Features of Mental Imagery in Young People with Low Mood

Lauren Chuttoo

May 2022

Research submitted in partial fulfilment of

the requirements for the degree of

Doctor in Clinical Psychology (DClinPsy),

Royal Holloway, University of London.

<u>Acknowledgements</u>

Table of Contents

List of Figures & Tables

I. Lay Summary

Introduction

When our minds wander, we often think about the future. This could be thinking about what we plan to do later today or about specific events years in the future. Our thoughts about the future often impact how we feel now. Usually, if we think about a happy future event in detail, we feel better. Detailed future thinking is a skill that starts developing in childhood and carries on developing until we are adults. As it is a developing skill, it would be expected that young people think about the future differently to adults.

The wellbeing of young people is vital because mental health conditions that start earlier in life can be particularly damaging. This means it is important to know if detailed future thinking can be used to help young people feel better. So far most future thinking research has been on adults rather than young people.

There are two parts to this research. Part one is a review of studies which looked at how future-thinking has been used with young people and whether future thinking changed how young people felt. Part two is my own study that explored how young people imagined the future and whether this changed after a task where they thought about a future event in detail.

Systematic review

Introduction

There have been many adult studies where people have been asked to think about the future. These studies have used future thinking in different ways to see if it makes a difference to how people feel. These studies found that future thinking does affect how we feel. It was unknown if these findings would be the same for young people. The review aimed

to weigh up the evidence to see if future thinking tasks have made the same sort of difference to young people.

Method

A systematic search of the literature was carried out to find out what future thinking tasks had been used with young people under the age of 24 years. The review aimed to find out if future thinking tasks led to young people feeling better. After going through 12,725 possible studies, 19 studies were found to be eligible for the review. An extra 12 studies were found by looking at the reference lists of some key papers. These 31 studies were put together in a table to compare them. Similarities and differences in participants, future thinking tasks and outcomes were explored.

Results

Three different types of future thinking task were found to have been used with young people:

1. Positive thinking exercises (imagining yourself at your best in the future)

2. Episodic Future Thinking (imagining specific good events happening to you in the future)

3. Controlled worry tasks (asking people to worry in different ways)

There were mixed findings, but many tasks led to young people feeling better. There were more studies in the upper limit of the age range, and only one child study. There was some very small evidence that future thinking tasks were not as good at changing mood for younger people than other people. Some tasks made people picture the future, rather than just think about it. There were bigger changes in how people felt if they had pictured the future. The studies often did not give a lot of detail in how they did their study. This meant it was

hard to say whether they had minimised the chances of finding false results. This cast doubt on the conclusions of the studies and weakened the evidence of the review.

Conclusions

Future thinking tasks have been used with young people and have led to young people feeling better. This gives some hope that future thinking tasks may be adapted to be used in treatments for young people with low mood.

My own study

Introduction

When people picture things in their minds, there are different features that can be found in that image. Some of these features include:

- Viewpoint of the image, either imagining it through your own eyes, or observing the scene like a fly on the wall
- Emotion: whether feelings come to mind in the image
- Sensory details: see, hear, taste touch, smell things in the image.
- Dampening: thoughts that come up that ruin the positive bits of the image
- Accessibility: how long it takes to imagine the image

Studies have found that these features are different when adults have low mood. This study wanted to find out if the same would be true for young people with low mood.

Method

This study compared descriptions of imagined future events before and after young people completed a task. This study used data that had already been collected for another project. Young people aged 16-21 years had been recruited if they answered a questionnaire to say they had low mood. They first did a task where they thought of six possible future

situations that could happen to them. They were then allocated at random to a task. They either thought in detail about a happy future event, or a task where they imagined an activity like brushing teeth. They then imagined and described another six future events that were different to the time before. These 12 answers per person were used as the core data for the study.

A coding strategy was created to find and count the five features in these imagined situations. A young person who had had low mood gave their opinion on the coding strategy. Audio recordings of the imagined situations were typed out into scripts. These scripts were then graded using the coding system. All the coded information was then analysed using statistics.

Results

The results showed there was no connection between the five features and level of low mood in the young people. There was no connection between the features and how vivid participants rated their imagery. The group who imagined a happy future event did not give more detailed descriptions than the group who imagined a routine task. So, the effects we were predicting were not found.

Impact, integration, and dissemination

The review and my own study both looked at how young people think about the future. The review indicated that future thinking tasks might be helpful in improving mood for young people. It highlighted the need for more studies with younger children. The findings of my study suggested that the features of imagery generated by young people are not related to level of depression or ability to imagine things vividly. It might be that features of imagery differs from person to person. This is important to know and shapes understanding of how young people use imagery. The findings will be shared with the young

people who participated in this study. The findings have also been shared with fellow Royal

Holloway clinical psychology trainees as part of an annual research forum.

II. Systematic Review

Does thinking about the future influence affect in children and young people?

Abstract

Thinking about the future is a basic human cognitive ability that can affect how we feel in the present. Recent research has found that interventions incorporating future thinking have led to improvements in affect in adults. This study aimed to discover what interventions had been used with children and young people, and whether there was evidence that these interventions improved affect. Databases PsycInfo, PsycArticles, Cochrane Library, Pubmed and Medline were searched using selected search terms. Thirty-one studies were identified, with a total of 2706 participants. There were 25 undergraduate samples and six child/adolescent samples. Each study had assessed an intervention that was either a positive intervention, an episodic future thinking intervention or a controlled worry intervention. Analysis involved synthesising the results of each group of interventions. Studies found significant effects on mood across all three groups of studies, however some studies, some with younger samples, failed to find an effect. Imagining the future in pictorial form led to greater change in affect than language based future thinking. In conclusion, interventions incorporating future thinking are likely to lead to short term changes in affect, however the study was undermined in its conclusions in relation to young people specifically as many undergraduate samples contained participants older than 24 years.

<u>Introduction</u>

Research has suggested that for up to 50% of time we are awake, our minds wander from the present moment and travel elsewhere, such as the past or future (Killingsworth & Gilbert, 2010). The ability to think about the future is a complex cognitive process that begins developing in infancy and continues developing into adolescence and adulthood (Atance & Meltzoff,2005; Gott & Lah, 2014)). Thoughts about the future occur spontaneously and more frequently than memories (Jason et al., 1989), with thoughts concerning the near future and day to day problem-solving the most common (D'argembeau et al., 2011).

D'argembeau et al. (2012) discuss the function of future thinking, showing that important future thoughts are key for one's identity, in the same way that important memories define one's sense of self. They also found that those who make greater meaning of their past also project greater meaning onto future events. Research has found that imagined future events generate greater affect than memories, regardless of positive or negative valence (Caruso, 2010; Rasmussen & Berntsen, 2013). This important element of being able to pre-feel potential situations may be a driving mechanism by which we are able to anticipate the future and set goals.

In Western society there is an emphasis on the pursuit and attainment of goals to achieve life satisfaction, but it is important to consider whether wellbeing can be improved just by thinking about attaining goals (Schubert et al., 2020). The positive psychology movement initiated by Seligman (2000) identified a range of interventions designed to improve wellbeing through the cultivation of positive thoughts feelings and behaviours. One such intervention entitled the Best Possible Self (BPS), includes writing about one's ideal future self, after everything has gone as well as it possibly could (King, 2001). The BPS intervention has been found to be more beneficial for positive and negative affect than other

positive psychology interventions (Carrillo et al., 2019), indicating that it is not just its positive valence but also the future thinking element that leads to increased optimism.

The BPS intervention has been adapted widely and researched in relation to managing pain (Gatzounis & Meulders, 2022) and diabetes (Gibson et al., 2021) and different environments such as work settings (Jennings et al., 2022) and classrooms (Duan et al., 2021). One meta-analysis of healthy adult samples found BPS to be an effective intervention in improving wellbeing, optimism and positive affect with moderate effect sizes, and larger effects with older participants (Carrillo et al., 2019). A more recent meta-analysis found more modest benefits, reporting small effect sizes for positive affect and optimism, concluding BPS lacked long term benefits but was effective in inducing positive mood (Heekerens & Eid, 2020).

While the BPS intervention facilitates positive future thinking, research has also considered negative future thinking. Excessive negative thoughts about the future occur in various anxiety disorders, significantly impacting on quality of life (Barrera & Norton, 2009). Cognitive Behavioural Therapy (CBT) is a longstanding frontline treatment for anxiety disorders where problematic thoughts are explored and put to the test. However studies have also investigated worry interventions which target the process of worry itself. Worry is the verbal form of negative future thinking and it has been suggested that verbal worrying enables cognitive avoidance and inhibits emotional processing in the long term (Borkovec et al., 1998). If this was accurate then engaging with the worry process, for example, through dedicated worry periods that limit the amount of worrying, can have beneficial effects by disrupting this avoidance. Another theory is the reduced concreteness theory of worry (Stöber, 1998, 2000), which describes how the quality of imagery is dependent on how concrete the verbal thought is, with abstract thoughts leading to low vividness and longer time to access images. If worries are therefore less concrete, this will lead to reduced

imagery, as observed in high worriers and those with generalized anxiety disorder (Stöber & Borkovec, 2002).

In studies of populations with persecutory delusions, engaging in worry interventions led to reduced delusional distress and delusions themselves (Foster et al., 2010; Freeman et al., 2015). Research has furthered understanding of worry through inducing worry in experimental studies. Leigh and Hirsch (2011) asked participants to worry in imagery or verbal form and assessed the impact on working memory performance. High worriers had less working memory capacity when worrying verbally as opposed to imagery worrying, leading the authors to conclude that training in imagery-based strategies may be helpful for high worriers.

A third strand of future thinking research has investigated how people can imagine more specific future events and how this relates to anxiety and depression. MacLeod and Byrne (1996) recruited a large student sample and divided them into three groups: those with anxiety, mixed anxiety-depression and controls, and asked them to generate future scenarios. Both the anxiety and mixed groups generated more negative future situations than the controls, but only the mixed group reported fewer positive experiences. Recent research has continued to explore these effects, with Hallford et al. (2020a) finding that people with major depression had impairments in generating positive future episodes compared to controls. Hallford et al. (2018) conducted a meta-analysis of future thinking and psychopathology, finding that those with a psychiatric diagnosis have significantly less detailed future thinking.

In another meta-analysis that sought to examine the effect of future thinking on affect in adults, 63 experimental studies were identified, covering the areas of positive future thinking, negative future thinking and future episodic simulation (Schubert et al., 2020). The authors reported that future thinking can enhance positive affect when people imagine a

positive future and increase negative affect when people engage in worry. They found that few studies reported long term follow-up and so the long term effects of future thinking were unclear. Despite limitations, the study concluded that research into future thinking could have various applications in treatments for clinical populations.

The United Kingdom (UK) government has highlighted that the mental health of children and young people is a national priority (www.gov.uk). In the UK, one in six 6-19 year olds have a probable mental disorder, such as depression, with rates of disorders being exacerbated by the Covid-19 lockdown (Newlove-Delgado et al., 2021). As depression beginning in adolescence is often more chronic than when it begins in adulthood (Hankin, 2006), it is imperative that effective interventions are provided early to reduce the likelihood of chronicity and debilitation. National Institute for Health and Care Excellence (NICE) recommend Cognitive Behavioural Therapy (CBT) for the treatment of depression in children and young people (NG134, 2019). Cognitive restructuring and imagery are important tools in CBT and both can be used in relation to the future. An analysis of studies that have used future thinking and evaluated effect on outcome, would provide evidence for using future thinking in this way.

Given the findings of future thinking on affect in adult studies, it would be important to explore whether the same findings have been found in studies with children and young people. The World Health Organisation (WHO) categorises young people as those aged 10-24 years with no lower limit for the start of childhood (www.who.int). Childhood to 24 years of age   is a period of cognitive development and therefore it cannot be assumed that young people will think about the future in the same way as adults. This has been evidenced by studies that have shown children's planning abilities improve with age (Atance, 2008) and understanding of future concepts such as 'tomorrow' develops over different age groups (Atance, 2015). Thus research using children and young people samples specifically, is

important and may yield important insights that can be incorporated into therapeutic treatments for these age groups.

Rationale for review

There has been substantial growth in research investigating the effects of future thinking in the last few decades. This had led to several key systematic reviews (Gamble et al., 2019; Hallford et al., 2018; Hallford & Grant, 2022) that consolidate findings as to how future thinking relates to anxiety and depression, which will inform future treatments for adults with these conditions. Schubert et al. (2020) reported the importance of future thinking on affect, with implications for the treatment of anxiety and depression. There has been no such systematic review considering the effect of future thinking on affect in young people. Schwarz et al. (2020) conducted a systematic review of imagery in children and adolescents with various psychopathologies, identifying that future imagery was a promising area in need of further exploration. While Schwarz et al. (2020) had an age limit of 20 years, it was considered important for the purpose of this study to extend the age to 24 years, based on the WHO categorisation of young people and the knowledge that cognitive development in still ongoing to this age (Arain et al., 2013). A proposed review of interventions that have manipulated future thinking (including future imagery) in young people would offer deeper insights into how this cognitive process impacts on mood. This could then inform therapies for anxiety and depression in young people, at a crucial window of opportunity for intervention.

Systematic Review questions

The review aimed to answer the following questions:

1. What types of future thinking interventions have been used with children and young people?

2. What is the evidence future thinking interventions have impacted affect in children and young people?

<u>Method</u>

This review was designed and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2015) and Guidance for undertaking Systematic Reviews in Health care (Centre for Reviews and Dissemination [CRD]2008). The review protocol can be found in appendix A. This study took place between November 2021 and May 2022. The review was registered and published on PROSPERO International Prospective Register of Systematic Reviews (registration number: CRD42021291605) on 16th November 2021. The search was carried out between 6-9th January 2022.

<u>Eligibility criteria</u>

The inclusion criteria were:

1. Peer reviewed, quantitative studies where participants were required to think about the future as a specific intervention or task. The future thinking element must equate to 50% or more of the intervention so that outcomes can be associated with future thinking.

2. Use of a psychological outcome measure taken at two or more time points to enable comparison.

3. Mean age of study participants 24 years or under.

4. No restrictions on date of publication.

The exclusion criteria were:

1. Study populations with physical health conditions, neurological disorders, developmental disorders, brain injuries and substance use.

2. Study populations with eating disorders, psychosis or personality disorders.

3. Studies focusing on test anxiety, body image or sports interventions.

4. Non-English language studies.

Search strategy

Relevant articles were identified by searching major internet-based bibliographic databases: APA PsycInfo, APA PsycArticles, Cochrane Library, Medline and PubMed, with access provided by Royal Holloway University of London. In addition to this search, the references of eligible articles and existing systematic reviews, were reviewed for further appropriate studies.

The search terms included the population, intervention and outcome under study and were derived from existing literature on the topic. Boolean operators (AND, OR) and truncations were applied, using an asterisk to capture variations of the root term. The following terms were used for the search:

[child* OR teen* OR adolescen* OR "young-people" OR youth OR "school-based" OR juvenile OR "young-adult" OR college OR student OR undergraduate]

AND

["future-think*" OR "imagin* the future" OR "prospective-imagery" OR "future-imagery",
"future sim*" OR optimism OR pessimism OR worry OR "positive-psychology" OR "best-possible-sel*" OR "possible-selves"]

AND

[intervention OR task OR treatment OR program]

AND

[affect OR wellbeing OR "quality of life" OR satisfaction OR psychopathology OR anxiety OR depression OR "depressive -symptoms" OR "low-mood"].

There were no filters (for example, location or publication dates), applied to the search.

Study selection

The study selection process began with the electronic search of five bibliographic databases that produced titles and abstracts for screening. These five separate searches were downloaded into compatible files and imported into 'Zotero reference manager' to form one reference database. This enabled duplicates to be removed. Article titles and abstracts were then screened and those that did not meet the eligibility criteria were excluded. The full text of an article was accessed if there was not sufficient information in the title or abstract to exclude. A second rater completed the screening process for 20% articles. Disagreements between raters were resolved through discussion and if no consensus could be agreed the project supervisor had the final decision.

Data extraction

Each paper was reviewed against the systematic review aims, with only relevant information extracted. Author, date, country of origin, sample characteristics, intervention details, findings and limitations were extracted. This was completed by the author and then the second reviewer completed this independently for 10% studies. Where there was missing data, authors of the articles were contacted with requests for missing information.

Quality Assessment

The review was conducted to capture intervention studies that evaluated the effect of future thinking. Therefore the Cochrane risk-of-bias tool for randomized trials version 2 (RoB 2; Sterne et al., 2019) was used to assess bias in each study. Randomised controlled trials are considered the gold standard of study designs and therefore the RoB 2 is vigorous in assessing the highest quality studies. It has 5 domains: risk of bias arising from randomisation, bias due to deviations from intended interventions, bias in missing outcome data, bias in measurement of outcome and bias in reporting results. Within each domain are a series of questions to be answered Yes, Probably Yes, No, Probably No, No Information or Not Applicable. Diagrammatic algorithms based on these answers then indicate whether the overall domain scores as High, Some Concerns or Low risk of bias. Studies are classified as overall high risk of bias if one or more domains are high risk. Studies must have low risk of bias in every domain to be classified as low risk overall. A second rater assessed 13% of selected studies using the RoB 2 with disagreements resolved through discussion.

Data synthesis

        The strategy for synthesising data was dependent on the types of study found. A narrative synthesis of the data as described by Popay et al. (2006) was deemed suitable. This enabled systematic exploration of the relationships within and between studies to answer the proposed research questions.

Results

Figure 1. PRISMA flowchart for the selection process of studies included in the systematic review

Identification

12725 records identified

9915 records after duplicates removed

Screening

9915 titles and abstracts screened

48 full text articles assessed

9867 records excluded

Eligibility

18 articles eligible including 19 studies

30 full text articles not meeting criteria

[Mean age above cut off (n=7)
Inappropriate study design (n=4)
Inappropriate intervention (n=10)
Inappropriate outcome measure (n=7)
Not in English language (n=1)
Not peer reviewed (n=1)]

12 studies identified through references

Included

Total 31 studies included in data synthesis

The study selection process is shown in Figure 1. The search of the five electronic databases returned a total of 12725 articles for screening. After duplicates were removed, 9915 articles remained for title and abstract screening. A second reviewer repeated the screening process for 1983 (20%) articles, with strong agreement (99%). The six disagreements were resolved through discussion. Of the total articles, 9867 were excluded, leaving 48 articles that could not be excluded based on title or abstract. The full texts of these articles were accessed, with 30 determined as not meeting the eligibility criteria. Reasons for exclusion included: mean age above cut off (seven studies), inappropriate study design (four studies), not meeting intervention requirements (10 studies), no appropriate outcome measure (seven studies), not in English language (one study) and not peer reviewed (one study). This left 18 eligible articles, with one article reporting the results of two separate eligible studies. The references of eligible studies and key literature (Carrillo et al., 2019; Schubert et al., 2020) were reviewed to identify further relevant studies and these were then reviewed for eligibility. Twelve additional studies were included after being identified in the references, giving a total of 31 studies included in the analysis. A second reviewer completed data extraction for 2 (10%) studies with 90% agreement.

Characteristics of Included Studies

Thirty-one studies published between 2001 and 2021 were included in the review (See Table 1). The studies were reported from countries around the world, including three from Asia (China: Auyeung & Mo, 2019; Japan: Yogo & Fujihara, 2008; Singapore: Liau et al., 2016), three from Australia (Busby-Grant & Wilson, 2021; McIntosh & Crino, 2013, Wong & Moulds, 2011), 11 from Europe (Belgium: Demeyer & De Raedt., 2014; Germany: Heekerens et al., 2020; Skodzik et al., 2016; Skodzik et al., 2017; Spain: Enrique et al., 2018; the Netherlands: Meevissen et al., 2011; Nicolson et al., 2020; Peters et al., 2013; Renner et

al., 2014; the UK: Pile et al., 2021a, Pile et al., 2021b), and 14 from the United States of America (USA). These were: Austenfeld and Stanton (2008); Behar et al. (2012); Duan et al. (2021); Feldman and Dreher (2012); Frala et al. (2014); Frein and Ponsler (2013); Harrist et al. (2007); Jing et al. (2016), study 1, study 2; King (2001); Layous et al. (2013); Lyubomirsky et al. (2011); McLaughlin et al. (2007) study 2, and Owens and Patterson (2013).

Thirty studies were experimental randomised controlled trial (RCT) designs comparing two or more randomised groups on psychological measures. One study (Pile et al., 2021a) used a single case experimental design.

There were a total of 2706 participants, with sample sizes ranging from n=9 (McIntosh & Crino, 2013; Pile et al., 2021a) to n=355 (Lyubomirsky et al., 2011), median=75. All participants were from the general population rather than clinical populations.

Four studies used adolescent (13-18 years) samples (Frala et al., 2014; Liau et al., 2016; Pile et al., 2021a; Pile et al., 2021b), one study used a child sample (Owens & Patterson, 2013) and 26 studies had mean age samples between 18-24 years.

All but one study (Frein & Ponsler, 2013) had majority female participants. The two studies with the youngest participants, Owens and Patterson (2013) and Frala et al. (2014) had more equitable samples. Only 13 studies reported on the ethnicity of their samples. Auyeung and Mo (2019) Liau et al. (2016) and Yogo and Fujihara (2008) had East Asian samples . Eight studies (Behar et al., 2007; Demeyer and De Raedt. 2014;, Frala et al., 2014; Feldman and Dreher, 2012; Harrist et al., 2007; McLaughlin et al., 2007; Owens and Patterson, 2013; Pile et al., 2021a) had majority white samples. Two studies had ethnically diverse samples (Layous et al., 2013; Lyubomirsky et al., 2013).

Twenty-seven studies had undergraduate student samples, two studies recruited from schools, one study recruited from a summer camp and one from the local community. The sampling procedures were not clear in all studies. Eight studies described advertising their studies to recruit (Auyeung & Mo, 2019; Enrique et al., 2008; Frala et al., 2014; Layous et al., 2013; Lyubomirsky et al., 2011; McIntosh & Crino, 2013; Nicolson et al., 2020; Peters et al., 2009). Ten studies stated that they recruited university undergraduates (Busby-Grant & Wilson, 2021; Demeyer & De Raedt, 2014; Harrist et al., 2007; Jing et al., 2016 studies 1 and 2; McLaughlin et al., 2007; Renner et al., 2014; Skodzik et al., 2016; Skodzik et al., 2017; Yogo & Fujihara, 2008) and five studies stated that they recruited from psychology courses (Behar et al., 2012; Frein & Ponsler, 2013; Heekerens et al., 2020; King, 2001; Wong & Moulds, 2011). In two studies participants were required to participate in their task as part of their course (Duan et al., 2021; Feldman & Dreher, 2021) and two studies described selecting participants (Austenfeld & Stanton, 2008; Liau et al., 2016). Liau et al., (2016) described selecting participants based on school administrators' views on who would engage with the task. Three studies stated they recruited from schools (Owens & Patterson, Pile et al., 2021a; 2021b). One study, Meevissen et al. (2011) was particularly vague about recruitment, stating that most participants were from the faculty of psychology and neuroscience but with no further information. Only 11 studies stated that they had collected informed consent from participants. There were 14 studies that said course credit or payment was offered in exchange for participation (Auyeung & Mo, 2019; Busby-Grant & Wilson, 2021; Duan et al., 2021; Frein & Ponsler, 2013; Harrist et al., 2007; Heekerens et al., 2020; Jing et al., 2016 studies 1 and 2; King, 2001; Layous et al., 2013; Lyubomirsky et al., 2011; Nicolson et al., 2020; Peters et al., 2013; Wong & Moulds, 2011).

The studies used a variety of self-report outcome measures. The most common were the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) and its child

adapted version (used in 18 studies) and the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) and its child adapted version, used in5 studies. Both of these measures are well validated and have been used widely in research.

Thirteen studies were one-session interventions. Five studies involved a single session and homework tasks (Auyeung & Mo, 2019; Enrique et al., 2018; Heekerens et al., 2020; Meevissen et al., 2011; Peters et al., 2013), and ten studies involved 3-4 sessions (Austenfeld & Stanton, 2008; Frein & Ponsler, 2013; Harrist et al., 2007; Jing et al., 2016 study 1; Jing et al., 2016 study 2; King, 2001; Layous et al., 2013; Owens & Patterson, 2013, Pile et al., 2021a; Pile et al., 2021b). Two studies incorporated longer interventions with 6 sessions (Yogo & Fujihara, 2008) and 8 sessions (Lyubormirsky et al., 2011).

Nineteen studies had pre and post intervention data collection points only and the remaining twelve studies included additional follow-up time periods as well, which ranged from one week (Heekerens et al., 2020) two weeks (Meevissen et al., 2011; Peters et al., 2013), four weeks (Duan et al., 2021; Feldman & Dreher, 2012),five weeks (Yogo &Fujihara, 2008), three months (Enrique et al., 2018; McIntosh & Crino, 2013; Pile et al., 2021a; Pile et al., 2021b) and six months (Lyubormirsky et al., 2011).

The studies could be divided into three distinct groups, resembling the clusters identified by Schubert et al. (2020). Dividing the studies into these groups enabled a more coherent analysis due to the heterogeneity of studies that had explored the impact of future thinking in different ways. The studies were therefore divided into 1) studies that investigated the effects of Positive Interventions, 2) studies that investigated episodic future thinking and 3) studies that investigated the effects of controlled worry on affect.

Table 1. displays the characteristics of the included studies.

