Emotional Regulation Skills and Depression in Adolescence

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It should also be acknowledged that some material throughout this thesis portfolio has been informed by or utilised from my ClinPsyD Thesis Proposal.

Abstract

Background: It is acknowledged that there are both cognitive and emotional processes which may underpin depression, but these factors are less explored in adolescent populations. This thesis aims to consider the developmental differences in emotional regulation strategies and depression across adolescence. Furthermore, it aims to examine the interactions between executive functions, emotional regulation and depression in early adolescence, a cohort rarely studied in this context.

Methods: Using a meta-analytic approach, the relationship between six emotional regulation strategies and depression across adolescence (early [10-14 years], mid [15-18 years] and late [19-25 years]) were examined. This included 44 studies (equating to 92 effects sizes, N= 46,533). The empirical study used a cross-sectional design to examine associations between three executive functions, two emotional regulation strategies and depression using self-report measures with 51 adolescents aged 11-14 years.

Results: Maladaptive emotional regulation strategies were all significantly positively associated with depression, whilst adaptive strategies had mixed findings, with only one, (cognitive reappraisal) being significantly negatively associated with depression. Exploratory findings suggest that there were no differences in the use of emotional regulation strategies across stages of adolescence. The empirical study found that executive function impairment significantly predicted depression, but this relationship was not moderated by emotional regulation. A significant positive relationship was found between suppression (maladaptive strategy) and depression, whilst a significant negative relationship was found between cognitive reappraisal (adaptive strategy) and depression.

Conclusions: This thesis presents supporting evidence that maladaptive emotional regulation strategies are associated with greater depressive symptomology, whilst adaptive strategies may be associated with lesser symptomology. It also identifies the cognitive and emotional

processes which may increase the likelihood of onset of depression in adolescents and explores clinical implications of these findings.

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Chapter 1: Introduction to the Thesis Portfolio

It is estimated that 1 in 5 children and young people (CYP) aged 8 to 25 years in the United Kingdom likely have a mental health (MH) difficulty (National Health Service [NHS] England, 2023). Mood disorders such as anxiety and depression are the most common MH difficulties in CYP (Clarke et al., 2020) with a reported increase across all MH disorders, compounded by the COVID-19 pandemic (Kauhanen et al., 2022; Viner et al., 2022).

It is recognised that onset of depression typically occurs from mid-adolescence (Petito et al., 2020) and can be a risk factor to suicide if not identified and supported (Windfuhr et al., 2008). Variance in depression presentation has implications for identification, and often in young people can be missed due to presenting as other things such as behavioural problems or struggling academically amongst other difficulties (Thapar et al., 2012). Similarly, a young person may experience depressive symptomology, but may not meet the diagnostic criteria for clinical depression, also known as major depressive disorder in the Diagnostic and Statistical Manual of Mental Disorders (5th ed., DSM-5; American Psychiatric Association [APA], 2013).

With this in mind, it is important to consider the continuum of depression and how it may present in adolescents, as well as considering possible factors which may influence vulnerability to depression. Of interest is emotional regulation (ER). ER is understood to be the set of complex underlying mechanisms involved in processing, managing, and responding to emotional experiences (Gross & Thompson, 2007). Interestingly, there is suggestion that ER may improve with age as a result of the development of pre-frontal regions of the brain which are associated with cognitive control and executive functions ([EF], Gogtay et al., 2004; Martin & Ochsner, 2016; Tamnes et al., 2013).

Existing research has considered the strong overlap between these cognitive and emotional factors in adult cohorts largely (Demeyer et al., 2012; Joormann & D'Avanzato,

2010; Morris et al., 2013), but developmental research is now examining this more in adolescent populations. Deficits in one area, e.g., EF (Wante et al., 2016) may in turn increase susceptibility to MH difficulties such as depression (Baune et al., 2014). The same can be said for ER, where global difficulties are associated with poorer MH (Kovacs et al., 2008), as well as skills-based ER influencing young people's overall MH and well-being (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017).

This thesis portfolio will explore how ER is related to depression throughout the stages of adolescence. It is hoped to better understand the cognitive and emotional developmental changes which occur for adolescents and how this relates to psychopathology. In addition, having this insight will help build on existing approaches used to support young people with their MH and improve their skills in ER.

Chapter 2 uses a meta-analytic method to synthesise and explore the current literature, examining the associations between depression and six ER strategies across early (10-14 years), mid (15-18 years) and late adolescence (19-25 years) in both clinical and non-clinical samples. Three of the ER strategies are considered adaptive (cognitive reappraisal, acceptance and problem-solving) and three maladaptive (suppression, avoidance, and rumination). Thus far, there have been mixed findings in the associations between these skills and depression in youth. To our knowledge there have been no systematic reviews/ meta-analyses conducted which explore this relationship across the developmental stages of adolescence. The aim of this paper is to provides an insight into whether there are developmental differences in the use of ER skills and depression across adolescence.

Chapter 3 illustrates the links between both the meta-analytic review and empirical study, considering the possible cognitive factors which may underpin depression during adolescence. Chapter 4 uses an empirical cross-sectional study design to explore two ER skills more closely, whilst also considering their influence on relationships between EF (a

group of cognitive skills involved in thinking, processing, and responding to stimuli/information) and depression in early adolescence (11-14 years).

Chapters 5 and 6 present further methodology and results deemed supplementary to both the meta-analysis and empirical paper. Finally, to conclude, chapter 7 summarises key findings of both papers, alongside critically appraising and evaluating the thesis portfolio as a whole.

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Chapter 2: Systematic Review and Meta-Analysis

A meta-analysis examining emotional regulation skills in youth with depression.

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Abstract

Introduction: The resources and skills a person has available to manage their emotional experiences – their emotional regulation skills – are related to their mental wellbeing. These skills can be classified as adaptive (helpful, e.g., acceptance) or maladaptive (unhelpful, e.g., avoidance). This meta-analytic review assessed the association between the use of adaptive and maladaptive emotional regulation skills, and symptoms of depression in adolescents. Unlike previous meta-analyses, we included studies spanning the full adolescent range from 10 to 25 years, and explored whether any associations were moderated by phase of adolescence (early, middle, or late).

Methods: This meta-analytic review was pre-registered on PROSPERO (CRD42023460510). Three electronic databases were searched and systemically reviewed using pre-outlined inclusion/exclusion criteria e.g. adolescents aged between 10-25 years, and valid self-report measures of depression and six emotion regulation strategies, three adaptive (acceptance, reappraisal, problem-solving) and three maladaptive (rumination, suppression, avoidance).

Results: Random effects meta-analyses were conducted. 44 studies (92 effect sizes) met the inclusion criteria for analysis. Effects were quantified for the full adolescent age range (10-25 years), and separately for early (10-14), mid (15-18) and late adolescence (19-25). There was a significant relationship between four emotion regulation strategies, one adaptive (reappraisal) and three maladaptive (suppression, rumination, and avoidance), and depression. These effects were not moderated by stage of adolescence (early, middle, or late).

Conclusion: The use of maladaptive emotion relation strategies was linked to elevated symptoms of depression, with weaker evidence for an association between the use of adaptive strategies and reduced depressive symptoms. These results suggest adolescents using maladaptive strategies are likely to be at increased risk for mental health problems. We interpret

these results in terms of the potential for teaching adaptive strategies to adolescents who frequently use maladaptive strategies to reduce symptoms of depression.

Keywords: Emotional Regulation, Strategies, Depression, Adolescence, Youth, Meta-analysis

Introduction

Adolescence is marked by biological, cognitive, and social changes (Blakemore & Mills, 2014; Young et al., 2019). These include hormonal surges associated with puberty (Pfiefer & Allen, 2021); the maturation of grey matter and white tracts supporting higher cognitive function (Dumontheil, 2016; Dumontheil et al., 2016; Mills et al., 2016) and the rapid development of executive functions (EF) which are skills facilitating emotional and behavioural regulation (Blakemore & Choudhury, 2006; Yurgelun-Todd, 2007). Additionally, significant changes in personal relationships and societal roles including increased sensitivity to, and reliance on, peers over parents and taking on more independent adult-like responsibilities (Dahl, 2004; Orben et al., 2020). These changes can be adaptive and positive, but they can also be aversive and stressful, increasing risk for mental health (MH) problems (Blakemore & Mills, 2014).

The ability to manage and regulate emotional responses (i.e., emotional regulation [ER]), facilitates coping and allows flexibility in these emotionally evocative and changing situations (Compas et al., 2017; Eisenberg et al., 2010). In adulthood, disruptions to ER capacities and the use of maladaptive regulatory strategies (those associated with negative long-term outcomes, Aldao et al., 2010) are implicated in the onset, maintenance, and recurrence of MH disorders (Gross, 2013; Jazaieri et al., 2013). Similar associations are reported between ER skills and symptoms of anxiety and depression in adolescence (Aldao et al., 2010; Garnefski & Kraaij, 2018; Kraft et al., 2023; Schäfer et al., 2017; Young et al., 2019). The aim of this study was to conduct a meta-analytic review of the association between the use of adaptive and maladaptive ER strategies and symptoms of depression across adolescence.

ER is a term used to describe the conscious and unconscious processes used to experience and express emotion (Gross, 1998). Gross's extended process model of ER describes multiple regulatory strategies that enable us to modify our emotional responses at

different times and in different contexts: some strategies are used to manage the generation of an emotional reaction before it occurs, while others are invoked during an ongoing emotional reaction. These strategies can be appraised as both adaptive (helpful) and maladaptive (unhelpful) depending on the situation and a person's goals (Aldao et al., 2015; Gross, 2015; Kobylińska & Kusev, 2019; Sheppes et al., 2014), but when used habitually certain strategies can be classified as either adaptive or maladaptive because of their links to symptoms of mental ill-health (Aldao et al., 2010; Kraft et al., 2023).

Six (three adaptive and three maladaptive) strategies have been associated with psychopathology in previous systematic reviews and meta-analyses (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017). The same six strategies were reviewed in the current meta-analysis, using the consensus definitions of each skill as follows. **Adaptive (helpful) strategies:** *Acceptance* encompasses the awareness and ability to acknowledge and accept emotions and internal events (Hayes et al., 2011) and is key to Acceptance and Commitment therapy ([ACT]; Harris, 2007). *Problem-Solving* involves altering the situations (by acting or thinking) that evoke emotional reactions to find a better way of managing them (Aldao et al., 2010). It is used in both Solution-Focused therapy (de Shazer et al., 1986) and Cognitive Behavioural Therapy ([CBT]; Beck,1979). *Cognitive reappraisal* refers to reframing thoughts and emotional experiences to manage them in a more positive way (Gross, 1998). It is a key component of CBT, which helps a person identify and adjust negative thinking patterns and appraisals of situations (Beck, 1979).

Maladaptive(unhelpful) strategies: *Rumination* refers to repetitively focussing on the causes and consequences of emotional experiences (Nolen-Hoeksema & Watkins, 2011; Nolen-Hoeksema et al., 2008). This becomes problematic when a person gets stuck in negative thought cycles and is unable to use more helpful strategies to mitigate their thoughts and feelings (Nolen-Hoeksema, 2000). *Suppression* involves trying to cognitively suppress

negative or difficult thoughts and emotional experiences, which may in fact bring negative thoughts or experiences to mind (Wenzlaff & Wegner, 2000). *Avoidance* can refer to the behavioural avoidance of external stimuli or events, or the cognitive avoidance of negative internal thoughts and emotions (Hayes et al., 1996; Kraft et al., 2023). Here we focus on cognitive avoidance, which can reduce negative emotions in the short-term, but is associated with the long-term persistence of symptoms of depression and anxiety (Siu & Shek, 2010; Werner & Gross, 2010).

During adolescence, ER becomes more self-regulatory and less guided by extrinsic influences (Eisenberg et al. 2010; Gross 2013), due to cognitive and neural development. Adolescence is characterised by structural maturation of the grey matter and white tracts supporting higher cognitive function (Dumontheil et al., 2016; Mills et al., 2016) that are accompanied by rapid changes in EF that support emotional- and self-regulation (Best & Miller, 2010; Dumontheil et al., 2010; Rosenblum & Lewis, 2006; Silvers et al., 2012; van der Aar et al., 2019). Combined with the hormonal and social changes that occur in adolescence, which intensify emotional experiences and are associated with increased stress, these developments cause restructuring of ER strategies and their use (Zimmermann & Iwanski, 2014). Adolescence is therefore a crucial period for the development of effective ER strategies (Ahmed et al. 2015; McRae et al., 2012; Stegge & Terwogt, 2007).

