tyszkiewicz, M., & Raes, F. (2022). *Reducing Anhedonia in Major Depressive Disorder with Future Event Specificity Training (FEST): A Randomized Controlled Trial*. <https://doi.org/10.31234/osf.io/s276e>

Hallford, D., Sharma, M., & Austin, D. (2020b). Increasing Anticipatory Pleasure in Major Depression through Enhancing Episodic Future Thinking: A Randomized Single-Case Series Trial. *JOURNAL OF PSYCHOPATHOLOGY AND BEHAVIORAL ASSESSMENT*, 42, 751–764. <https://doi.org/10.1007/s10862-020-09820-9>

- Hallford, D., Yeow, J., Fountas, G., Herrick, C., Raes, F., & D'Argembeau, A. (2020c). 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>
- Hanel, P. H. P., & Vione, K. C. (2016). Do Student Samples Provide an Accurate Estimate of the General Public? *PLoS ONE*, *11*, e0168354. <https://doi.org/10.1371/journal.pone.0168354>
- Hershfield, H. (2011). Future self-continuity: How conceptions of the future self transform intertemporal choice. *Annals of the New York Academy of Sciences*, *1235*, 30–43. <https://doi.org/10.1111/j.1749-6632.2011.06201.x>
- Hershfield, H., Garton, M. T., Ballard, K., Samanez-Larkin, G. R., & Knutson, B. (2009). Don't stop thinking about tomorrow: Individual differences in future self-continuity account for saving. *Judgment and Decision Making*, *4*, 280–286.
- Hollon, S. D., Thase, M. E., & Markowitz, J. C. (2002). Treatment and Prevention of Depression. *Psychological Science in the Public Interest: A Journal of the American Psychological Society*, *3*, 39–77. <https://doi.org/10.1111/1529-1006.00008>
- Holmes, E., 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*, 249–280. <https://doi.org/10.1146/annurev-clinpsy-021815-092925>
- Holmes, E., Lang, T. J., Moulds, M. L., & Steele, A. M. (2008). Prospective and positive mental imagery deficits in dysphoria. *Behaviour Research and Therapy*, *46*, 976–981. <https://doi.org/10.1016/j.brat.2008.04.009>
- Holmes, E., Lang, T. J., & Shah, D. M. (2009). Developing interpretation bias modification as a 'cognitive vaccine' for depressed mood: Imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology*, *118*, 76–88. <https://doi.org/10.1037/a0012590>
- Holmes, E., & Mathews, A. (2005). Mental Imagery and Emotion: A Special Relationship? *Emotion (Washington, D. C.)*, *5*, 489–497. <https://doi.org/10.1037/1528-3542.5.4.489>
- Holmes, E., & Mathews, A. (2010). Mental imagery in emotion and emotional disorders. *Clinical Psychology Review*, *30*, 349–362. <https://doi.org/10.1016/j.cpr.2010.01.001>

- Holmes, E., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive Interpretation Training: Effects of Mental Imagery Versus Verbal Training on Positive Mood. *Behavior Therapy, 37*, 237–247. <https://doi.org/10.1016/j.beth.2006.02.002>
- Hudson, J. A., Mayhew, E. M. Y., & Prabhakar, J. (2011). The development of episodic foresight: Emerging concepts and methods. *Advances in Child Development and Behavior, 40*, 95–137. <https://doi.org/10.1016/b978-0-12-386491-8.00003-7>
- Janssen, N. P., Hendriks, G.-J., Baranelli, C. T., Lucassen, P., Oude Voshaar, R., Spijker, J., & Huibers, M. J. H. (2021). How Does Behavioural Activation Work? A Systematic Review of the Evidence on Potential Mediators. *Psychotherapy and Psychosomatics, 90*, 85–93. <https://doi.org/10.1159/000509820>
- 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*, 103947. <https://doi.org/10.1016/j.brat.2021.103947>
- Ji, J. L., Holmes, E., & Blackwell, S. E. (2017). Seeing light at the end of the tunnel: Positive prospective mental imagery and optimism in depression. *Psychiatry Research, 247*, 155–162. <https://doi.org/10.1016/j.psychres.2016.11.025>
- Juul, S., Gluud, C., Simonsen, S., Frandsen, F. W., Kirsch, I., & Jakobsen, J. C. (2021). Blinding in randomised clinical trials of psychological interventions: A retrospective study of published trial reports. *BMJ Evidence-Based Medicine, 26*, 109–109. <https://doi.org/10.1136/bmjebm-2020-111407>
- Kappes, H. B., & Oettingen, G. (2011). Positive fantasies about idealized futures sap energy. *Journal of Experimental Social Psychology, 47*, 719–729. <https://doi.org/10.1016/j.jesp.2011.02.003>
- Kessler, R. C. (2012). The Costs of Depression. *The Psychiatric Clinics of North America, 35*, 1–14. <https://doi.org/10.1016/j.psc.2011.11.005>
- King, L. (2001). The Health Benefits of Writing about Life Goals. *Personality and Social Psychology Bulletin, 27*, 798–807. <https://doi.org/10.1177/0146167201277003>
- Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience, 2*, 635–642. <https://doi.org/10.1038/35090055>

Kosslyn, S. M., & Thompson, W. L. (2003). When is early visual cortex activated during visual mental imagery? *Psychological Bulletin*, *129*, 723–746. <https://doi.org/10.1037/0033-2909.129.5.723>

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). *Single-case designs technical documentation*. http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf

Lau-Zhu, A., Holmes, E., Butterfield, S., & Holmes, J. (2017). Selective Association Between Tetris Game Play and Visuospatial Working Memory: A Preliminary Investigation. *Applied Cognitive Psychology*, *31*, 438–445. <https://doi.org/10.1002/acp.3339>

Lewinsohn, P. M. (1974). A behavioral approach to depression. *Essential papers on depression*, 150-172. Liao, A. K., Neihart, M. F., Teo, C. T., & Lo, C. H. M. (2016). Effects of the Best Possible Self Activity on Subjective Well-Being and Depressive Symptoms. *The Asia-Pacific Education Researcher*, *25*, 473–481. <https://doi.org/10.1007/s40299-015-0272-z>

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *BMJ*, *339*, b2700. <https://doi.org/10.1136/bmj.b2700>

Lobo, M., Moeyaert, M., Cunha, A., & Babik, I. (2017). Single-Case Design, Analysis, and Quality Assessment for Intervention Research. *J Neurol Phys Ther*, *41*, 187–197. <https://doi.org/10.1097/NPT.0000000000000187>

Loveday, P. M., Lovell, G. P., & Jones, C. M. (2016). The Best Possible Selves Intervention: A Review of the Literature to Evaluate Efficacy and Guide Future Research. *Journal of Happiness Studies*. <https://doi.org/10.1007/s10902-016-9824-z>

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*, 335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-u](https://doi.org/10.1016/0005-7967(94)00075-u)

- MacLeod, A. K., & Byrne, A. (1996). Anxiety, depression, and the anticipation of future positive and negative experiences. *Journal of Abnormal Psychology, 105*, 286–289. <https://doi.org/10.1037/0021-843X.105.2.286>
- MacLeod, A. K., Tata, P., Kentish, J., & Jacobsen, H. (1997). Retrospective and Prospective Cognitions in Anxiety and Depression. *Cognition and Emotion, 11*, 467–479. <https://doi.org/10.1080/026999397379881>
- Macleod, A., & Salaminiou, E. (2001). Reduced positive future-thinking in depression: Cognitive and affective factors. *Cognition & Emotion - COGNITION EMOTION, 15*, 99–107. <https://doi.org/10.1080/0269993004200006>
- Maggin, D. M., Briesch, A. M., & Chafouleas, S. M. (2013). An Application of the What Works Clearinghouse Standards for Evaluating Single-Subject Research: Synthesis of the Self-Management Literature Base. *Remedial and Special Education, 34*, 44–58. <https://doi.org/10.1177/0741932511435176>
- Manthey, L., Vehreschild, V., & Renner, K.-H. (2016). Effectiveness of Two Cognitive Interventions Promoting Happiness with Video-Based Online Instructions. *Journal of Happiness Studies, 17*, 319–339. <https://doi.org/10.1007/s10902-014-9596-2>
- Markman, K. D., & McMullen, M. N. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review, 7*, 244–267. https://doi.org/10.1207/S15327957PSPR0703_04
- Mathews, C. O. (1977). A review of behavioral theories of depression and a self-regulation model for depression. *Psychotherapy: Theory, Research & Practice, 14*(1), 79.
- Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109*, 602–615.
- McCue, R., McCormack, T., McElnay, J., Alto, A., & Feeney, A. (2019). The future and me: Imagining the future and the future self in adolescent decision making. *Cognitive Development, 50*, 142–156. <https://doi.org/10.1016/j.cogdev.2019.04.001>
- McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica, 22*, 276–282.

- Molinari, G., Garcia-Palacios, A., Enrique, A., Roca, P., Comella, N., & Botella, C. (2018). The Power of Visualization: Back to the Future for Pain Management in Fibromyalgia Syndrome. *PAIN MEDICINE*, *19*(7), 1451–1468. <https://doi.org/10.1093/pm/pnx298>
- Morina, N., Deeptose, C., Pusowski, C., Schmid, M., & Holmes, E. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of Anxiety Disorders*, *25*, 1032–1037. <https://doi.org/10.1016/j.janxdis.2011.06.012>
- Murphy, S., O'Donoghue, M., Blackwell, S., Nobre, A., Browning, M., & Holmes, E. (2017). Increased rostral anterior cingulate activity following positive mental imagery training in healthy older adults. *SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE*, *12*, 1950–1958. <https://doi.org/10.1093/scan/nsx120>
- Namaky, N., Glenn, J., Eberle, J., & Teachman, B. (2021). Adapting cognitive bias modification to train healthy prospection. *BEHAVIOUR RESEARCH AND THERAPY*, *144*. <https://doi.org/10.1016/j.brat.2021.103923>
- Nelis, S., Holmes, E., Palmieri, R., Bellelli, G., & Raes, F. (2015). Thinking Back about a Positive Event: The Impact of Processing Style on Positive Affect. *Frontiers in Psychiatry*, *6*. <https://www.frontiersin.org/articles/10.3389/fpsy.2015.00003>
- Nelis, S., Vanbrabant, K., Holmes, E., & Raes, F. (2012). Greater Positive Affect Change after Mental Imagery than Verbal Thinking in a Student Sample. *Journal of Experimental Psychopathology*, *3*, 178–188. <https://doi.org/10.5127/jep.021111>
- Oettingen, G., & Mayer, D. (2002). The motivating function of thinking about the future: Expectations versus fantasies. *Journal of Personality and Social Psychology*, *83*, 1198–1212.
- Owens, R. L., & Patterson, M. M. (2013). Positive psychological interventions for children: A comparison of gratitude and best possible selves approaches. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *174*, 403–428. <https://doi.org/10.1080/00221325.2012.697496>
- Patel, V., Chisholm, D., Parikh, R., Charlson, F. J., Degenhardt, L., Dua, T., Ferrari, A. J., Hyman, S., Laxminarayan, R., Levin, C., Lund, C., Mora, M. E. M., Petersen, I., Scott, J., Shidhaye, R., Vijayakumar, L., Thornicroft, G., & Whiteford, H. (2016). Addressing the burden of mental, neurological, and substance use disorders: Key messages from Disease