Table 1. Characteristics of systematic review studies

Author(s) (year) (country)	Sample in analysis	Condition(s) (Dosage)	Data collection time points	Outcome measure(s)	Findings
Positive Interventions					
Austenfeld and Stanton (2008). USA.	Undergraduates (n=63). Mean age: 19. Sex: 44 (70%) female.	1.Best Possible Self (BPS) (3 weekly 20 minute sessions) *or* 2.Writing about stressful experience (WS) *or* 3. Writing about past 24 hours (WP)	Pre and post.	Positive and Negative Affect Schedule (PANAS)-X Hostility subscale (Watson & Clark, 1999), Emotional Approach Coping Scales including emotional processing subscale (Stanton et al., 2000), Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), Blood pressure.	There were no significant differences in outcome between BPS and control tasks. However when controlling for emotional coping style, significant effects were found. BPS resulted in lower hostility and reduced hospital visits for low emotional processors compared to control group. BPS resulted in increased hospital visits for high emotional processors.
Auyeung and Mo (2019).	Undergraduates (n=100).	1. Best Possible Self (1 introductory	Pre and Post	PANAS (Watson et al., 1998), Centre for	There was no significant difference in outcome between BPS and control. BPS

China.	Mean age: 22. Sex: 73 (73%) female.	session then daily practice for 6 days) *or* 2.Listing and writing about events that happened in the last 24 hours.		Epidemiologic Studies Depression Scale Shortened version (CESD-10; Andersen et al., 1994), Flourishing Scale (Diener et al., 2010), Adult Hope Scale (Snyder et al., 1991).	significantly increased positive affect (PA) and flourishing, with significant decrease in depressive symptoms.
Duan et al. (2021). USA.	Undergraduates (n=77). Mean age: 19. Sex: 69% female.	1. Best Possible Self *or* 2. Write about 3 typical days (1 session)	Pre, Post, 1 month follow-up	Satisfaction with Life Scale (SWLS; Diener et al.,1985), Scale of Positive and Negative Experience for Subjective Wellbeing (Diener et al., 2010), Flourishing Scale (Diener at al., 2010).	There were no significant differences in outcome between BPS and control. BPS did not significantly improve wellbeing or other measures.
Enrique et al. (2018). Spain.	University students (n=78). Mean age: 24. Sex: 65% female.	1. Best Possible Self *or* 2. Daily activities	Pre, During, Post, 1 month and 3 month follow-up	PANAS Spanish version (Sandin et al., 1999), Beck Depression Inventory-II (Beck et al., 1996).	There were no significant differences in outcome between BPS and control, at pre during or post intervention. BPS group had significantly higher positive affect at 1 month follow-up, lost at 3 month follow-up.

Feldman and Dreher (2012). USA.	Undergraduates (n=96). Mean age: 18. Sex: 69 (72%) female.	1. Hope intervention: using a hope-based mapping diagram to accomplish goals (1 session) *or* 2. Muscle relaxation *or* 3. No intervention	Pre, Post, 1 month follow-up	Goal Specific Hope Scale (Feldman et al., 2009), Purpose in Life Test (Crumbaugh & Maholick, 1964), Vocational Identity Questionnaire (Dreher et al., 2007).	There was a significant difference in outcome between Hope intervention and control between pre and post, which was lost at follow up. Hope intervention led to significant improvements on all measures compared to control.
Frein and Ponsler (2013). (Study 1) USA.	University students (n=39). Mean age: 20. Sex: 3 (8%) female.	1. BPS-self *Or* 2. BPS-other *Or* 3. Write daily activities (15min every day for 4 days)	Pre and Post	PANAS (Watson et al., 1988).	There was a significant difference with positive affect significantly increased in the BPS-self group compared to BPS-other and writing about daily activities. Positive affect was also significantly higher post intervention in the BPS-other group compared to writing about daily activities. There was no significant difference in negative affect between groups.
Harrist et al. (2007). USA.	University students (n=75). Mean age: 21. Sex: 50 (67%) female.	1. BPS written *or* 2. BPS spoken *or* Neutral topic written	Pre and Post	Mood Rating Scale (Diener & Emmons, 1984). Health visits.	There was a significant difference with the BPS group scoring significantly higher positive mood post test compared to neutral written topic, and BPS group scoring significantly lower negative

		or			mood post test compared to the neutral topic groups. BPS group has significantly fewer health visits post test than the neutral topic group.
		Neutral topic spoken			
Heekerens et al., (2020). Germany.	Undergraduates (n=171). Mean age: 22. Sex: 78 (72%) female.	1.Best Possible Self (1 session and 20 min practice for 3 days) *or* 2. Briefly imagine the previous day	Pre, Post, 1 week follow-up	PANAS German version (Krohne et al., 1996), SWLS German version (Glaesmer et al., 2011), Goal Ambivalence Scale (Koletzko et al., 2015), Gratitude questionnaire German version (Guillemin et al., 1993), Future Expectations Scale (Peters et al., 2015), State Hope Scale German version (Guillemin et al., 1993).	There was a significant difference with the BPS group scoring significantly higher on positive affect post-test, maintained at follow-up.
King, (2001). USA.	Students (n=81). Mean age: 21. Sex: 69 (85%) female.	1. Write BPS for 4 days *Or* 2. Write about trauma for 4 days	Pre and Post	Mood ratings (Diener & Emmons, 1984), SWLS (Diener et al., 1985), Life Orientation Test (LOT) (Scheier &	There was a significant difference with those who wrote their BPS significantly higher in psychological wellbeing than others.

		or 3. Write about trauma for 2 days and BPS for 2 days 4. Write about plans for tomorrow for 4 days		Carver, 1985).	
Layous et al. (2013). USA.	Students (n=131). Mean age: 19. Sex: 94 (72%) female.	1. BPS in person with Testimony (x1 45min session for 4 weeks) *Or* 2. BPS in person no testimony *Or* 3. BPS online with testimony *Or* 4. BPS online no Testimony *Or* 5. Writing about previous 24 hours in person	Pre and Post	Affect Adjective Scale (Diener & Emmons, 1985).	There was a significant difference with the BPS group showing significantly greater increases in positive affect than the control group. There were no significant differences between in person BPS or online BPS groups. The testimony BPS group had significantly higher positive affect than the no testimony group.

		Or			
		6. Writing about previous 24 hours online			
Liau et al. (2016). Singapore.	Students (n=162). Mean age: 17. Sex: 75% female.	1. Best Possible Self (1 session and 1 month follow up) *or* 2. Writing about the past week	Pre, Post, 1 month follow-up	PANAS (Watson et al., 1988), CES-D (Radloff, 1977).	There was a significant difference with BPS group significantly reducing negative affect compared to control group. There was no effect on positive affect.
Lyubomirsky et al. (2011). USA.	Undergraduates (n=355). Mean age: 20. Sex: 248 (70%) female.	High motivation *or* Low motivation x 1.BPS *Or* 2. Gratitude *Or* 3. Daily activities	Pre, Post, 6 month Follow-up	Mood scales (Feldman Barrett & Russell, 1998), SWLS (Diener et al., 1985), Subjective Happiness Scale (Lyubomirsky & Lepper, 1999).	There was a significant difference whereby participants who were highly motivated to enhance their own wellbeing, had significantly higher wellbeing post BPS and post gratitude compared to those of low motivation and those writing about daily activities. This significant difference was maintained at 6 months.
Meevissen et al. (2011). The Netherlands.	Undergraduates (n=54). Mean age: 23. Sex: 50 (93%) female.	1. Best Possible Self (1 session and 5min daily practice for 2 weeks) *or* 2. Imagine daily	Pre, Post, 1 and 2 week follow-up	PANAS Dutch version (Mackinnon et al., 1999), LOT (Scheier & Carver, 1985). Subjective Probability	There was a significant difference with BPS group significantly improving positive affect compared to control group. There was no effect on negative affect.

		activities		Task (MacLeod, 1996) Attributional Style Questionnaire Dutch version (Cohen et al., 1986).	
Nicolson et al. (2020). The Netherlands.	Undergraduates (n=51). Mean age: 21. Sex: 53 (80%) female.	1. Best Possible Self (1 session and 5 min daily practice for 2 weeks) *or* 2.Time management task	Pre and Post	PANAS (Watson & Clark, 1994), Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). LOT-Revised (LOT-R;Scheier et al., 1994), Perceived Stress Scale (Cohen et al. 1983), Cortisol levels.	There was a significant difference with BPS group showing significant increases in PA and decrease in worry compared to the control group. There was no effect on negative affect, rumination or perceived stress.
Owens and Patterson (2013). USA.	Children (n=62). Mean age: 7. Sex: 32 (52%) female.	1. Best Possible Self (4-6 weekly sessions) *or* 2.Gratitude intervention *or* 3.Draw a picture of something you have	Pre and Post	PANAS-Children (Laurent et al., 1999), Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Seligson et al., 2003). Perceived	There were no significant differences between groups on affect. There was a significant increase in global esteem in BPS condition, not found in gratitude or control condition.

		done today		Competence Scale for Children (Harter et al., 1982).	
Peters et al. (2013). The Netherlands.	Undergraduates (n=82). Mean age: 22. Sex: 69 (84%) female.	1. Best Possible Self (1 session and 5min daily practice for 1 week) 2. Gratitude intervention 3. List everyday activities	Pre, Post, 1 week and 2 week follow-up.	SWLS (Diener et al., 1985), LOT-Revised (Scheier et al., 1994).	There was a significant difference with BPS group scoring higher on SWLS than control at 1 week follow-up and trend towards significance at 2 weeks on SWLS. The gratitude intervention did not differ from control at either time point, or differ from BPS.
Renner et al. (2014). The Netherlands.	Undergraduates (n=40). Mean age: 22. Sex: 32 (80%) female.	Negative mood induction then: 1. Best Possible Self (1 session) *or* 2. Imagine a typical day	Pre and Post	PANAS (Watson et al., 1988), Dysfunctional Attitude Scale (Weissman & Beck, 1978), Visual Analogue Scales.	There was a significant difference with BPS group significantly increasing in PA compared to control. No significant difference in NA.
Yogo and Fujihara (2008). Japan.	Undergraduates (n=83). Age range: 18-19. Sex: 71% female.	1. Write about BPS *Or* 2. Write about trauma *Or* 3. Write about trivial	Pre, Post, 1 week and 5 week follow up	Multiple Mental States (Terasaki et al., 1992).	There was a significant difference with BPS group significant reduced depression and anxiety compared to other groups.

		event			
Episodic Future Thinking					
Busby-Grant and Wilson (2021). Australia.	Undergraduates (n=197). Mean age: 22. Sex: (78%) female.	1. Positive future thinking (PFT) (1 session) *or* 2.Negative future thinking (NFT) *or* 3.Non-affect directed future thinking (NDFT)	Pre and Post	PANAS (Watson et al., 1988).	There was a significant increase in positive affect and no change in negative affect in the PFT condition. There was a significant decrease in positive affect and significant increase in negative affect in the NFT condition.
Demeyer and De Raedt (2014). (study 2). Belgium.	Undergraduates (n=41). Mean age: 19. Sex: 28 (68%) female.	1.Generating positive long term future images (1 session) *or* 2.Generating positive short term future images	Pre and Post	PANAS (Watson et al., 1988).	There was no significant difference in affect between groups. There was a significant increase in positive affect and decrease in negative affect after both conditions. Higher positive affect and lower negative affect was found in those with expansive future time perspective.
Pile et al. (2021a). UK.	Adolescents (n=9), scoring above clinical cut-off for depression. Mean age: 16.	Future thinking: imagery rescripting to build a positive future image (1 session)	Pre, Post, 3 month follow-up	Mood and Feelings Questionnaire (MFQ; Angold et al., 1995), Screen for Child Anxiety Related	All participants showed a decrease in depression symptoms. 75% had subclinical depression at follow-up. Large effect size from pre to post and pre to follow-up.

				Disorders (SCARED; Birmaher et al., 1997), Child Revised Impact of Events Scale (CRIES; Perrin et al., 2005), Rosenberg Self Esteem Scale (RSES; Rosenberg, 1965).	
Pile et al. (2021b). UK.	Adolescents (n=56). Mean age: 17. Sex: 62% female (test), 59% female (control).	1. Imagery based cognitive behavioural intervention (IBCI) with future thinking (4 sessions) *or* 2. Non-directive supportive therapy	Pre, post, 3 month follow-up	MFQ (Angold et al., 1995), SCARED (Birmaher et al., 1997), CRIES (Perrin et al., 2005), RSES (Rosenberg, 1965).	Both groups showed a decrease in depression symptoms from pre to post, and another decrease at follow-up. Large effect sizes were seen in favour of IBCI at post and follow-up.
Controlled Worry					
Behar et al. (2012). USA.	Undergraduates (n=108). Mean age: 19. Sex: 51% female.	1. Think about positive future event (winning prize) (x5 4.5minute sessions) Or 2. Think about	Pre and Post	PANAS (Watson et al., 1998), PSWQ (Meyer et al., 1990).	There was a significant increase in negative affect in positive, negative and neutral valence repetitive thinking groups.

		negative future event (giving speech) Or 3. Think about neutral future event (centralised European government)			
Frala et al. (2014). USA.	Adolescents (n=50). Mean age:14. Sex: 26 (52%) female.	1. Worry task (WT): list personal worries and then think about them (1 session) *or* 2. Thinking about neutral everyday topics.	Pre and Post	PANAS-Children (Joiner et al., 1996), PSWQ (Meyer et al., 1990), Future Oriented Verbal Linguistic Analog Scale for Children (McLaughlin et al., 2007), Self assessment Maniken Scales (Lang, 1980), Subjective Units of Distress Scale (Wolpe, 1958).	There was a significant difference with WT participants reporting higher worry, depression and negative affect than control. Both groups decreased in happiness, with WT participants less happy than controls.
Jing et al. (2016). Study 1. USA.	Undergraduates (n=25). Mean age: 20.	All participants watched video of adults doing a task.	Pre and Post	Worry ratings, Coping Orientation to Problems Experienced Inventory	There were significant differences between groups. There was a significantly larger decrease in anxiety

	Sex: 23 (66%) female.	Then randomised: 1. Recall specific episodic details from video *or* 2. Control: Maths problems Then worry task: Listing worrisome events, imagining negative outcomes and reappraising, and problem-solving steps (3 sessions)		(COPE; Carver et al., 1989).	ratings for the Recall group compared to control. Participants generated significantly more relevant (problem-solving) steps in Recall condition and significantly fewer irrelevant steps, compared to the control.
Jing et al. (2016). Study 2. USA.	Undergraduates (n=26). Mean age: 20. Sex: 20 (63%) female.	All participants watched video of adults doing a task. Then randomised: 1. Recall specific episodic details from video *or* 2. Asked general	Pre and Post	PANAS (Watson et al., 1988), Worry ratings, COPE (Carver et al., 1989).	There was a significant difference between groups with significant increases in positive affect in Recall condition but not in control condition. There was significant decreases in composite negative affect scores for both conditions.

		questions about the video			
		Then worry task: Listing worrisome events, imagining negative outcomes and reappraising, and problem-solving steps (3 sessions)			
McIntosh and Crino, (2013). Australia.	Undergraduates with excessive worry (n=9). Mean age: 22. Sex: 8 (89%) female.	1. Worry task: listening to an audio recorded script of a personally feared scenario (1 session) *or* 2. Worry task: Live imagining of a feared situation	Pre, Post 3 month follow-up	PSWQ (Meyer et al., 1990), Intolerance of Uncertainty Scale (IUS) English version (Buhr & Dugas, 2002), Generalized Anxiety Disorders Questionnaire-Fourth edition (Newman et al., 2002), Depression, Anxiety and Stress Scale (DASS21; Lovibond & Lovibond, 1995). Credibility/expectation	There were no significant differences between groups with general worry reducing on PSWQ across both conditions. Gains maintained at 3 month follow-up. All general worry and intolerance of uncertainty treatment responders reported improvements on depression and anxiety stress scales by at least one severity rating on the DASS21. Live imagining group had superior results to audio group for general worry, IUS and DASS21.

				scales (Borkovec & Nau, 1972), Quality of Life Inventory (Frisch, 1994).	
McLaughlin et al. (2007). Study 2. USA.	Students (n=109), divided into those with High Rumination, High worry and rumination and Control. Mean age: 19. Sex: 82 (75%) female.	1. Worry task then rumination task *Or* 2. Rumination task than worry task	Pre and Post	PANAS (Watson et al., 1988), BDI (Beck et al., 1979), Mood and Anxiety Symptoms Questionnaire (MASQ; Watson & Clark, 1991).	Both worry and rumination led to significant increases in negative affect and significant decreases in positive affect with no order effects found.
Skodzik et al. (2016). Germany.	Undergraduates (n=125). Mean age: 23. Sex: 75% female.	1. Worry task: verbal worrying about an imminent speech (1 session) *or* 2. Imagery worrying about a speech *or* 3.Distraction	Pre and Post	PANAS (Watson et al., 1988), PSWQ German version (Stöber, 1995), State Trait Anxiety Inventory (STAI) German version (Spielberger et al., 1970), Beck Depression Inventory-II German version (Hautzinger et	There was a significant difference between groups. The increase in negative mood was significantly higher in the verbal worry task than distraction. Imagery worrying group did not experience significantly greater increased in negative affect than the other conditions.

				al., 2006), Fear or Negative Evaluation Scale German version (Kemper et al., 2012), Spontaneous Use of Imagery Scale (SUIS) German version (authors), Physiological measures.	
Skodzik et al. (2017). Germany.	Undergraduates (n=71). Mean age: 22. Sex: 85% female.	1. Training in mental imagery and imagery homework (1 session) *or* 2.Waiting List	Pre and Post	PANAS (Watson et al., 1988), PSWQ German version (Stöber, 1995), STAI German version (Spielberger et al., 1970), SUIS German version (authors).	There were no significant differences between groups on the PSWQ or PANAS. There was a significant interaction the mental imagery group reducing in worry and increase in worry in waiting list group. The effect of mental training on worry was moderated by trait worry and trait anxiety. There were only significant increases in positive affect for those with high trait anxiety.
Wong and Moulds (2011).	Undergraduates (n=80). Mean age: 21. Sex: 49 (61%)	1. Anticipating an imminent speech *Or*	Pre and post	Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond,	There was a significant difference with those in the anticipatory group significantly higher anxiety than the

Australia.	female.	2. Distraction from thinking about an imminent speech	1995).	distraction group.

Methodological Quality of Included studies

The Cochrane Risk of Bias Tool version 2 (RoB 2; Sterne et al., 2019) is recommended to assess bias in randomised trials and was used to assess the quality of the studies included in the review. Tables 2a and 2b. show the risk of bias ratings for each study and a full table of all assessment of risk decisions can be found in appendix B. A second rater assessed 4 studies (13% of total studies) using the RoB 2, with 97% agreement.

Only one study (Pile et al., 2021b) was a randomised controlled trial that had been registered on the International Standard Randomised Controlled Trial Number (ISCTRN) registry of clinical trials. Pile et al., (2021b) scored low risk of bias across all five domains and was therefore classified as low risk of bias overall. One study (Pile et al., 2021a) was a single case experimental design and therefore was rated as high risk of bias on the RoB 2 due to the absence of randomisation in the study design. One study (Enrique et al., 2018) scored as having some concerns regarding quality, and was therefore not categorised as high or low bias.

The remaining 29 studies all had randomised controlled trial designs, with participants randomly allocated to different conditions. These studies showed various levels of risk of bias across domains including high, some concerns and low risk, but all were classified overall as high risk of bias for having one or more high risk domain.

Details of the randomisation procedure, and details regarding any deviations from the intended intervention, were lacking for most studies, resulting in high risk of bias ratings. Most studies did not report intention to treat analyses. Details regarding what participants were told regarding their allocated intervention were missing in most studies and so it was difficult to ascertain any potential impact this may have had on outcomes leading to increased risk of bias. Outcome measures were considered appropriate for all studies. Reporting of

measurements were not found to be indicative of bias for studies in the review, with

outcomes described in relation to pre-specified analysis plans.

Table 2a. Revised Cochrane Risk of Bias tool for randomised trials (RoB 2) assessment of Positive intervention studies

Domain	Austenfeld & Stanton (2008).	Auyeung & Mo (2019)	Duan et al. (2021).	Enrique et al. (2018)	Feldman & Dreher (2012).	Frein & Ponsler (2013).	Harrist et al. (2007).	Heekerens et al. (2020)	King (2001).	Layous et al. (2013).	Liau et al. (2016).	Lyubomirsky et al. (2011).	Meevissen et al. (2011).	Nicolson et al. (2020).	Owens & Patterson (2013).	Peters et al. (2013).	Renner et al. (2014).	Yogo & Fujihara (2008).
Randomisation	S/C	LOW	S/C	S/C	S/C	S/C	S/C	HIGH	S/C	S/C	HIGH	S/C	S/C	LOW	S/C	S/C	S/C	S/C
Deviations from intended interventions	HIGH	S/C	HIGH	S/C	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGHI	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Missing outcome data	HIGH	HIGH	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH
Measurement of the outcome	HIGH	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	S/C	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH
Selection of the reported result	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Overall risk of bias rating	HIGH	HIGH	HISH	S/C	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

Key: Y: Yes. N: No. PY: Probably yes. PN: Probably no. NI: No information. NA: Not applicable. LOW: Low risk. HIGH: High risk. S/C: Some concerns.

Table 2b. Revised Cochrane Risk of Bias tool for randomised trials (RoB 2) assessment of Episodic future thinking and worry studies

Domain	Busby Grant & Wilson (2021).	Demeyer & De Raedt (2014).	Pile et al. (2021a)	Pile et al. (2021b)	Behar et al. (2012)/	Frala et al. (2014).	Jing et al. (2016). Study 1.	Jing et al. (2016). Study 2.	McIntosh & Crino (2013).	McLaughlin et al. (2007). Study 2.	Skodzik et al. (2016).	Skodzik et al. (2017).	Wong & Moulds (2011).
Randomisation	S/C	S/C	HIGH	LOW	S/C	S/C	S/C	S/C	LOW	S/C	S/C	S/C	LOW
Deviations from intended interventions	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Missing outcome data	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW
Measurement of the outcome	LOW	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW	LOW
Selection of the reported result	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Overall risk of bias rating	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

Key: Y: Yes. N: No. PY: Probably yes. PN: Probably no. NI: No information. NA: Not applicable. LOW: Low risk. HIGH: High risk. S/C: Some concerns.

<u>Characteristics of Positive Intervention studies</u>

There were 18 studies in the Positive Interventions group with a total of n=1800 participants. The studies were all published between 2001-2021 and conducted in the USA (nine studies), Europe (six studies), and East Asia (three studies). The mean age ranged from seven (Owens & Patterson, 2013) to 24 years (Enrique et al., 2018), with 17 studies using university undergraduate samples and one recruiting from a school. Seventeen studies used the Best Possible Self (BPS) intervention (King, 2001), and one study used a self-designed hope intervention (Feldman & Dreher, 2012). Both interventions required thinking positively about the future. All studies reported randomly allocating participants to the different conditions. Eight studies compared a positive future thinking intervention to one other control condition and 10 studies compared three or four conditions. Comparator conditions included: writing about a stressful or traumatic experience, writing about or imagining the past 24 hours, muscle relaxation, time management exercise, gratitude exercise, drawing a picture of an experience earlier in the day. Nine studies captured data at pre and post, while the other nine studies also included a follow-up. These follow-ups were at one week (Heekerens et al., 2020), one and two weeks (Meevissen et al., 2011; Peters et al., 2013) four weeks (Feldman & Dreher, 2012; Duan et al., 2021), five weeks (Yogo & Fujihara, 2008), three months (Enrique et al., 2018) and six months (Lyubormirsky et al., 2011). A range of outcome measures were used including PANAS (10 studies), Satisfaction with life scale (five studies), and Centre for Epidemiologic Studies Depression Scale (three studies).

<u>Impact of Positive Interventions on affect</u>

The studies reported varying effects of the intervention on affect. Frein and Ponsler (2013), Heekerens et al., (2020), Meevissen et al., (2011), Nicolson et al., (2020), Peters et al., (2013) and Renner et al., (2014) found the Best Possible Self (BPS) significantly improved positive affect greater than control, as measured by the PANAS (Watson et al., 1988). Harrist et al. (2007), King (2001) and Layous et al. (2013) also found the BPS led to significantly greater psychological wellbeing than comparator groups but used different measures. Auyeung and Mo (2019) found the BPS intervention significantly improved positive affect but not significantly better than control conditions. The remaining studies reported more mixed evidence. Owens and Patterson (2013) reported significant effects on global esteem but no effects on positive affect. Duan et al. (2021) found no significant outcomes of the BPS. Initially Enrique et al., (2018) and Feldman and Dreher (2012) found significant effects in favour of their respective future thinking interventions but this was lost at follow-up. Austenfeld and Stanton (2008) found a significant effect but only with a specific type of coping style. Similarly, Lyubomirsky et al., (2011) found a significant effect where participants had been categorised as being highly motivated to improve their wellbeing.

The studies with significant effects between conditions were single session interventions with homework tasks of imagining their BPS in the future. This was also true of the Auyeung and Mo (2019) study that found significant improvements but not superiority over the control group. The exact duration of the session and homework practice times varied and seemed to have no relationship to finding a significant effect.

Meevissen et al. (2011), Nicolson et al. (2020), Peters et al. (2013) and Renner et al. (2014) are all part of the same research group, with participants all sampled from Maastricht University, The Netherlands. They perhaps are likely to share similar intervention protocols and similar participant demographics, leading to similar results. However Renner et al. (2014) had slight differences in design, being the only study to induce a sad mood prior to the intervention.