Previous meta-analyses have revealed associations between ER strategies and MH in adolescence (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017). Most recently, these associations have been explored in the context of ER being a transdiagnostic process giving rise to multiple MH conditions, but both reviews also reported the outcomes specific to depression (Kraft et al., 2023; Schäfer et al., 2017). Kraft et al. (2023) found significant associations between all six ER strategies, with adaptive strategies being negatively related to lower levels of depression and maladaptive being positively related to elevated depressive

symptoms in child and adolescent samples with a mean age of up to 18 years. They reported small effects for problem-solving, cognitive reappraisal, and suppression, and medium effects for acceptance, rumination, and avoidance. Schäfer et al. (2017) similarly reported significant associations across the board, with smaller effects for problem-solving, cognitive reappraisal, and suppression than for acceptance, rumination, and avoidance. However, their effect sizes for problem-solving and cognitive reappraisal were approximately twice that of Kraft et al.'s (2023) and their age range was limited to 13-18 years.

Here we update these reviews to include the full adolescent age range but focus specifically on depressive symptoms. We chose to focus on this age range as it is now widely accepted that adolescent growth (neural, social, and cognitive) continues into the 20s, and that adolescence spans from 10 to 25 years of age (Jaworska & MacQueen, 2015; Sawyer et al., 2018; Sharma et al., 2013). It also maps onto the way in which youth services in the National Health Service (NHS) in the UK are currently commissioned to support young people (NHS England, 2019).

By including the late adolescence phase spanning the late teens to 25 years (Patton et al., 2018), we were also able to explore whether stage of adolescence (early-, mid- or late-) affected the relationship between ER and depressive symptoms. While Schäfer et al. (2017) reported that age, entered as a continuous variable, did not moderate these associations, earlier meta-analyses found stronger associations between rumination and depressive symptoms in older compared to younger youth (Rood et al., 2009), and stronger associations between depression and both suppression and problem-solving in adult compared to youth samples (Aldao et al., 2010).

To summarise, the aim of the current meta-analysis was to explore the association between depressive symptoms, three adaptive and three maladaptive ER strategies in adolescence. We included ER skills with a solid theoretical and empirical foundation that could

be measured by validated self-report measures. The following research questions were addressed: 1) is there a significant relationship between the self-reported use of prominent adaptive (cognitive reappraisal, problem solving, and acceptance) and maladaptive (avoidance, suppression, and rumination) ER strategies and depressive symptoms in adolescents aged 10–25 years, and 2) are these associations moderated by stage of adolescence categorised as early (10-14 years), middle (15-18 years) and late adolescence (19-25 years). Based on similar meta-analytic reviews exploring narrower and younger age ranges, we anticipated that more frequent use of adaptive and less frequent use of maladaptive ER strategies would be associated with fewer symptoms of depression. We also anticipated there would be an effect of stage of adolescence, with the effects reducing in late adolescence due the use of ER strategies becoming more consistent with increasing age (Abela et al., 2002; Abela & Hankin, 2007).

Method

Study protocol and search strategy

A systematic review was conducted following PRISMA guidelines (Moher et al., 2009). See Appendix B for PRISMA checklist completed. The study protocol was registered with the international prospective register of systematic reviews on 5th September 2023 (PROSPERO, CRD42023460510).

Three electronic databases, PsycINFO, Medline and CINAHL, were searched for articles published between 1st January 1990 and 15th September 2023. Searches were limited to 1990 onwards because validated self-report measures of ER were introduced at this time (Gratz & Roemer, 2004; Gross & John, 2003, Kraft et al., 2023; Penza-Clyve & Zeman, 2002; Schäfer et al., 2017).

The search terms used Medical Subject Headings (MeSH) for each respective database as well as general emotional regulation terms (emotional regulation OR “emotion* regulat* strateg*” OR “emotion* regulat* skill*” OR “coping skill” OR “coping stateg*” OR

"emotion* regulation" or "regulation of emotion" OR "affect regulation" OR "mood regulation" or "emotion* self regulation), for specific ER skills of interest (reapprais*" OR acceptance OR suppress* or avoid* or "problem solv*" OR ruminat* OR adaptive OR maladaptive), young people (youth OR adolesce* OR child* OR teen* OR "young people" OR "young adult" OR student OR kid* OR juvenile) and depression (Depress* OR "depressive disorder" OR "Low Mood" OR "depressive symptoms"). See Appendix C for full electronic search strategy for one database as per PRISMA checklist. The initial search yielded 3253 papers (after 1591 duplicates were removed). See Figure 1 for PRISMA flowchart.

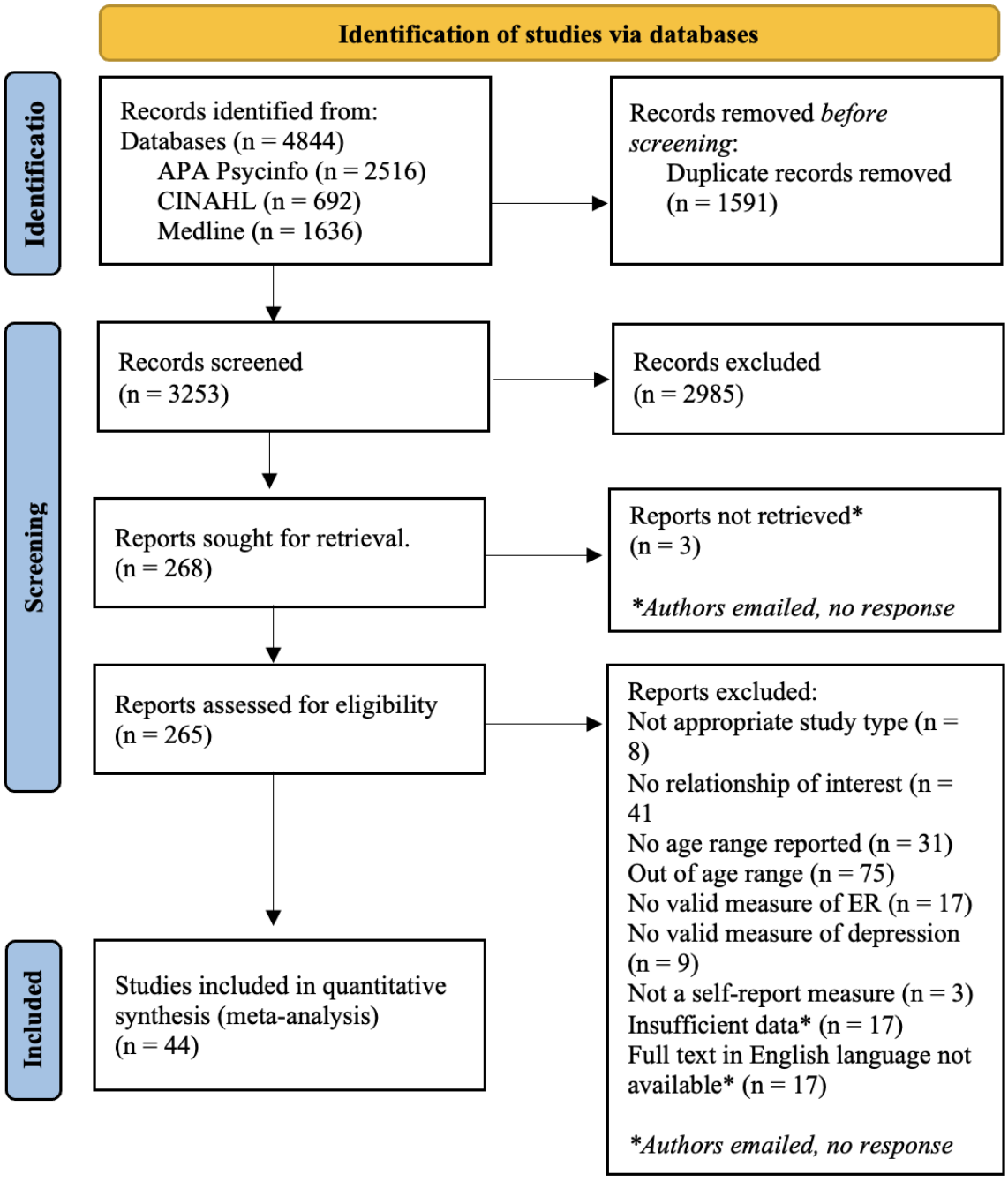
Study Selection

Studies meeting the following inclusion criteria were selected: 1) Published in a peer-reviewed journal with full-text availability. Systematic reviews and meta-analyses were not included but were consulted to ensure all relevant studies were included in the current analysis. 2) The article had to be published in English, or accessible in English. 3) The study examined the association between at least one ER skill (avoidance, rumination, suppression, cognitive reappraisal, problem-solving and acceptance) and depressive symptoms, all measured by validated self-report scales. Randomised Control Trial (RCT) and longitudinal study designs were included if the relationship of interest was reported at baseline. 4) All participants were aged 10-25 years, or the data for a subgroup in this age range were reported separately. No restrictions were applied to the sample type – it could be clinical, subclinical, or non-clinical, and participants could be at any level of education, in work, unemployed or in a clinical setting. 5) The study included ratings of depressive symptoms that were separable from other mental health conditions (e.g., anxiety). Studies reporting data for participants with co-morbid mental health conditions, additional diagnoses (e.g., ADHD or physical health conditions) or other elevated mental health symptoms were excluded. 6) Data from the same sample had not been reported elsewhere. For studies that reported the same measures from the same sample, the

most recent article was included, and the others excluded. 7) Studies including sufficient data to calculate an effect size for the association between ER and depression.

Figure 1

PRISMA Flowchart (Study Selection Process)



Data coding and extraction

Titles and abstracts were reviewed by the principal investigator (ZT) to remove studies that clearly did not meet the inclusion criteria. An independent researcher (JB-trainee clinical psychologist) screened a random 10% of the abstracts sought for retrieval (n=320) to check they were suitable for full text screening. There were no disagreements between the principal investigator and the independent researcher. Where there was shared uncertainty about an abstract, a third researcher (JH-Professor of Psychology) was sought. The same process was followed for full text screening: it was completed by the principal investigator, with a random 10% checked (n=26) by the independent researcher. Both principal investigator and independent researcher were in full agreement about full texts included in the final screening, so a third opinion was not sought from a third researcher (Professor of Psychology).

The following data were extracted at full text screening: (a) article details (e.g., title, author, publication year and DOI), (b) study setting, study location/country (c) study characteristics (e.g., design, recruitment, sample size) (d) sample characteristics (e.g., mean age, ethnicity, clinical vs nonclinical sample), (e) measures used and outcomes, (f) statistical analysis used and corresponding correlation co-efficient or equivalent. A summary of the key characteristics of the 44 included studies are provided in Table 1. The full details of data extracted will be included in supplementary materials when published.