Control Priorities, 3rd edition. *The Lancet*, 387, 1672–1685. [https://doi.org/10.1016/S0140-6736\(15\)00390-6](https://doi.org/10.1016/S0140-6736(15)00390-6)

Pearson, J., Naselaris, T., Holmes, E., & Kosslyn, S. M. (2015). Mental Imagery: Functional Mechanisms and Clinical Applications. *Trends in Cognitive Sciences*, 19, 590–602. <https://doi.org/10.1016/j.tics.2015.08.003>

Pellas, J., Renner, F., Ji, J., & Damberg, M. (2022). Telephone-based behavioral activation with mental imagery for depression: A pilot randomized clinical trial in isolated older adults during the Covid-19 pandemic. *INTERNATIONAL JOURNAL OF GERIATRIC PSYCHIATRY*, 37. <https://doi.org/10.1002/gps.5646>

Peters, M. L., Flink, I. K., Boersma, K., & Linton, S. J. (2010). Manipulating optimism: Can imagining a best possible self be used to increase positive future expectancies? *The Journal of Positive Psychology*, 5, 204–211. <https://doi.org/10.1080/17439761003790963>

Pham, L. B., & Taylor, S. E. (1999). From thought to action: Effects of process- versus outcome-based mental simulations on performance. *Personality and Social Psychology Bulletin*, 25, 250–260. <https://doi.org/10.1177/0146167299025002010>

Quoidbach, J., Wood, A. M., & Hansenne, M. (2009). Back to the future: The effect of daily practice of mental time travel into the future on happiness and anxiety. *The Journal of Positive Psychology*, 4(5), 349–355. <https://doi.org/10.1080/17439760902992365>

Renner, F., Murphy, F. C., Ji, J. L., Manly, T., & Holmes, E. (2019). Mental imagery as a “motivational amplifier” to promote activities. *Behaviour Research and Therapy*, 114, 51–59. <https://doi.org/10.1016/j.brat.2019.02.002>

Renner, F., Schwarz, P., Peters, M. L., & Huibers, M. J. H. (2014). Effects of a best-possible-self mental imagery exercise on mood and dysfunctional attitudes. *Psychiatry Research*, 215, 105–110. <https://doi.org/10.1016/j.psychres.2013.10.033>

Renner, F., Werthmann, J., Paetsch, A., Bär, H. E., Heise, M., & Bruijniks, S. J. E. (2021). Prospective Mental Imagery in Depression: Impact on Reward Processing and Reward-Motivated Behaviour. *Clinical Psychology in Europe*, 3, Article 2. <https://doi.org/10.32872/cpe.3013>

Roepke, A. M., & Seligman, M. E. P. (2016). Depression and prospection. *British Journal of Clinical Psychology*, 55, 23–48. <https://doi.org/10.1111/bjc.12087>

- Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, 76, 805–819. <https://doi.org/10.1037/0022-3514.76.5.805>
- Rutchick, A. M., Slepian, M. L., Reyes, M. O., Pleskus, L. N., & Hershfield, H. (2018). Future self-continuity is associated with improved health and increases exercise behavior. *Journal of Experimental Psychology: Applied*, 24, 72. <https://doi.org/10.1037/xap0000153>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.
- Schacter, D. L., Addis, D. R., & Buckner, R. L. (2007). Remembering the past to imagine the future: The prospective brain. *Nature Reviews. Neuroscience*, 8, 657–661. <https://doi.org/10.1038/nrn2213>
- Schacter, D. L., Addis, D. R., & Buckner, R. L. (2008). Episodic Simulation of Future Events. *Annals of the New York Academy of Sciences*, 1124, 39–60. <https://doi.org/10.1196/annals.1440.001>
- Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic Future Thinking: Mechanisms and Functions. *Current Opinion in Behavioral Sciences*, 17, 41–50. <https://doi.org/10.1016/j.cobeha.2017.06.002>
- Schubert, T., Eloo, R., Scharfen, J., & Morina, N. (2020). How imagining personal future scenarios influences affect: Systematic review and meta-analysis. *Clinical Psychology Review*, 75, 101811. <https://doi.org/10.1016/j.cpr.2019.101811>
- Shapira, L. B., & Mongrain, M. (2010). The benefits of self-compassion and optimism exercises for individuals vulnerable to depression. *The Journal of Positive Psychology*, 5(5), 377–389. <https://doi.org/10.1080/17439760.2010.516763>
- Simić, A., Vardo, E., & Solaković, Š. (2021). Future Self-Continuity Increases Responsibility during Covid-19 Restrictions. *Psihologijske Teme*, 30, 205–223. <https://doi.org/10.31820/pt.30.2.3>
- Sokol, Y., & Serper, M. (2020). Development and Validation of a Future Self-Continuity Questionnaire: A Preliminary Report. *Journal of Personality Assessment*, 102, 677–688. <https://doi.org/10.1080/00223891.2019.1611588>