In addition, Renner et al., (2014) did not state whether they specifically asked participants to imagine BPS across various life domains, as the other three studies did. Meevissen et al. (2011), Nicolson et al. (2020), Peters et al. (2013) all asked participants to think of the best possible ways life could develop across personal, relational and professional domains. Auyeung and Mo., (2019), Enrique et al. (2018), Layous et al. (2013) and Liau et al. (2016) also asked participants to think across domains, specifying 5 domains: family, social life, work, recreation and health. Lyubomirsky et al., (2011) was more vigorous with 8 domains, whereas Frein and Ponsler (2013), Harrist et al., (2007), King (2001), and Yogo and Fujihara (2008) did not report whether or not they asked participants to think across multiple life domains. In contrast, Duan et al., (2021) sampled a group of undergraduate teachers in training and adapted the BPS intervention to only the professional domain, asking participants to imagine themselves in the future as the best possible teacher they could be. This study found no significant effects of the intervention. It is possible that some participants did not anticipate eventually becoming teachers or value their future professional self and may have lost interest in the task. Taken together this indicates that more than one domain in the BPS is potentially important for changes in mood.

The only studies to not find or have limited effects on positive affect were Owens and Patterson., (2013), Liau et al. (2016), Feldman and Dreher. (2012) and Duan et al., (2021). These studies had the lowest mean age samples of the Positive Interventions group, at 7, 17, 18 and 19 years respectively. This provides very tentative evidence that the BPS interventions were not helpful for younger people in increasing positive affect. However, none of these three studies had homework practice tasks whereas the other studies that showed significant effects incorporated homework tasks.

Owens and Patterson (2013) were the only study that asked their participants to draw themselves in the future rather than a written exercise. It is possible that participants were more engaged in creating a picture than imagining themselves in the future. The intervention occurred over several weekly sessions so it may not be that future thinking practice over time is important, but rather self-directed study or independent engagement with future thinking, as in homework tasks, is important. The study found a significant effect on global esteem which suggests that there was a positive benefit of the exercise compared to a neutral task, but it was not significantly better than another positive intervention (gratitude exercise).

The BPS is an established intervention that was first described over 20 years ago by King (2001). In comparison, the Hope intervention used by Feldman and Dreher (2012) was self-designed by the authors and therefore was slightly anomalous in the Positive Interventions group. However the intervention itself had similar components such as identifying goals and visualisation, but had added psychoeducation on hope. The authors reported attrition rates at follow-up as being the cause of non-significant findings, however the results suggest that future thinking

50

interventions may have short term effects. This connects with Enrique et al., (2018), which found that positive effects were not sustained at follow-up and thereby indicates that mood changes following future thinking exercises may be short-lasting.

Most of the BPS studies only focused on whether BPS, itself a positive intervention, improved positive affect. Of the five studies that also reported on the effect of the BPS on negative affect, two studies (Liau et al. (2016) and, Yogo & Fujihara, 2008), both East Asian studies, found a significant decrease following the BPS, which was not seen in the control group. While Yogo and Fujihara (2008) did not assess positive affect, Liau et al., (2018) found no effect of BPS on positive affect. The authors discussed how differences in East Asian cultures may have impacted how the intervention was received and its subsequent effects. Four American studies: Owens and Patterson (2013), Duan et al., (2021), Feldman and Dreher (2012) and Austenfeld and Stanton (2008) reported no or limited significant effects on positive affect, suggesting there may be limitations with the BPS in improving affect in young Americans.

Five studies investigated the impact of additional features in combination with BPS on mood. These included coping style (Austenfeld & Stanton, 2008), BPS for oneself or another (Frein & Ponsler, 2013), written or spoken BPS (Harrist et al., 2007), BPS with testimony recommending BPS or without (Layous et al., 2013), and motivation to improve wellbeing (Lyubomirsky et al., 2011). Austenfeld and Stanton (2008) was an interesting addition to the studies in that it only found significant effect when examining coping strategies as a moderator. Those with high emotional coping had worse depressive symptoms following the BPS task compared to those with low emotional coping who had improved depressive symptoms at 3 months. The opposite

was true for participants with low emotional coping. The study sample consisted of medical students who had completed clinical rotations, therefore were at a vastly different developmental stage than the Owens and Patterson (2013) study sample of 7-year-olds. Austenfeld and Stanton (2008) was particularly brief in its description of procedures and analysis, scoring as high risk of bias on several domains in the RoB 2 and thus results should be treated with caution.

Frein and Ponsler (2013) found a significant difference between those imagining their personal BPS as opposed to those imaging the BPS of someone else. This is to be expected that personally relevant information would elicit greater affect than information referencing others. Layous et al. (2013) also found a significant difference between their BPS conditions. They found that when BPS was accompanied with a testimony where BPS was recommended, this led to greater increases in positive affect. This implies the sensitivity of the intervention to peer influence, which may be particularly important in younger people (Kandel, 1986). In comparison Harrist et al. (2007) found no significant difference between their BPS conditions, comparing those who wrote and spoke their BPS. This suggests the effects of future thinking on mood are not moderated by these forms of processing. Similar to Austenfeld and Stanton (2008) who considered personal coping styles, Lyubomirsky et al. (2011) also looked at how whether motivation led to an increase in wellbeing following BPS. Those who were motivated to improve their wellbeing had higher positive affect. Taken together this suggests the impact of positive future thinking on mood may be sensitive to individual characteristics.

Characteristics of Episodic Future Thinking (FT) Studies

There were four studies in the FT group with a total of n = 303 participants. One study was published in 2014 (Demeyer & De Raedt, 2014), whereas three were more recent and published in 2021. One study was conducted in Australia (Busby-Grant & Wilson., 2021), and the remaining three were in Europe. The range of mean sample ages varied from 16 years (Pile et al., 2021a) to 23 years (Busby-Grant & Wilson, 2021). Pile et al., (2021a) was the only study in the review to recruit participants that met a clinical cut off for a mental health condition (depression). Pile et al. (2021a) used a single case experimental design and therefore had no independent comparator group. The remaining three studies randomly allocated participants to one of two or three conditions. Busby-Grant and Wilson (2021) compared positive future thinking with negative and non-directed future thinking. Demeyer and De Raedt (2014) manipulated the time frame of future imagery between conditions, asking participants to imagine their short term or long-term future. The intervention featured in Pile et al., (2021a) and Pile et al., (2021b) was part of a four-session imagery based cognitive behavioural intervention, featuring memory specificity training and imagery rescripting through the development of a positive future image. These studies collected data at pre, post and three month follow-up. The remaining two studies (Busby-Grant & Wilson, 2021; Demeyer & De Raedt, 2014) were single session interventions and had pre and post time points. These studies both used the PANAS as their main outcome measure. Pile et al., (2021a) and Pile et al., (2021b) used a range of measures including the Mood and Feelings Questionnaire (MFQ), Screen for Child Anxiety Related Disorders (SCARED), Child Revised Impact of Events Scale (CRIES), and Rosenberg Self Esteem Scale (RSES).

<u>Impact of Episodic Future Thinking on affect</u>

All four studies found significant effects on affect. Busby-Grant and Wilson (2021) and Demeyer and De Raedt (2014) both used single session interventions with undergraduates. However their manipulations were different, leading to nuanced findings. Busby-Grant and Wilson (2021) found that positive future thinking led to significant improvements in positive affect, and no change in negative affect, whereas negative future thinking led to significant decrease in positive affect and significant increase in negative affect. Demeyer and De Raedt (2014) did not look at positive or negative future thinking, but rather the temporal distance of the future thinking. Participants were asked to imagine the near or far future with both groups reporting significantly increased positive affect and reduced negative affect after the exercise. There was a positive correlation between ability to think further into the future and positive affect post intervention, and negative correlation between this ability and negative affect post intervention.

The remaining two studies in this category were from the same research group and therefore held similar theoretical and intervention underpinnings. Pile et al., (2021a) and Pile et al., (2021b) both found reductions in measures of depression following future imagery rescripting exercises as part of a larger intervention. Pile et al., (2021b) was the only study in the review to be rated as overall low risk of bias and therefore reflects good quality evidence that future thinking can significantly reduce symptoms of depression.

Characteristics of Controlled Worry studies

There were 10 studies in the worry group with a total of n=603 participants. The studies were all published between 2007-2017 and conducted in the USA, Europe and Australia. The mean age ranged from 14 (Frala et al., 2014) to 23 years (Skodzik et al., 2016), with nine studies using university undergraduate samples and one recruiting from a school. All studies compared two groups of randomly allocated participants. In five studies, a worry task involving thinking negatively about the future was compared to a non-worry task. These control conditions included: thinking about neutral everyday topics, recalling a recent neutral event, distraction and waiting list. One study examined the order effects of worry and rumination on mood (McLaughlin et al., 2007), another compared repetitive future thinking across negative, positive and neutral future thinking (Behar et al., 2012). One study manipulated the format of worrying between the two conditions (McIntosh & Crino, 2013), and the final two studies introduced a specific recall task or control condition before asking participants to worry (Jing et al., 2016 study 1; Jing et al., 2016 study 2).

Nine studies reported outcome measures that had been taken pre and post intervention and one of these studies also reported outcomes at three month follow-up (McIntosh & Crino, 2013). No other worry study included a follow-up collection point.

Impact of Controlled Worry on affect

The results of the worry studies were heterogeneous and therefore provided mixed evidence for effect on affect. In an adolescent sample, Frala et al., (2014) found

worrying led to higher worry, depression and negative affect than controls, although thinking about neutral everyday topics also decreased happiness scores. This finding was similar to Behar et al. (2012) which found that being told think repetitively about a negative future event, an imminent speech, and a neutral future event, led to significant increases in negative affect. This study also found increases in negative affect for positive based future thoughts (winning a prize), indicating it was the process of repetitive thinking itself that contributed to the changes in affect. A strength of this study was that participants received guidance defining the difference between verbal and imagery-based thinking. This is in comparison to Frala et al. (2014) where no such instruction was given and therefore the outcomes cannot be connected to either form of thinking. This is important because research has previously associated imagery-based thinking with greater affect than verbal thinking.

Skodzik et al. (2016) further explored verbal and imagery-based worry. They found that negative mood was significantly greater in participants assigned to verbal worry compared to a distraction task; but negative mood was not significantly greater in participants who were assigned to imagery worry compared to distraction. In Wong and Moulds' (2011) study, anxiety was also significantly higher in the anticipatory group compared to the distraction group, however like Frala et al. (2014) they made no distinction between verbal or imagery-based worry. Skodzik et al. (2017) explored imagery-based worry compared to a wait list, finding that worry as rated on the PSWQ, reduced between the two time points in the imagery group. However, they found no significant effects on affect outcomes on the PANAS.

McIntosh and Crino (2013) also found reductions in worry following worry tasks including imagining feared situations and listening to audio recordings of the

worries, with improvements maintained at 3 months. However this study scored particularly high for potential risk due to not reporting data, and had a small sample (n=9) indicating the findings of this study should be treated with caution.

Similar to Behar et al. (2012), Skodzik et al. (2016) and Skodzik et al. (2017), McLaughlin et al. (2007) also controlled for verbal and imagery-based worry. This study aimed to explore the order effects of worry and rumination, finding that regardless of order, these conditions led to significant increases in negative affect and significant decreases in positive affect. McLaughlin et al. (2007) was the only study besides Jing et al. (2016) study 2 to report on positive affect, finding that worry and rumination significantly reduced positive affect.

Jing et al. (2016) study 1 found a significant reduction in anxiety following their worry task. They theorised that a task to increase episodic retrieval would aid various cognitive tasks including future problem-solving. Half of the sample were asked to recall specific events from a video and half underwent a control condition. They were then all asked to worry about a possible bad outcome and generate problem solving ideas. Those who had undergone the recall task generated significantly more relevant ways of solving problems and significantly fewer irrelevant steps. Jing et al. (2016) study 2 built on study 1, incorporating mood measures and finding significant increases in positive affect in the recall condition but not control. These studies each had high risk of bias in three out of five RoB 2 domains and therefore there are notable threats to validity in their conclusions.

Discussion

Summary

This systematic review aimed to answer several research questions, including what types of future thinking interventions have been used with young people and the evidence future thinking interventions have impacted on affect in young people. A similar systematic review had been conducted in adults but not previously in children and young people. The answers to these research questions would help to determine whether future thinking interventions lead to changes in affect and therefore can be used in treatments for children and young people with affective disorders. The systematic search of five databases (PsycInfo, PsycArticles, Cochrane Library, Pubmed and Medline) led to the identification of 31 eligible studies. Data were extracted from these studies and presented in a standardised format. The relationships between studies were explored. All articles were quality assessed using the RoB 2 and all but two were found to be at high risk of bias.

Main findings

The review found intervention studies that used future thinking with young people, reporting different effects on mood. The PANAS (Watson et al., 1988) was used by 18 studies, and is a well-validated measure of affect (Crawford & Henry, 2004). Seventeen studies had used the Best Possible Self (BPS) intervention, mostly using a one session intervention and asking participants to imagine themselves in the future as if everything had gone well. It seemed important to incorporate homework tasks and to imagine BPS across multiple life domains in order for significant increases in positive affect. There was little evidence to suggest that improvements in

affect were sustained long term as most significant effects were lost at follow up. The studies investigating positive future thinking that failed to show significant improvements in positive affect, also had the youngest samples. In studies that reported effects on negative affect, only one found that BPS significantly decreased negative affect, possibly connected to cultural differences. One study discussed individual differences in emotional processing as moderating the effects of the BPS intervention.

Four studies used an episodic future thinking type intervention. These studies all reported significant findings. One manipulated the valence of future thinking, finding that positive future thinking led to significantly increased positive affect but did not decrease negative affect, whereas negative future thinking decreased positive affect and increased negative affect. Another study manipulated the temporal distance of future thinking, also finding future thinking led to increased positive affect but in this study negative affect decreased. The remaining two studies used future thinking as part of an imagery rescripting exercise, finding reductions in depressive symptoms.

The remaining nine studies investigated worry as a form of negative future thinking, finding mixed results of effect on affect. Verbal worrying seemed to lead to increases in negative affect whereas worrying in imagery form could lead to decreased worry as measured on the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). Some studies reported no effect on affect, whereas if the intervention included problem-solving, this led to an increase in positive affect.

<u>Interpretation</u>

Visualising the future rather than verbally thinking about the future seemed important across all three groups in finding a significant effect on affect, as reflected by the studies that incorporated specific instructions to do this and the studies with visualisation homework tasks. This connects with other research that has found thinking in imagery elicits greater affect than thinking in verbal form (Holmes et al., 2008a; Schubert et al., 2020). This may relate to verbal thinking requiring more working memory (Leigh & Hirsch, 2011) and therefore serves to distance oneself from the affective experience of the imagined scenario. However, not all studies reported whether they instructed participants to think in verbal or imagery form. Even if studies asked participants to think in a specified way, participants might still have chosen to think in their preferred style of thinking, leading to differences in outcomes across studies.

Individual differences and cultural factors emerged as potential reasons for differences in effects on affect. Other studies that have examined the effects positive interventions have reported that this can make people with certain coping strategies feel worse (Sergeant & Mongrain, 2011). A Canadian study, Sergeant and Mongrain (2011) found that people with non-clinical depression who scored highly on measures of "neediness" (described as excessive helplessness and reliance on others to be happy) found positive interventions (for example, gratitude exercise) detrimental to their self-esteem. In the present systematic review, the included studies came from around the world, and while that suggests future thinking is gaining global interest in research, there is likely to be conflicting findings as a result of variation across cultures around perceptions of thinking about the future and positive thinking. Indeed,

in one study published by the Harvard Business Review, different countries' future orientation (described as the extent to which a culture encourages and rewards future oriented behaviour) varied, with Singapore the most future oriented and Russia the least, and a positive association found between future orientation and levels of happiness (Javidan, 2007).

Overall there was a paucity of studies found for children and young adolescents, with the majority of studies sampling older adolescents and young adults. If studies had been found with samples of varying ages ranges, it would have been interesting to explore age as a moderating factor. It is understood that future thinking develops with age but it may not be a consistent process and may be subject to individual differences. Meevissen et al. (2011) suggested that young people may find it easier to think about the future because their futures are more undecided than older people. However, this does not take into account how future thinking develops with age. Indeed in the studies with the youngest samples, future thinking did not always lead to changes in affect which might have been expected. This suggests that future thinking may not be as developed in young people and therefore does not generate as strong affective response. More studies with younger age samples would be needed to investigate this more definitively.

The findings of the review indicate that future thinking can significantly modify affect in the short term and therefore would benefit from further research. However it is important to note that the generalisability of findings may be limited due to the samples typically featuring more females, as well as frequently more white participants and with higher educational level. Crucially, the eligibility criteria stated that the study sample's mean age would be below 24 years. Fourteen studies (Busby-

Grant et al., 2021; Harrist et al., 2007; Heekerens et al., 2020; Jing et al., 2016 study 1 and study 2; King, 2001; Layous et al., 2013; Lyubomirsky et al., 2011; McIntosh & Crino, 2013; Meevissen et al., 2011; Nicolson et al., 2020; Peters et al., 2013; Renner et al., 2014; Skodzik et al., 2017) included participants older than 24 years, although the study sample means were within the accepted range. This significantly weakens the study in respect to evidencing future thinking in young people. Studies in the future should aim to sample groups from varied backgrounds but control samples so that it can be deduced what intervention works for whom.

Strengths and limitations

The study's strengths lie in the comprehensiveness of the search strategy, with a substantial number of studies screened. Important decisions were made collaboratively, with second reviewer input at screening, study eligibility and study quality assessment. This meets recommendations that the process of conducting a systematic review should be a shared process (Centre for Reviews and Dissemination, [CRD] 2008). However, the study did not include grey literature which might have yielded more results that could have shaped the narrative of findings further.

There was some homogeneity of study design (randomised trials) and outcome measure (for example, the PANAS) that enabled straightforward comparison across studies. While all studies had a core component of future thinking, the studies had used future thinking in different ways, creating different interventions. Grouping studies by the three main types of future thinking interventions enabled a coherent analysis of future thinking overall. This strategy enabled a more nuanced exploration within the groups that might not have been possible in the studies had been analysed

as one group. This is particularly important as the different interventions were opposingly valenced and led to varying effects on positive and negative affect. The increase of positive affect does not automatically equate to decrease in negative affect and so the study of these effects requires careful, nuanced analysis. For example, a controlled worry intervention (negative future thinking) may reduce negative future thinking but is unlikely to improve positive affect (as in Skodzik et al., 2016), and a positive intervention may improve positive affect but may not reduce negative affect. Therefore the method of analysis in this study to separate and synthesise study findings in consideration of type of study and valence, was to its benefit.

The study's limitations relate to the low quality of studies as measured by the RoB 2. All but two of the included studies scored as high risk of bias. Guidance suggests that pooling the results of low quality studies in a meta analysis can be misleading and give credence to poor quality studies (CRD, 2008). The RoB 2 is a vigorous tool to assess randomised control trials, the gold standard of designs. Most included studies did not define themselves as randomised control trials, yet they randomly assigned participants to different conditions and compared them to assess effect. Despite the lack of control over samples, these experimental studies were crucially also lacking in sufficient methodological detail, so that on various RoB 2 questions, studies were often scoring 'No Information'. This indicates the need for studies to use tools such as the Consolidated Standards of Reporting Trials (CONSORT) statement (www.consort-statement.org). This would then ensure studies are not deemed at risk of bias which calls into question the validity of their conclusions.

Another important limitation of the study was that 14 studies had participants who were over the age of 24 years. The inclusion criterion that studies had a mean age of 24 years or younger enabled the review to pool more evidence regarding the effect of future thinking on mood in young people. However as this is a study of how young people think about the future, having older participants within the analysis has weakened the conclusions that can be drawn about young people and in retrospect it would have been better to have included studies that had a maximum age of 24 years.

Clinical implications

This systematic review found a complicated picture regarding how future thinking impacts on affect. It may be possible that interventions incorporating future thinking tasks could be used to elicit positive change in affect for young people with low mood or anxiety, but it is probable that such changes would not be long-lasting. The effects of thinking positively about the future may be particularly sensitive to cultural norms as well as individual factors such as coping style. The studies that used non-clinical samples created analogue samples by inducing low mood and recruiting high worriers and those with low mood. These studies all found positive effects which indicates that future thinking may form part of a useful intervention for young people with affective disorders. There was less convincing evidence that younger age participants benefited from future thinking, but this may have been confounded by a lack of future imagery in these studies' interventions. Future imagery and visualisation as opposed to verbal future thinking may be particularly important in eliciting changes in affect. While the dosage of interventions were similar, interventions seemed to lead to greater affect change where there were elements of

additional self-directed practice. Overall, there were notable weaknesses of the study that limit the extent to which any clinical implications can be drawn. These weaknesses included the inclusion of mostly low quality studies and that 14 studies included participants over the age of 24 years.

Future research

The review identified gaps in the research regarding future thinking interventions at different ages of development. During the literature search there were studies that had investigated future interventions for school age children in relation to test performance and other educational outcomes. As children's wellbeing remains a national priority, it would be important to replicate such investigations with affective outcomes.

The episodic future thinking group of studies seemed to reveal particularly important findings in how future thinking can be manipulated to explore interesting treatment effects. More studies of this nature with larger samples would provide more evidence as to the utility of future thinking interventions as treatments for people with affective disorders.

Conclusions

This systematic review identified and collated research studies that have used future thinking interventions with young people and assessed their effect as measured by various psychological measures but specifically measures of affect. The findings showed various future thinking applications and how these have impacted on positive

and negative affect. The findings across the three types of intervention, Best Possible Self, episodic future thinking and worry, were mixed but there was evidence to suggest that future thinking can lead to changes in affect in the short term. Most of the included studies were assessed as being at high risk of bias which limits the extent to which conclusions can be drawn. Future studies should ensure they are following reporting guidelines to minimise this risk. In addition more studies are needed to investigate future thinking in children and young adolescents as this study identified that this area was particularly lacking. More knowledge about whether and how these interventions work in young people would be useful, as this has not been shown conclusively by this study.

III. Empirical study

Features of mental imagery in young people with low mood

Abstract

Research has shown that adults with low mood display notable differences in the way they imagine positive future scenarios. The phenomenological features of imagery (for example, the perspective of the image and sensory details), have also been shown to differ when compared to healthy groups. There has been less research investigating these findings in young people. This study aimed to investigate the features of future mental imagery as described by young people with low mood. It was hypothesised that features of imagery would relate to severity of low mood and ability to imagine scenes vividly. It was also hypothesised that there would be a greater change in features of imagery following a positive future imagery task when compared to a control imagery task.

This study used archival data. Forty-seven participants aged between 16-21 with low mood had imagined six personally relevant future events in response to cue words before and after an imagery task (total 12 events per participant). Participants had been randomly allocated to one of two imagery tasks: a positive future simulation or imagining a procedural task after imagining the first six events. In this study a coding strategy was developed with an expert by experience to analyse the descriptions for different phenomenological features. These features included sensory details, emotional content, perspective, accessibility and dampening. The analysis investigated the association of features in relation to severity of low mood,

participants' ability to imagine an event vividly, and whether features changed before and after the imagery task.

There were no significant associations between features of imagery and severity of low mood or participants' ratings of imagery vividness. The positive future imagery task did not lead to significantly greater changes in features compared to imagining a procedural task. While the study did not confirm findings, it provides some insights into the features used by young people with low mood when creating future imagery.

Introduction

Mental imagery refers to the everyday practice of creating internal representations in the absence of external information and has been described as "seeing with the mind's eye" (Kosslyn et al., 2001, p.635). This pictorial form of thinking is separate from other forms of cognition such as language-based thoughts or semantic knowledge. Mental imagery enables us to leave the present moment and re-experience memories as well as pre-feel future scenarios, known as mental time travel (Suddendorf et al., 2009). This process is then incorporated into the initiation and maintenance of various behaviours, such as avoiding threats by remembering failures and recalling past solutions when problem-solving.

Mental imagery can induce emotions such as joy, sadness, anger and fear and physiological responses, creating stronger affective reactions than verbal thoughts (Schubert et al., 2020). Neuroimaging studies have provided evidence that common neural structures are employed in both the imagining of scenarios and in the

68

experience of them (Pearson et al., 2015). The potential overlap between mental imagery and perception could be the crux of how mental imagery can elicit such strong affective responses. Mental imagery is therefore a key area for research into treatments for mood disorders, which are typically defined by pervasive levels of distress and negative affect.

Conti and Irish (2021) discuss how mental imagery is predominantly facilitated through the visual domain, with visual details from lived experiences being assimilated in the creation of future oriented simulations. Imagery abilities vary amongst healthy people and exist along a spectrum from aphantasia (absence of imagery) to perphantasia (photo-like imagery ability). Research has investigated how individual neurological differences account for the variation in this ability, with smaller visual cortices associated with stronger but less precise visual mental imagery (Bergmann et al., 2016). Conti and Irish (2021) called for the distinguishing of at least 3 key properties of mental imagery: imagery strength, precision, and subjective vividness.

The vividness of mental imagery has been an important focus for research and can be defined as a marker of image experience and intensity. Imagery vividness has been associated with motivation (Kavanagh et al., 2009), motor performance (Callow et al., 2006) and mood (Morina et al., 2011). The vividness of the imagery in part depends on the image being pictured, the capacity of cognitive process including memory systems and individual differences (Bywaters et al., 2004). While more research on this topic has been with adults, child studies have also found that mental imagery can be vivid in childhood and adolescence (Schwarz et al., 2020) and increases in vividity with age (Isaac & Marks, 1994). Measures have been developed

to capture the vividness of a person's mental imagery such as the Prospective Imagery Task (Holmes et al., 2008b; Stöber, 2000). Various phenomenological features of imagery can contribute to the subjective experience of vividness which shall now be discussed in relation to the literature. These include the sensory details, emotional content, perspective, image accessibility and dampening which shall now be discussed in turn.