Table 1

Study characteristics of studies included in the meta-analyses

Study	N	Study Design	Study Country	Age Range	Mean Age (SD)	ER measure used	ER strategies	Depression Measure used
Adrian et al. (2019)	287	Longitudinal	USA	16-17	16.56 (0.52)	CRSQ	Rumination	CDI
Alix et al. (2020)	354	Cross-sectional	Canada	14-18	Not reported	WCQ	Problem-Solving	YSR
Andreotti et al. (2011)	124	Longitudinal	USA	18-24	19.25 (1.19)	ERQ	Reappraisal	ASR
Arnarson et al. (2016)	182	Longitudinal	Portugal	12-16	13.65 (1.43)	CERQ	Rumination	CDI
Betts et al. (2009)	88	Correlational	Australia	12-16	13.92 (1.21)	ERQ	Reappraisal, Suppression	RADS

Cano et al. (2020)	200	Cross-sectional	USA	18-25	21.30 (2.09)	ERQ	Reappraisal, Suppression	CES-D
Cerutti et al. (2017)	240	Cross-sectional	Italy	10-15	11.80 (0.97)	ERQ	Reappraisal, Suppression	CDI
Chen et al. (2019)	1955	Cross-sectional	China	10-20	14.85 (2.86)	ERQ	Reappraisal, Suppression	CES-D
Chen & Cheung (2021)	187	Cross-sectional	China	18-25	21.60 (1.88)	ERQ	Reappraisal, Suppression	PHQ-9
Chervonsky & Hunt (2019)	262	Longitudinal	Australia	11-12	11.97 (0.35)	ERQ	Reappraisal, Suppression	CES-D

Connell et al. (2013)	59	Cross-sectional	USA	11-17	13.71 (1.71)	ERQ	Reappraisal, Suppression	CDI
De France & Hollenstein (2019)	99	Longitudinal	Canada	12-15	13.40 (1.05)	RESS	Reappraisal, Suppression, Rumination	BDI
De France et al. (2018)	1288	Longitudinal	Netherlands	12-15	12.90 (0.81)	ERQ	Reappraisal, Suppression	CDI
de Jonge-Heesen et al. (2020)	1341	Cross-sectional	Netherlands	11-14	13.91 (0.55)	CCSC-R	Avoidance	CDI
Dumont & Provost (1999)	297	Cross-sectional	France	14-16	Eight graders - 14 (0.70) Eleventh	WCQ	Problem-Solving, Avoidance	BDI

					graders - 16.8 (0.80)			
Eastabrook et al. (2014)	123	Cross-sectional	Canada	13-16	14.51 (0.89)	ERQ	Reappraisal, Suppression	CDI
Ferraz de Camargo & Rice (2020)	349	Cross-sectional	Australia	12-18	14.25 (1.15)	CERQ	Reappraisal	RCADS
Ford et al. (2019)	136	Cross-sectional	USA	14-18	15.50 (NR)	ERQ	Reappraisal, Suppression	CES-D
Garnefski & Kraaij (2006)	1761	Cross-sectional	Netherlands	12-18	Sample 1 - 13.11 (0.74) Sample 2 -	CERQ	Acceptance, Reappraisal, Rumination	SCL-90

					16.11 (0.77)			
Garnefski & Kraaij (2018)	582	Cross-sectional	Netherlands	13-16	14.24 (0.84)	CERQ	Acceptance, Reappraisal, Rumination	SCL-90
Hilt et al. (2008)	94	Cross-sectional	USA	10-14	12.70 (NR)	CRSQ	Rumination	CDI
Juang et al. (2016)	1279	Cross-sectional	USA	18-25	19.60 (1.57)	ERQ	Reappraisal, Suppression	CES-D
Klemanski et al. (2017)	51	Cross-sectional	USA	10-14	Not reported	CRSQ	Rumination	CDI

Krause et al. (2018)	408	Longitudinal	USA	11-14	11.98 (0.96)	RRS	Rumination	CDI
Liu et al. (2020)	755	Cross-sectional	China	17-25	19.80 (2.41)	ERQ	Reappraisal	SDS
Lougheed & Hollenstein (2012)	177	Cross-sectional	Canada	12-16	13.60 (1.10)	ERQ	Reappraisal, Suppression	BDI
Ma & Fang (2019)	1067	Cross-sectional	China	12-18	14.84 (1.59)	ERQ	Reappraisal, Suppression	DASS
Madjar et al. (2019)	594	Cross-sectional	Israel	14-17	14.96 (1.33)	CERQ	Acceptance, Reappraisal	CDI

Niu et al. (2023)	154	Longitudinal	USA	18-23	20.05 (1.28)	CERQ	Acceptance, Reappraisal, Rumination	PROMIS
Pepping et al. (2016)	113	Cross-sectional	Australia	12-18	14.90 (1.60)	ERQ-CA	Reappraisal, Suppression	DASS
Sai et al. (2016)	639	Cross-sectional	China	12-18	TBC	ERQ	Reappraisal, Suppression	CES-D
Shapero et al. (2019)	127	Longitudinal	USA	12-13	15.28 (1.00)	ERQ	Reappraisal	CDI
Shen (2022)	709	Cross-sectional	China	12-18	14.54 (1.70)	ERQ	Reappraisal, Suppression	CES-D
Skymba et al. (2022)	422	Cross-sectional	USA	18-21	18.52 (0.64)	ERQ-CA	Reappraisal	MFQ

Sobol et al. (2021)	351	Cross-sectional	Poland	12-16	15.01 (0.93)	CERQ	Acceptance, Reappraisal, Rumination	CDI
Stikkelbroek et al. (2016)	398	Cross-sectional	Netherlands	11-22	16.40 (2.90)	CERQ	Acceptance, Reappraisal, Rumination	CDI
Sung et al. (2006)	72	Cross-sectional	USA	14-18	15.70 (0.87)	CRI-Y	Problem-Solving, Reappraisal, Avoidance	RADS
Turliuc et al. (2020)	310	Longitudinal	Romania	13-18	15.30 (1.67)	ERQ	Reappraisal, Suppression	BDI

van den Heuval et al. (2020)	411	Cross-sectional	Netherlands	12-21	16.89 (2.77)	CERQ	Acceptance, Reappraisal, Rumination	CDI
Ye et al. (2022)	2423	Cross-sectional	China	19-25	20.44 (1.60)	ERQ	Reappraisal, Suppression	CES-D
Yin et al. (2022)	1132	Cross-sectional	China	12-18	14.66 (1.44)	ERQ	Reappraisal, Suppression	PHQ-9
Yu et al. (2021)	1554	Cross-sectional	China	10-18	15.58 (1.25)	RRS	Rumination	CES-D
Zhao & Zhao (2015)	504	Cross-sectional	China	16-18	16.86 (0.68)	ERQ	Reappraisal, Suppression	CES-D
Zimmermann et al. (2021)	177	Longitudinal	USA	17-24	Not reported	Brief Cope	Reappraisal, Avoidance	PHQ-9

Note. ER= Emotional Regulation, CRSQ= Children's Response Style Questionnaire, WCQ= Ways of Coping Questionnaire, ERQ = Emotional Regulation Questionnaire, CERQ = Cognitive Emotional Regulation Questionnaire, RESS = Regulation of Emotion Systems Survey, CCSC-R = Children's Coping Strategies Checklist- Revised, RRS= Ruminative Response Scale, ERQ-CA = Emotional Regulation Questionnaire for Children and Adolescents, CRI-Y = Coping Response Inventory- Youth, CDI = Child Depression Inventory, YSR= Affective Problems Scale from the Youth Self Report , ASR = Adult Self Report, RADS= Reynolds Adolescent Depression Scale, CES-D = Center for Epidemiologic Studies Depression Scale, PHQ-9 = Patient Health Questionnaire-9, BDI= Beck Depression Inventory, RCADS= Revised Anxiety and Depression Scale, SCL-90 = Symptom Checklist 90, SDS= Self Rated Depression Scale, DASS= Depression Anxiety Stress Scale, PROMIS = The Patient Reported Outcomes Measurement Information System Emotional Distress Depression Short Form, MFQ= Mood and Feelings Questionnaire.

Risk of Bias

The principal investigator completed a risk of bias check using the Newcastle-Ottawa Scale (NOS), recommended by Cochrane collaboration as a quality assessment tool (Lo et al., 2014). A version of the NOS modified for cross-sectional studies (see Appendix D) was used to conduct a risk of bias check on each study included in the final meta-analysis. NOS assesses quality of each study based on three main criteria: 1) selection; 2) comparability and 3) outcome. Each criteria has multiple questions that are rated using a star system (0 being poorest, 9 being highest). An average star rating is then calculated for each study. Scores of 0-2 indicate *poor quality*, 3-5 is *fair quality*, and 6-9 *good quality*. All 44 included studies were rated by the principal investigator (ZT) and independent researcher (JB). There were no disagreements on risk of bias assessments between the raters.

Effect size calculation and correction

Calculations were based on the effect size *r* (Borenstein et al., 2009). These were obtained directly from the studies, or converted from other statistics (e.g., Cohen's *d*, r^2, beta coefficients from univariate regression) as required (Lipsey & Wilson, 2001). Studies reporting a beta-coefficient, and no other measures of effect, from multivariate regression analyses were excluded as it was not possible to determine the variance associated with a single predictor. All *r* statistics were transformed into Fishers *z* values to ensure the different correlation coefficients fit a normal distribution (Corey et al., 1998; Lipsey & Wilson, 2001). For reporting purposes Fishers *z* values were converted back to *r* values. Cohen's (1992) criteria were used to interpret the effect sizes as small (r= .10 to.30), medium (r= .30 to .50) and large (r= .50 to 1.0).

Data-analysis plan

Random effects meta-analysis was used to allow for heterogeneity (Borenstein et al., 2010). Version 4.4-0 of the 'metafor' package in R was used to conduct the analyses (Viechtbauer, 2010). Six meta-analyses were conducted to examine the strength of the

relationship between depressive symptoms and each of the six ER skills. Summary effect sizes, 95% confidence intervals (CI) and predictive intervals (PI) were calculated. The latter represent the uncertainty expected in the pooled effect size if a new study was added to the meta-analysis.

Moderator analyses were planned to explore whether there were differences in the associations between depression and ER skills by stage of adolescence (early: 10-14 years, mid: 15-18 years or late: 19-25 years), providing there were a minimum of five studies in each age band for a sufficiently powered moderator analysis (Hedges & Pigott, 2001). The principal investigator categorically coded stages of adolescence using the reported mean age for each study. For some studies which considered age ranges across more than one stage of adolescence, the mean age of the sample was rounded up/down respectively e.g., Pepping et al. (2016) sample spanned from 12-18 years, with a mean age of 14.9, this was rounded up and included in the mid-stage of adolescence group. Studies which had a mean age between 10-14.49 years were included in the *early adolescence group*, studies with a mean age of 14.5-18.49 years were included in the *mid adolescence group* and studies with a mean age of 18.5-25 years were included in *late adolescence*. Sensitivity analyses were conducted to assess heterogeneity, publication bias and risk of bias.

Results

Included studies

Table 2 summarises the 44 included studies, which yielded a total of 92 effect sizes across the ER skills. There were 46,533 participants across all studies, with an age range of 10-25 years and a mean age of 15 years and 6 months (M= 15.57, SD = 2.50).

Table 2

Summary of meta-analytic outcomes examining associations with depressive symptoms by emotion regulation strategy

			Meta-analysis							*Heterogeneity*			
						95% CI's		*95% PI's*					
ER strategy	*k*	*N*	*r*	*z*	*p*	*LL*	*UL*	*LL*	*UL*	*Q*	*df*	*p*	I^2 *(%)*
Adaptive													
Acceptance	8	5394	.10	1.14	.256	-.07	.27	-.40	.55	503.67	7	<.001	97.53
Problem Solving	3	723	.00	0.01	.992	-.38	.38	-.65	.66	41.85	2	<.001	96.09
Reappraisal (cognitive)	38	19,237	-.15*	-5.03	<.001	-.21	-.09	-.46	.19	510.53	37	<.001	93.78
Maladaptive													
Rumination	15	6332	.43*	8.45	<.001	.34	.52	.52	.06	177.16	14	<.001	94.09
Suppression	23	12,960	.21*	9.64	<.001	.17	.25	.04	.40	82.22	22	<.001	78.94
Avoidance	5	1887	.41*	4.87	<.001	.25	.54	.03	.68	53.10	4	<.001	92.00

Note * Significant pooled effect size in r statistic. *k = number of studies included.*

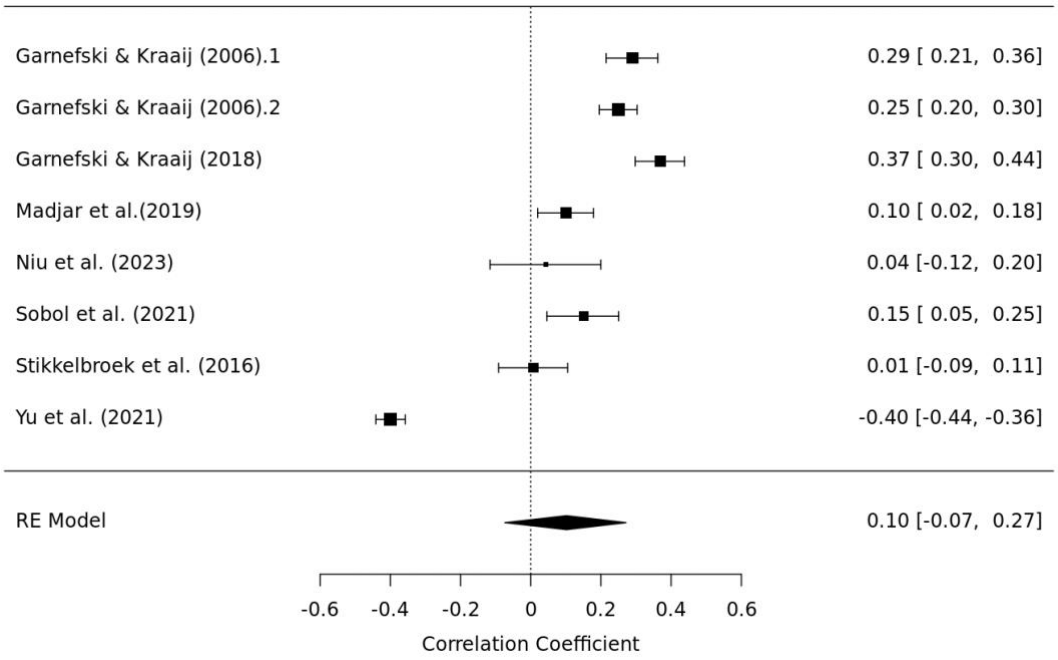
Association with Depressive Symptoms for Each Emotion Regulation Strategy

Table 2 summarises the outcomes of the meta-analysis for each of the six ER strategies. For all meta-analyses, the Q statistic was significant indicating considerable heterogeneity between the effect sizes across the studies for each ER strategy. Additional sensitivity analyses (leave-one-out approach) were utilised to examine each studies impact on the overall pooled effect size and heterogeneity for each meta-analysis run (see Figures 9-14 in additional results chapter 6).