- Stöber, J. (2000). Prospective cognitions in anxiety and depression: Replication and methodological extension. *Cognition and Emotion, 14*, 725–729.
<https://doi.org/10.1080/02699930050117693>
- Strunk, D. R., Lopez, H., & DeRubeis, R. J. (2006). Depressive symptoms are associated with unrealistic negative predictions of future life events. *Behaviour Research and Therapy, 44*, 861–882. <https://doi.org/10.1016/j.brat.2005.07.001>
- Strunk, D. R., & Sasso, K. (2017). Phenomenology and Course of Mood Disorders. In *The Oxford Handbook of Mood Disorders*. Oxford University Press.
- Suddendorf, T., Bulley, A., & Miloyan, B. (2018). Prospecction and natural selection. *Current Opinion in Behavioral Sciences, 24*, 26–31. <https://doi.org/10.1016/j.cobeha.2018.01.019>
- Sun, H.-Y., Jiang, Y.-P., Wang, X., Cui, L.-Y., & Sun, H.-M. (2023). The effect of episodic foresight on intertemporal decision-making: The role of future self-continuity and perceived control. *Cognitive Processing*. <https://doi.org/10.1007/s10339-023-01124-6>
- Szpunar, K. K., & Schacter, D. L. (2013). Get real: Effects of repeated simulation and emotion on the perceived plausibility of future experiences. *Journal of Experimental Psychology: General, 142*, 323–327. <https://doi.org/10.1037/a0028877>
- Szpunar, K. K., Spreng, R. N., & Schacter, D. L. (2014). A taxonomy of prospecction: Introducing an organizational framework for future-oriented cognition. *Proceedings of the National Academy of Sciences of the United States of America, 111*, 18414–18421.
<https://doi.org/10.1073/pnas.1417144111>
- Torkan, H., Blackwell, S. E., Holmes, E., Kalantari, M., Neshat-Doost, H. T., Maroufi, M., & Talebi, H. (2014). Positive Imagery Cognitive Bias Modification in Treatment-Seeking Patients with Major Depression in Iran: A Pilot Study. *Cognitive Therapy and Research, 38*, 132–145. <https://doi.org/10.1007/s10608-014-9598-8>
- Treadway, M. T., & Zald, D. H. (2011). Reconsidering anhedonia in depression: Lessons from translational neuroscience. *Neuroscience and Biobehavioral Reviews, 35*, 537–555.
<https://doi.org/10.1016/j.neubiorev.2010.06.006>
- Urminsky, O. (2017). The Role of Psychological Connectedness to the Future Self in Decisions Over Time. *Current Directions in Psychological Science, 26*, 34–39.
<https://doi.org/10.1177/0963721416668810>

- van Gelder, J.-L., Hershfield, H., & Nordgren, L. F. (2013). Vividness of the Future Self Predicts Delinquency. *Psychological Science, 24*, 974–980.
<https://doi.org/10.1177/0956797612465197>
- Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology, 97*, 346–353.
<https://doi.org/10.1037/0021-843X.97.3.346>
- Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin, 98*, 219–235. <https://doi.org/10.1037/0033-2909.98.2.219>
- Williams, J. M. (1996). Depression and the specificity of autobiographical memory. In *Remembering our past: Studies in autobiographical memory* (pp. 244–267). Cambridge University Press. <https://doi.org/10.1017/CBO9780511527913.010>
- Williams, J. M., & Broadbent, K. (1986). Autobiographical memory in suicide attempters. *Journal of Abnormal Psychology, 95*, 144–149. <https://doi.org/10.1037/0021-843X.95.2.144>
- Wilson, D. B., & Mason, G. (2017). *Formulas Used by the “Practical Meta-Analysis Effect Size Calculator”*. <https://www.semanticscholar.org/paper/Formulas-Used-by-the-%E2%80%9CPractical-Meta-Analysis-Size-Wilson-Mason/5d66868b1b418da90fe6ccf203ff6afa70394602>
- World Health Organization. (2017). *Depression and other common mental disorders: Global health estimates* (WHO/MSD/MER/2017.2). World Health Organization.
<https://apps.who.int/iris/handle/10665/254610>
- Wu, H., Mata, J., Furman, D. J., Whitmer, A. J., Gotlib, I. H., & Thompson, R. J. (2017). Anticipatory and consummatory pleasure and displeasure in major depressive disorder: An experience sampling study. *Journal of Abnormal Psychology, 126*, 149–159.
<https://doi.org/10.1037/abn0000244>
- Yogo, M., & Fujihara, S. (2008). Working memory capacity can be improved by expressive writing: A randomized experiment in a Japanese sample. *British Journal of Health Psychology, 13*, 77–80. <https://doi.org/10.1348/135910707X252440>
- Zhou, W., Li, P., Lei, X., & Yuan, H. (2022). Envision a bright future to heal your negative mood: A trial in China. *Cognitive Therapy and Research, 46*, 343–357. [psych. https://doi.org/10.1007/s10608-021-10246-0](https://doi.org/10.1007/s10608-021-10246-0)

Appendices

Appendix A

Ethics application



Ethics Review Details

You have chosen to self certify your project.	
Name:	McCue, Robyn (2020)
Email:	NJJT032@live.rhul.ac.uk
Title of research project or grant:	The effects of positive prospective imagery on in-the-moment affect, anticipated affect, behavioural engagement and future self-connectedness.
Project type:	Royal Holloway postgraduate research project/grant
Department:	Psychology
Academic supervisor:	Andrew McLeod
Email address of Academic Supervisor:	a.macleod@rhul.ac.uk
Funding Body Category:	No external funder
Funding Body:	
Start date:	04/04/2022
End date:	28/02/2023

Research question summary:

The first aim of this study is to examine the effects of positive prospective imagery (imagining positive future events), versus verbal processing of future events, on in-the-moment affect, anticipated affect, future self-connectedness and behavioural engagement in rewarding activities.