Mental imagery can arise in any of the five sense experiences, with visual, auditory, gustatory, olfactory or tactile properties, and visual imagery arguably the most frequently used sense. Andrade et al. (2014) developed the Plymouth Sensory Imagery Questionnaire to capture the level of sensory details that may occur in mental imagery. They found that vision and touch were the easiest sensory modalities to imagine, with visual and auditory rated the most vivid. Interestingly, all participants in the study were in the top third for one sensory modality and the bottom third for another modality, indicating the privileging of some senses over others rather than uniform performance across sensory modalities.

D'Argembeau and Van Der Linden (2004) in their adult study comparing past and future imagery, investigated sensory details of mental imagery. They found interesting effects, including how memories contained more sensory details than prospective imagery, mental imagery of the near future contained more sensory details than temporally distant mental imagery, and there were more sensory details in positive events compared to negatively valenced events. This indicates that while there is overlap between remembering the past and imagining the future, there are also separate processes as reflected by these different effects.

In a study with young people, Meiser-Stedman et al. (2012) found that those in the 11-12 age range generated more sensory-based, fragmented memories as opposed to the 16-18 age range participants that expressed more complex emotions such as helplessness, when generating memories. This indicates that generating mental imagery is a developing process through adolescence and that the use of different features may emerge at different ages. The second feature for consideration is the emotional quality of the image. Mental imagery has a complex relationship with emotion which has been explored in various studies. Imagining a future moment of glory may elicit feelings of happiness and imagining a phobic object can elicit fear, this process of imagining events rather than language-based thinking leads to greater affect (Holmes & Mathews, 2005). However imagining something positive does not always lead to positive affect, and can make someone feel worse due to the cognitive comparison between the positive image and the actuality of a situation (Joorman et al., 2007). Such appraisals can be manipulated through Imagery Rescripting, an important technique incorporated into various psychological treatments for mood disorders.

Intrusive and distressing imagery is a hallmark of Post Traumatic Stress Disorder, Social Anxiety Disorder, Phobias, Depression and suicidality, and therefore is an important treatment target. Research has considered the impact of emotion in relation to how mental imagery effects one in the present, and there are ways of capturing the emotional content of the image imagined. For example, the Adapted Autobiographical Interview (AAI; Addis et al., 2008) can capture a range of "internal' elements. These included event details, time details, perceptual details (including the spatial arrangement of items in the image), and emotion/thought details. They also

categorised external elements that were not part of the main event but included

semantic details (general knowledge) and repetitions. In the AAI, descriptions are

transcribed and then sentences are broken down into idea segments. Using this tool,

Addis et al. (2008) found that younger people generated more internal details than

older people in their imagery for past and future images, however they also found that

the older group rated their images with greater emotional intensity. This reiterates the

nuances that may exist between young people and adults when generating mental

imagery.

The third feature of imagery to be discussed is image perspective. Nigro and

Neisser (1983) discussed the difference between Observer Perspective and Field

Perspective memories. Field perspective refers to experiencing the MI as though

actually living the experience personally, whereas Observer reflects seeing oneself as

a fly on the wall. Early hypotheses were that observer perspective memories had

undergone additional processing, meaning that only older memories would be recalled

in this way. However even fresh memories can be experienced in observer

perspective. It was then proposed that the type of situation would influence the

perspective through which it was remembered. The study found that if the scenario

was one of being evaluated, the experience was more likely to be recalled in observer

perspective. If the individual wanted to describe a situation objectively, they also

chose to recall the event in observer perspective. This is particularly relevant for

research into social anxiety disorder whereby feared negative evaluation leads to

debilitating avoidance of social situations. Chapman et al. (2020) found that children

with higher social anxiety reported more negative observer perspective imagery,

indicating that this could be a maintenance factor in the condition. Further research

has found that changing one's perspective from field to observer reduces the vividness and emotion of the scenario but changing one's perspective from observer to field does not increase vividness or emotion (Holmes et al., 2016). This is important as it pertains as to whether perspective may be malleable and a target for treatment. Burnett-Heyes et al. (2017) concluded that adolescents require training in how to switch between perspectives, highlighting that this is not a straightforward process for children and young people.

The fourth feature is the time taken to imagine an image, normally called accessibility. There exists a rich literature on the time taken to generate imagery, particularly in relation to people with depression. People with depression have been found to take longer to generate images in response to cue words (Cocude et al., 1997), and take longer to rotate mental images (Chen et al., 2013). For future events specifically, studies have found it takes longer to imagine negative future events than positive future events (D'Argembeau & Van Der Linden, 2004), possibly because people tend to be more optimistic about the future (Newby-Clark & Ross, 2003). There may also be age differences. Beni et al., (2007) found older people took longer to generate future images compared to younger people, indicating a decline with age that was not found when examining the ability to maintain an image. They also found that both groups took longer to generate specific images compared to general ones, and together these findings highlight the nuances in image accessibility.

The final feature that shall be discussed here is the cognitive process of dampening. Dampening refers to the process of downgrading reactions to positive affect, and may include redirecting attention, self-criticism and focusing on negative elements of a situation. Not surprisingly, dampening is related with negative affect

(Nelis et al., 2015) and as such is frequently observed in anxiety and depression. Quoidbach et al. (2010) discuss dampening in the form of negative mental time travel (NTT) finding that NTT was particularly detrimental to life satisfaction. NTT is the process of rumination on positive future events and was identified as being a contributing factor for participants feeling lonely in a study of emotion regulation (Kearns & Creaven, 2017). Despite these interesting findings, there seems little research into how dampening occurs in mental imagery, beyond suggestions that observer perspective may be a form of dampening in mental imagery (Holmes et al., 2008c; Nelis et al., 2015).

So far five features of mental imagery, as they relate to both past and future images, have been explored. In the last few decades research has accelerated in its exploration of episodic future thinking (EFT), which is using autobiographical knowledge to create future scenarios. These scenarios may be experienced as mental imagery but they may also be constructed through verbal cognitions.

The Autobiographical Memory Test (AMT; Williams & Broadbent, 1986) was developed to explore how people recall and describe personal events from their past in response to cue words. This has been adapted for use with future events (Brown et al., 2013; Raffard et al., 2013) and referred to as the Episodic Future Thinking-Test (EFT-T). Participants generate future scenarios in response to positive and negative valenced cue words. Scenarios must be personally relevant and take place within the space of a day. If the responses meet these requirements they are classified as specific. Studies have found that more specific events are associated with greater affect (D'Argembeau et al., 2011). Therefore the EFT-T is an important tool in the exploration of prospective mental imagery.

Studies have explored prospective mental imagery in relation to various psychopathologies. In a non-clinical sample of young people with low mood, Holmes et al. (2008b) found that those with higher levels of depression had reduced vividness for positive prospective imagery, and increased vividness for negative prospective imagery. This finding is consistent with part of the Tripartite Model (Clark & Watson, 1991) that describes how both anxiety and depression are characterised by increased negative affect but only depression is associated with reduced positive affect. Pile and Lau (2018) found further support for the Tripartite model with their study on future thinking in adolescents. They found that depression was associated with more vivid imagery for negative events and less vivid imagery for positive events across the past and future; whereas anxiety was associated with vivid imagery for past negative events. Having less vivid positive future imagery seemed to magnify the relationship between severity of life events and depression, thereby indicating positive future imagery as a treatment target in young people with low mood.

In another study by Kuyken and Howell (2006), 31 adolescents who had never had depression were compared with 34 adolescents who had depression. They found that those with depression had more vivid imagery, more negative imagery and more observer perspective imagery. This review has already noted that young people generate mental imagery differently to adults, and Kuyken and Howell (2006) have found that young people with depression generate mental imagery differently to their peers. In one study of adolescents with PTSD, intrusive mental imagery was identified as a maintaining factor for the condition (Steil et al., 2022). Therefore given these findings it seems important that research with young people with low mood is

conducted to establish relationships between depression and features of imagery. The findings of such research could then shape future treatments for depression.

When depression develops in adolescence it can be more chronic than when it develops in adulthood (Hankin, 2006) and so it is important to offer early and effective therapeutic interventions. Recommended treatments for depression in adolescence include Cognitive Behavioural Therapy (CBT), but there is evidence that CBT may be no better than other psychosocial interventions in treating the condition (Goodyer et al., 2017). Therefore further research is needed into the cognitive processes of young people with depression that can inform and improve treatments for depression.

This study aimed to explore five features of imagery (sensory details, emotion, perspective, time to access, dampening) generated by young people with low mood when thinking about the future. These features have not been extensively explored in young people or young people with low mood previously. A particular interest was to explore whether features of imagery related to levels of depression, levels of baseline vividness in imagery and whether features changed following a brief positive future imagery exercise. The findings would expand on the field of knowledge regarding imagery in young people, which was expected to be different from adults given the differences in cognitive capacity (Luna et al., 2004). Establishing relationships between features, vividity and severity of depression could then potentially inform treatments incorporating prospective imagery for depression.

The aim of the present study was to investigate the future emotional mental imagery generated by young people with low mood, and whether the frequency or qualities of these features changed following a brief, positive future imagery exercise.

The hypotheses were:

1.At baseline, higher symptoms of depression will be linked decreased use of sensory information, decreased use of emotion, decreased field perspective, increased time to access an image, and increased use of dampening strategies. This will be independent of cue valence.

2.At baseline, having more vivid future imagery in the Prospective Imagery Task (PIT) will be linked to increased specificity on the EFT-T, increased emotion, sensory information and use of field perspective.

3.A brief positive imagery enhancing exercise will increase use of field perspective, increase sensory information, increase emotion, reduce time taken to access the image and reduce the use of dampening strategies.

Method

Design

This study used a randomised controlled design to compare the effect of a positive future imagery task on features of imagery described by young people with low mood. The study also incorporated correlational analyses between severity of low mood and features of imagery, and imagery vividness ratings and features of imagery.

The study used archival data that had been collected for another DClinPsy project at Kings College London university. The study hypotheses that relate to the features of imagery, coding and subsequent data analyses, are unique to this project.

Ethical considerations

An amendment was made to the original King College London ethics application (Ref. HR-19/20-20969) to include the present study, on the grounds of maximising the use of the archived dataset. The amendment application can be found in Appendix C. Participants had consented for their data to be archived for further research as part of the original informed consent process. Ethics approval was granted for the present study with the proviso that all participants were contacted to inform them of the additional use of data (Ref. MOD-21/22-20969). In line with General Data Protection Regulation, participant consent was needed for the sharing of audio recordings that might disclose identity. All participants were contacted to inform them of the additional use of their data to include the present study and request the sharing of their audio recording. Thirty-one participants responded with their consent for their audio data to be shared. Sixteen participants did not respond and so their audio recordings were transcribed by the data owner (project supervisor of both projects). The anonymised transcribed data were then shared for this analysis. The project was self-certified with Royal Holloway University of London ethics committee.

Participants

Forty-seven participants (39 females, mean age = 19, SD 1.4, range 16-21 years, 45% white ethnic backgrounds) had been recruited through the online research

forum www.callforparticipants.com and Kings College London university research portal between February to September 2021. Participant characteristics can be found in Table 3.

Table 3. Participant Characteristics

	Positive FT Group (n=22)	Control Group (n=25)	Total sample (n=47)
Age ($\bar{X}$, Standard Deviation)	19.0 (1.5)	19.6 (1.3)	19.3 (1.4)
Gender *n*(%)			
Female	17 (77.3)	22 (88.0)	39 (82.9)
Male	4 (18.2)	3 (12.0)	7 (14.9)
Transgender	1 (4.5)	0 (0)	1 (2.1)
Ethnicity *n*(%)			
White British	6 (27.3)	8 (32.0)	14 (29.8)
White Other	3 (13.6)	4 (16.0)	7 (14.9)
Black African/Caribbean/Other	4 (18.2)	1 (4.0)	5 (10.6)
Asian Indian/Pakistani/Bangladeshi	4 (18.2)	3 (12.0)	7 (14.9)
Chinese	1 (4.5)	2 (8.0)	3 (6.3)
Asian Other	2 (9.1)	3 (12.0)	5 (10.6)
Mixed heritage	1 (4.5)	3 (12.0)	4 (8.5)
Other	1 (4.5)	1 (4.0)	2 (4.2)
Education level *n*(%)			
Not in education	1 (4.5)	1 (4.0)	2 (4.3)
Secondary school	1 (4.5)	0 (0.0)	1 (2.1)
Further education	4 (18.2)	2 (8.0)	6 (12.8)
Undergraduate	14 (63.6)	22 (88.0)	36 (76.6)
Postgraduate	2 (9.1)	0 (0.0)	2 (4.3)

All participants had provided written informed consent. Inclusion criteria included: age between 16-21 years scoring 5 or higher on the PHQ-8. Exclusion criteria included: experiencing psychosis, diagnosis of learning disability, significant head injury, neurological disorder or currently receiving psychological intervention.

<u>Measures</u>

Imagery measures

Prospective Imagery Task (PIT; Holmes et al., 2008b) is a 16-item measure where participants are required to imagine a defined situation and then rate the image for its clarity and detail (vividity) on a 5 point scale (1 no image at all, 2 – unclear and not detailed, 3 – unclear but some detail, 4 – moderately clear, 5 – very clear and detailed). Half of the items are positively valenced and half are negatively valenced. Example items include: "you will be unwell" and "you will be very fit and healthy". Pile and Lau (2018) used this task in a study with young people with low mood, reporting acceptable to good internal consistency (Cronbach's alpha for positive past =.77, negative past =.72, positive future =.74, negative future =.83). The PIT was collected at session and at 1 week follow-up.

Episodic Future Thinking Test (EFT-T; Hallford et al., 2020b) measures specificity of imagined situations. Instructions are read out beforehand, explaining that a different event should be given for each cue word and that the event must be plausible freely. Participants are required to respond to each by describing an imagined, personally relevant, future event inspired by the cue word, that takes place within the space of a day. Participants are given six cue words successively. Three cue words are positive and three cue words are negatively valenced, and these are presented in a random order. The cue words delivered once each across the two EFT-T trials were: Alone, Beautiful, Danger, Failure, Fear, Happy, Hope, Friend, Lost, Stress, Strong and Success. Descriptions are then classified as specific if the event occurs within the space of a day. If an event occurs over the space of a day (for example, finishing an assignment), or repeats multiple times (for example, hurting

someone's feelings), is not a future or personally relevant event, it would be categorised as non-specific. Hallford et al. (2020b) reported that the EFT-T items showed good internal reliability (McDonald's ω =.85) and good convergent validity, with scores on the EFT-T correlating with autobiographical memory specificity on the Autobiographical Memory Test (Williams & Broadbent, 1986).

The EFT-T was used in two ways in this study. 1) It was used as a measure of how specific participants were in their imagined future scenarios. Each response was rated as specific or non-specific by the data-collecting researcher and again by the author of the present study. Responses were rated using EFT-T specificity guidelines used by Hallford et al. (2021b). 2) The future descriptions provided in response to the EFT-T cue words, were used as the data to answer hypotheses. The descriptions were therefore analysed with the coding system. There was no lower or upper time-limit for the descriptions. The EFT-T was administered twice in the lab session: before and after the imagery intervention.

Mood measure

Patient Health Questionnaire-8 (PHQ-8; Kroenke et al., 2009) was used to measure low mood. This 8-item measure requires respondents to rate each item on a 4 point scale of how frequently they have experienced each statement over the past 2 weeks, with 0 not at all, 1 several days, 2 more than half the days, 3 nearly every day. Statements relate to elements of low mood such as "little interest or pleasure in doing things" and "feeling down, depressed or hopeless". The PHQ-8 has reported good internal reliability (.88) and convergent validity (r= 0.72) with the Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) in a similar population (Alpizar et al., 2018). Participants were eligible for the study if they scored

5 or greater on the PHQ-8. The PHQ-8 was measured at screening, at the lab session, and at 1 week follow-up.

<u>Coding measures</u>

Sensory details were captured in two ways. The first was presence of a sensory detail in the description, coded as 'present' or 'not present'. The number of descriptions coded as present for sensory details, were summed to provide a total score of sensory-present descriptions per participant (score out of six). The second was a count of how many times a sensory detail was provided in the response. Sensory details referred to the five senses (vision, hearing, taste, touch and smell).

Emotion details were captured in two ways. The first was presence of an emotion word in the description, coded as 'present' or 'not present'. The number of descriptions coded as present for an emotion, were summed to provide a total score of emotion-present descriptions per participant (score out of six). The second was a count of how many times an emotion word was provided in the response.

Field perspective was coded as 'present' or 'not present'. Field perspective indicated the person was describing their image as if living the experience in the present moment, using the "I" position. Statements such as "I see myself…" were indicative of being a fly on the wall of the image and so were considered observer perspective. These descriptions were coded as not present for field perspective. The number of descriptions coded as field perspective present were summed to provide a total score of field perspective descriptions per participant (score out of six).

Dampening was coded as 'present' or 'not present'. Dampening referred to fault-finding, negative mental time travel (as defined by rumination on positive future events), distractions and excessive repetition of negative information.

In addition to the coding of features of imagery, accessibility was collected.

Accessibility was a timed measure in seconds, starting from the end of the cue word being spoken to the time the participant responded in a stream of words describing the image. Initial utterances unrelated to their description were disregarded.

Standardised instructions for the coding were developed to guide the coding process (see Appendix D).

Intervention

Manipulation exercise

The manipulation was a positive future thinking imagery exercise. The participant first identified a future activity or goal that they would like to do in the future, which would elicit positive emotions. They were then guided through three stages of imagining this goal.

Imagining the goal

The participant was asked to imagine the goal in detail, with prompts such as: "where are you? What are you doing?" They were prompted for sensory details (such as, "what can you hear?") and physiological responses (for example, "what is your body doing?"). The participant was asked if they were feeling any emotions and to rate this out of 10. They were asked to focus their attention on the part of the image

that elicited the most positive emotion. They were prompted to describe any thoughts (for example, "what is going through your mind?") and to focus on the image as a whole for a few moments, before being asked to return to the present moment.

Giving advice

The participant was told that their "future self" is one who has completed the goal and their "current self" is who they are at present. They were asked to imagine what the future self would say to the current self, through various questions, including "can you tell your current self how it feels to have achieved your goal of completing [activity]?" and "what might your current self, need to help them complete [activity]?". The participant was then brought back to the present moment.

Progression from current to future self

Next the participant was asked to imagine the steps needed to get from their current self to their future self. There were prompts such as, "where are the tough steps?" and "what is going to be easy about the journey?" They were asked to focus on the image before bringing their attention back to the present moment.

After each step the participant was guided to complete a worksheet with what they had described, which was then emailed to them at the end of the session.

Control condition

In the control condition, the participant was asked to imagine three household activities one after the other. In the first imagined activity, the participant was asked to imagine brushing teeth in detail. The second two imagined activities were the participant's choice of activity. For each imagined activity, they were guided through where they were and if anyone else was present. They were prompted as to any

sensory and physiological details, and then asked to return to the present moment. There was no worksheet for these participants. Both conditions were intended to last approximately 20 minutes.

Original data collection

On signing up to the study, participants were emailed screening measures via Qualtrics. If participants' screening PHQ-8 score was 5 or higher they were invited to an online, individual lab session in the following week. On the day of the lab session, the participant was randomly allocated to one of two conditions (positive future thinking or control). Randomisation was carried out by a computer allocator and overseen by the project supervisor who was not involved in the lab sessions. The participant was blind to the test or the control status of the condition. All lab sessions were conducted and audio-recorded on Microsoft Teams.

The lab session began with the participant completing the PHQ-8 (session PHQ-8), the Prospective Imagery Task (PIT; Holmes et al., 2008b) and Episodic Future Thinking Test (EFT-T; Hallford et al., 2020b). The EFT-T was administered according to instructions. These included only prompting participants for more information to clarify whether they were imagining a specific episodic future event, and not for further details. Participants could skip a cue word if they could not think of a future event. Following the EFT-T, the participant then proceeded to their allocated condition: positive future thinking imagery exercise or neutral procedural imagery exercise. The total duration of the lab session was approximately 1 hour.

Following the imagery task, the participant re-completed the EFT-T. The participant was debriefed, for example, they were asked how they found the session and they were reminded that a follow-up PHQ-8 would be emailed to them in one week's time. They were given a £15 voucher for participating on return of the follow-up PHQ-8.

Present study coding design

The coding proforma can be found in Appendix E. The original coding proforma included the grid for collecting coding data on sensory information, perspective, and dampening, and accessibility.

Expert by Experience

A young person with lived experience of depression was consulted in the design of the coding. This consultation led to the inclusion of emotion being added to the coding as a way of collecting depth of feeling elicited during the exercise. This expert by experience also recommended considering the valence of the cue words and the effect this had on the response. The young person was paid for their time.

Revising the coding

Following this meeting the coding proforma was revised. Emotion was included as two variables 1) present/not present and 2) a count.

Some cue words in the EFT-T were emotions, e.g. "happy", and so repetition of "happy" in the response was not counted. This was in order to provide equity across the cue words and also because it may have represented priming of the cue word rather than a true emotional response.

The valence of the response was also included. The response could be positive, negative, mixed or neutral, as reflected in the weighting of positive or negative information in the response.

The coding proforma was discussed with the researcher who had collected the data. This was to offer an early check that the coding would likely capture the various features described in participants' responses. This discussion led to no further amendments.

Transcription

The original audio recordings were transcribed. The recordings contained no information on intervention allocation, participant demographics or PIT or PHQ measures. The recordings were listened to repeatedly, each time the script was refined until an accurate written account of what had been said was produced. The scripts contained no identifiable information. Where participants described potentially identifiable information in their answer (for example, the football team they played for), this was parenthesised. An example transcript can be found in Appendix F.

Pilot

The coding was piloted on two EFT-T responses. There followed further revision of the coding instructions, such as including complex emotions (for example, regret), and the decision to compile a list of all those emotions included for consistency and transparency. The final list of emotions following coding of all transcripts can be found in appendix G.

Coding analysis

Following the pilot and final revision, the remaining transcriptions were subjected to coding analysis. Where possible the coding of the transcript was double-checked by listening to the audio file which could offer greater understanding of the imagined scenario through speech intonation. Only after all transcripts had been coded was the blind removed for participant information and condition.

For each complete EFT-T of six cue words, the data included: 1) number of matched positive valences (positive cue word and positive response) with a score out of three), 2) number of matched negative valences (negative cue word and negative response) with a score out of three), 3) number of responses with sensory details mentioned, with a score out of six), 4) count of sensory details , 5) number of responses with an emotion mentioned (score out of six), 6) count of emotions , 8) number of responses in field perspective (score out of six), 9) accessibility recorded in seconds, and 10) number of responses with dampening strategies (score out of six). The pre and post EFT-T scores were combined for overall EFT-T scores. These scores and counts were then entered into International Business Machines Corporation Statistical Package for the Social Sciences (IBM SPSS) Windows Version 25, for data analysis.

Results

Multiple testing and Type 1 error strategy

With multiple testing there is the risk of Type 1 error, therefore attempts were made to report both uncorrected results and results adjusted to maintain a family-wise error rate of 5%. Families of tests were defined based on sets of inter-related analyses and are outlined in each section.

Three participants were unable to give a response to one cue word each during their lab session. These words were danger, hope and lost, with one appearing in the pre-EFT-T and two occurrences in the post-EFT-T. Therefore out of a possible 564 cue word responses across the whole sample, there were 561 descriptions for analysis.

Where participants had provided a response to a cue word, there was no missing data, except one entry. A participant's response (participant 61) to a cue word on the accessibility variable was missing as the lab session had been interrupted and it was not possible to accurately time this. One participant (participant 88) did not return a follow-up PHQ-8.

The responses to the EFT-T were timed. The mean overall length of time for a response was 38.02 seconds (SD 18.50). Table 4 shows the means of the duration of EFT-T descriptions, before and after the intervention, for each group.

Table 4. Mean duration of EFT-T responses (seconds)

Total (n=47)			Positive FT Group (n=22)			Control Group (n=25)		
Mean (Standard Deviation)			Mean (Standard Deviation)			Mean (Standard Deviation)		
Pre	Post	Total	Pre	Post	Total	Pre	Post	Total
35.81	40.82	38.02	38.71	39.52	39.12	33.26	42.02	37.01
(16.05)	(24.41)	(18.50)	(15.08)	(22.29)	(16.50)	(16.72)	(26.64)	(20.47)

Coding agreement

Ten transcripts were selected at random for a second rater to co-rate using the coding proforma and instructions. This second rater was blind to study hypotheses. Inter-rater agreement for the two raters returned varying levels of agreement for the

different variables with all but one indicating moderate or strong agreement (see Table 5).

Table 5. Agreement on coding

		Level of agreement
Valence	Kappa = .880	Strong
Sensory Presence	Kappa = .889	Strong
Sensory Count	Intraclass Coefficient = .929	Strong
Emotion Presence	Kappa = .771	Moderate
Emotion Count	Intraclass Coefficient = .959	Strong
Field Perspective Count	Kappa = .511	Weak
Dampening Count	Kappa = .792	Moderate

The inter-rater agreement for two raters' ratings on EFT-T specificity (specific or non-specific) for descriptions was kappa = .804 indicating a strong level of agreement between ratings.

Exploratory data analysis

There were n=22 participants in the test (Positive Future Thinking) group and n=25 in the control group (imagining procedural activity). There were no significant differences between the two groups, such as age ($t(45) = -1.568$, $p= .124$), screening PHQ-8 score ($t(45) = .429$, $p= .670$), or PIT score ($t(45) = 1.114$, $p= .271$)

Exploratory data analysis was conducted to assess whether assumptions for parametric tests were met. This involved checking outcome variables for a normal distribution. Boxplots were examined for outliers, with extreme scores identified as falling more than three standard deviations above or below the sample mean.