These analyses revealed that the pooled effect sizes remained largely consistent, for reappraisal, rumination, and suppression therefore all studies were included in the final analyses. For acceptance, excluding one larger study (Yu et al., 2021), increased the pooled effect size r= .18 but assessed heterogeneity remained moderate-large. For problem-solving, there were a limited number of studies, but excluding one study (Alix et al., 2020) slightly reduced heterogeneity but still remained in the moderate to large range. Lastly, for avoidance excluding one study (de Jonge Heesen et al., 2020, sample 1) increased the pooled effect size r= .51 but assessed heterogeneity remained moderate to large so this study was still included in the overall analysis.

Figure 2

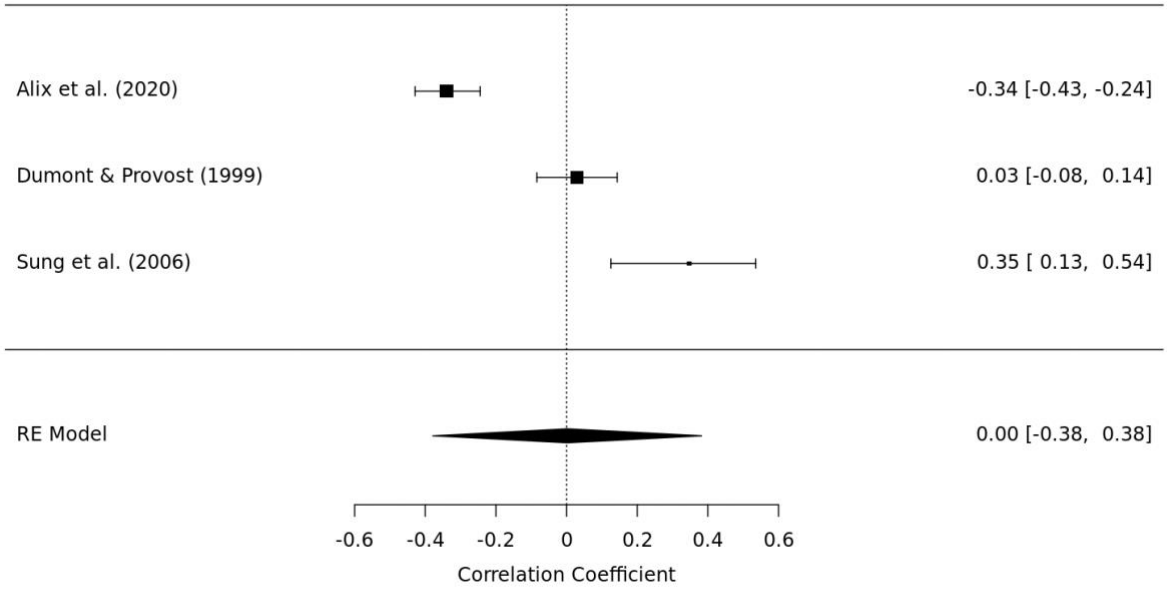
Forest plot of effect sizes for acceptance and depression, showing pooled effect size



Two of the three adaptive ER skills, acceptance and problem-solving were not significantly associated with depressive symptoms (see Figures 2 and 3 respectively). It should be noted that only three studies reported the association between problem-solving and depression, so these results should be interpreted cautiously.

Figure 3

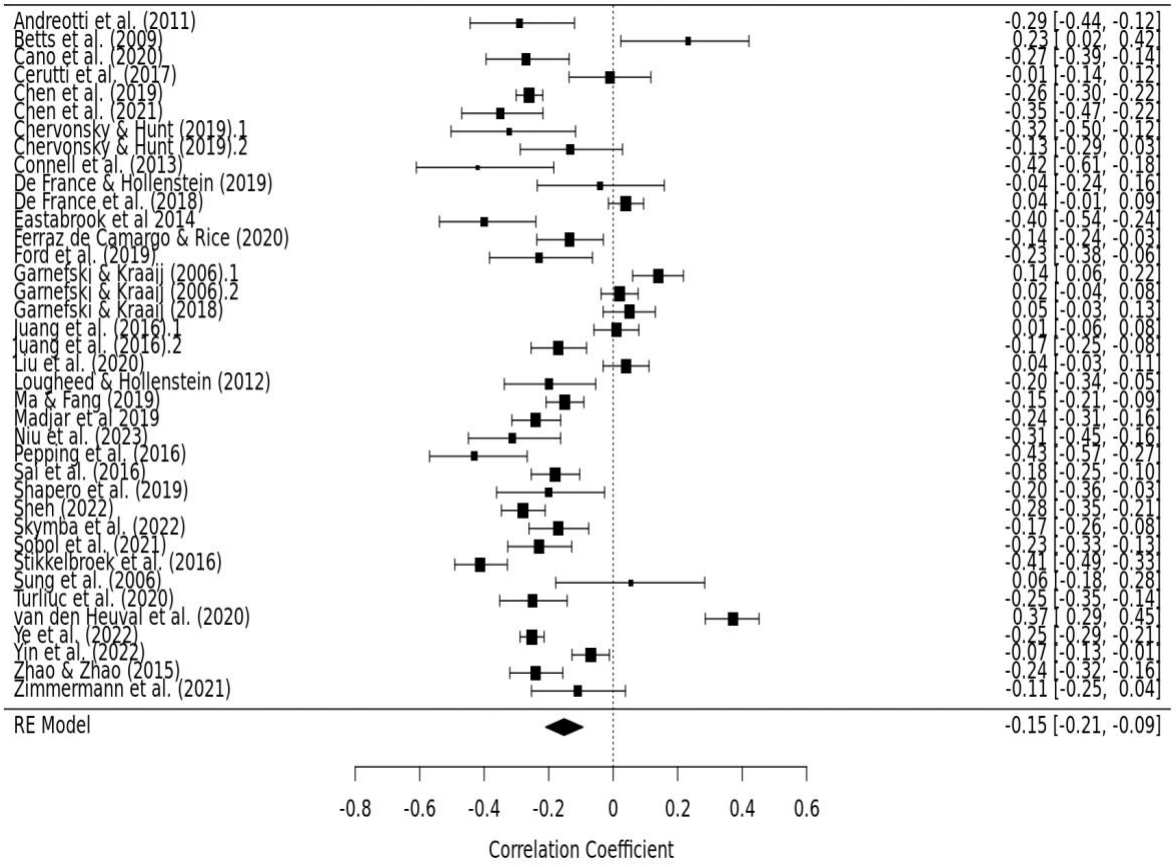
Forest plot of effect sizes for problem-solving and depression, showing pooled effect size.



There was a small negative relationship between the third adaptive ER strategy, reappraisal, and depressive symptoms indicating that the less frequently this strategy was used, the higher the depressive symptoms (see Figure 4).

Figure 4

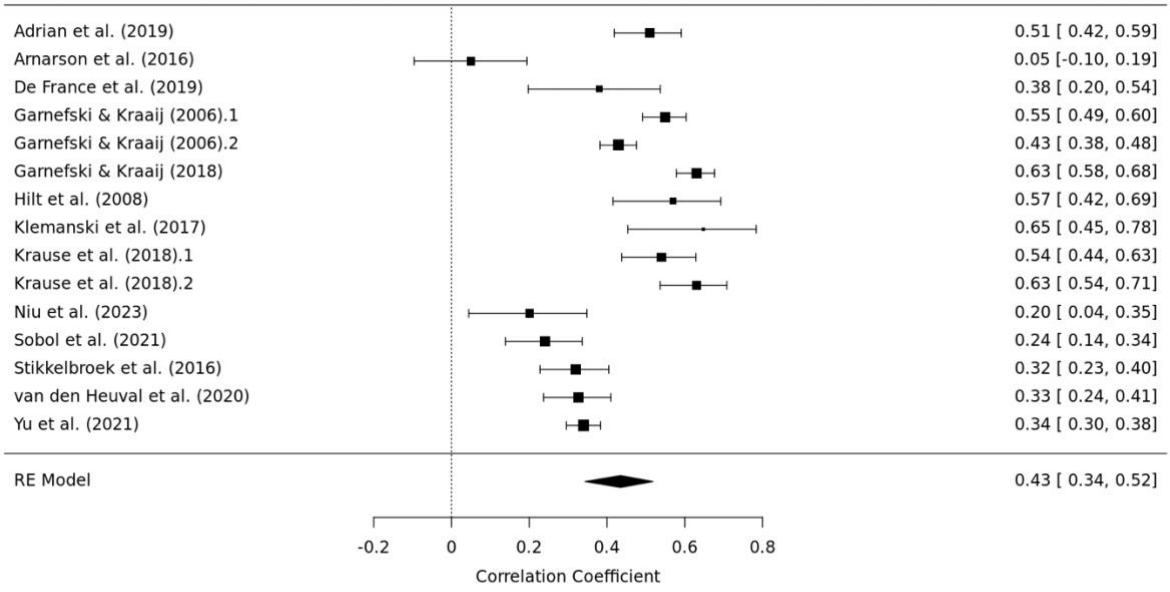
Forest plot of effect sizes for reappraisal and depression, showing pooled effect size



There was a significant association between all three maladaptive ER strategies and depressive symptoms. For rumination this was a positive relationship, with a medium pooled effect size, showing that the more an adolescent ruminated the higher their depressive symptoms (see Figure 5).