A second aim of this study is to explore potential mediators and moderators of the relationship between positive prospective imagery, affect and behaviour.

This study aims to test the following hypotheses:

1. Positive prospective imagery will promote greater positive in-the-moment affect, anticipated affect, future self-connectedness and behavioural engagement than a more verbal-semantic form of future thinking.
2. Increases in positive affect and future self-connectedness will mediate the relationship between positive prospective imagery and behavioural engagement at two weeks follow-up.
3. Depressive symptoms will moderate the relationship between condition and outcome.

Research method summary:

Participants will be undergraduate and postgraduate students recruited using the participant pool from Royal Holloway University of London. A random sampling method will be utilised.

The study will utilise a 2x2 mixed design with one between-groups factor (Condition: Imagery vs Verbal) and one within-subjects factor (Time: Pre and Post). Participants will be randomly allocated to one of the two conditions.

We aim to recruit 68 participants across the two conditions.

Participants will complete the following validated measures at baseline: Temporal Experiences of Pleasure Scale (Gard et al., 2008); Plymouth Sensory Imagery Questionnaire (Andrade et al., 2014); Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995).

Participants will be asked to provide three future events that they are looking forward to and to either engage in imagery-led or verbally-led thinking about these events.

Participants will complete the following validated measures pre and post imagery/verbal manipulation: Positive and Negative Affect Scale State Version (Watson, Clark & Carey, 1988); Future self-continuity scale (Herschfield et al., 2009). Participants will also rate anticipated pleasurable affect and behavioural intention before and after manipulation.

Two weeks following in-person testing, participants will be emailed to enquire as to whether they engaged in the nominated events.

Working with participants that are 'at risk'

Will the research involve any of the following 'at risk' participants?

Children (under the age of 16),

No

Participants with cognitive or physical impairment that may render them unable to give informed consent,

No

Participants who may be at risk due to personal, emotional, psychological or other reasons,

No

Participants who may become at risk as a result of the conduct of the study (e.g. because it raises sensitive issues) or as a result of what is revealed in the study (e.g. criminal behaviour, or behaviour which is culturally or socially questionable),

No

Participants who are in unequal power relations (e.g. groups that you teach or work with, in which participants may feel coerced or unable to withdraw),

No

Participants who may potentially suffer negative consequences if identified (e.g. professional censure, exposure to stigma or abuse, damage to professional or social standing),

No

Details,

Other considerations when working with people and their data

Does your study include any of the following?

Will it be necessary for the research that people take part in the study without their informed consent at the time?,

No

Will the research, however briefly, be managing identifiable or special category data as defined by GDPR? (Please see the Royal Holloway's research ethics intranet page for guidance),

No

Is pain or discomfort likely to result from the study?,

No

Could the study induce psychological stress or anxiety, or cause harm or negative consequences beyond the risks encountered in normal life?,

No

Does this research involve NHS patients, staff, premises, resources, data or tissue samples?,

No

If so what is the NHS Approval number,

Are drugs, placebos or other substances to be administered to the study participants, or will the study involve invasive, intrusive or potentially harmful procedures of any kind?.

No

Will human tissue including blood, saliva, urine, faeces, sperm or eggs be collected or used in the project?.

No

Will the research work with a dataset that requires a data sharing agreement?.

No

Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?.

No

Is there a risk that any of the material, data, or outcomes to be used in this study has been derived from ethically-unsound procedures?.

No

Details,

Risks to the Environment / Society

Will the conduct of the research pose risks to the environment, site, society, or artifacts?.

No

Will the research be undertaken on private or government property without permission?.

No

Will geological or sedimentological samples be removed without permission?.

No

Will cultural or archaeological artifacts be removed without permission?.

No

Details,

Risks to Researchers, Research Collaborators, and Royal Holloway

Does your research present any of the following risks to researchers, research collaborators, or Royal Holloway?

Is there a possibility that researchers or research collaborators could be exposed to emotional or physical risks (e.g. by being alone with vulnerable, or potentially aggressive participants, by entering an unsafe environment, by working in countries in which there is unrest, accessing archives with troubling content, or by examining material that may cause secondary trauma)?.

No

Is the topic of the research sensitive or controversial such that the researcher could be ethically or legally compromised (e.g. as a result of disclosures made during the research)?.

No

Will the research involve the investigation or observation of, proximity to, or participation in illegal practices?.

No

Could any aspects of the research mean that Royal Holloway has failed in its duties of care?.

No

Is there any reputational risk concerning the source of your funding?.

No

Is there any other ethical issue that may arise during the conduct of this study that could bring the institution into disrepute?.

No

Details,

Declaration

By submitting this form, I declare that the questions above have been answered truthfully and to the best of my knowledge and belief, and that I take full responsibility for these responses. I undertake to observe ethical principles throughout the research project and to report any changes that affect the ethics of the project to the University Research Ethics Committee for review.