The Emotion-Count and Accessibility variables contained outliers which when removed via winsorising, returned normal distributions. The Perspective and Dampening variables had skewed distributions ($z > 3.29$, $p<.001$) and so were transformed using Square root and Log-10 respectively to obtain a normal distribution.

Primary analyses

Hypothesis 1

PHQ-8 screening scores and session scores were each correlated with each variable to determine association between level of low mood and sensory information, emotion, perspective, accessibility and dampening. There were no significant correlations (see Table 6 for correlation coefficients).

Table 6. Pearson's r correlation coefficient for Features and PHQ-8

Feature	Screening PHQ-8	Session PHQ-8
Responses with sensory information present	-.068	-.016
Sensory information	-.089	-.186
Responses with emotion present	-.216	-.060
Emotion words	-.268	-.070
Field perspective	-.043	.041
Accessibility	-.027	.145
Dampening	-.020	.072

There was a significant positive correlation between PHQ-8 session scores and EFT-T specificity scores ($r(47) = .297$, $p= .042$) suggesting higher PHQ-8 session

scores were associated with more specific responses to cue words. However, once the

p value was corrected for conducting seven correlations within this family of tests, the

result was no longer significant (p > 0.007)

Hypothesis 2

Prospective Imagery Task (PIT) session scores were correlated with each

variable to determine association between imagery vividness and emotion, sensory

detail, perspective, accessibility and dampening. There were no significant

correlations (see Table 7). Although there was a significant positive correlation

between scores on the PIT with specificity of images on the EFT-T ($r(47) = .299$,

p=.041), suggesting higher PIT score was associated with more specific images.

However this was no longer significant once the p value was corrected for conducting

five correlations (p>0.01).

Table 7. Pearson's r correlation coefficient for Features and PIT

Feature	PIT
Responses with sensory information present	-.045
Sensory information	-.039
Responses with emotion present	.210
Emotion words	.173
Field perspective	.226

Hypothesis 3

A Group (test by control) x Time (pre, post) Mixed Model ANOVA was

conducted with each variable to investigate Hypothesis 3: that the positive future

imagery task would lead to increases in emotion, sensory details and field perspective,

and decreases in dampening and time taken to access images. Table 8 reports the pre and post means for the groups for each feature.

Table 8. Group means for each feature before and after intervention

	Positive FT Group (n=22) Mean (Standard Deviation)		Control Group (n=25) Mean (Standard Deviation)	
	Pre	Post	Pre	Post
Responses with sensory information	1.45 (1.44)	1.14 (1.21)	1.28 (1.21)	1.76 (1.33)
Sensory information (count)	2.14 (2.30)	1.91 (2.18)	1.92 (2.00)	2.76 (2.63)
Responses with emotion	1.91 (1.48)	2.14 (1.61)	2.80 (1.76)	3.00 (2.02)
Emotion (count)	3.64 (2.87)	4.05 (3.63)	4.68 (3.64)	5.44 (4.51)
Field Perspective	5.05 (1.50)	4.45 (1.595)	5.00 (1.32)	5.48 (1.09)
Dampening	.91 (1.19)	.86 (1.58)	.68 (.69)	.80 (.96)
Accessibility	9.82 (5.53)	8.61 (4.63)	9.49 (5.62)	10.42 (5.48)

Sensory information

For number of responses where sensory details were mentioned, there was no significant effect of Group ($F(1,45) = .570$, $p = .454$), Time ($F(1,45) =.118$, $p = .733$), or Group x Time interaction ($F(1,45) = 2.867$, $p = .097$).

Similarly, for number of sensory details, there was no significant effect of Group ($F(1,45) = .344$, $p = .560$), Time ($F(1,45) = .601$, $p = .442$) or Group x Time interaction ($F(1,45) = 1.822$, $p = .184$).

Emotion

For number of responses where an emotion was mentioned, there was a significant effect of Group ($F(1,45) = 4.003$, $p=.05$). However, once corrected for conducting seven tests within this family of tests, the result was no longer significant ($p > 0.007$). There was no significant main effect for Time ($F(1,45) = .687$, $p = .411$) or Group x Time interaction ($F(1,45) = .003$, $p = .958$).

For number of emotion words, there was no significant effect of Group ($F(1,45) = 1.666$, $p=.203$), Time ($F(1,45) = 1.139$, $p = .292$), or Group x Time interaction ($F(1,45) = .103$, $p = .750$).

Field perspective

For field perspective, there was a significant Group x Time interaction ($F(1,45) = 7.394$, $p = .009$), however once corrected for conducting seven tests within this family of tests, the result was no longer significant ($p > 0.007$). There was no significant effect of Group ($F(1,45) = 2.372$, $p = .130$) or Time ($F(1,45) = .045$, $p = .834$).

Dampening

For use of dampening strategies, there was no significant effect of Group ($F(1,45) = .013$, $p = .909$), Time ($F(1,45) = .322$, $p = .573$) or Group x Time interaction ($F(1,45) = .535$, $p = .468$).

Accessibility

Finally, for accessibility, there was a significant Group x Time interaction ($F(1,44) = 5.687$, $p = .021$), which when corrected for conducting seven tests within this

family of tests, the result was no longer significant (p > 0.007). There was no significant effect of Group (F(1,44) = .117, p = .734) or Time (F(1,44) = .039, p = .845).

<u>Secondary analyses</u>

<u>Impact of intervention on features and valence</u>

A three way Mixed ANOVA was conducted with Group (Test or Control) x Time (Pre, Post) x Valence (Positive, Negative) for each feature.

<u>Sensory information</u>

For sensory frequency, there was a significant main effect of Time (F(1,45) = 11.027, p=.002), which remained significant when corrected for conducting seven tests within this family of tests, (p < 0.007). There was a significant Time x Valence interaction (F(1,45) = 6.272, p=.016) which when corrected for conducting seven tests within this family of tests, the result was no longer significant (p > 0.007). Paired t-tests were conducted to explore sensory frequency at different time points and found no significant effects.

For sensory count there was a significant main effect of Time (F(1,45) = 17.639, p=.000), significant Time x Valence interaction (F(1,45) = 14.562, p=.000) and significant Group x Time x Valence interaction (F(1,45) = 5.222, p=.027). The first two main effects when corrected for conducting seven tests within this family of tests, and remained significant (p < 0.007) and therefore were further explored by paired samples t-tests, however there were no significant effects found. The Group x Time x Valence interaction was no longer significant when corrected for conducting seven tests (p > 0.007).

Emotion

For emotion frequency, there was a significant main effect of Group ($F(1,45)$= 4.003, p=.05) and significant main effect of Valence ($F(1,45)$= 7.239, p=.01) but no significant interactions. After correcting for conducting seven tests within this family of tests, the result was no longer significant ($p > 0.007$).

For emotion count, there was a significant main effect of Time ($F(1,45)$ = 29.158, p=.000), significant main effect of Valence ($F(1,45)$ =29.466, p=.020), and significant main effect of Time x Valence ($F(1,45)$= 27.027, p=.000). There was no significant effect of Group x Valence or interaction of Group x Time x Valence. After correcting for conducting seven tests within this family of tests, significant main effect of Time and Time x Valence remained significant ($p < 0.007$). This was further explored with t-tests and found no significant findings.

Field perspective

For field perspective, there was a significant main effect of Time ($F(1,45)$ = 1656.6, p<.001), and Group x Time x Valence interaction ($F(1,45)$= 5.675, p=.022). After correcting for conducting seven tests within this family of tests, only the result for Time was significant ($p < 0.007$). This was then further explored by paired samples t-tests. Field perspective scores for pre-intervention positive cue words were compared with field perspective scores for post-intervention positive cue words which was found to be not significant. This was repeated for pre and post field perspective counts for negative cue words and was also found to be not significant.

<u>Accessibility and Dampening</u>

For accessibility there was a significant main effect of Time ($F(1,44) = 96.070$, $p=.000$), Valence ($F(1,44) = 52.874$, $p=.000$), Time x Valence interaction ($F(1,44) = 48.510$, $p=.000$), and significant Time x Valence x Group interaction ($F(1,44) = 4.002$, $p=.05$). After correcting for conducting seven tests within this family of tests, the results remained significant for main effect of Time, Valence and Time x Valence interaction ($p < 0.007$). Paired samples t-tests were conducted to determine relationships: comparing the accessibility times for positive and negative cue words, the accessibility times for positive cue words pre and post, and for negative cue words pre and post; for each group. There were no significant findings.

For dampening there were no significant effects.

<u>Impact of intervention on mood measured by PHQ-8</u>

To assess the effect on mood of the positive future imagery exercise compared to the control, a Mixed Model ANOVA was conducted, with Group (Test or Control) x Time (Screening, Session, Follow-up) comparison of PHQ-8 scores. Mauchly's Test of Sphericity was significant and therefore Huyn-Feldt tests were used. There was a significant effect of Time ($F(2,88) = 20.623$, $p = .000$), but not Group or Group x Time interaction. Both groups followed the same trend with high PHQ-8 scores at screening (mean = 13.9) which dropped at session (mean = 10.8) and follow-up (mean = 10.1). This was followed up with paired samples t-tests for the Positive Future Thinking and control group, comparing screening and pre, pre and follow-up and screening and follow-up PHQ-8 scores. For both groups, there was a significant

reduction between screening and session (test group, (t(21) = 2.332, p= .027; control group (t(24) = 4.498, p=.000), and screening and follow-up (test group, (t(20) = 3.093, p=.006; control group (t(24) = 4.539, p= .000). There was no significant difference between session and follow-up for either group (test group, (t(20) = .289, p=.776; control group (t(24) =1.134, p=.268).

Impact of intervention on EFT-T specific descriptions

To assess whether there was an effect of valence, a three way ANOVA was conducted with Group (test or control) x Time (Pre, Post EFT specificity score) x Valence (Specific Positive Cue words score, Specific Negative Cue words score). There were no significant results except Time x Valence interaction (F (1,45) = 8.012, p=.007). This was then explored with paired samples t-tests with all participants (n=47). The number of specific responses to positive cue words significantly increased from pre to post EFT-T (t(46)= -2.408, p=.020), but the comparison between pre and post specificity scores for negative cue words was non significant (t(46) = -1.045, p=.302).

Narrative of responses to cue words (n=561)

Two hundred and thirty-two descriptions (41% of total descriptions) included a temporal time frame, providing a reference of how far into the future the imagined scenario occurred. Nineteen descriptions of the future scenario were for today or tomorrow, 49 referenced the upcoming week/weeks, 105 referenced the upcoming months, and 59 referenced an event occurring in one or more years' time. Participants

also frequently said their event would occur "as soon as" Covid-19 lockdown restrictions lifted at some time in the future.

Discussion

This study set out to assess the features of imagery employed by young people with low mood when they imagine their personally relevant futures and whether this related to level of depression. It aimed to establish a relationship between phenomenological features and self-reported vividness of images, as well as assess whether a brief positive future imagery exercise would lead to changes in these features.

It was expected that higher levels of depressive symptoms would be associated with decreased use of emotion, sensory information and field perspective, and increased time to access an image and use of dampening. No significant correlations were found to confirm these hypotheses. It was also expected that scores on the Prospective Imagery Task (PIT), a self-report measure of vivid imagery, would be associated with increased sensory information and field perspective. No significant results were found to confirm these hypotheses either. Initially, the PIT significantly correlated with specificity on the EFT-T which was expected, however once this was corrected for multiple tests this was no longer significant.

It was hypothesised that a brief positive future imagery task would lead to increases in sensory details, use of field perspective, and reduce dampening strategies, compared to a control imagery task. These hypotheses were not confirmed, with statistical tests finding non significant results.

Previous research has found that increased sensory details in mental imagery is associated with higher levels of psychopathology (Moritz et al., 2014). In this study sensory details were not described by all participants and did not significantly change following an imagery exercise. During the exercise participants were prompted as to the sensory experience of the positive future scenario, therefore it is perhaps surprising that this did not translate to increased sensory details in the post EFT-T. It is possible that as this was a non-clinical sample, the levels of depressive symptoms were not sufficient to see high levels of sensory detail. The responses that contained sensory details were mostly in the visual domain, which is in line with Andrade et al. (2014) who found that people tend to report details from only one or two sensory domains. In non-clinical samples, it has been shown that people tend to report more sensory details for near future events rather than far future events (D'Argembeau & Van Der Linden, 2004). Where not all participants were referencing time points in their responses it was not possible to explore this relationship in this study, however it introduces the importance of temporal distance in influencing levels of detail in mental imagery.

Previous studies have found that adults with depression have a bias for using more observer perspective in their imagery (Kuyken & Moulds, 2009; Holmes et al., 2016). This study found that most young people typically adopted a field perspective when describing events, however the reliability of this measure was particularly weak and so it cannot be taken as convincing evidence. It was difficult to objectively rate perspective, particularly as some descriptions began from one perspective and changed to another. In some instances, participants clearly described seeing themselves doing something which indicated an observer perspective. However

individual linguistic choices made determining the perspective from the text difficult. Perhaps a graded scale from 'complete field perspective' to 'complete observer) similar to Liang et al. (2021) may have captured the complexity in descriptions, however objectively coding this may still have been problematic. Burnett-Heyes et al. (2017) discuss how children and adolescents may need training in adopting different perspectives in their imagery. In the present study participants were not told from which perspective to describe their imagery and so the responses reflect a natural response. While observer perspective is associated with dampening of positive affect, some young people described seeing themselves in moments of glory (for example, participant 123), utilising ideas from television programmes, which indicated that they were not dampening affect but rather using techniques they had seen in the media. This indicates that young people may use playful and creative ways of envisioning themselves in the future. Schwarz et al. (2020) described how children and adolescents may have less control over their mental imagery, but perhaps it is this lack of control that enabled the adolescents in this study to be more creative in their thinking and draw on other techniques to create imagery, such as those from film and television. Due to the weak inter-rater reliability noted for perspective, it is not possible to draw any discernible conclusions for this feature in relation to the hypotheses, which therefore is a significant weakness of the study.

An important consideration is the length of EFT-T descriptions, with a mean duration of under 60 seconds. Previous research with studies that have used the AAI to explore internal and external details, have used descriptions that are at least three minutes long (Gaesser et al., 2011). Therefore it may have been that the descriptions were simply not long enough to gather sufficient details. Another limitation is that this

study asked participants to generate future images and as such intentionally created these representations. Therefore when exploring features of imagery it would be interesting to also explore mental imagery that occurs spontaneously as this has the potential to show more disorder related features (Vassilopoulos & Moberly, 2013).

Overall there was no significant association between level of depression and the various features of mental imagery. It may be that an individual's use of mental imagery features may be more connected to individual differences. D'Argembeau and Van Der Linden (2006) found individuals with a higher capacity for visual imagery were more likely to use sensory details as well as other individual differences related to emotion regulation. Vella and Moulds (2014) also discussed individual differences in relation to use of perspective. It was beyond the scope of this study to explore such individual differences in features of mental imagery, but would be worthy of further exploration.

Similar to D'Argembeau et al. (2011), this study collected data on the content of the mental imagery described. In response to the 'danger' cue word, the majority of participants described a scenario of walking home after dark and being followed. Notably many young people responded positively to 'alone' saying that they liked to be alone and was a time for relaxation in their bedrooms. All responses to 'happy' and 'beautiful' were positive, with time outside and celebrations featuring frequently in both. Not unexpectedly, participants described more routine evens in the near future and more momentous events (graduation, weddings) in the far future. Overall, young people drew on their religions, cultures, family life, education, work and social situations in their EFT-T.

Given the importance of social situations and peer groups at this developmental stage, it would be interesting to explore whether these differ from an adult population. In designing imagery interventions, it would be important to use relatable examples of personally relevant future scenarios such as those described in this study.

Limitations

The study has several, notable limitations. The EFT-T does not specify that participants should think in verbal or imagery form, and it was not possible to definitively and objectively judge this from the responses descriptions alone. Therefore it is possible that some of the descriptions represented more language-based future thought than prospective imagery per se. Asking participants to either imagine or think in verbal forms would rectify this problem in future research.

Trying to definitively code responses was also problematic at times. Research has typically asked participants to subjectively rate the degree to which their image is in field or observer perspective (e.g. Liang et al., 2021). It was difficult to objectively rate the perspective in some descriptions, as reflected in the weak inter-rater reliability, and it was made more difficult when participants appeared to begin in one perspective and migrate to the other. This variable had the lowest agreement between co-raters, reflecting the difficulty of ascertaining perspective from the description. As such no conclusions can be drawn regarding perspective as a feature of imagery in relation to the hypotheses and is therefore a major limitation of the study. Future studies collecting data should also collect the participants' subjective rating of perspective to gain a clearer understanding of image viewpoint.

It is possible that the hour long, online intervention created test fatigue for the participants who may have had pre-existing concentration and motivation difficulties, since these are associated with low mood (Keller et al., 2019). Perhaps participants therefore rushed their second EFT-T or felt less able to engage with the task, resulting in less detailed responses. This may have been particularly true for those in the test group who had a task requiring more imagination compared to the control who imagined a routine.

This was a non-clinical sample of young people with low mood, however PHQ-8 scores had dropped substantially between screening and lab session. It may be possible that participants increased their scores at screening to be able to participate in the study. However, it is also possible that low mood in young people may present differently to those with a clinical diagnosis, with more natural fluctuations in mood. Often young people in the audio recordings presented as bright and cheerful. Perhaps the adolescents were experiencing state low mood, with a more labile presentation, whereby they felt low when on their own and happier when engaging in a social interaction such as the lab session with the researcher. A clinical sample with more pervasive low mood might have sustained a similar PHQ-8 score between screening and lab session. It is also possible that a clinical sample may generate imagery differently to an analogue group such as the one in this study, particularly as a cut-off score of 5 on the PHQ-9 is a low threshold. A clinical sample of depressed young people might therefore offer a clearer picture of imagery in young people with depression in future studies.

The control group were also more detailed than the test group in their descriptions before the intervention (despite no significant difference in PIT between

groups), and so this potentially hid intervention effects on features of imagery that might have been seen if the groups had been more comparable. The imagery tasks may have been too similar to discern meaningful differences. A third no-intervention group would have benefited the study in enabling the impact of imagery exercises on mental imagery features to be compared against no intervention, which could confirm an effect of imagery exercises.

Due to the number of variables to analyse, there was also the issue of multiple testing that increased the likelihood of Type I error of finding a significant result when the answer came about by chance. To reduce the possibility of this, whilst also not making a Type II error, the study reported uncorrected results and results that were corrected for the number of tests within a family of tests, preserving family-wise error rate at 5%. This eliminated all five significant findings in the primary analyses.

Implications

The implications of this study are limited due to the lack of significant findings. Imagery exercises may be helpful in enabling young people with low mood to create more detailed prospective mental imagery, as reflected in the increase in specific events recalled for positive cue words post imagery exercise, but the evidence for the benefit of future thinking exercises specifically in doing this, is lacking. . This study did not find that a positive future imagery exercise was better than a procedural imagery task at changing the features of imagery in expected directions, which are understood to be associated with improved symptomology. The way that the features changed overall suggests that features of imagery are potentially malleable with short, guided imagery interventions, although it may be that more guidance is needed to train young people in their use of imagery. At best it may be that imagery exercises

may be suitable adjuncts to therapies for depression rather than stand-alone treatments in their own right, as discussed by Burnett-Heyes et al. (2017).

Conclusions

       This study aimed to explore features of emotional mental imagery in young people with low mood. The findings did not support the research hypotheses and therefore no discernible conclusions can be drawn in relation to features of imagery and young people with low mood. Interesting effects were noted in relation to the valence of cue words and emotion generated in the EFT-T. This element of the study was introduced by a young person with lived experience of depression and therefore has important clinical grounding. Future research could continue to explore the complex relationship between features of mental imagery and emotion and how this relates to individual differences in young people with low mood.

IV. Integration, impact and dissemination plan

Integration

This research is composed of two separate but connected research studies. The theme of prospective imagery in young people is central to both projects. I was drawn to this topic because having experienced insomnia as a child, I used to imagine a future day of happiness in specific detail and by way of what I assume was the agreeable effect this had on me, would often fall asleep before I could imagine it for very long. This experience taught me one way that future thinking can be used and when the opportunity arose, I was keen to investigate this topic.

The first chapter of this thesis was a systematic review that searched the literature for studies of children and young people which had incorporated a future thinking task and assessed its impact on mood. This addressed the research questions, "what types of future thinking interventions have been used with children and young people?" and "what is the evidence that future thinking interventions have impacted on affect in children and young people?". The second chapter comprised the empirical project, which was a study of features of imagery generated by young people with low mood when imagining the future. Both of these projects aimed to identify how future thinking may lead to improvements in mood. The systematic review looked at future thinking tasks more broadly but the empirical study aimed to elicit the internal features of prospective imagery which are themselves related to affect.

The systematic review synthesised 21 studies that had incorporated a future thinking task. These studies could be grouped into three distinct types of intervention. One group were Controlled Worry tasks that had manipulated the way young people were asked to worry and think negatively about the future. The majority of studies fell

into the Positive Interventions group, with most using the Best Possible Self intervention to elicit positive future thinking. The last group, termed the Episodic Future Thinking group, required participants to think about specific episodes in the future and manipulated various elements of this instruction, such as the temporal distance of the episode. The empirical study intervention would have fallen into this category of studies. The systematic review found that there was evidence that future thinking interventions led to changes in affect in young people, although the evidence for younger samples was lacking. The review overall included studies with mostly samples of undergraduate groups and 14 studies had participants over the age of 24, weakening the validity of this being a review of future thinking in young people. The empirical study sample was also comprised of mostly undergraduate students although the inclusion age range had been 16-21 years. Both of these studies were therefore limited in finding the effects of future thinking in younger samples and particularly child-age groups.

The outcome measure used in the empirical study was the Patient Health Questionnaire-8 (PHQ-8; Kroenke et al., 2009) which is the same as the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) without Item 9 that identifies risk of suicide and self-harm. The PHQ-9 is used widely in the UK as a screening tool for depression in clinical services in the UK (Gyani et al., 2013) and therefore the PHQ-8 was considered a suitable adapted measure for screening for low mood in the study. However the PHQ-8 was not used for any of the studies in the systematic review, which featured an array of other psychological measures.

Most of the systematic review studies measured mood immediately before and after the intervention, with some including follow-up measures. The empirical study

used the PHQ-8 immediately before the intervention, but as it asks the recipient to consider the frequency of statements over the last 2 weeks, and it would be unlikely to change immediately after an hour-long intervention. It might have been expected that there would be a change on PHQ-8 at 1 week follow-up, but this was not found. The systematic review indicated that the benefits of future thinking on mood may pertain to the time period immediately after the intervention, and therefore this is in-keeping of why no such effect was found in the empirical study as no mood measure was repeated at that time. Some of the systematic review studies that found significant improvements in mood incorporated homework tasks. With this knowledge, if the empirical study had incorporated a homework task, there might have been more of a change in PHQ-8 at follow up.

Future research

Future thinking is an area that could benefit from further research, however as a subjective, internal process it may remain complex to study the mechanisms of it. There are a variety of ways of facilitating and instructing future thinking tasks and measuring outcomes on mood. For more consistent evidence, studies with similar methodologies, interventions and measures would be needed. More research in younger groups would also be of benefit to the knowledge base. Both studies discussed how individual differences in future thinking may have a role and this would also be important to explore in future research.

Challenges of the research

When scoping the literature for potential gaps in future thinking research that a systematic review could address, there were several existing, similar systematic

review proposals registered on Prospero (www.crd.york.ac.uk). Therefore it was an early challenge to ensure that this systematic review was novel, valuable and likely to build the evidence base.

The systematic review aimed to find studies that had incorporated future thinking and the effects on mood. However, there is not one identified term to encompass what the review was searching for, and how studies might have described their future thinking element. For this reason, there needed to be generous search criteria, which then yielded a large volume of results. This was not unlike Schubert et al. (2020), which reviewed future thinking interventions in adults. Many of the studies screened in the systematic review were completely unrelated to the field of interest which expedited the screening process for the author. However, for the second reviewer, who was less familiar with the study theory and this eligibility criteria, this was a time-consuming process. The initial proposal for the systematic review had stated that 50% of articles would be screened by a second reviewer; in consideration of the second reviewer and the large volume of results, this was amended to 20% and re-submitted to Prospero (www.crd.york.ac.uk).

Initially, another empirical research project on an entirely unrelated subject had been planned, that then fell-through due to the Covid-19 pandemic second wave. As a result of this, the author was late in joining the research group. This meant that the present empirical study needed to be designed within the constraints of the protocol of the Kings College London (KCL) study. It had been the plan to co-facilitate recruitment and data collection, however this was ultimately not possible, as it took time for the present study research proposal to be approved and for ethics amendments to be accepted, by which point all data had been collected. While this

was disappointing, it meant that there could be more input into the development of the coding of features and data analysis.

A second, related challenge was how to handle the data that had already been collected, as participants could not be asked clarifying questions about their imagery, which is potentially important as imagery can be a particularly subjective phenomenon. The KCL study only used the EFT-T responses to determine whether each imagined event was specific or not (an event occurring within a day). This meant that as soon as a participant had given sufficient information indicating whether the event was specific or not, there were no more prompts. This led to heterogeneity in the length of responses, that limited the extent the data could be consistently analysed. The adapted autobiographical interview (Addis et al., 2008) was considered in the development of the coding however this has been used previously on longer descriptions. Some responses in the present study were only a sentence in length. Therefore the coding strategy needed to be developed in a way that could best capture the features coherently and consistently on data that had originally had another purpose. This was why it was important to check the coding with the researcher who had collected the data, discuss with the project supervisors who had previous experience of the EFT-T and conduct a pilot.