Figure 5

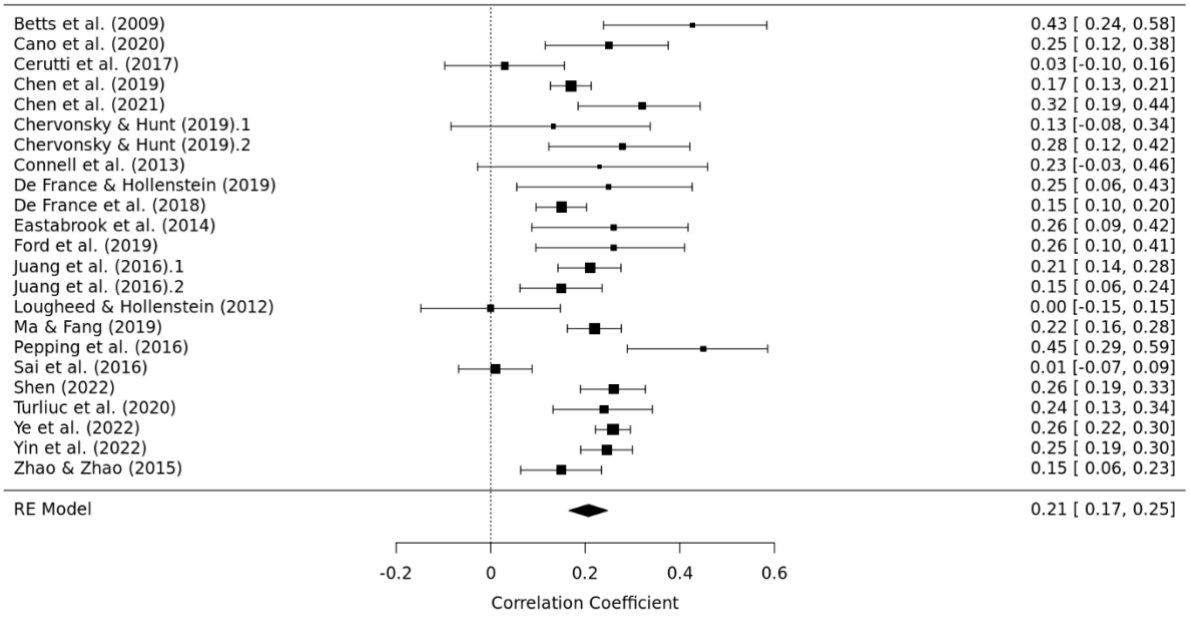
Forest plot of effect sizes for rumination and depression, showing pooled effect size



For suppression, the relationship with depressive symptoms was also positive, but the overall effect size was small, indicating the greater use of suppression as an ER strategy was associated with increased depressive symptoms (see Figure 6).

Figure 6

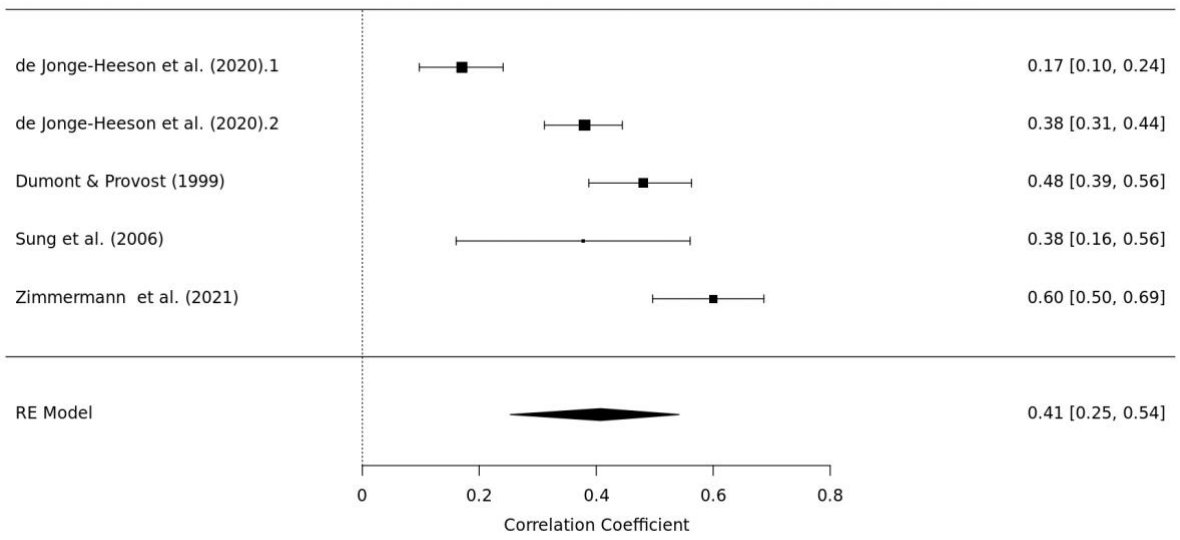
Forest plot of effect sizes for suppression and depression, showing pooled effect size



A smaller number of studies reported the association between avoidance and depression, so these results should be interpreted with caution. Together, they revealed a positive association between avoidance and depression, with a medium effect size, suggesting greater avoidance was linked to higher rates of depressive symptoms (see Figure 7).

Figure 7

Forest plot of effect sizes for avoidance and depression, showing pooled effect size



Moderator analyses

Previous research suggests there are stronger links between some ER strategies and depression in older compared to younger youth (e.g., Rood et al., 2009). For this reason, stage of adolescence (early- , mid- , late-adolescence) was modelled as a moderator in all meta-analyses where there were five or more studies. None of these models were significant, indicating that the associations between the use ER strategies and depression is not moderated by age (see Table 3).

Table 3

Moderator analyses for stages of adolescence for each emotional regulation skill

ER strategy	*k*	*QM*	*df*	*p*
Adaptive				
Acceptance	8	0.08	2	.96
Reappraisal (cognitive)	38	0.18	2	.92
Maladaptive				
Rumination	15	1.09	2	.58
Suppression	23	1.43	2	.49
Avoidance	5	5.71	2	.06

Quality and Risk of Bias

All included studies were rated as ‘Fair’ or ‘Good’ on the Newcastle-Ottawa Scale (NOS) that assesses risk of bias. This meant no studies were excluded from each ER strategies overall meta-analyses (see Table 4). The lack of poor-quality studies was likely influenced by the inclusion criteria that stated only studies using validated self-report measures of depressive symptoms and ER strategies would be selected.

Table 4

Newcastle-Ottawa Scale (NOS) quality ratings for included studies

	Selection				Comparability	Outcome		Rating Outcome	
Study identifier	Representativeness	Sample Size	Non-Response rate	Ascertainment of screening/surveillance tool	Confounders investigated	Assessment of outcome	Statistical test	Count of stars	Overall rating
Adrian et al. (2019)	*	0	0	**	*	*	*	6	Good
Alix et al. (2020)	0	0	0	**	*	*	*	5	Fair
Andreotti et al. (2011)	0	0	*	**	*	*	*	6	Good
Arnarson et al. (2016)	0	0	*	**	*	*	*	6	Good
Betts et al. (2009)	0	0	0	**	0	*	*	4	Fair
Cano et al. (2020)	*	0	*	**	*	*	*	7	Good

Cerutti et al. (2017)	*	0	*	**	*	*	*	7	Good
Chen et al. (2019)	*	0	0	**	*	*	*	6	Good
Chen & Cheung (2021)	0	0	0	**	*	*	*	5	Fair
Chervonsky & Hunt (2019)	*	0	*	**	*	*	*	7	Good
Connell et al. (2013)	*	0	0	**	*	*	*	6	Good
De France & Hollenstein (2019)	*	0	*	**	*	*	*	7	Good
De France et al (2018)	0	*	0	**	*	*	*	6	Good
de Jonge-Heesen et al. (2020)	*	*	0	**	0	*	*	6	Good
Dumont & Provost (1999)	0	0	0	**	0	*	*	4	Fair

Eastabrook et al. (2014)	0	0	0	**	*	*	*	5	Fair
Ferraz de Camargo & Rice (2020)	0	*	*	**	*	*	*	7	Good
Ford et al. (2019)	0	*	*	**	*	*	*	7	Good
Garnefski & Kraaij (2006)	*	0	0	**	*	*	*	6	Good
Garnefski & Kraaij (2018)	*	*	0	**	*	*	*	7	Good
Hilt et al. (2018)	*	0	*	**	0	*	*	6	Good
Juang et al. (2016)	0	0	0	**	*	*	*	5	Fair
Klemanski et al. (2017)	0	0	0	**	0	*	*	4	Fair
Krause et al. (2018)	*	0	*	**	*	*	*	7	Good
Liu et al. (2020)	*	0	0	**	*	*	*	6	Good

Lougheed & Hollenstein (2012)	0	0	0	**	0	*	*	4	Fair
Ma & Fang (2019)	*	0	*	**	*	*	*	7	Good
Madjar et al. (2019)	*	0	0	**	*	*	*	6	Good
Niu et al. (2023)	0	0	0	**	*	*	*	5	Fair
Pepping et al. (2016)	0	0	0	**	0	*	*	4	Fair
Sai et al. (2016)	*	0	0	**	*	*	*	6	Good
Shapero et al. (2019)	0	0	0	**	*	*	*	5	Fair
Shen (2022)	*	0	0	**	*	*	*	6	Good
Skymba et al. (2022)	*	0	0	**	*	*	*	6	Good
Sobol et al. (2021)	0	0	0	**	*	*	*	5	Fair

Stikkelbroek et al. (2016)	*		0		0	**	*		*	*	6	Good
Sung et al. (2006)		0	0	*		**		0	*	*	5	Fair
Turliuc et al. (2020)	*		0	*		**	*		*	*	7	Good
van den Heuval et al. (2020)	*	*			0	**	*		*	*	7	Good
Ye et al. (2022)	*	*			0	**	*		*	*	7	Good
Yin et al. (2022)	*	*			0	**	*		*	*	7	Good
Yu et al. (2021)	*	*			0	**	*		*	*	7	Good
Zhao & Zhao (2015)	*	*			0	**	*		*	*	7	Good
Zimmermann et al. (2021)	*		0		0	**	*		*	*	6	Good

Publication bias

Funnel plots were produced using Duval and Tweedie's (2000) trim-and-fill method to detect publication bias (i.e., that studies with non-significant results are less likely to be published). In the absence of publication bias, effect sizes should be symmetrically distributed around the mean on the funnel plots (Rothstein, 2007). The trim-and-fill method identifies studies which may cause asymmetry, and then estimates the number of studies needed via imputation to make a funnel plot more symmetrical (i.e., the number of unpublished or missing studies). A more symmetrical plot indicates a lower risk of publication bias. The funnel plots for each ER strategy are presented in the additional results chapter (Figures 15-20). Visual inspections of the funnel plots reveal that there was little evidence of publication bias for acceptance or problem-solving (2 additional studies needed for symmetry), and for rumination (1 additional study needed) or avoidance (symmetrical and no studies needed). There was some evidence for publication bias for reappraisal and suppression where an additional six studies were needed for symmetry, although this number is still low.

Fail-safe N analyses were also run to further check for publication bias (Orwin, 1983). These provide the number of non-significant effect sizes needed for each ER strategy to make the results of the meta-analysis non-significant: the higher the number (fail-safe N), the greater the number of non-significant effects needed to make the outcomes non-significant, meaning the less chance there is of publication bias (Oswold & Plonsky, 2010). The outcomes revealed: 71 effect sizes would be needed for acceptance; 1 for problem-solving; 4217 for reappraisal; 6005 for rumination; 3586 for suppression, and 475 for avoidance.

In conclusion, the risk for publication bias for reappraisal, rumination, suppression, and avoidance was low, but higher for acceptance and problem-solving.

Discussion

The current meta-analytic review examined the relationship between six ER strategies (acceptance, problem-solving, reappraisal, rumination, suppression, and avoidance) and depression across the full adolescent age range (10-25 years: Jaworska & MacQueen, 2015; Sawyer et al., 2018; Sharma et al., 2013). A total of 44 studies yielding 92 effect sizes were included, and none were rated as poor quality. One adaptive strategy, cognitive reappraisal, was significantly negatively associated with depressive symptoms, and all three maladaptive strategies, rumination, suppression, and avoidance, were significantly positively related to depressive symptoms. The relationships between acceptance and depression and problem-solving and depression were not significant. Adolescent stage (early-, mid-, or late-) did not moderate these effects.

The relationships between the maladaptive strategies and depressive symptoms were all positive, with significant effect sizes ranging from small to medium, indicating that more frequent use of these strategies was associated with elevated depressive symptoms. The largest effect sizes were for rumination and avoidance, with a smaller effect size for suppression. This pattern is broadly consistent with the outcomes of Kraft et al.'s (2023) recent meta-analytic review that excluded older adolescents and those in college, and with Schäfer et al.'s (2017) review that included a narrower and younger age range. Both reported larger effect sizes for rumination and avoidance with depression than suppression. It should be noted that the difference in effect sizes across these reviews was from small (suppression) to large (avoidance and rumination), while ours were from small (suppression) to medium (avoidance and rumination). These differences cannot be attributed to differences in the number of studies included, as Schäfer et al. (2017) included fewer while Kraft et al. (2023) included more. The primary difference between the reviews is the age range included, pointing to the idea that the

use of maladaptive strategies has a smaller impact on symptoms of depression when the whole adolescent age range is considered (we return to this later in the discussion).