Certificate produced for user ID, NJJT032

Date:	16/10/2022 13:10
Signed by:	McCue, Robyn (2020)
Digital Signature:	RJ MCCUE
Certificate dated:	10/16/2022 1:27:00 PM
Files uploaded:	PARTICIPANT INFORMATION SHEET.docx DEBRIEF SHEET.docx CONSENT FORM.docx Full-Review-3133-2022-02-18-14-12-NJJT032.pdf Full-Review-3133-2022-02-18-14-14-NJJT032.pdf Full-Review-3133-2022-10-13-14-03-NJJT032.pdf

Appendix B

Participant information sheet

PARTICIPANT INFORMATION SHEET FOR STUDY OF FUTURE THINKING

Study title: *The impact of thinking about the future on mood, feelings towards the future-self, and behaviour.*

Researcher name: Robyn McCue

Supervisor: Professor Andrew MacLeod

Invitation to participate in study

I would like to invite you to participate in this research project which forms part of my Doctorate in Clinical Psychology. Your decision to take part in this study is completely voluntary. Before you decide whether you would like to take part, it is important to read the following information sheet carefully. If you decide not to take part, this will not affect your education in any way.

This information sheet provides details on the aims of this study and what participation involves. If you have further questions or concerns related to this study, please do not hesitate to contact me for more detail (see contact details below).

What are the aims of this research?

The aim of this study is to explore the link between different ways of thinking about the future, mood and whether those affect what you do.

What will happen if I take part?

If you consent to take part, you will be asked to complete some questionnaires that ask about your mood over the last week, how you are currently feeling, your views on your future self, and your ability to imagine things.

You will then be asked to select ten future events/activities that you would like to do and would enjoy doing over the next two weeks. You will be asked to think about two of these events in more detail. You will then complete another questionnaire about your mood, how you are currently feeling and your views on yourself in the future.

We will contact you by email **two weeks after you take part** to ask you whether the events/activities that you were looking forward to actually happened.

It is estimated that the in-person portion of this study will take up to 60 minutes in total to complete. The follow-up email will take no more than 10 minutes. You will receive a debrief sheet after the two-week follow up explaining the study in more detail.

What happens if I change my mind?

If you change your mind, you can withdraw from the study without having to give a reason. You are able to withdraw your data from the study up to three months after participation, at which point the analysis will be completed.

What are the possible risks of taking part?

As part of this study, we will ask you to complete a measure of depression. This is because individuals experiencing low mood sometimes struggle to think about the future and we would like to account for this in our study. While we do not anticipate that any part of the study will be distressing to participants, we would like you to be aware of the above before agreeing to take part.

Remember that you are free to withdraw from the study at any point without having to give a reason. At the end of the study, we will provide you with details of support services available at RHUL and externally should you wish to seek further support.

What are the possible benefits of taking part?

This research may help us to better understand how thinking about the future impacts people's mood, their view of themselves in the future, and whether they engage in positive behaviour. The results of this study may help to inform future interventions for individuals experiencing low mood.

What information about me will be collected and will my information be kept confidential?

Your data will be processed in accordance with the General Data Protection Regulation (GDPR, see GDPR statement at the end of this document) and will be destroyed after 5 years.

For the purposes of this study, you will be allocated a unique code meaning that you will not be identifiable from your responses. You will be asked to provide a signature on the consent form. Consent forms will be stored in a locked cabinet in the research supervisor's office on RHUL campus. Your responses during the study will be transferred to a password protected electronic database and stored on an encrypted hard drive that only the researcher and research supervisor will have access to.

We will contact you by email two weeks after taking part in the study to complete some final questions. Your email will be stored in a separate password protected database to maintain anonymity. Email addresses will be deleted after the two-week follow up period unless you indicate that you would like a copy of the results on the consent form. In this case, email addresses will be deleted after a summary of results have been sent to you.

We would like your permission to use this data in future studies, and to share this with other researchers (e.g. in online databases). As your responses will have a unique code, you will not be identifiable from this data.

What will happen to the results of the study?

The results of this study will be written up and submitted as a doctoral thesis for the Doctorate of Clinical Psychology. The results may also be submitted to a peer-reviewed

academic journal for publication. Upon completion of the study, participants who expressed interest in hearing about the results will also receive a brief summary of the results via email. You can indicate on the consent form whether you would like to receive a summary of the study results.

Due to the nature of this research, it is possible that other researchers may find the data collected to be useful in answering future research questions. Any request from other researchers for access to the anonymised group data will be considered by the research team.

Who has reviewed the study?

The proposal and ethics for the research has been approved by Royal Holloway, University of London Ethics Committee (Code: 3133-2022-10-16-26-NJTT032).

Who should I contact for further information?

If you have any questions or require more information about this study, please contact me using the following contact details:

Name: Robyn McCue

Email: Robyn.McCue.2020@live.rhul.ac.uk

What if I have further questions or if something goes wrong?

If you wish to make a complaint about the conduct of the study, you can contact the research supervisor - Professor Andrew MacLeod (A.Macleod@rhul.ac.uk), Department of Psychology, Royal Holloway University of London.

General Data Protection Regulation Statement

Important General Data Protection Regulation information (GDPR). Royal Holloway, University of London is the sponsor for this study and is based in the UK. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the study will be stored securely on hosted on servers within the European Economic Area'. Royal Holloway is designated as a public authority and in accordance with the Royal Holloway and Bedford New College Act 1985 and the Statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your personal data from being accidentally lost, used or accessed in any unauthorised way or altered or disclosed. Royal Holloway has also put in place procedures to deal with any suspected personal data security breach and will notify you and any applicable regulator of a suspected breach where legally required to do so. To safeguard your rights, we will use the minimum personally-identifiable information possible (i.e., the email address you provide us). The lead researcher will keep your contact details confidential and will use this information only as required (i.e., to provide a summary of the study results if requested and/or for the prize draw). The lead researcher will keep information about you and data gathered from the study, the duration of which will depend on the study. Certain individuals from RHUL may look at your research records to check the

accuracy of the research study. If the study is published in a relevant peer-reviewed journal, the anonymised data may be made available to third parties. The people who analyse the information will not be able to identify you. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/> and if you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk

NB: You may retain this information sheet for reference and contact us with any queries.