Impact

The findings of the systematic review and empirical study must both be treated with caution. The systematic review included 14 studies whereby some participants were over the age of 24, therefore reducing the validity of this being a systematic review of how future thinking tasks have been used with young people. The empirical project found no convincing effects and the perspective feature in particular had weak

inter-rater reliability. Notwithstanding these notable limitations, the following findings could be considered helpful to various stakeholders.

Key messages

- **Future thinking has been used as a key ingredient of interventions that have influenced affect in young people.**

  The systematic review identified 31 instances where interventions including future thinking had been used with young people. Of these interventions, many led to changes in affect.

- **Homework or independently administered visualisation tasks may boost the effects of affect.**

In the systematic review, a notable difference between the studies that reported significant effects and those that reported non-significant effects were the use of follow-up tasks, particularly those that required visualisation of the future. As children and young people often receive homework from school, it may be that this is a feasible way of boosting the effects of the intervention. Imagining the future rather than just thinking about it in language form is likely to be particularly helpful.

- **Future thinking as an ingredient of intervention can be used in different ways to produce different effects on mood in the short term**

  The systematic review identified interventions of different valences, including positive and negative future thinking. Positive future thinking led to short term improvements in mood as expected. The controlled worry studies

featured in the study were not designed to create a negative mood per se but to explore the effects of different ways of worrying.

- **Individual differences in how young people construct future images is worthy of further exploration.**

In the empirical study, there were young people who used dampening for all of their images, and there were many more young people who never used this feature. Dampening strategies did not correlate with low mood scores and so it would be interesting to explore whether there are other reasons as to why this occurred. Descriptions that contained dampening created a particularly negative frame for the described image, reminiscent of what might be expected in someone with low mood.

- **More research is needed to understand the development of future thinking in young people**.

While both the systematic review and empirical study aimed to investigate future thinking in young age-groups, both were limited in this endeavour. The systematic review found only a few studies with child and adolescent samples, and many of the empirical study participants were undergraduates including older participants. This indicates the difficulties in recruiting younger people where consent may be needed from parents and the requirements of alternative incentives to course credit. Despite this, it is a research imperative to investigate the development of future thinking in younger people. It is very tentative evidence but the systematic review studies with younger samples did not significant effects, and the test group of the empirical study, who had a younger mean age, generally

scored lower across the features than the control group. As future thinking is a developing process, research is required on younger groups to assess when these developments in future thinking ability occur.

Key beneficiaries

Schools

A finding of the systematic review screening process was the number of positive interventions including the Best Possible Self that had already been implemented in schools to improve wellbeing. Schools are increasingly being tasked with offering interventions to support their students' wellbeing (Public Health England, 2021). The findings from this systematic review indicate that the Best Possible Self intervention can leads to some improvements in affect, and so this is an example of an intervention that schools could implement as a wellbeing initiative.

Young people and families

Children, adolescents and young people may be motivated to do things that improve their own wellbeing. In today's society, young people are increasingly aware of social and personal issues such as enjoying good mental and physical health. For this reason, interventions such as the Best Possible Self that have been shown to be effective for young people in the short term, could be promoted to young people as an exercise to boost wellbeing. Parents are likely to want to support their children if it is likely to help their wellbeing, as well as support them with positive goals for the future.

Clinical impact

The systematic review found studies with non-clinical young samples but some studies had induced low mood and screened for low mood. In these studies future thinking was found to be helpful for improving mood in the short term and as such may it is possible that future thinking could be developed and used for treatments for low mood in children in the future. The learning from controlled worry interventions may also be helpful in treating young children with excessive worry, with the guidance for worries to be imagined rather than thought about in verbal form, which is likely to reduce negative affect.

The empirical study explored features of imagery. Features of imagery may be important clinically but this study has not found evidence of relationships between imagery and levels of depression, or whether imagery can change following brief interventions. This study has therefore not found evidence to support features of imagery being a treatment target in depression. Cognitive behavioural therapy can incorporate imagery exercises and clinicians treating young people for low mood could enquire about the young person's use of imagery features, enquiring whether imagining things in first person elicits greater affect for example. It may be that training in how to use features will enable young people to be able to have more control over the features of their imagery, for example, choosing to adopt an observer position when wanting to disengage from distressing images. Overall this study has found no evidence that young people alter their imagery following an imagery enhancing exercise but it is possible that more explicit imagery training guidelines could lead to changes.

Research impact

Both the systematic review and empirical study identified difficulties in recruiting younger people to investigate future thinking. This highlighted a research gap in understanding which could be filled with more studies with child samples.

The coding strategy designed in the empirical study was straightforward to use with good inter-rater reliability for features except perspective. This indicates that this could be a way of quantifying features in imagery descriptions. A strength of this coding system was that it was designed for data that had already been collected and so could be used by other studies on archival data.

Personal impact

I consider myself a visual learner and thinker and was therefore drawn to a project grounded in imagery. The findings of this project have taught me strategies about how to purposely use imagery to my advantage, putting a name to things I intuitively knew but was not aware of. Imagining things in detail to create a pleasurable experience for me, is more interesting and helpful as a coping strategy than mindfulness, which is comparable in the sense of training the mind and focus of attention. I have found that since beginning this project I have found myself asking clients about their imagery more often and been more curious about the effect this has on their emotions. I have also used guided imagery more often as a therapeutic tool and found that this has been well-received. As such this project on future imagery has had an important impact on my clinical work and has served to expand my therapeutic repertoire.

Dissemination

Dissemination is the process of sharing research findings to relevant audiences and is an integral element of a research project (Marín-González et al., 2017). Only through effective dissemination can research findings contribute to greater knowledge in the field and lead to change.

First, participants and researchers who were involved in the empirical project will receive a summary of the findings. As participants were young people, care will be taken to ensure the findings are in lay language suitable for 16-21 year olds. The expert by experience who participated in the original research may be consulted again for this purpose.

The project has already been presented in an academic forum to clinical psychology doctoral trainees and course staff at Royal Holloway University of London. This forum was an opportunity to present the research theory, methodology, findings and conclusions and was an opportunity for peer feedback on all areas of the empirical project. This project therefore served to inspire and share learning with peer researchers. The forum enabled discussion around the possible differences between features in past and future imagery, and how research might reasonably explore the spectrum of aphantasia (absence of imagery) to perphantasia (photo-like imagery ability). This was then considered in the consolidation of this thesis where appropriate.

The empirical project will be written for publication in peer reviewed journals, with consideration given to journal relevance and impact factor. A similar study looking at the phenomenological features of imagery in young people with social anxiety disorder (Liang et al., 2021) was published in the Journal of Behaviour

Therapy and Experimental Psychiatry and therefore might be fitting for this study. Easterbrook et al., (1991) found that studies that have significant findings are more likely to be published, a phenomenon known as publication bias. The empirical study did not yield significant findings and as such its value and contribution will have to be emphasised in order to overcome this bias.

The systematic review yielded a range of significant effects that would be of value to disseminate further. The Prospero record for this study (found at www.crd.york.ac.uk) will be updated to state that the review is complete and a report of findings will be uploaded.

For this study to be accepted for publication, it is likely that the findings would need to be subjected to meta-analysis. This would require further statistical analysis, which is feasible. Following this, suitable journals could be approached for peer review and may include those that publish research on children and adolescents. The systematic review also found similar findings to a systematic review of future thinking in adults (Schubert et al., 2020) which was published in Clinical Psychology Review, and so this journal may also be considered.

The thesis in its entirety will be uploaded to Pure, Royal Holloway University of London's research information system. Here it can be accessed by future researchers researching the topic of future thinking and can be used as grey literature for further understanding in the field.

V. References

Addis, D., Wong, A. & Schacter, D. (2008). Age-related changes in the episodic

    simulation of future events. *Psychological Science,19*(1), 33-41.

Alpizar, D., Plunkett, S. W., & Whaling, K. (2018). Reliability and validity of the 8-

    item Patient Health Questionnaire for measuring depressive symptoms of

    Latino emerging adults. *Journal of Latina/o Psychology*, *6*(2), 115.

Andrade, J., May, J., Deeprose, C., Baugh, S. & Ganis, G. (2014). Assessing

    vividness of mental imagery: the Plymouth Sensory Imagery Questionnaire.

    British Journal of Psychology, 105, 547-563.

Angold, A., Costello, E. J., Messer, S. C., Pickles, A., Winder, F., & Silver, D.

    (1995). The development of a short questionnaire for use in epidemiological

    studies of depression in children and adolescents. *International Journal of*

    Methods in Psychiatric Research, 5, 237–249.

Andersen, E., Malmgren, J., Carter, W., & Patrick, W. (1994). Screening for

    depression in well older adults: Evaluation of a short form of the CES-D.

    American Journal of Preventive Medicine, 10(2), 77–84.

Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., ... & Sharma, S.

    (2013). Maturation of the adolescent brain. *Neuropsychiatric disease and*

    treatment, *9*, 449.

Atance, C. & Meltzoff, A. (2005). My future self: young children's ability to

    anticipate and explain future states. *Cognitive Development*, 20, 341-361.

Atance, C. (2008). Future thinking in young children. *Current Directions in Psychological Science*, *17*(4), 295-298.

Atance, C. (2015). Young children's thinking about the future. *Child Development Perspectives*, *9*(3), 178-182.

Austenfeld, J. & Stanton, A. (2008). Writing about emotions versus goals: effects of hostility and medical care utilization moderated by emotional approach coping processes. *Journal of Health Psychology, 13*, 25-38.

Auyeung, L. & Mo, P. (2019). The efficacy and mechanism of online positive psychological intervention (PPI) in improving well-being among Chinese university students: a pilot study of the best possible self intervention. *Journal of Happiness Studies*, 20, 2525-2550.

Barrera, T. L., & Norton, P. J. (2009). Quality of life impairment in generalized anxiety disorder, social phobia, and panic disorder. *Journal of anxiety disorders*, *23*(8), 1086-1090.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). Cognitive therapy of depression. New York: Guilford Press.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). BDI-II manual (2nd ed.). San Antonio: Psychological Corporation.

Beni, R., Pazzaglia, F. & Gardini, S. (2007). The generation and maintenance of visual mental images: evidence from image type and aging. *Brain and Cognition*, 63, 271-278.

Bergmann, J., Genç, E., Kohler, A., Singer, W. & Pearson, J. (2016). Smaller primary

   visual cortex is associated with stronger but less precise mental imagery.

   Cerebral Cortex, 26, 3838-3850.

Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., et al.

   (1997). The Screen for Child Anxiety Related Emotional Disorders

   (SCARED): Scale construction and psychometric characteristics. *Journal of*

   the American Academy of Child and Adolescent Psychiatry, 36(4), 545–553.

   https://doi.org/10.1097/00004 583-199704000-00018.

Borkovec, T.D., & Nau, S.D. (1972). Credibility of analogue therapy rationales.

   Journal of Behaviour Therapy and Experimental Psychiatry, 3, 257–260.

Borkovec, T., Ray, W. & Stöber, J. (1998). Worry: a cognitive phenomenon

   intimately linked to affective, physiological and interpersonal behavioral

   processes. *Cognitive Therapy and Research*, *22*(6), 561-576.

Brown, G. P., MacLeod, A. K., Tata, P., & Goddard, L. (2002). Worry and the

   simulation of future outcomes. *Anxiety, Stress, and Coping*, 15, 1–17.

   https://doi.org/10.1080/10615800290007254

Buhr, K., & Dugas, M.J. (2002). The intolerance of uncertainty scale: psychometric

   properties of the English version. *Behaviour Research and Therapy*, 40, 931–

   946.

Burnett Heyes, S., Pictet, A., Mitchell, H., Raeder, S. M., Lau, J. Y. F., Holmes, E. A.,

   & Blackwell, S. E. (2017). Mental imagery-based training to modify mood and

   cognitive bias in adolescents: Effects of valence and perspective. *Cognitive*

   Therapy and Research, *41*(1), 73-88.

Busby-Grant, J. & Wilson, N. (2021). Manipulating the valence of future thought: the

    effect on affect. *Cognition, Language and Development, 124*(1), 227-239.

Bywaters, M., Andrade, J., & Turpin, G. (2004). Determinants of the vividness of

    visual imagery: The effects of delayed recall, stimulus affect and individual

    differences. *Memory*, *12*(4), 479-488.

Callow, N., Roberts, R., & Fawkes, J. Z. (2006). Effects of dynamic and static

    imagery on vividness of imagery, skiing performance, and confidence. *Journal*

    of Imagery Research in Sport and Physical Activity, *1*(1).

Carrillo, A., Rubio-Aparicio, M., Molinari, G, Enrique, A., Sánchez-Meca, J. &

    Baños, R. (2019). Effective of the best possible self intervention: a systematic

    review and meta-analysis. *Plos One*, *14*(9), e0222386.

Caruso, E. (2010). When the future feels worse than the past: a temporal

    inconsistency in moral judgment. *Journal of Experimental Psychology:*

    General, 139(4), 610-624.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies:

    A theoretically based approach. *Journal of Personality and Social Psychology*,

    56, 267–283. http://dx.doi.org/10.1037/0022-3514 .56.2.267

Centre for Reviews and Dissemination, University of York. (2008). Systematic

    Reviews: CRD's guidance for undertaking reviews in health care. CRD: York,

    UK.

Chapman, J., Halldorsson, B., & Creswell, C. (2020). Mental imagery in social

    anxiety in children and young people: a systematic review. *Clinical child and*

    family psychology review, *23*(3), 379-392.

Chen, J., Yang, L-Q., Zhang, Z-J., Ma, W-T., Xing-qu, W., et al. (2013). The
association between the disruption of motor imagery and the number of
depressive episodes of major depression. *Journal of Affective Disorders*, 150,
337–43.

Clark, L. & Watson, D. (1991). Tripartite model of anxiety and depression:
psychometric evidence and taxonomic implications. *Journal of Abnormal
Psychology*, 100(3), 316-336.

Cocude, M., Charlot, V. & Denis, M. (1997). Latency and duration of visual mental
images in normal and depressed subjects. *Journal of Mental Imagery*, 21, 127–
142.

Cohen, S., Kamarck, T., Mermelstein, R., 1983. A global measure of perceived stress.
J. Health Soc. Behav. 24, 386–396. https://doi.org/10.2307/2136404.

Cohen, L., van den Bout, J., Kramer, W., & Vliet, T. (1986). A Dutch attributional
style questionnaire: psychometric properties and findings of some Dutch
American differences. *Cognitive Therapy and Research, 10*(6), 665e669.

Conti, F. & Irish, M. (2021). Harnessing visual imagery and oculomotor behaviour to
understand prospection. *Trends in Cognitive Sciences*, 25(4), 272-283.

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule
(PANAS): Construct validity, measurement properties and normative data in a
large non-clinical sample. *British journal of clinical psychology*, 43(3), 245-
265.

Crumbaugh, J. C., & Maholick, L. T. (1964). An experimental study in existentialism: The psychometric approach to Frankl's concept of noogenic neurosis. *Journal of Clinical Psychology*, 20, 200–207.

D'Argembeau, A. & Van Der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and Cognition*, 12, 844-858.

D'Argembeau, A. & Van Der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: the effect of vivid visual imagery and emotion regulation strategies. *Consciousness and Cognition*, 15, 342-350.

D'Argembeau, A., Renaud, O. & Van Der Linden, M. (2011). Frequency, characteristics and functions of future-oriented thoughts in daily life. *Applied Cognitive Psychology,* 25, 96-103.

D'Argembeau, A., Lardi, C. & Van Der Linden, M. (2012). Self defining future projections: exploring the identity function of thinking about the future. *Memory*, *20*(2), 110-120.

Demeyer, I. & De Raedt, R. (2014). The effect of future time perspective manipulation on affect and attentional bias. *Cognitive Therapy Research*, 38, 302-312.

Dreher, D. E., Holloway, K. A., & Schoenfelder, E. (2007). The vocation identity questionnaire: Measuring the sense of calling. *Research on the Social Scientific Study of Religion,* 18, 99–120.

Diener, E., Emmons, R. A., Larsen, R. J., & Grifn, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49, 71–75. https://doi.org/10.1207/s15327752jpa4901.

Diener, E., & Emmons, R. A. (1984). The independence of positive and negative affect. *Journal of Personality and Social Psychology*, 47, 1105–1117.

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D., Oishi, S., et al. (2009). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research, 97*(2), 143–156. https://doi.org/10.1007/s11205-009-9493-y.

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D., & won, Oishi, S Biswas-Diener, R. . (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research*, 97(2), 143–156. https://doi.org/10.1007/s11205-009-9493-y.

Duan, S., Exter, M., Newby, T. & Fa, B. (2021). No impact? Long term effects of applying the best possible self intervention in a real-world undergraduate classroom setting. *International Journal of Community Well-being, 4,* 581-601.

Easterbrook, P., Gopalan, R., Berlin, J. & Matthews, D. (1991). Publication bias in clinical research. *The Lancet*, *337*(8746), 867-872.

Enrique, A., Breton-Lopez, J., Molinari, G., Banos, R. & Botella, C. (2018). Efficacy of an adaptation of the Best possible self intervention implemented through positive technology: a randomized control trial. *Applied Research Quality Life*, 13, 671-689.

Feldman Barrett, L., & Russell, J. A. (1998). Independence and bipolarity in the structure of current affect. *Journal of Personality and Social Psychology*, 74, 967–984.

Feldman, D. B., Rand, K. L., & Kahle-Wrobleski, K. (2009). Hope and goal attainment: Testing a basic prediction of hope theory. *Journal of Social and Clinical Psychology*, 28, 479–497.

Feldman, D. & Dreher, D. (2012). Can hope be changed in 90 minutes? Testing the efficacy of a single session goal-pursuit intervention for college students. *Journal of Happiness Studies*, 13, 745-759.

Foster, C., Startup, H., Potts, L. & Freeman, D. (2010). A randomised controlled trial of a worry intervention for individuals with persistent persecutory delusions. *Journal of Behavior Therapy and Experimental Psychiatry*, 41, 45-51.

Frala, J., Mischel, E., Knapp, A., Autry, K. & Leen-Feldner, E. (2014). Adolescent worry induction: an experimental laboratory evaluation. *Journal of Experimental Psychopathology*, *5*(1), 52-71.

Freeman, D., Dunn, G., Startup, H., Pugh, K., Cordwell, J., Mander, H., ... & Kingdon, D. (2015). Effects of cognitive behaviour therapy for worry on persecutory delusions in patients with psychosis (WIT): a parallel, single-blind, randomised controlled trial with a mediation analysis. *The Lancet Psychiatry*, *2*(4), 305-313.

Frein, S. & Ponsler, K. (2014). Increasing positive affect in college students. *Applied Research Quality Life*, 9, 1-13.

Frisch, M.B. (1994). Quality of Life Inventory: Manual and treatment guide.

    Minneapolis: National Computer Systems.

Gaesser, B., Sacchetti, D. C., Addis, D. R., & Schacter, D. L. (2011). Characterizing

    age-related changes in remembering the past and imagining the

    future. *Psychology and Aging, 26*(1), 80–84.

Gamble, B., Moreau, D., Tippett, L. & Addis, D. (2019). Specificity of future thinking

    in depression: a meta-analysis. *Perspectives on Psychological Science*, *14*(5),

    816-834.

Gatzounis, R., Meulders, A. (2022). Pain and avoidance: The potential benefits of

    imagining your best possible self. *Behaviour Research and Therapy*. DOI:

    https://doi.org/10.1016/j.brat.2022.104080.

Glaesmer, H., Grande, G., Braehler, E., & Roth, M. (2011). The German version of

    the Satisfaction With Life Scale (SWLS). *European Journal of Psychological*

    Assessment, 27, 127–132.

Gibson, B., Umeh, K., Newson, L. & Davies, I. (2021). Efficacy of the best possible

    self protocol in diabetes self-management: a mixed methods approach. *Journal*

    of Health Psychology, *26*(3), 332-344.

Goodyer, I. M., Reynolds, S., Barrett, B., Byford, S., Dubicka, B., Hill, J., ... &

    Senior, R. (2017). Cognitive behavioural therapy and short-term

    psychoanalytical psychotherapy versus a brief psychosocial intervention in

    adolescents with unipolar major depressive disorder (IMPACT): a multicentre,

    pragmatic, observer-blind, randomised controlled superiority trial. *The Lancet*

    Psychiatry, 4(2), 109-119.

Government response to the consultation on transforming children and young

    people's mental health provision: a green paper and next steps. (2018).

    Department of Health and Social Care / Department of Education.

    www.gov.uk

Gott, C. & Lah, S. (2014). Episodic future thinking in children compared to

    adolescents. *Child Neuropsychology*, *20*(5), 625-640.

Guillemin, F., Bombardier, C., & Beaton, D. (1993). Crosscultural adaptation of

    health-related quality of life measures: Literature review and proposed

    guidelines. *Journal of Clinical Epidemiology*, 46, 1417–1432.

Gyani, A., Shafran, R., Layard, R., & Clark, D. M. (2013). Enhancing recovery rates:

    lessons from year one of IAPT. *Behaviour research and therapy*, *51*(9), 597-

    606.

Hallford, D., Austin, D., Takano, J., & 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.

Hallford, D., Barry, T., Austin, D., Raes, F., Takano, K., & Klein, B. (2020a). *Journal*

    of Affective Disorders, 260, 536-543.

Hallford, D. J., Takano, K., Raes, F., & Austin, D. W. (2020b). Psychometric

    Evaluation of an Episodic Future Thinking Variant of the Autobiographical

    Memory Test–Episodic Future Thinking-Test (EFT-T). *European Journal of*

    Psychological Assessment, 36(4), 658-669.

Hallford, D. J., & Grant, J. B. (2022). Characteristics of Episodic Future Thinking in

Anxiety: A Systematic Review and Meta-Analysis.

DOI: 10.31234/osf.io/ufkxh.

Hankin, B. L. (2006). Adolescent Depression: Description, causes, and

interventions. *Epilepsy & behavior*, 8(1), 102-114.

Harrist, S., Carlozzi, B., McGovern, A. & Harrist, A. (2007). Benefits of expressive

writing and expressive talking about life goals. *Journal of Research in*

Personality, 41, 923-930.

Harter, S. (1982). The perceived competence scale for children. Child Development,

53, 87–97. doi:10.2307/1129640.

Hautzinger, M., Keller, F., & Kühner, C. (2006). Beck Depressions-Inventory (BDI-

II). Frankfurt: Harcourt Test Services.

Heekerens, J., Eid, M. & Heinitz, K. (2020). Dealing with conflict: Reducing goal

ambivalence using the best-possible-self intervention. *The Journal of Positive*

Psychology, 15(3), 325-337. DOI: 10.1080/17439760.2019.1610479

Heekerens, J. & Eid, M. (2021). Inducing positive affect and positive future

expectations using the best-possible-self intervention: A systematic review and

meta-analysis. *The Journal of Positive Psychology, 16*(3), 322-347. DOI:

10.1080/17439760.2020.1716052

Holmes, E. & Mathews, A. (2005). Mental imagery and emotion: a special

relationship? *Emotion, 5*(4), 489-497.

Holmes, E., Mathews, A., Mackintosh, B., & Dalgleish, T. (2008a). The causal effect of mental imagery on emotion assessed using picture-word cues. *Emotion*, *8*(3), 395-409.

Holmes, E., Lang, T. J., Moulds, M. L., & Steele, A. M. (2008b). Prospective and positive mental imagery deficits in dysphoria. *Behaviour research and therapy*, *46*(8), 976-981.

Holmes, E., Coughtrey, A. & Connor, A. (2008c). Looking at or through rose-tinted glasses? Imagery perspective and positive mood. *Emotion*, *8*(6), 875-879.

Holmes, E., Blackwell, S., Burnett-Hayes, S., Renner, F. & Raes, F. (2016). Mental imagery in Depression: phenomenology, potential mechanisms and treatment implications. *Annual Review of Clinical Psychology*, 12, 249-80.

Isaac, A. R., & Marks, D. F. (1994). Individual differences in mental imagery experience: developmental changes and specialization. *British Journal of Psychology*, *85*(4), 479-500.

Jason, L., Schade, J. & Furo, L. (1989). Time orientation: past, present and future perceptions. *Psychological Reports*, 64, 1199-1205.

Javidan, M. (2007). Forward-thinking cultures. *Harvard Business Review*, *85*(7-8), 20.

Jennings, R. E., Lanaj, K., Koopman, J., & McNamara, G. (2022). Reflecting on one's best possible self as a leader: implications for professional employees at work. *Personnel Psychology*, *75*(1), 69-90.

Jing, H., Madore, K. & Schacter, D. (2016). Worrying about the future: an episodic

specificity induction impacts problem-solving, reappraisal and well-being.

Journal of Experimental Psychology: General, *145*(4), 402-418.

Joorman, J., Siemer, M. & Gotlib, I. (2007). Mood regulation in depression:

differential effects of distraction and recall of happy memories on sad mood.

Journal of Abnormal Psychology, *116*(3), 484-490.

Joiner, T. E., Catanzaro, S. J., & Laurent, J. (1996). Tripartite structure of positive and

negative affect, depression, and anxiety in child and adolescent psychiatric

inpatients. *Journal of Abnormal Psychology*, 105, 401-409.

http://dx.doi.org/10.1037/0021-843X.105.3.401

Kandel, D. B. (1986). Processes of peer influences in adolescence. In *Development as

action in context* (pp. 203-227). Springer, Berlin, Heidelberg.

Kavanagh, D. J., May, J., & Andrade, J. (2009). Tests of the elaborated intrusion

theory of craving and desire: Features of alcohol craving during treatment for

an alcohol disorder. *British Journal of Clinical Psychology*, *48*(3), 241-254.