Together, our studies suggest the habitual use of avoidance and rumination increase the severity of depressive symptoms more than suppression, but that all three have an impact. Thus, it seems either hyperfocus on (Nolen-Hoeksema & Watkins, 2011; Nolen-Hoeksema et al., 2008), or avoidance of, negative thoughts and emotions (Hayes, 1996; Kraft et al., 2023) are strongly related to adolescent depression, presumably because they prolong and intensify experiences of negative emotions (Ehring & Watkins, 2008; Gross & John, 2003; Hankin, 2008; Siu & Shek, 2010; Werner & Gross, 2010).

The associations between adaptive ER strategies and symptoms of depression were small and negative, and only significant for cognitive reappraisal and not acceptance or problem-solving. The effect size between cognitive reappraisal and depressive symptoms was similar in magnitude to that reported by Kraft et al. (2023); both were smaller than that reported by Schäfer et al. (2017). All three, however, show that the habitual use of cognitive reappraisal was associated with lower levels of depression, probably because it reduces negative emotions through positive reframing (Garnefski & Kraaij, 2018; Rood et al., 2009) and lowers levels of rumination (Hilt & Pollak, 2012). Despite the effect size for problem-solving being non-significant, it was similar in magnitude to that reported by Kraft et al. (2023): ours was -.15 and theirs -.17. Only three studies met our inclusion criteria for problem-solving, while k=19 met Kraft et al.'s (2023). This may explain why our results did not reach significance, and certainly suggests they should be interpreted cautiously.

The effect size between acceptance and depressive symptoms was small and non-significant, contrasting both Kraft et al. (2023) and Schäfer et al. (2017) who reported significant negative medium effect sizes indicative of more frequent acceptance being associated with fewer depressive symptoms. We anticipated a similar pattern given acceptance

can provide adolescents with the experience that negative emotions associated with stress and change are common during adolescence, being tolerable and transient (Hayes & Lillis, 2014; Singer & Dobson 2007). The differences in our outcomes cannot be explained by the number of studies included in the reviews as Kraft et al. (2023) included a greater number (k=19) and Schäfer et al. (2017) included only two. It is possible that the outcomes were influenced by inclusion of individuals in late adolescence in our review.

Across our review and both Kraft et al.'s (2023) and Schäfer et al.'s (2017) there were stronger associations between the frequent use of maladaptive strategies and more severe symptoms of depression than between the frequent use of adaptive strategies and fewer symptoms of depression. As proposed by Aldao & Nolen-Hoeksema (2010), one explanation for these effects may be that adaptive strategies are only useful for reducing symptoms of psychopathology (including depressive symptoms) when the use of maladaptive strategies is high: their effectiveness is context-dependent. The moderating effect of maladaptive ER strategies on the association between adaptive strategy use and depression has been established in adult populations and warrants further investigation adolescence (Aldao et al., 2010; Demeyer et al., 2012; Joormann & D'Avanzato, 2010) .

Stage of adolescence (early-, mid-, or late adolescence) did not moderate the effects of ER strategy on depressive symptoms. The absence of an age effect in adolescence is consistent with previous reviews that have explored the effects of age as a continuous variable (e.g., Schäfer et al., 2017). However, we did anticipate an effect of the stage of adolescence with smaller effects in late adolescents who we included, but were not included in previous meta-analyses, as the use of ER strategies becomes more consistent with increasing age (Abela et al., 2002; Abela & Hankin, 2007). There were differences in the relationships between ER strategy use and depression in our review compared to others (e.g., smaller effects for maladaptive strategies and a non-significant effect for acceptance), which may be explained by

the inclusion of older adolescents here. It is possible the moderating effect of adolescent stage was not significant due to the limited number of studies per adolescent age group (Hedges & Pigott, 2001).

Implications

The current review, consistent with previous meta-analyses (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017), highlights that the habitual and frequent use of maladaptive ER strategies, rumination, avoidance, and to a lesser extent, suppression, increase the likelihood of an adolescent experiencing depression or depressive symptoms. Our data suggest these effects extend into late adolescence. In terms of the prevention of adolescent depression, identifying and reducing the frequent use of these approaches in response to emotional experiences is likely to be beneficial. Our data reveal that frequent cognitive reappraisal may be a protective factor against depressive symptoms, validating its use as a clinical tool in therapeutic approaches such as CBT (Beck, 1979). While the use of other adaptive ER strategies was not directly linked to fewer depressive symptoms, it could be that their effectiveness is moderated by frequently using maladaptive ER strategies. If this is the case, teaching adaptive strategy use to adolescents who are habitually using maladaptive strategies might be an effective clinical tool for reducing symptoms of depression (e.g., Aldao & Nolen-Hoeksema, 2010; Aldao et al., 2016).

Limitations and future directions

The strengths of this review are its focus on the whole of the adolescent age range, its focus on theoretically grounded ER strategies, and strict inclusion criteria that meant only studies using validated measures were included and that the risks of publication bias and inclusion of poor-quality studies were low. It is limited by the correlational nature of the studies included, which means causation cannot be inferred, unlike meta-analyses of longitudinal and intervention designs (e.g., Cavicchioli et al., 2022; Moltrecht et al., 2019). It was also limited

by the number of studies meeting the inclusion criteria. For all ER strategies except problem-solving there were more than the recommended five studies (Hedges & Pigott, 2001), but in some cases this was still below the more desirable 10 (e.g., acceptance and avoidance), and often below the recommended five for moderator analyses, limiting the interpretability and confidence of some of the effects. The method in which studies were grouped categorically to examine age effects as part of the moderator analyses was limited. There was a potential loss of information utilising the mean age of samples rather than the full age range of respective studies (which may have largely varied from the mean). It may be that future studies would benefit from distinguishing their results by age group in order for a more accurate examination of age differences across variables. To further explore the relationship between ER strategies and depressive symptoms in late adolescence, and potentially capture more studies, the age range could be limited by using the mean age of 25, instead of the maximum age of 25.

Only self-report measures were included. While they were all valid and reliable measures, self-report measures are known to be influenced by social desirability and response tendencies (Zeman et al., 2007) and they do not capture other social, environmental, or biological influences on the development of ER. Future meta-analyses should combine reports from multiple informants and from different measurement types (e.g., neural, and cognitive) to extend and validate the effects found here. Another future direction would be to consider cultural differences in the relationships between ER and depression. We identify that there was a proportion of studies included in this review that were conducted in Eastern cultures (e.g., 10 in China). Different cultural groups such as collectivistic or individualistic may interpret depressive symptoms and/or ER differently. For example, suppression may not be seen as ‘maladaptive’ and instead may be more culturally normative/accepted in Eastern culture (Schunk et al., 2022; Wei et al., 2015). Although measures were checked for validity, they may not have accounted for these cultural differences which is a limitation of this review.

Conclusion

Considering this meta-analytic review alongside two others conducted relatively recently, there is evidence that the frequent and habitual use of maladaptive ER strategies is associated with more severe symptoms of depression in adolescence. The more frequent use of cognitive reappraisal, an adaptive ER strategy, was associated with fewer symptoms of depression across this and the previous reviews, supporting its use as a helpful tool in many therapeutic approaches. The current review suggests acceptance and problem-solving do not affect depressive symptoms in adolescents, but further work should be conducted to explore whether they are effective in reducing depressive symptoms in adolescents who frequently use maladaptive strategies.

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Chapter 3: Bridging Chapter

The meta-analysis in chapter 2 considered the relationship between six emotional regulation (ER) skills and depression across adolescence. To our knowledge, this was the first meta-analysis to examine the relationship of ER with unipolar depression across all stages of adolescence, early (10-14 years), mid (15-18) and late (19-25 years). This meta-analysis provided evidence consistent with previous findings that ER strategies typically associated with being maladaptive (rumination, suppression, and avoidance) are all significantly positively related to depression (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017). Compared to previous reviews, the meta-analysis in chapter 2 reported mixed findings in relation to adaptive ER skills (cognitive reappraisal, acceptance and problem solving), finding only a significant negative relationship between cognitive reappraisal and depression. Across all stages of adolescence, there were no differences found between the use of ER skills and depression.

It appears the relationship between suppression, and cognitive reappraisal with depression across adolescence is well established (De France et al., 2022; Garnefski & Kraaj, 2016; Kraft et al., 2023; Schäfer et al., 2017) however, the cognitive underpinnings of this relationship are less understood. Similarly, from the meta-analysis outlined in chapter 2 and previous reviews, it appears a large proportion of existing empirical research in this area is conducted with mid-late aged adolescents (Kraft et al., 2023; Schäfer et al., 2017). However, in order to support the prevention of onset of depression in adolescence, earlier identification of vulnerability factors should be considered. Numerous developmental changes occur throughout adolescence, e.g., biological, social, and emotional (Blakemore & Mills, 2014; McRae et al., 2012; Young et al., 2019; Zimmermann & Iwanski, 2014), but early adolescence is a key time for the development executive functions (EFs) and ER; mapping onto brain maturation and transitioning from childhood into adolescence (Crone & Dahl,

2012; Dahl, 2004; Lantrip et al., 2016). Therefore, it felt important to consider the relationship between EFs, ER skills and depression in early adolescence, a cohort less studied in this context.

Chapter 4 is going to examine suppression and cognitive reappraisal's association with depression in early adolescence more closely, whilst considering how EFs may also contribute to this association. There has so far been some exploration of the relationships between these variables, but none have yet examined the strength and direction of these (Lantrip et a1., 2016; Wante et al., 2017).

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Chapter 4: Empirical Research Paper

Do Emotional Regulation Skills Moderate the Relationship Between Depression and Executive Functioning in Adolescents?

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Abstract

Associations between executive function deficits and elevated depressive symptoms have been reported in adolescence. Executive function difficulties are also associated with the increased use of maladaptive and reduced use of adaptive emotion regulation strategies. The aim of this study was to test whether two emotional regulation strategies, one adaptive (reappraisal) and one maladaptive (suppression) moderated the link between three executive functions: working memory, inhibition and shifting and depression in early adolescence. A total of 51 adolescents, aged 11-14 years, completed validated self-report measures of executive function, emotional regulation strategies and depression online. The data revealed that elevated depressive symptoms were significantly associated with executive function difficulties across all three executive functions. There was also an increased use of the adaptive emotion regulation strategy, cognitive reappraisal, and reduced use of the maladaptive emotion regulation strategy, suppression. However, neither emotion regulation strategy significantly moderated the links between the three executive functions and depression (although it should be noted that the study was underpowered to detect small effects). These data contribute to our understanding of the relationship between cognition, emotion regulation and depression in early adolescence, and to the evidence base for cognitive therapy for young people, informing what needs to be targeted as a priority.

Keywords: Depression, Adolescents, Emotional Regulation, Executive Functions

Introduction

The prevalence of depression and depressive symptoms increases dramatically throughout adolescence (Keyes et al., 2019; Rohde et al., 2012) and onset early in adolescence is associated with lifelong persistent symptoms (Weavers et al., 2021). Understanding the factors that increase vulnerability to depression during early adolescence is therefore paramount for reducing the long term economic and social burden of mental ill health (Knapp & Wong, 2020; Rehm & Shield, 2019) and moving towards a proactive model of intervention (Fenwick-Smith et al., 2018). In adults, difficulties with executive functions (EFs) – the higher order cognitive control functions that regulate our emotions and behaviour – have been linked to increased depression (Dotson et al., 2020; Joormann & D'Avanzato, 2010; Snyder, 2013; Wagner et al., 2012). One explanation for this association is that EFs enable the flexible and effective deployment of emotion regulation (ER) strategies - the skills used to manage and regulate emotional responses (Joormann & D'Avanzato, 2010). The aim of this study was to explore the relationship between EFs and depressive symptoms in early adolescence, and to test whether this relationship was moderated by ER strategies.

EFs are a set of higher-order cognitive skills that enable us to manage our thoughts, behaviour, and emotions. There are many models of EF, but the majority consensus is that they include: 1) shifting/switching – the ability to flexibly shift attentional focus between activities sometimes called cognitive flexibility; 2) inhibition – the ability to inhibit impulsive or unwanted responses, and; 3) updating/working memory – the ability to temporarily hold information in mind and update this information in the course of ongoing cognitive activities (Friedman & Miyake, 2017; Miyake et al., 2000; St Clair-Thompson & Gathercole, 2006; Theodoraki et al., 2019). This three-factor model of EF is adopted in the current study.