Appendix C
Consent form

*The impact of thinking about the future on mood, feelings towards the future-self, and
behaviour.*

Anonymous ID number _____

I confirm that I have read and understood the information sheet about this study	<i>Yes / No</i>
I have had the opportunity to ask questions about this study	<i>Yes / No</i>
I have received satisfactory answers to my questions	<i>Yes / No</i>
I understand my participation in this study is voluntary	<i>Yes / No</i>
I understand that I am free to withdraw from the study/research project at any time up to 3 months after participation without giving a reason and without detriment to myself	<i>Yes / No</i>
Do you agree to take part in the study?	<i>Yes / No</i>
Would you like to receive a summary of the results of this study by email?	<i>Yes / No</i>

Signature of participant:

Name in block letters:

Email:

Date:

NB: This consent form will be stored separately from the anonymous information you provide during this study.

Appendix D
Demographics sheet

ANONYMOUS PARTICIPANT ID: _____

Date of birth:	
How would you describe your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-binary <input type="checkbox"/> Not listed _____ <input type="checkbox"/> Prefer not to say
Ethnicity:	<input type="checkbox"/> Asian or Asian British <input type="checkbox"/> Black, Black British, Caribbean, or African <input type="checkbox"/> Mixed or multiple ethnic groups <input type="checkbox"/> White <input type="checkbox"/> Other ethnic group
What course are you studying at RHUL?	
Undergrad/Postgrad?	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Postgraduate (Masters) <input type="checkbox"/> Postgraduate (Doctoral)
First (native) language:	

Appendix E

Event Selection Instructions and Activity Ratings

We would like you to think of TEN events or activities that you would like to do and would enjoy doing over the next two weeks.

These events must be specific to a time and location, so things that are happening in particular places and at particular times.

You can choose any type of event or activity, for example, related to socializing, work or study, hobbies or interests, anything at all.

Here are some examples:

Going for lunch with a friend at a specific restaurant next Friday afternoon.

Attending a yoga class at the gym on Monday morning by yourself.

Watching a movie in the cinema with your partner on Friday evening.

Playing in a football match at the local club on Wednesday night.

Event 1	
Event 2	
Event 3	
Event 4	
Event 5	
Event 6	
Event 7	
Event 8	
Event 9	
Event 10	

Please respond to the questions below using the following scale:

Not at all				Somewhat					Very much so
1	2	3	4	5	6	7	8	9	

	How <i>pleasant/enjoyable</i> do you think it will be doing...	How <i>likely</i> is it you will engage (take part in)...
Event 1		
Event 2		
Event 3		
Event 4		
Event 5		
Event 6		
Event 7		
Event 8		
Event 9		
Event 10		

Appendix F

Imagery-led Instructions

[Instructions provided verbally]

Now, I am going to ask you a bit more about two of the events you have provided and ask you to think about them in a bit more detail.

One event/activity you said you are looking forward to was... (read Event with lowest intention rating). I will call this Event A.

I want you to try to build up a detailed image of the event, as if you are really experiencing the event and as if a movie of the event was unfolding in your head. Spend a few moments imagining this event, seeing it as if you were really there in the situation.

I am going to provide you with some questions that might help [place imagery questions in front of participant]. It might help to notice what you can see around you, what you can hear, what you can feel, touch and experience when you think of the event. Perhaps you might look around you in the image and notice what is going on around you. Perhaps you might imagine what happens after the event?

I am going to give you one minute to really focus on the image you are thinking about.

[Instructions were repeated for the second event]

Appendix G

Imagery-Led Questions

What can you see around you?

What can you hear?

What can you feel, touch and experience in that situation?

What is happening around you?

What happens immediately after the event?

When instructed, please take a moment to write down what you were thinking about, using the questions above to guide you:

Event A

When instructed, please take a moment to write down what you were thinking about, using the questions above to guide you:

Event B

Appendix H

Verbal-led Instructions

[Instructions provided verbally]:

Now, I am going to go back over each of the events you provided and ask you to think about them in a bit more detail.

The first event/activity you said you are looking forward to was... (read Event with lowest intention rating). I will call this Event A.

I want you to try to think in words about the event, its causes, meanings and implications for you. Spend a few moments thinking about the event in words and meanings, using verbal language of the sort that you use when you speak.

I am going to provide you with some questions that might help [place verbal questions in front of participant]. It might help to think about why this event might happen, and what this event might mean for your life. Perhaps you might think about what the consequences and significance of this event might be for you? Perhaps you might think about what you would think of yourself after the event, and what this event might say about you? How might you describe to a friend why this event is something you are looking forward to?

I am going to give you one minute to really focus on the words you are thinking about.

[Instructions were repeated for the second event]

Appendix I

Verbal-led Questions

What might cause this event to happen?

What might this event mean for your life? What might be the consequences and significance of this event for you?

What might you think of yourself after the event?

What might this event say about you?

How might you describe to a friend why this event is something you are looking forward to?