Kearns, S. M., & Creaven, A. M. (2017). Individual differences in positive and

negative emotion regulation: Which strategies explain variability in

loneliness?. *Personality and mental health*, *11*(1), 64-74.

Keller, A., Leikauf, J., Holt-Gosselin, B., Staveland, B. & Williams, L. (2019). Paying

attention to attention in depression. *Translational Psychiatry*, 9, 279.

https://doi.org/10.1038/s41398-019-0616-1

Kemper, C. J., Lutz, J., & Neuser, J. (2012). Konstruktion und Validierung einer

    Kurzform der Skala Angst vor negativer Bewertung (SANB-5*). Klinische*

    Diagnostik und Evaluation, 4, 343e3

Koletzko, S., Herrmann, M., & Brandstatter, V. (2015). Unconflicted goal striving:

    Goal ambivalence as a mediator between goal self-concordance and well-

    being. *Personality and Social Psychology Bulletin*, 41, 140–156.

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy

    mind. *Science*, *330*(6006), 932-932.

King, L. A. (2001). The health benefits of writing about life goals. *Personality and*

    Social Psychology Bulletin, *27*(7), 798-807.

Kosslyn, S., Ganis, G. & Thompson, W. (2001). Neural foundations of imagery.

    Nature Reviews Neuroscience, 2, 635-642. DOI 0.1038/35090055

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief

    depression severity measure. *Journal of General Internal Medicine*, *16*(9),

    606-613.

Kroenke, K., Strine, T., Spitzer, R., Williams, J., Berry, J. & Mokdad, A. (2009). The

    PHQ-8 as a measure of current depression in the general population. *Journal*

    of Affective Disorders, *114*(1-3), 163-173.

Krohne, H. W., Egloff, B., Kohlmann, C. W., & Tausch, A. (1996). Positive and

    negative affect schedule--German version. *Diagnostica*.

Kuyken, W., & Howell, R. (2006). Facets of autobiographical memory in adolescents
with major depressive disorder and never-depressed controls. *Cognition &
Emotion, 20*(3–4), 466–487. https://doi.org/10.1080/ 02699930500342639.

Kuyken, W. & Moulds, M. (2009). Remembering as an observer: How is
autobiographical memory retrieval vantage perspective linked to depression?
Memory, 17(6), 624-634, DOI: 10.1080/09658210902984526

Lang, P. J. (1980). Behavioral treatment and bio-behavioral assessment: Computer
applications. In J. B. Sidowski, J. H. Johnson, & T. A. Williams (Eds.),
Technology in mental health care delivery systems (pp. 119-137). Norwood,
NJ: Ablex.

Laurent, J., Salvatore, J. C., Joiner, T. E., Rudolph, K. D., Potter, K. I., Lambert, S., ...
Gathright, T. (1999). A measure of positive and negative affect for children:
Scale development and preliminary validation. *Psychological Assessment*, 11,
326–338. doi:10.1037/1040- 3590.11.3.326

Layous, K., Nelson, S. & Lyubomirsky, S. (2013). What is the optimal way to deliver
a positive activity intervention? The case of writing about one's best possible
selves. *Journal of Happiness Studies*, 14, 635-654.

Leigh, E. & Hirsch, C. (2011). Worry in imagery and verbal form: effect on residual
working memory capacity. *Behaviour Resarch and Therapy*, 49, 99-105.

Liang, C., Huang, Y., & Hung, F. (2021). Apprehension about the future:
investigating the phenomenological characteristics of episodic future thinking
in socially anxious adolescents. *Journal of Behavior Therapy and
Experimental Psychiatry*, 73, 101668.

Liau, A., Neihart, M., Teo, C. & Lo, C. (2016). Effects of the best possible self
activity on subjective well-being and depressive symptoms. *Asia-Pacific
Education Research*, *25*(3), 473-481.

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(3),
335–343.

Luna, B., Garver, K., Urban, T., Lazar, N. & Sweeney, J. (2004). Maturation of
cognitive processes from late childhood to adulthood. *Child Development,
75(*5), 1357-1372.

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness:
Preliminary reliability and construct validation. *Social Indicators Research*,
46, 137–155.

Lyubomirsky, S., Dickerhoof, R., Boehm, J. & Sheldon, K. (2011). Becoming happier
takes both a will and a proper way: an experimentl longitudinal intervention to
boost wellbeing. *Emotion, 11*(2), 391-402.

Mackinnon, A., Jorm, A. F., Christensen, H., Korten, A. E., Jacomb, P. A., &
Rodgers, B. (1999). A short form of the positive and negative affect schedule:
evaluation of factorial validity and invariance across demographic variables in
a community sample. *Personality and Individual Differences*, 27, 405-416.

MacLeod, A. K. (1996). Affect, emotional disorder, and future-directed thinking.
Cognition & Emotion, 10(1), 69-86.

MacLeod, A. K., & Byrne, A. (1996). Anxiety, depression, and the anticipation of

future positive and negative experiences. *Journal of Abnormal*

Psychology, *105*(2), 286.

Marín-González, E., Malmusi, D., Camprubi, L. & Borrell, C. (2017). The role of

dissemination as a fundament part of a research project: lesson learning from

SOPHIE. *International Journal of Health Services*, *47*(2), 258-276.

McIntosh, C. & Crino, R. (2013). Towards a unified worry exposure protocol for

generalised anxiety disorder: a pilot study. *Behaviour Change*, *30*(3), 210-225.

McLaughlin, K., Borkovec, T., & Sibrava, N. (2007). The effects of worry and

rumination on affect states and cognitive activity. *Behavior Therapy*, 38, 23-

38.

Meevissen, Y., Peters, M., & Alberts, H. (2011). Become more optimistic by

imagining a best possible self: effects of a two week intervention. *Journal of*

Behavior Therapy and Experimental Psychiatry, 42, 371-378.

Meiser-Stedman, R., Dalgleish, T., Yule, W., & Smith, P. (2012). Intrusive memories

and depression following recent non-traumatic negative life events in

adolescents. Journal of Affective Disorders, 137(1–3), 70–78.

https://doi.org/10.1016/j.jad.2011.12.020

Meyer, T., Miller, M., Metzger, R., Borkovec, T. (1990). Development and validation

of the penn state worry questionnaire. *Behaviour Research and Therapy,*

28(6), 487-495.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., ... &

Stewart, L. A. (2015). Preferred reporting items for systematic review and

meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*, *4*(1), 1-9.

Morina, N., Deeprose, C., Pusowski, C., Schmid, M., & Holmes, E. A. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of anxiety disorders*, *25*(8), 1032-1037.

Moritz, S., Hörmann, C. C., Schröder, J., Berger, T., Jacob, G. A., Meyer, B., ... & Klein, J. P. (2014). Beyond words: Sensory properties of depressive thoughts. *Cognition and Emotion*, *28*(6), 1047-1056.

National Institute for Health and Care Excellence. (2019). *Depression in children and young people: identification and management.* (NICE Guideline No. 134). Retrieved from https://www.nice.org.uk/guidance/ng134

Nelis, S., Holmes, E. A., & Raes, F. (2015). Response styles to positive affect and Depression: Concurrent and prospective associations in a community sample. *Cognitive therapy and research*, *39*(4), 480-491.

Newby-Clark, I. & Ross, M. (2003). Conceiving the past and future. *Personality and Social Psychology Bulletin, 29*(7), 807-818.

Newlove-Delgado, T., Williams, T., Robertson, K., McManus, S., Sadler, K., Vizard, T., Cartwright, C., Mathews, F., Norman, S., Marcheselli, F., Ford, T. (2021). Mental Health of Children and Young People in England. NHS Digital, Leeds.

Newman, M.G., Zuellig, A.R., Kachin, K.E., Constantino, M.J., & Cashman-McGrath, L. (2002). Preliminary reliability and validity of the generalized anxiety disorder questionnaire-IV: A revised self-report diagnostic measure of generalized anxiety disorder. *Behavior Therapy*, 33(2), 215– 233.

Nicolson, N., Peters, M., Meevissen, Y. (2020). Imagining a positive future reduces

    cortisol response to awakening and reactivity to acute stress.

    Psychoneuroendrocinology, 116, 104677.

Nigro, G. & Neisser, U. (1983). Point of view in personal memories. *Cognitive*

    Psychology, 15, 467-482.

Owens, R., & Patterson, M. (2013). Positive Psychological Interventions for Children:

    A Comparison of Gratitude and Best Possible Selves Approaches. *The Journal*

    of Genetic Psychology, *174*(4), 403-428. DOI:

    10.1080/00221325.2012.697496

Pearson, J., Naselaris, T., Holmes, E. & Kosslyn, S. (2015). Mental imagery:

    functional mechanisms and clinical applications. *Trends in Cognitive Sciences*,

    19(10), 590-602.

Perrin, S., Meiser-Stedman, R., & Smith, P. (2005). The Children's Revised Impact of

    Event Scale (CRIES): Validity as a screening instrument for PTSD.

    Behavioural and Cognitive Psychotherapy, 33(04), 487.

    https://doi.org/10.1017/S1352465805002419.

Peters, M., Meevissen, Y., & Hanssen, M. (2013). Specificity of the best possible self

    intervention for increasing optimism: comparison with a gratitude

    intervention. *Terapia Psicologica*, *31*(1), 93-100.

Peters, M., Vieler, J., & Lautenbacher, S. (2015). Dispositional and induced optimism

    lead to attentional preference for faces displaying positive emotions: An eye-

    tracker study. *Journal of Positive Psychology*, 11, 258–269.

Pile, V., & Lau, J. Y. (2018). Looking forward to the future: impoverished vividness
for positive prospective events characterises low mood in adolescence.
Journal of Affective Disorders, 238, 269-276.

Pile, V., Smith, P., Leamy, M., Oliver, A., Blackwell, S., Meiser-Stedman, R., Dunn,
B., Holmes, E. & Lau, J. (2021a). Harnessing mental imagery and enhancing
memory specificity: developing a brief early intervention for depressive
symptoms in adolescence. *Cognitive Therapy and Research*, 45, 885-901.

Pile, V., Smith, P., Leamy, M., Oliver, A., Bennett, E., Blackwell, S., Meiser-
Stedman, R., Stringer, D., Dunn, B., Holmes, E., & Lau, J. (2021b). A
feasibility randomised controlled trial of a brief early intervention for
adolescent depression that targets emotional mental images and memory
specificity (IMAGINE). *Journal of Behavior Research and Therapy.* 143,
103876.

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., ... & Duffy,
S. (2006). Guidance on the conduct of narrative synthesis in systematic
reviews. *A product from the ESRC methods programme Version*, *1*(1), b92.

Quoidbach, J., Berry, E. V., Hansenne, M., & Mikolajczak, M. (2010). Positive
emotion regulation and well-being: Comparing the impact of eight savoring
and dampening strategies. *Personality and individual differences*, *49*(5), 368-
373.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in
the general population. *Applied psychological measurement*, *1*(3), 385-401.

Raffard, S., Esposito, F., Boulenger, J. P., & Van der Linden, M. (2013). Impaired
ability to imagine future pleasant events is associated with apathy in
schizophrenia. *Psychiatry Research*, 209, 393–400.
https://doi.org/10.1016/j.psychres.2013.04.016

Rasmussen, A. & Berntsen, D. (2013). The reality of the past versus the ideality of the
future: emotional valence and functional differences between past and future
mental time travel. *Memory and Cognition,* 41, 187-200.

Renner, F., Schwarz, P., Peters, M., & Huibers, M. (2014). Effects of a best-possible-
self mental imagery exercise on mood and dysfunctional attitudes. *Psychiatry
Research*, 215, 105-110.

Rosenberg, M. (1965). Society and the adolescent self-image. Princeton, NJ:
Princeton University Press.

Sandín, B., Chorot, P., Lostao, L., Joiner, T., Santed, M., & Valiente, R. M. (1999).
Escala PANAS de afecto positivo y negativo: Validación factorial y
convergencia transcultural. Psicothema, 11, 37–51.

Scheier, M., & Carver, C. S. (1985). Optimism, coping and health: Assessment and
implications of generalized outcome expectancies. *Health Psychology*, 4, 219-
247.

Scheier, M.F., Carver, C.S., Bridges, M.W. (1994). Distinguishing optimism from
neuroticism (and trait anxiety, self-mastery, and self-esteem) - a reevaluation
of the Life Orientation Test. *J. Pers. Soc. Psychol.* 67, 1063–1078.
https://doi.org/10.1037// 0022-3514.67.6.1063.

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.

Schwarz, S., Grasmann, D., Schreiber, F., & Stangier, U. (2020). Mental Imagery and

    its Relevance for Psychopathology and Psychological Treatment in Children

    and Adolescents: a Systematic Review. *International Journal of Cognitive*

    Therapy, 13, 303-327.

Seligman, M. & Csikszentmihalyi, M. (2000). Positive psychology. *American*

    Psychologist, *55*(1), 5-14.

Seligson, J., Huebner, E. S., & Valois, R. F. (2003). An investigation of a brief life

    satisfaction scale with elementary school children. *Social Indicators Research*,

    73, 355–374. doi:10.1007/s11205-004-2011-3

Sergeant, S., & Mongrain, M. (2011). Are positive psychology exercises helpful for

    people with depressive personality styles?. *The Journal of Positive*

    Psychology, *6*(4), 260-272.

Skodzik, T., Zettler, T., Topper, M., Blechert, J. & Ehring, T. (2016). The effect of

    verbal and imagery-based worry versus distraction on the emotional response

    to a stressful in-vivo situation. *Journal of Behavior Therapy and Experimental*

    Psychiatry, 52, 51-58.

Skodzik, T., Leopold, A. & Ehring, T. (2017). Effects of a training in mental imagery

    on worry: a proof-of-principle study. *Journal of Anxiety Disorders*, 45, 24-33.

Snyder, C., Harris, C., Anderson, J., Holleran, S., et al. (1991). The will and the ways:

    Development and validation of an individual-differences measure of hope.

Journal of Personality and Social Psychology, 60(4), 570–585.

https://doi.org/10.1037//0022-3514.60.4.570.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). The state-trait anxiety intventory. Palo Alto, CA: Consulting Psychologist.

Stanton, A. L., Kirk, S. B., Cameron, C. L., & Danoff-Burg, S. (2000). Coping through emotional approach: Scale construction and validation. *Journal of Personality and Social Psychology*, 78, 1150–1169.

Steil, R., Weiss, J., Rimane, E., Renneberg, B., & Rosner, R. (2022). Long term efficacy of developmentally adapted cognitive processing therapy in youth with abuse related PTSD—Follow-up of a randomized control trial. *Child Abuse & Neglect*, *132*, 105808.

Sterne, J., Savovic, J.,Page, M., Elbers, R., Blencowe, N., Boutron, I. et al. (2019). RoB 2: a revised tool for assessing risk of bias in randomised trials. *British Medical Journal, 366* :l4898 doi: https://doi.org/10.1136/bmj.l4898

Stöber, J. (1995). Besorgnis: Ein Vergleich dreier Inventare zur Erfassung allgemeiner Sorgen. *Zeitschrift für differentielle und diagnostische Psychologie*, 16(1), 50e63.

Stöber, J. (2000). Prospective cognitions in anxiety and depression: replication and methodological extension. *Cognition and Emotion,14*(5), 725-729.

Stöber, J. & Borkovec, T. (2002). Reduced concreteness of worry in generalized anxiety disorder: findings from a therapy study. *Cognitive Therapy and Research*, *26*(1), 89-96.

Suddendorf, T., Addis, D., & Corballis, M. (2009). Mental time travel and the shaping of the human mind. *Philosophical Transactions: Biological* Sciences, *364*(1521), 1317-1324.

Terasaki, M., Kishimoto, Y., & Koga, A. (1992). Construction of a multiple mood scale. *Japanese Journal of Psychology*, 62, 350–356.

Vassilopoulos, S. P., & Moberly, N. J. (2013). Cognitive bias modification in pre-adolescent children: Inducing an interpretation bias affects self-imagery. *Cognitive therapy and research*, *37*(3), 547-556.

Vella, N. C., & Moulds, M. L. (2014). The impact of shifting vantage perspective when recalling and imagining positive events. *Memory*, *22*(3), 256-264.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology*, *54*(6), 1063.

Watson, D. & Clark, L. A., (1991). The Mood and Anxiety Symptom Questionnaire. Unpublished manuscript, Department of Psychology, University of Iowa, Iowa City.

Watson, D., & Clark, L. A. (1999). The PANAS-X: Manual for the Positive and Negative Affect Schedule-Expanded Form. Retrieved from: University of Iowa, Department of Psychology, Web site: http://www.psychology.uidwI.edu/Faculty/Watson/Watson.html

Weissman, A.N., Beck, A.T. (1978). Development and validation of the Dysfunctional Attitude Scale: a preliminary investigation. Paper presented at

the 86th annual convention of the American Psychological Association, Toronto, Ontario, Canada.

Williams, J. M. G., & 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

Wolpe, J. (1958). Psychotherapy by reciprocal inhibition. Stanford, CA: Stanford University Press.

Wong, Q. & Moulds, M. (2011). Impact of anticipatory processing versus distraction on multiple indices of anxiety in socially anxious individuals. *Behaviour Research and Therapy*, 49, 700-706.

Yogo, M. & Fujihara, S. (2008). Working memory capacity can be improved by expressive writing: a randomised experiment in a Japanese sample. *British Journal of Health Psychology*, 13, 77-80.

VI. Appendices

Appendix A. Systematic Review: Systematic Review Protocol

Title
Do interventions targeting future thinking modify anxiety, depression and mood in children and young people?

Registration
To be registered on PROSPERO, international prospective register of systematic reviews. (https://www.crd.york.ac.uk/prospero/).

Authors
Lauren Chuttoo
Trainee Clinical Psychologist, Royal Holloway University of London
NHJT020@live.rhul.ac.uk

Dr Victoria Pile
Clinical Psychologist, King's College London
Victoria.Pile@kcl.ac.uk

Professor Andrew Macleod
Clinical Psychologist, Royal Holloway University of London
Andrew.Macleod@rhul.ac.uk

Collaborators
Rowan Hevesi
Trainee Clinical Psychologist, Royal Holloway University of London

Contributions
LC is CI leading protocol development, analyses and dissemination. RH is a second reviewer. All authors will contribute to data interpretation and article drafts.

Introduction
The ability to think about ones' future is a complex cognitive process that begins developing in early childhood and continues developing into adulthood (Atance & Meltzoff, 2005). Future thinking involves pre-experiencing possible scenarios, and therefore has a role in planning, anticipatory and delayed gratification processes, and can be both a deliberate process and unintentional e.g. via intrusive thoughts. While autobiographical memories are used to construct mental representations of the future, research has shown that greater affect is generated when imagining the future compared to remembering the past (Schubert et al., 2020). In addition to this, while future thinking can take both verbal and pictorial forms, it is prospective imagery that facilitates greater affect (Holmes et al., 2006). Given these important findings,

research is increasingly investigating how future thinking impacts on wellbeing, and how interventions targeting future thinking modify symptoms of anxiety and depression.

When thinking about the future, representations can be negatively valenced, e.g. imagining feared situations, or positively valenced, e.g. imagining the day of an achievement. In Generalised Anxiety Disorder (GAD), a person develops persistent fears and worries, affecting day to day life. Worry typically occurs in verbal form and is believed to be a strategy to avoid distressing mental imagery associated with potential problems (Stober & Borkovec, 2002). In a study of high worriers, participants were asked to worry in verbal or imagery forms, with verbal worrying leading to increased negative intrusions and imagery worrying leading to decreased negative intrusions (Stokes & Hirsch, 2010). This suggests that the verbal processing of worry is key to worry maintenance. Exposure to worry is central to cognitive behaviour therapy for GAD and has been shown to improve symptoms as a stand-alone treatment when compared to relaxation (Hoyer et al., 2009). Affect in response to worry differs across the life span with older people showing less emotional change following induced worry (Gould et al., 2015). Recent research has explored the relationship between symptoms of GAD and future thinking in adolescents, finding that higher scores measuring the impact of prospective imagery (arousal, intrusions) were associated with more symptoms of GAD and depression (Pile & Lau, 2020).

Thinking positively about the future is typically a pleasurable exercise, regardless of whether imagined future situations are realistic or fantastical, or personally or not personally relevant. However when future thinking is more detailed, it is associated with increased positive expectations that the future event will occur and increased positive affect (Hallford et al., 2020 single case). People with depression have been found to have difficulty imagining detailed, positive future events and also report less anticipatory pleasure for it (Macleod & Salaminiou, 2001). Positive future thinking interventions have been developed such as the 'Best Possible Self' (BPS) intervention. Enrique et al., (2018) found the BPS intervention increased positive affect and reduced symptoms of depression when compared to a control condition in a non-clinical adult sample. In a study of teens with depressive symptoms, Pile et al., (2020) implemented an intervention in which past negative images were rescripted and future positive images were generated, leading to reductions in depression scores.

In a systematic review and meta analysis of the effect of imagining the future on affect, Schubert et al., (2020) report on three clusters of studies that have explored the topic in adults, with studies focusing on worry, best personal self and comparison between past and future. They found a moderate to strong impact on affect that had a stronger impact compared to remembering the past. These studies were experimental in design with one-off sessions incorporating a future thinking task and non-clinical samples. Given that there are differences between future thinking and affect in young people compared to adults, and that adolescence is an important time of future orientation (e.g. choosing potentially career defining options), it would be important to explore these processes in this age group. When mood disorders occur in young people, they are often more pervasive than when they occur in adulthood (Hankin, 2006) and so this presents an important time to intervene in order to prevent chronicity. It is therefore important to to conduct an analysis of interventions targeting

future thinking in young people, to assess whether such interventions can modify symptoms of anxiety and depression.

Objective
The objective is to review the literature for interventions targeting future thinking that modify symptoms of anxiety, depression and mood in young people, and then to establish treatment effects.

Methods
Eligibility criteria
Population - Human participants: children and young people, defined as the mean participant age being 24 years or under
Intervention - Interventions that specifically target future thinking: e.g. where individuals are explicitly asked to think about the future. The focus of at least 50% of the total intervention must be on thinking about the future.
Comparison - Intervention studies with two or more data points enabling either 1) comparison pre and post intervention, 2) comparison between different groups or 3) comparison between two different interventions
Outcome - The main outcome is change in a psychological measure including positive/negative affect, wellbeing, satisfaction, quality of life and measures of psychopathology including anxiety and depression.
Articles must be peer reviewed articles published in the English language. There are no limitations regarding date of publication.

Information sources
PubMed, Ovid Medline, Cochrane Library, APA PsycINFO, APA PsycARTICLES, will be searched using a pre-defined search strategy, from study start to January 2021.

Search strategy
The search strategy is designed to capture articles relevant to the population, intervention, and outcome. Population terms: child, teen, adolescent, young-people, youth, school-based, juvenile. Intervention terms; future-think, imagining the future, prospective future, prospective imagery, future imagery, future simulation, optimism, pessimism, worry, positive psychology, best possible self, possible selves, intervention, task, treatment, program. Outcome terms: affect, wellbeing, quality of life, satisfaction, psychopathology, anxiety, depression, depressive symptoms, low mood. Figure 1 provides an example search.

Figure 1. An example search on APA PsycINFO, November 2021		
1	child*, teen*, adolescen*, "young-people", youth, "school-based", juvenile, "young-adult", college, paediatric, student, undergraduate	2085955
2	"future-think*", "imagin* the future", "prospective future", "prospective-imagery", "future-imagery", "future sim*", optimism, pessimism, worry, positive psychology, "best-possible-sel*", "possible-selves"	38107
3	intervention, task, treatment, program	1955231
4	affect, wellbeing, "quality of life", satisfaction, psychopathology, anxiety, depression, "depressive - symptoms", "low-mood".	1096499
5	1 and 2 and 3 and 4	4765

Study records
Data management
Records will be managed through Mendeley, reference managing software, which enables the removal of duplicates.

Selection process
Titles and abstracts will be screened for inclusion by first reviewer (LC) as well as a second reviewer (RH) for 50% of papers. The full text of a study will be reviewed and considered potentially relevant when it cannot be clearly excluded from the title and abstract. The references of included studies will be screened for further eligible studies. A third reviewer (VP) will mediate if there are disagreements.

Data collection process
Two reviewers will extract the data independently using a standardised form. Data extraction from 10% of papers will be replicated by a second researcher and checked for discrepancies. Any discrepancies will be resolved through discussion.

Data items
Data extracted will include the following summary data :publication date, sample characteristics [including mean age], sample size, study design, intervention, measures and outcomes.

Outcomes and prioritisation
The main outcomes will include psychological measures including positive/negative affect, wellbeing, satisfaction, quality of life and measures of psychopathology including anxiety and depression. Mood measures will be prioritised over other measures.

Risk of bias in individual studies
The quality of selected articles will be assessed using a suitable tool based on the study designs identified. The Critical Appraisal Skills Programme (CASP) checklist could be considered. Risk assessment to be completed by second rater for 20% of papers.

Data synthesis
Data will be presented in a tabulated form to enable comparison between studies. A narrative and quantitative synthesis of the findings of included studies will be provided.
For the meta-analysis, standardised mean differences for individual studies will be pooled using random effects models and 95% confidence intervals and two sided P values will be reported. Subgroups of different mental health disorders (e.g, depression, anxiety disorders etc) and age (children or teens) will be assessed separately if sufficient studies are found.

Confidence in cumulative evidence
The strength of the body of evidence will be assessed using Grading of Recommendations, Assessment, Development and Evaluation (GRADE) criteria.