There is substantial evidence that elevated depressive symptoms are linked to poor working memory (Nikolin et al., 2021; Semkovska et al., 2019; Snyder, 2013), impaired

switching (Lui et al., 2021; Meiran et al., 2011; Whitmer & Gotlib, 2012) and inhibitory control problems (Bessette et al., 2020; Joorman et al., 2007; Richard-Devantoy et al., 2016) in adults. Associations between poor EF and elevated depressive symptoms in adolescence are less well-studied, and the evidence is more mixed, with some reporting links (Baune et al., 2014; Wante et al., 2017) and others not (Vilgis et al., 2015). However, research suggests poor working memory and switching abilities may increase vulnerability to depression in children and young people (Goodall et al., 2018; Klimkeit et al., 2011; Mitchell & Phillips, 2007).

There are three primary theoretical accounts of links between EF difficulties and elevated depressive symptoms. The interference hypothesis suggests psychological distress disrupts cognitive processing by shifting cognitive resources away from task-relevant information and onto negative thoughts (Donati et al., 2021; Llewellyn et al., 2008; Stawski et al., 2006), resulting in both short- and long-term EF difficulties (Dolcos et al., 2020). The cognitive reserve hypothesis suggests poor EF impairs the downregulation of negative emotional responses, such as sadness, leading to increased depression (LeMoult & Gotlib, 2019; Millan et al., 2012). Finally, the dynamic mutualism hypothesis integrates these two opposing theories, arguing that depressive symptoms and EF interact reciprocally across the lifespan (Fuhrmann et al., 2020). It has also been suggested that the role of EF in ER might attenuate depressive symptoms (Joormann & D'Avanzato, 2010).

ER strategies are the skills that enable us to manage and regulate emotional responses in emotionally evocative and changing situations (Compas et al., 2017; Eisenberg et al., 2010). They are typically classified as either adaptive (cognitive reappraisal, problem-solving or acceptance) or maladaptive (rumination, avoidance or suppression) because of their links to symptoms of mental ill-health when used habitually (Aldao et al., 2010; Kraft et al., 2023). The use of maladaptive strategies (those associated with negative long-term outcomes, Aldao et al. 2010) is implicated in the onset, maintenance, and recurrence of mental health disorders in

adults (Gross, 2013; Jazaieri et al., 2013; Scheibe & Blanchard-Fields, 2009) and linked to elevated symptoms of anxiety and depression in adolescents (Aldao et al., 2010; De France & Hollenstein, 2019; Garnefski & Kraaij, 2018; Kraft et al., 2023; Schäfer et al., 2017; Young et al., 2019).

In adults, EF deficits are associated with the increased use of maladaptive ER strategies, including rumination (Davis & Nolen-Hoeksema, 2000; Demeyer et al., 2012; Joormann et al., 2006; Joormann & Stanton, 2016), and a reduction in the use of adaptive ER strategies such as cognitive reappraisal (Joormann & Gotlib, 2010). Based on these associations, and the links between EF and depression, it has been suggested that ER may be the pathway through which EF influences depression. That is, because EF controls the processes that regulate our emotions, (including ER skills), poor EF might lead to the use of more maladaptive strategies that increases the risk of depression. Studies with adults support the suggestion that EF and ER skills interact to influence depressive symptoms (Joorman & Gotlib, 2010; Smoski et al., 2012; Stubberud et al., 2021).

To date, to our knowledge, only one study has explored whether EF and ER interact to influence depressive symptoms in adolescence. This is surprising given adolescence is characterised by a rapid maturation in EF abilities (Crone & Dahl, 2012; Dahl, 2004; Best & Miller, 2010; Dumontheil et al., 2010; Rosenblum & Lewis, 2006; Silvers et al., 2012; van der Aar et al., 2019) that causes the restructuring of ER strategies and their use (Zimmermann & Iwanski, 2014).

Wante et al. (2017) explored the associations between EF, ER and depressive symptoms in adolescents aged 10-16 years. They explored links between a broad range of EFs, the use of 15 ER strategies in response to anxiety, sadness, and anger, and depressive symptoms. Overall, they found that greater EF deficits were linked to elevated symptoms of depression and to the

use of more maladaptive and less adaptive ER strategy use. They also found that ER strategies mediated the link between EF deficits and increased depressive symptoms.

Current study

The aim of the current study was to explore the association between three key EFs and depressive symptoms in early adolescence, and to test whether these links were moderated by two specific ER strategies – cognitive reappraisal and suppression. We chose to focus on these two strategies because one is adaptive and one maladaptive, and because there is a transition from a greater reliance on suppression during childhood to greater use of reappraisal in adolescence - a transition that parallels developmental changes in EFs (Lantrip et al., 2016). Based on the theoretical model proposed in Wante et al. (2017) who found that ER mediates relationship between EF and depression, we also chose to input ER as our moderator variable to observe the strength and direction of these interactions. We also chose to focus in on only three EFs to align with leading theoretical models of EF (e.g., Miyake et al., 2000), and to focus on early adolescence (11-14 years) as this is both a key time for the development of EFs (Crone & Dahl, 2012) and for depressive symptoms that are associated with particularly long-lasting effects (Weavers et al., 2021). Wante et al. (2017) relied on parent-reported ratings of their children's EF and depressive symptoms, and child self-reports of ER strategy use. Here we use self-report across all measures to improve consistency (e.g., all measures from the same informant) and to capture the perspective of the adolescents (Harwood, 2010).

The following hypotheses were tested. First, it was predicted that there would be a significant negative relationship between EF and depression, with adolescents with higher EF having lower symptoms of depression. Second, it was predicted that increased maladaptive strategy use (suppression) would be linked to increased depressive symptoms, and that increased adaptive strategy use (cognitive reappraisal) would be linked to decreased symptoms of depression. It was predicted that reduced EF would be linked to increased

suppression (maladaptive) and increased EF would be associated with increased cognitive reappraisal (adaptive). Finally, it was predicted that links between EF and depression would be moderated by ER. Specifically, it was predicted that reduced EF would interact with elevated maladaptive strategy use (suppression) and lower adaptive strategy use (cognitive reappraisal), leading to elevated depression, while increased EF would interact with increased adaptive strategy use (cognitive reappraisal) and reduced maladaptive strategy use (suppression) leading to lower levels of depression.

Method

Participants

A total of 52 participants were recruited (33 females *M*= 13 years, *SD*= 1; 16 males *M*= 12.7 years, *SD*= 1.04; 2 transgender *M*= 13.5 years, *SD*= 0.71, and 1 who did not disclose their gender). Participants were aged between 11-14 years (*M*=12.71 years, *SD*= 1.05). Those with uncorrected visual problems were excluded, but there were no other exclusionary criteria. Ethnicity of sample was 92.2% white/white British, 3.9% white and Asian, 1.9% white and Black African, 1.9% mixed/multiple ethnic groups. A total of 9.8% of participants stated that they had a diagnosed mood disorder such as anxiety or depression, a further 35.3% considered themselves to have a mental health (MH) difficulty, and of both of these groups 19.6% stated that they were receiving support for their MH. A priori power analysis conducted in G*Power, based on outcomes from Wante et al. (2017), revealed a sample of size of 52 was required to detect a moderate relationship with a medium effect size and statistical power of .8 (see Appendix F).

Participants were recruited through study advertisements displayed in schools across East Anglia, United Kingdom, and later posted on social media (Twitter and Facebook) to supplement recruitment. Parents/carers interested in their child participating contacted the research team with an expression of interest and were then sent participant information sheets

and consent forms by email (see Appendix G & H). Written informed consent was provided by legal parent/carer(s), and the adolescents provided click-to-tick assent (see Appendix I & J). The research team contact details were provided to the parents/carers and adolescents.

Procedure

Participants completed an online survey in their own time, with support from parents/ carers if needed. This included accessible study information followed by an assent tick box, a demographics questionnaire asking about age, gender, and ethnicity with an option to disclose whether they had a mood disorder and/or were receiving support for this and then three questionnaires assessing emotion regulation, executive function, and depression respectively (see Appendix K). In total it took approximately 20 minutes to complete the study. All participants completed these questionnaires in the same order and were given an aftercare debrief sheet at the end of the study (see Appendix L). Participants were told they could withdraw at any time during the study and that they could withdraw their data up to two weeks after completion by emailing the research team and providing their participant code. Ethical approval was granted by the University of East Anglia, Faculty of Medicine and Health Sciences Research Committee (ETH2223-1559, see Appendix M). See chapter five for additional methodology and ethical considerations.

Measures

Executive Function

The Behavioural Rating Inventory of Executive Functions (BRIEF-SR) is a self-report measure used to assess EF in 11–18-year-olds (Guy et al, 2004). There are 80 items describing everyday behaviours the require EF, which participants rate for frequency on a scale of ‘Never’, ‘Sometimes’, and ‘Often’. The 80 items are summed to provide eight subscale scores; inhibit, self-monitor, shift, emotional control, task completion, working memory, and plan & organize. Here we included subscales measuring inhibit, shift, and working memory. Raw scores for each

subscale can be converted to T scores (Gioia et al., 2015), but as they are normed by gender using a binary classification (male or female) and because we had transgender participants and one who did not disclose their gender, the raw scores were instead converted to Z scores to control for age. BRIEF-SR has good internal consistency .80-.98 and test re-test reliability .81 (Baron, 2000; Gerard et al., 2000). Higher scores indicate greater EF impairment.

Emotional regulation

The child adapted version of Emotional Regulation Questionnaire (ERQ-CA), suitable for use with 10–18-year-olds was administered (Gullone & Taff, 2012). This is a 10 item self-report measure that provides measures of two ER strategies, cognitive reappraisal and expressive suppression (See Appendix N). Each item describes statements related to emotional experiences and how a person manages them, which participants score on a 5-point scale ranging from 'Strongly Disagree' to 'Strongly Agree'. The ERQ-CA has good psychometric properties, including good internal consistency (see Gullone & Taff, 2012 for details). To control for age effects, all raw scores were converted to Z scores. Higher scores indicate greater use of a particular strategy.

Depression

The Mood and Feelings Questionnaire [MFQ] is a self-report measure designed to screen for depression/depressive symptomology in young people aged 6-19 (Angold et al., 1995; Costello & Angold, 1988). The child self-report short version of the MFQ was administered (See Appendix O). This contains 13 items describing moods and feelings that participants rate based on how much they reflect their own feelings on a scale of 'Not true', 'Sometimes True' and 'True'. The MFQ is a reliable and valid measure in both clinical and non-clinical samples of young people, (Burleson Daviss et al., 2006; Sund et al., 2001; Wood et al., 1995) with good internal consistency .91 and test-retest reliability 0.84 (Thabrew et al.,

2018; Sund et al., 2001). To control for age effects, all raw scores were converted to Z scores. Higher scores indicate elevated levels of depression.

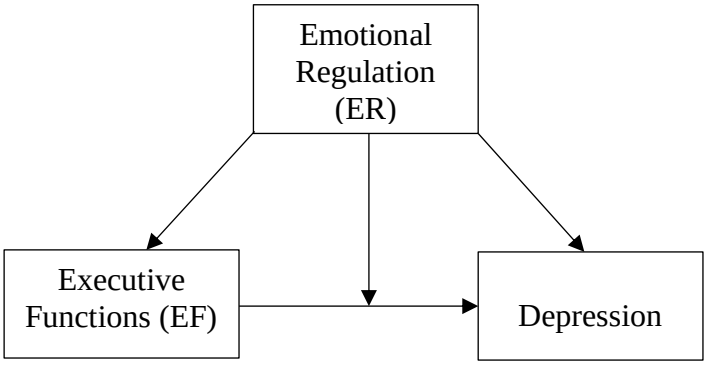
Data analytic plan

All analyses were conducted using IBM SPSS version 29.0.1.0. The moderation analyses were conducted using an additional statistical package PROCESS macro version 4.2 (Hayes, 2022) for SPSS. For all analyses, data were only included for participants with complete data. Data were excluded for one participant who had incomplete data leaving a sample size of N= 51. Due to this, the study did not meet the estimated sample size with recommended statistical power so the results should be interpreted cautiously.