When instructed, please take a moment to write down what you were thinking about, using the questions above to guide you:

Event A

When instructed, please take a moment to write down what you were thinking about, using the questions above to guide you:

Event B

Appendix J

Manipulation Checks

Please respond to the questions below using the following scale:

Not at all	Somewhat						Very much so	
1	2	3	4	5	6	7	8	9

1. How much did you find yourself visualising in your mind's eye what it was like to experience...

Event A? _____

Event B? _____

2. How much did you find yourself thinking in words about...

Event A? _____

Event B? _____

3. Overall, how difficult did you find this task?

Appendix K

Follow-up Email (Behavioural Engagement and Enjoyment Ratings)

Dear (Name),

Thank you for completing the first part of my study, titled “The impact of thinking about the future on mood, feelings towards the future-self, and behaviour”. **To complete the study and receive your credits**, please complete the questions in the attached word document and return to Robyn.McCue.2020@live.rhul.ac.uk

Please do not hesitate to contact me if you have any questions.

Yours sincerely

Robyn McCue

Trainee Clinical Psychologist

[A word document was attached to the document that included the ten events provided by participants].

When you took part in the first part of my study, “The impact of thinking about the future on mood, feelings towards the future-self, and behaviour”, you selected ten events that you would like to take part in and would enjoy in the next two weeks.

To remind you, these are the events you selected: *[participants nominated events listed]*

We would like to ask you some more questions about these events. Please use the following scale where indicated.

Not at all		Somewhat					Very much so	
1	2	3	4	5	6	7	8	9

	Did you take part in this event/activity? (Yes/No)	If no, please write a brief description as to why.	If yes, please rate how pleasurable/enjoyable you found the event (1-9)
Event 1			
Event 2			
Event 3			
Event 4			
Event 5			
Event 6			
Event 7			
Event 8			
Event 9			
Event 10			

Appendix L

Debrief

[Sent by email]

Dear participant,

Thank you for your participation in this study. We really appreciate your time.

The primary aim of this study is to investigate whether there is a difference between thinking about the future in a more verbally-based way and thinking about the future in a more imagery-based way. We are interested in whether thinking about the future in a more imagery-based way can improve how people feel in the present moment, make them feel more connected to their future self, and lead them to engage in more positive activities, compared to more verbally-based forms of future thinking.

We are also interested in seeing whether individuals experiencing low mood might find it more difficult to think about the future in a more imagery-based way, and therefore might benefit less from imagining the future.

The results of this study may help us to better understand how thinking about the future can help support individuals experiencing low mood. If you are experiencing low mood and would like to find out more or to seek further support for this, please see the following link: <https://intranet.royalholloway.ac.uk/students/help-support/supporting-you-at-royal-holloway/mental-health.aspx>

If you have changed your mind and no longer wish to be involved in this research, you can ask us to withdraw your data from the study. If you have any questions about this research, please do not hesitate to get in touch with me via email at

Robyn.McCue.2020@live.rhul.ac.uk or the research supervisor, Andrew MacLeod (A.Macleod@rhul.ac.uk).

Thank you again for your time.

Kind regards,

Robyn McCue

Trainee Clinical Psychologist

Appendix M

Search Strings for Systematic Review

Database	Search terms
EBSCO (APA PsycExtra, APA PsycArticles, APA PsycInfo, MEDLINE):	(prospective OR future OR prospection OR pre-experienc* OR "best possible self" OR "possible selves") AND (simulation OR image* OR visuali#ation OR visuali#e) AND (intervention OR training OR treatment) AND depress*
Web of Science:	((ALL=(prospective OR future OR prospection OR pre-experienc* OR "best possible self" OR "possible selves")) AND ALL=(simulation OR image* OR visuali?ation OR visuali?e)) AND ALL=(intervention OR training OR treatment)) AND ALL=(depress*)

Appendix N

Items from Downs & Black Checklist (1998) for Quality Assessment

Item	Question
1	Is the hypothesis of the study clearly described?
2	Are the main outcomes to be measured clearly described?
3	Are the characteristics of participants clearly described?
4	Are interventions of interest clearly described?
5	Are the distributions of principal confounders in each group of subjects to be compared clearly described? (Yes, Partially, No)
6	Are the main findings clearly described?
7	Does the study provide estimates of random variability in the data for the main outcomes?
8	Have all important adverse events that may be a consequence of the intervention been reported?

- 9 Have characteristics of participants lost to follow up been described?
 - 10 Have actual probability values been reported?
 - 11 Were subjects asked to participate in the study representative of the entire population from which they were recruited?
 - 12 Were subjects prepared to participate representative of the entire population from which they were recruited?
 - 13 Were staff, places & facilities representative of the treatment the majority of patients receive?
 - 14 Was an attempt made to blind participants to the intervention they received?
 - 15 Was an attempt made to blind those measuring the main outcomes of the intervention?
 - 16 If any of the results of the study were based on "data dredging", was this made clear?
 - 17 Do the analyses adjust for different lengths of follow-up?
 - 18 Were the statistical tests used to assess the main outcomes appropriate?
 - 19 Was compliance with the intervention(s) reliable?
 - 20 Were the main outcome measures used accurate (valid & reliable)?
 - 21 Were participants in different intervention groups (trial & cohort studies) recruited from the same population?
 - 22 Were participants in different intervention groups over the same period of time?
 - 23 Were participants randomised to intervention groups?
 - 24 Was the randomised assignment concealed from both participants and facilitators until recruitment was complete and irrevocable?
 - 25 Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?
 - 26 Were losses of patients to follow-up taken into account?
 - 27 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?
-