References
Atance, C. M., & Meltzoff, A. N. (2005). My future self: Young children's ability to anticipate and explain future states. *Cognitive Development*, *20*(3), 341-361.

Enrique, A., Breton-Lopez, J., Molinari, G., Banos, R., & Botella, C. (2018). Efficacy of an adaptation of the best possible self intervention implemented through positive technology: a randomised control trial. *Applied Research in Quality of Life*, *13*(3), 671-689.

Gould, C., Gerolimatos, L., & Edelstein, B. (2015). Experimental examination of worry among older and young adults. *International psychogeriatrics, 27*(7), 1177-1190.

Hallford, D., Sharma, M., & Austin, D. (2020). Increasing anticipatory pleasure in major depression through enhancing episodic future thinking: a randomised single-case series trial. *Journal of Psychopathology and Behavioral Assessment,* 42, 751-764.

Hankin, B. L. (2006). Adolescent Depression: Description, causes, and interventions. *Epilepsy & behavior*, 8(1), 102-114

Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive interpretation training: Effects of mental imagery versus verbal training on positive mood. *Behavior therapy*, *37*(3), 237-247.

Hoyer, J., Beesdo, K., Gloster, A. T., Runge, J., Höfler, M., & Becker, E. S. (2009). Worry exposure versus applied relaxation in the treatment of generalized anxiety disorder. *Psychotherapy and Psychosomatics*, *78*(2), 106-115.

MacLeod, A. K., & Salaminiou, E. (2001). Reduced positive future-thinking in depression: Cognitive and affective factors. *Cognition & Emotion*, *15*(1), 99-107.

Pile, V., & Lau, J. (2020). Intrusive images of a distressing future: links between prospective mental imagery, generalised anxiety and a tendency to suppress emotional experience in youth. *Behaviour Research and Therapy*, 124,

Pile, V., Smith, P., Leamy, M., Oliver, A., Blackwell, S. E., Meiser-Stedman, R., Dunn, B., Holmes, E., & Lau, J. (2020). Harnessing Mental Imagery and Enhancing Memory Specificity: Developing a Brief Early Intervention for Depressive Symptoms in Adolescence. *Cognitive Therapy and Research*, 1-17.

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.

Stöber, J., & Borkovec, T. D. (2002). Reduced concreteness of worry in generalized anxiety disorder: Findings from a therapy study. *Cognitive Therapy and Research*, *26*(1), 89-96.

Stokes, C., & Hirsch, C. (2010). Engaging in imagery versus verbal processing of worry: impact on negative intrusions in high worriers. *Behaviour Research and Therapy*, *48*(5), 418-423.

Appendix B. Systematic Review: Full RoB 2 Quality Assessment Tables

Please see next page.

Appendix B. Table 1. Full RoB 2 Quality assessment of included studies: Positive studies

Risk of bias and domain	Austenfeld & Stanton (2008).	Auyeung & Mo (2019).	Duan et al. (2021).	Enrique et al. (2018)	Feldman & Dreher (2012).	Frein & Ponsler (2013).	Harrist et al. (2007).	Heekerens et al. (2020)	King (2001).	Layous et al. (2013).	Liau et al. (2016).	Lyubomirsky et al. (2011).	Meevissen et al. (2011).	Nicolson et al. (2020).	Owens & Patterson (2013).	Peters et al. (2013).	Renner et al. (2014).	Yogo & Fujihara (2008).
Was the allocation sequence random?	NI	Y	N	NI	NI	NI	NI	N	NI	NI	N	NI	NI	Y	NI	NI	NI	NI
Was the allocation sequence concealed?	NI	Y	NI	PY	Y	Y	NI	NI	Y	Y	N	PY	Y	PY	Y	PY	Y	NI
Did baseline differences between groups suggest a problem with randomisation?	N	N	N	N	N	NI	NI	PY	NI	N	NI	NI	N	N	N	N	N	NI
BIAS RATING	S/C	LOW	S/C	S/C	S/C	S/C	S/C	HIGH	S/C	S/C	HIGH	S/C	S/C	LOW	S/C	S/C	S/C	S/C
Were participants aware of their assigned intervention?	NI	N	NI	N	NI	Y	Y	N	N	N	Y	Y	NI	N	NI	N	NI	NI
Were people delivering the interventions aware of	N	NI	N	Y	NI	Y	Y	NI	Y	Y	Y	Y	NI	NI	NI	NI	NI	NI

participants assigned intervention?																		
Were there deviations from intended intervention?	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Were deviations likely to affect outcome?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Were deviations balanced between groups?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIAS RATING	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C	S/C
Was an appropriate analysis used to estimate the effect of assignment on intervention?	N	PY	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Was there potential for substantial impact of the failure to analyse participants in the group to	PN	PN	PN	NA	PN	PN	PN	PN	PN	PN	Y	PN	PN	PN	PN	PN	PN	PN

which they were randomised?																		
BIAS RATING	HIGH	S/C	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Were data for this outcome available for all or nearly all participants?	NI	N	N	Y	N	NI	NI	N	NI	NI	N	N	Y	N	N	N	Y	N
Is there evidence that the result was not biased by missing outcome data?	N	N	N	N	N	N	N	N	N	N	PN	PN	NA	N	N	N	NA	PN
Could missingness in the outcome depend on its true value?	NI	NI	PN	PN	PN	NI	NI	NI	NI	NI	NA	PN	NA	PN	PN	PN	NA	NI
Is it likely that missingness in the outcome depended on its true value?	NI	NI	N	PN	N	NI	NI	NI	NI	NI	NI	PN	NA	PN	PN	N	N	NI
BIAS RATING	HIGH	HIGH	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	HIGH
Was the method of measuring the outcome inappropriate?	NI	N	N	N	PN	N	N	N	N	N	N	N	N	N	N	N	N	N
Could	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

measurement of the outcome have differed between groups?																		
Were outcome assessors aware of the intervention received by participants?	NI	N	NI	Y	N	Y	Y	N	Y	Y	Y	Y	NI	N	NI	N	NI	Y
Could assessment of the outcome have been influenced by knowledge of intervention received?	NI	NA	NI	PN	NA	PN	PN	NA	NI	PN	Y	PN	NI	NA	NI	NA	NI	NI
Is it likely that assessment of the outcome was influenced by knowledge of intervention received?	NI	NA	NI	PN	NA	PN	PN	NA	NI	PN	PN	PN	NI	NA	NI	NA	NI	NI
BIAS RATING	HIGH	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	S/C	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH
Were the data that produced the result analysed in accordance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

with a pre-specified analysis plan?																		
Is the numerical result being assessed likely to have been selected on the basis of the results from multiple eligible outcome measurements within the outcome domain?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Is the numerical result being assessed likely to have been selected on the basis of the results from multiple eligible analyses of the data?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
BIAS RATING	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

Key: Y: Yes. N: No. PY: Probably yes. PN: Probably no. NI: No information. NA: Not applicable. LOW: Low risk. HIGH: High risk. S/C: Some concerns.

Appendix B. Table 2. Full RoB 2 Quality assessment of included studies: Episodic future thinking and worry studies

Risk of bias and domain	Busby Grant & Wilson (2021).	Demeyer & De Raedt (2014).	Pile et al. (2021a).	Pile et al. (2021b).	Behar et al. (2012)/	Frala et al. (2014).	Jing et al. (2016). Study 1.	Jing et al. (2016). Study 2.	McIntosh & Crino (2013).	McLaughlin et al. (2007). Study 2/	Skodzik et al. (2016).	Skodzik et al. (2017).	Wong & Moulds (2011).
Was the allocation sequence random?	NI	NI	N	Y	NI	NI	NI	NI	Y	NI	NI	NI	NI
Was the allocation sequence concealed?	Y	PY	N	Y	Y	NI	NI	PY	PY	NI	Y	NI	PY
Did baseline differences between groups suggest a problem with randomisation?	NI	N	Y	N	N	NI	NI	NI	N	NI	N	N	N
BIAS RATING	S/C	S/C	HIGH	LOW	S/C	S/C	S/C	S/C	LOW	S/C	S/C	S/C	LOW
Were participants aware of their assigned intervention?	N	NI	Y	N	N	NI	NI	NI	N	NI	NI	N	NI
Were people delivering the interventions aware of participants assigned intervention?	NI	NI	Y	Y	Y	NI	NI	NI	Y	NI	NI	NI	NI
Were there deviations from intended intervention?	NI	NI	NI	N	NI	NI	NI	NI	NI	NI	NI	NI	NI
Were deviations likely to affect outcome?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Were deviations balanced between groups?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BIAS RATING	S/C	S/C	S/C	LOW	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW
Was an appropriate analysis used to estimate the effect of assignment on	N	N	N	Y	N	Y	PN	PN	N	N	N	N	N

intervention?													
Was there potential for substantial impact of the failure to analyse participants in the group to which they were randomised?	PN	PN	PN	N/A	PN	NA	PN	PN	PN	PN	PN	PN	PN
BIAS RATING	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Were data for this outcome available for all or nearly all participants?	NI	NI	Y	Y	NI	NI	NI	NI	NI	NI	Y	N	N
Is there evidence that the result was not biased by missing outcome data?	N	N	NA	NA	N	N	N	N	N	N	NA	PN	PN
Could missingness in the outcome depend on its true value?	NI	NI	NA	NA	NI	NI	NI	NI	NI	NI	NA	PN	PN
Is it likely that missingness in the outcome depended on its true value?	NI	NI	NA	NA	NI	NI	NI	NI	NI	NI	NA	PN	PN
BIAS RATING	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW
Was the method of measuring the outcome inappropriate?	N	N	N	N	N	N	N	N	N	N	N	N	N
Could measurement of the outcome have differed between groups?	N	N	N	N	N	N	N	N	N	N	N	N	N
Were outcome	N	NI	Y	N	Y	NI	NI	NI	N	NI	N	Y	N

assessors aware of the intervention received by participants?													
Could assessment of the outcome have been influenced by knowledge of intervention received?	NA	NI	PN	NA	PN	NI	NI	NI	NA	NI	NA	PN	NA
Is it likely that assessment of the outcome was influenced by knowledge of intervention received?	NA	NI	PN	NA	PN	NI	NI	NI	NA	NI	NA	PN	NA
BIAS RATING	LOW	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	LOW	LOW	LOW
Were the data that produced the result analysed in accordance with a pre-specified analysis plan?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Is the numerical result being assessed likely to have been selected on the basis of the results from multiple eligible outcome measurements within the outcome domain?	N	N	N	N	N	N	N	N	N	N	N	N	N
NIs the numerical result being assessed likely to have been selected on the basis of	N	N	N	N	N	N	N	N	N	N	N	N	N

158

the results from multiple eligible analyses of the data?													
BIAS RATING	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

Key: Y: Yes. N: No. PY: Probably yes. PN: Probably no. NI: No information. NA: Not applicable. LOW: Low risk. HIGH: High risk. S/C: Some concerns.

Appendix C. Empirical Study: Ethics Amendment Form

Modification Request Form For Approved Research Ethics Applications

Modification Details

1 Applicant Status

MPhil/ PhD/ Special Doctorate

2 Select the RESC/REP which approved your initial application from the following list:

PNM RESC

3 Was ethical clearance originally obtained prior to 4th January 2021?

    ● Yes, ethical clearance was obtained before 4th January 2021
    ○ No, ethical clearance was obtained after 4th January 2021

4 Provide details of the type of modification proposed. Select all that apply.

- ☐ Study title
- ☐ Research procedure/protocol
- ☐ Participant group
- ☑ Sponsorship/collaborators
- ☐ Extension to approval needed
- ☐ Information Sheet(s)
- ☐ Consent form(s)
- ☐ Other recruitment documents
- ☐ Lead Researcher
- ☑ Other

4a Provide the details of the modification(s).

1. Adding Lauren Chuttoo, RHUL, to the research team:
Adding Lauren Chuttoo as another investigator. Lauren is a third year Clinical Psychologist in Training at Royal Holloway University of London. Lauren would like to use this dataset as part of her doctoral thesis. Her role is to code the generated future images in the Episodic Future Thinking Task for certain features (e.g. whether the description includes emotional language and reference to different senses). She will then analyse these in relation to some of the questionnaire measures (e.g. symptoms of depression) at pre and post intervention.

2. Seeking consent from participants to share their audio recordings with Lauren Chuttoo:
Tara to email previous participants to ask for their consent in Lauren accessing their anonymised data. A draft of this email is attached as a supporting document. This email would ask the participants to confirm, via email, that they consent for the audio recordings to be shared with Lauren for the purposes of transcription.

3. Sharing anonymised data with Lauren Chuttoo:
Sharing anonymised data with Lauren (as per the previous amendment). This will also include transcriptions that are stripped of identifiable data.
The study team is led by Dr Victoria Pile (KCL) and includes Lauren Chuttoo, Clinical Psychologist in Training from Royal Holloway, University of London. We would like to amend the form to include sharing data with Lauren (without any personally identifiable information). The data shared will include the main SPSS file with quantitative data but no personally identifiable information and anonymised transcripts from the Episodic Future Thinking task. These will be transcribed by the KCL researchers and checked for any personal identifiable information (which will be removed).

4. General data sharing:
Consistent with the impetus towards open science, once complete and ready for publication, we are planning to make the quantitative dataset publicly available (with no personally identifiable information).

4b Please clearly outline how the modification differs from the original approval

Lauren was previously not included as part of the research team, and therefore, participants have not consented to data being shared with her. In addition, her additional analysis of the anonymised data was not accounted for in the original approval.

4c Provide justification for the proposed modification.

The proposed additional analysis conducted by Lauren Chuttoo will maximise the utility of the dataset. The findings of this analysis will contribute to the knowledge base of the phenomenological features of imagery and future thinking. There is very limited understanding about the features of images that young people with depression generate and this analysis could help the design of new therapeutic treatments for young people with depression

4d Provide details of any ethical issues raised by the the proposed modification(s)

4e Provide any other information which you believe should be taken into account during ethical review.

Supporting Documents

3f Attach any modified or new supporting documents.

	Documents				
Type	Document Name	File Name	Version Date	Version	Size
Other	Explanation to participants (1)	Explanation to participants (1).docx	03/11/2021	1	25.0 KB

Signature

5 I confirm that the information in this form is accurate to the best of my knowledge and I take full responsibility for it. I consider that it would be reasonable for the proposed modification to be implemented. For student projects I confirm that my supervisor has approved my proposed modifications.

Project ID: 20969

Appendix D. Empirical Project: Coding Instructions

Features of Future Imagery Coding Instructions

Valence: code as Positive, Negative, Mixed, or Neutral

This to capture the overall valence of the response.

- The content of the response as a whole is determined as positive, negative, mixed positive and negative, or neutral.

- Social norms determine valence in the absence of the individual indicating whether the description is a positive/negative/mixed/neutral response.

- If there are both positive and negative elements in the description this would be categorised as mixed if in equal measure.

- If the response is more weighted towards positive or negative it can be coded as that valence. A neutral response would be where there are no indicators that the description is either positive or negative.

Examples

"I will see a friend" would be coded as positive. In the absence of further detail, social norms would expect this to be a positive experience.

"I will see my friend although we will probably argue, we disagree on everything, and I'll feel sad" would be coded as negative. Whilst seeing a friend is expected to be a positive experience, the participant has indicated this is likely to be a negative experience, and the description is weighted negatively.

"I will see a friend although we will probably argue" would be coded as mixed as the description is equally weighted with positive and negative information.

"I will see a friend, I will feel happy and we will laugh, I might get bored." would be positive as while there is some negative information, the description is weighted more positively overall.

"I will go and see someone I know" would be coded as neutral as there are no indicators that this is positive or negative.

Sensory Information: Count

This is to capture the sensory content of the descriptions. Count the number of

sensory details.

- Sensory information refers to clear descriptions of what the individual can see, hear, taste, touch, or smell.
- Sensory information should be differentiated from describing the situation. The response should reflect a sensory experience.
- For sight: "I see", "I look", and references to specific visual information such as light (e.g. sunny / brightness / darkness) or colours. If 'see' is used, this should be specifically in relation to vision rather than the use of the word see as in 'to meet with'.
- For hearing: I can hear, I am listening to, references to sounds, music or noise, references to sound volumes, words that evoke sounds, e.g. applause, tune, melody. "Laughing" would not be sufficient unless it was expanded to refer to the auditory nature of laughing, e.g. "others will hear us laughing".
- For taste: I can taste, references to tastes that are sweet/salty/bitter. It is not sufficient to say eating or drinking.
- For touch: I can touch/ feel and references to heat/cold or other tactile information. If 'feel' is used this should be specifically in relation to touch rather than the general use of the word feel or feeling, e.g. 'I feel I would be proud of myself', would not be counted but 'I can feel the breeze on my face' would be counted. The object that the person is feeling should be external to their body rather than internal experiences.
- For smell: I can smell, references to perfume, fragrance, descriptions that indicate the individual is imagining the olfactory experience.
- Sensory details may occur a short phrase. The same phrase can be repeated and would be counted each time.

Examples

"I will go to university, it has lovely grounds and I can see my new friends as they cross the lawn" would be counted as 1 for the sight of friends.

"At the beach, I hear the sound of the waves and we will get donuts, they'll taste sweet and I'll feel full." This would be 2 for sensory count: waves and tasting sweet. Feeling full would not count.

Sensory Information: Present/Not Present

If sensory count is one or more, score yes as present.

If sensory count is 0, sensory information

Emotion: Emotion count

This is to capture the emotional content of the description. Count the number of times an emotion is mentioned.

- If the EFT-t cue word is an emotion, e.g. 'happy' then use of this word in the response should not be counted.

- Emotional words similar to the EFT-t cue word can be counted, e.g. Lonely if the cue word was alone.

- The emotion mentioned can be positive or negative, expressed in first person or observer, and can be the emotion of someone or something else present.

- Count the emotion even if the description includes emotions that would not be felt, e.g. I would not be scared.

- The emotion referenced should be an emotion and not a descriptive word, e.g. "nice", "lovely" or word referencing a cognitive-physiological state, e.g. "tired", "exhausted".

- Complex emotions that involve a cognitive component, e.g. "disappointment", can be included where it is expressed as something that might be felt.

- Some emotions are used interchangably with cognitive processes, e.g. I would be worried. In this case it should be determined in the context of the sentence whether the participant is expressing an emotional or cognitive experience.

- Emotions should be expressed as emotions rather than as verbs, e.g. "I will feel relaxed", not "I will relax".

- Expressions of non-verbal emotion, e.g. "I will be crying", should not be included.

- Non-verbal emotional cues that the participant gives whilst describing their response e.g. crying or laughing, are also not counted.

- Emotions should be counted each time they are mentioned, so repeated

emotions increase the count.

Examples

"It will be a happy time" would be regarded as presence of emotion.

"I would not be scared" would be regarded as presence of emotion.

"When I go to my sister's house I will cry because I will be so happy to see her, and I hope she will be excited to see me" would be regarded as presence of emotion and the count would be coded as 2, for happy and excited. Hope would not be counted in this instance as it refers to an expectation (cognition), but could be counted if used in the context of, 'I feel hope/hopeful'. "Cry" would not be counted.

Emotion: Present/Not present

If emotion count is one or more, score yes as present.

Field Perspective (Yes/No)

To capture whether the description is in field perspective.

- The description should be described in first person as though the person is there experiencing the scenario, using the 'I' position and present tense. If this is found anywhere in the description it can be coded as first person.

- If 'I' is not mentioned at all in the description, it is unlikely to be considered first person.

- Use caution if the response includes "I think" or "I'm thinking of" as this indicates their current state rather than how they are imagining the future scenario and the perspective.

- If the response includes references to the image being a "birdseye view" of a situation, or "I see myself in a room" or describing how something "would" happen, e.g. "I would be scared" then this indicates an observer perspective and would not be field perspective.

Examples

"I am at home, drinking tea and watching a film." Would be field perspective.

"I can see myself getting upset after I've had an argument." Would not be field perspective as the description indicates they are a 'fly on the wall' observing the

situation.

Presence of Dampening (Yes/No)

This is to look at whether the individual uses strategies to down-regulate positive affect.

- Fault-finding in the image, e.g. "I can see bright blue cars, I don't like blue", or themselves (self-criticism), "I am not good at this."

- Doubts: "but it might not happen like that", "I don't know if I'm doing this right."

- Distractions: indications the person is distracted from the task, including by environmental factors (sounds) or via questions or comments to the researcher that are not relevant to the task.

- Excessive repetition of negative information.

- To be considered dampening the reference should not be part of the description of the future scenario, but rather a critique or commentary that occurs before, alongside or after the scenario.

Examples

"I try and teach my brother to ride a bike but he falls off and I'll feel sad" would not be dampening as this is part of the imagined scenario.

"I try and teach my brother to ride a bike but he falls off, I'm a useless teacher" would be considered dampening.

Appendix E. Empirical project: Coding sheet with example scores

Pre	Description	Valence	Emotion Count	Emotion Present	Sensory Count	Sensory Present	Field Perspective	Dampening	Accessibility (seconds)	Total duration	EFT-T specificity rating
Hope	Surgery	Pos	2	Yes	3	Yes	Yes	Yes	5	30	Specific
Strong	Gym	Neg	1	Yes	0	No	Yes	No	12	40	Specific
Happy	Film	Pos	2	Yes	0	No	Yes	No	3	45	Specific
Failure	Assignment	Neg	1	Yes	1	Yes	Yes	Yes	5	58	Not Specific
Fear	Animal	Neg	1	Yes	1	Yes	Yes	No	10	35	Specific
Lost	Town	Neut	1	No	0	No	Yes	Yes	3	52	Specific
Total Pre	-	-	8	5	5	3	6	3	6.3	43	5
Post	**Description**	**Valence**	**Emotion Count**	**Emotion Present**	**Sensory Count**	**Sensory Present**	**Perspective**	**Dampening**	**Accessibility**	**Total duration**	**EFT-T specificity rating**
Beautiful	Flowers	Pos	1	Yes	6	Yes	Yes	No	5	90	Specific
Friend	Activity w friend	Pos	2	No	0	No	Yes	Yes	6	87	Specific
Success	Results day	Pos	3	Yes	0	No	Yes	Yes	5	34	Specific
Stress	Animal	Mix	1	Yes	0	No	Yes	Yes	4	40	Specific
Danger	Animal	Mix	1	Yes	0	No	Yes	No	4	32	Specific
Alone	Driving	Pos	2	Yes	0	No	No	Yes	10	50	Specific
Total Post	-	-	8	5	6	1	5	4	5.6	55.5	6
Total	-	-	16	10	11	4	11	7	5.95	49.25	11

Appendix F. Empirical project: Example Transcript

Researcher [R], Participant [P]

[R] The first word is gonna be danger.

[P] OK, I guess this is a possible future event. I can imagine I like imagine it's summer and I'm with my friends going hiking, and we're exploring a new place, but we realize that we've got lost and we don't know where we are, and so I feel like I've said the danger as we're in this unknown place and I can imagine that we didn't, maybe didn't have signal on our phones. So we're just feeling a bit lost and potentially another not great situation, because it's an unknown place. We don't know where we are, we can't contact anyone and so I'm feeling a sense of like fear and danger.

[R] The next word is gonna be alone.

[P] So you can imagine in the future, if I'm revising for my exams, I probably will want to be on my own so I can kind of actually revise. Instead I get distracted by people, and even though I want to, I want to revise by myself I will end up feeling a bit lonely and alone. Because I haven't seen anyone. Maybe that day or for a while, I was, even though I wanted to kind of do my own work. I may be feeling a bit lonely.

[R] And were you kind of thinking of a particular moment when you were describing this?

So I was thinking again around exam time, 'cause that's when it kind of ramps up, so I probably would want to spend more time revising as a result. I might not be able to see everyone.

[R] The next word is gonna be success.

[P] So I can imagine the future event where I have been applying for different jobs and different positions and I can imagine it, the future event where I hear-back from them and hear that I've got
the job or position I wanted to get. So I got like a feeling of success. I managed to achieve the goal I was aiming towards and, and I feel happy that I've managed to succeed in that role.

[R] Ok. The next word is gonna be stress.

[P] So again kind of in the exam term, around exam time I feel very stressed 'cause I need to do lots of exams within a short amount of time, period and and so I'm stressed about doing well in exams and if I'm able to answer the question in enough detail, that will get me a good mark. And I was really stressed because I've got to balance doing exams with kind of the daily household activities and everything else like cooking and everything else that I have to do.

[R] OK. The next word is gonna be beautiful.

[P] So I can imagine in summer I I'm walking or exploring somewhere in nature and I can see like a sunrise or sunset. That kind of feeling that in nature that really beautiful and it's just kind of a really nice feeling and just we're happy and kind of at peace and away from the normal stress.

[R] That sounds really lovely. The last word is friend.

[P] I say I can imagine a future event with my friend and friends, erm where we we finished exams and kind of all the worries and stress is behind us and we just have a couple of weeks to kind of enjoy ourselves and do fun things which we will enjoy. Just take time to relax and enjoy the beginning of summer.

Appendix G. Empirical project: Emotion words included

Afraid
Angry
Annoyed
Anxious
Appreciative
At peace
Awkward
Calm
Confused
Content
Depressed
Demotivated
Disappointed
Disconnected
Disgusted
Disillusioned
Distressed
Embarrassed
Enthusiastic
Excited
Failure
Fear (when cue word is not fear)
Fearful
Frantic
Frustrated
Happy (when cue word is not happy)
Hopeful
Glad
Impatient
In awe
Lonely
Nervous
Optimistic
Overwhelmed
Panic
Panicked
Passionate
Peaceful
Proud
Regret
Relaxed
Relieved
Sad
Scared
Stressed (when cue word is not stress)
Surprised
Terrified
Thrilled
Upset
Worried