For all measures, descriptive statistics were produced to summarise the raw scores for each measure. Due to the wide age range, all raw scores were then converted to Z scores to control for age effects, and checks were conducted on the normality and linearity of the data (see additional methodology chapter for these checks). All subsequent analyses were conducted using the age-standardised Z scores. Correlational analyses were conducted to explore the relationships between all variables. Linear regressions were run to test whether each EF subscale (inhibit, shift and working memory) predicted depression. Each EF variable was added into a separate regression model using the enter method. We did not enter all three into the same model as they are highly correlated, and we were interested in testing the individual relationships between each aspect of EF and depression. Moderation analyses were then conducted to explore whether each ER strategy moderated the relationship between each EF and depression. See Figure 8 for hypothesised model of interactions. A post-hoc power analysis was run at the end.

Figure 8

Hypothesised conceptual model of variable interactions



Results

Means and standard deviations for all measures are reported in Table 5. All assumptions for normality and linearity were met.

Table 5

Descriptive statistics

Variable	*M*	*SD*	Min score	Max score	Z-score *(M)*	Z-score (*SD)*
Depression	9.33	7.78	0	26	0.00	0.99
Suppression	10.75	3.33	4	17	0.00	0.99
Reappraisal	18	5.09	6	30	0.00	0.99
Inhibit	15.86	4.42	8	24	0.00	0.99
Shift	15.86	4.27	8	24	0.00	0.99
Working Memory	16	4.79	8	24	0.00	0.99

Table 6 shows the correlations between all variables. Depression was significantly positively associated with suppression, and significantly negatively associated with reappraisal. Depression was significantly positively correlated with all three EF variables; inhibit, shift and working memory. Suppression was significantly positively associated with shift and working memory, but there was no significant association with inhibit. Reappraisal was significantly negatively associated with inhibit and working memory, but there was no significant association with shift.

Table 6

Associations between all variables

Variable	1	2	3	4	5	6
1.Depression	1					
2.Suppression	.36**	1				
3.Reappraisal	-.42***	-.05	1			
4. Inhibit	.43***	.22	-.26*	1		
5.Shift	.62***	.48***	-.09	.51***	1	
6.Working Memory	.62***	.44***	-.28*	.61***	.73***	1

Note. * $p < 0.05$, ** $p < 0.01$, *** $p<.001$

A series of linear regressions were used to test whether each EF was a significant predictor of depressive symptoms. Separate models were run for each EF as they are highly correlated with one another (see Table 7). Each model was significant: inhibit and depression, $F(1, 49) = 11.23$, $p < .002$; shift and depression, $F(1, 49) = 30.61$, $p < .001$ and

working-memory and depression, $F(1, 49) = 30.29$, $p < .001$. Overall, shift and working memory predicted more variance in depressive symptoms (approx. 4%) than inhibit (approx. 2%).

Table 7

Regression analysis summary predicting depression

Variable	β	*SE*	R^2	Adjusted R^2	*t*	*p*
Inhibit	.43	.90	.19	.17	3.35	.002
Shift	.62	.79	.39	.37	5.53	<.001
Working Memory	.62	.79	.38	.37	5.50	<.001

Moderation analyses were conducted to explore whether each ER strategy moderated the relationship between each measure of EF and depression (see Table 8). None of the moderation analyses were significant, indicating that in this sample ER did not moderate the relationship between EF and depression.

Table 8

Moderation effects: executive functions and depression, interacting with emotional regulation skills

Variable	*Coefficient*	*SE*	*t*	*p*	*95% CI*	
					LL	*UL*
Suppression						
Constant	-.02	.13	-0.16	.872	-.27	.23
Inhibit	.36	.13	2.83	.007	.10	.62
Suppression	.26	.13	1.94	.059	-.01	.52
Inhibit x Suppression	.10	.13	0.73	.470	-.17	.36
***r*= .52, R^2 = .27, *F*(3,47)= 5.82, *p*= .002**						
Constant	-.03	.12	-0.24	.813	-.27	.22
Shift	.59	.13	4.51	.000	.33	.85
Suppression	.09	.13	0.72	.473	-.17	.35
Shift x Suppression	.06	.11	0.58	.563	-.16	.28
***r*=.63 , R^2 = .40 , *F*(3, 47) = 10.23, *p*= <.001**						
Constant	-.01	.12	-0.10	.923	-.26	.23
Working Memory	.57	.13	4.49	.000	.32	.83
Suppression	.11	.13	0.87	.388	-.15	.37
Working Memory x Suppression	.03	.11	0.25	.804	-.20	.25
***r*= .63, R^2 = .40, *F*(3, 47) = 10.18 , *p*= <.001**						

Reappraisal						
Constant	-.07	.12	-0.59	.557	-.32	.17
Inhibit	.29	.13	2.28	.028	.03	.54
Reappraisal	-.29	.12	-2.39	.021	-.54	-.05
Inhibit x Reappraisal	-.28	.14	-1.99	.052	-.57	.00
***r*= .59 , *R*² = .34, *F*(3, 47) = 8.22 , *p*= <.001**						
Constant	-.01	.10	-0.09	.932	-.21	.19
Shift	.56	.10	5.43	.000	.35	.77
Reappraisal	-.35	.10	-3.49	.001	-.56	-.15
Shift x Reappraisal	-.10	.09	-1.07	.292	-.29	.09
***r*= .73 , *R*² = .53 , *F*(3, 47) = 17.83, *p*= <.001**						
Constant	-.05	.11	-0.44	.664	-.26	.17
Working Memory	.54	.11	4.96	.000	.32	.76
Reappraisal	-.21	.12	-1.82	.075	-.44	.02
Working Memory x Reappraisal	-.17	.10	-1.67	.101	-.38	.04
***r*= .69 , R² =.48 , *F*(3, 47) = 14.48 , *p*= <.001**						

Post-Hoc power analysis

A post-hoc analysis was conducted in G Power (see Appendix P). This revealed that with the recruited sample size of 51 participants, the study had statistical power of .6 to detect the smallest effect size (-.26) and .97 to detect the largest (.62) with a one-tailed test, alpha set to .05. The study was therefore well-powered to detect larger effect sizes, but under-powered to detect smaller effect sizes meaning some smaller significant associations and interactions may not have been identified (increased risk of type 2 error).

Discussion

The current study explored the relationships between EFs, ER and depression in early adolescence (11-14 years) using self-report measures. There was a specific focus on the three most widely measured EFs (Miyake et al., 2000) and two ER strategies that show a developmental transition from childhood to adolescence as EF develops – suppression, which reduces, and cognitive reappraisal, which increases (Lantrip et al., 2016).

Overall, there was a positive association between the more regular use of suppression as an ER strategy and increased depressive symptomology. This is consistent with our hypothesis and with previous reports (Wante et al., 2017) that suppressing negative emotions or experiences is maladaptive and increases depressive symptoms (Neumann et al., 2009; Schäfer et al., 2017). This is because the process of suppression might itself bring negative thoughts or experiences to mind (Wenzlaff & Wegner, 2000). By contrast, and again consistent with our hypothesis, there was a significant negative relationship between reappraisal and depression: the more a person used cognitive reappraisal, the lower their depressive symptoms were. This replicates previous findings (De France et al., 2022; Larsen et al., 2012; Shapero et al., 2018; Wante et al., 2017) and is consistent with the idea that reframing thoughts and emotional experiences to manage them in a more positive way can reduce depressive symptoms (Gross, 1998).

The relationships between EF and depressive symptoms were positive, and because higher scores in both domains indicated greater difficulties, these data suggest that deficits in all three EFs were linked to increased depression, consistent with previous reports that EF deficits increase vulnerability to depression in adolescents and adults (Dickson et al., 2017; Han et al., 2015, Holler et al., 2013; Meiran et al., 2011; Nikolin et al., 2021; Semkovska et al., 2019; Snyder, 2013). Finding that better EF is associated with reduced depression in early adolescence supports the idea that effortful cognitive control is needed to attenuate and regulate behaviour and emotions at a time of heightened social, biological, and emotional change (Blakemore & Mills, 2014; Crone & Dahl, 2012; Kertz et al., 2015). When this cognitive control fails, these many changes become aversive and stressful and confer increased risk for MH problems (Blakemore & Mills, 2014).

Working memory and shifting predicted slightly more variance in depression (4%) than inhibition (2%). Poorer working memory abilities have been linked to increased rumination and/or a poorer ability to control emotional information (Wante et al., 2018), which might explain these links. Alternatively, rumination might consume the limited resources of working memory, impacting on working memory ability e.g., as per the cognitive reserve hypothesis (LeMoult & Gotlib, 2019; Millan et al., 2012; Rosen & Engle, 1998). Shifting and inhibition have been associated with depression in much the same way – an inability to switch away from negative thoughts or to inhibit negative thoughts increases rumination, which can lead to depression (Brewin & Smart, 2005; Colich et al., 2016; LeMoult & Gotlib, 2019; Millan et al., 2012), or depressive thoughts can interfere with cognitive processing (Dolcos et al., 2020; Llewellyn et al., 2008; Stawski et al., 2006). Attempts have now been made to target these EF deficits through training interventions to reduce depression and anxiety (Beloe & Derekshan, 2019, Leone de voogd et al., 2016). The current data support the use of these approaches given the links between EF and depression.

The associations between EF and ER strategies were as predicted. Those with elevated EF problems were more likely to use suppression, and those with lower EF problems were more likely to use cognitive reappraisal. Previous research with adults suggested that EF deficits were associated with the increased use of maladaptive ER strategies, including rumination (Deyemer et al., 2012; Davis & Nolen-Hoeksema, 2000; Joormann et al., 2006; Joormann & Stanton 2016), and a reduction in the use of adaptive strategies such as cognitive reappraisal (Joormann & Gotlib, 2010). Similarly, Wante et al. (2017) found that in adolescents, better EF was associated with greater adaptive strategy use and lower maladaptive strategy use. Our data are consistent with these ideas.

Together, our data suggest adolescents with better EF are more likely to engage in reappraisal, which is adaptive, less likely to engage in suppression, which is maladaptive, and less likely to experience elevated levels of depression. This would point to an interaction between EF and ER in predicting depression (Goncalves et al., 2019). Previous reports have shown that ER mediates the relationship between EF and depression in adolescence using parent reports of child EF (Wante et al., 2017), and in adult studies the relationship between cognitive impairments and depression has been shown to be partially mediated by ER (Demeyer et al., 2012). However, our moderation analyses revealed no significant interactions between any of the EFs and either ER strategy when predicting depression. This is presumably because the study was underpowered to detect small effects, as revealed by our post hoc power analysis. On balance the pattern of effects based on the correlational outcomes suggests there may have been an interaction, but we say this cautiously, knowing the moderation effects were not significant, but also underpowered.

Strengths and limitations

This study provides some insights into the relationship between three EFs, two ER strategies and depressive symptoms in adolescence using reports provided by the adolescents

themselves. It is however limited by the sample size, which reduced our power to detect small effects. Second, while the reliance on self-report was positive in terms of involving the adolescents, reports from other informants alongside these would have increased the validity of the data. Using a self-report measure of EF had its advantages as it measures everyday EF. Conversely, the lack of performance-based EF which measure the three EF variables more distinctly tasks may also be a possible limitation. Future research would benefit from using a combination of both self-report behaviour ratings (trait-like EF) and task-based EF (state-like EF) to increase the validity of the data (Mareva et al., 2024). Third, the data were cross-sectional and correlational, limiting the conclusions that can be drawn about causality. Finally, we did not account for comorbidity, which may have impacted the outcomes.

Clinical and Research implications

Although preliminary, the current data suggest that EF deficits are linked to the use of maladaptive ER strategies and increased depressive symptoms. The clinical implications of this are that screening for EF deficits might help to identify adolescents who are at risk of depression, and at risk of using maladaptive ER strategies. Finding links between increased suppression and increased depression, and increased reappraisal and lower depression, supports the importance of identifying negative thinking patterns and maladaptive ER strategies while simultaneously promoting more helpful ER strategies as part of therapeutic interventions e.g., Cognitive Behavioural Therapy.

A large proportion of young people reported that they considered themselves to have a MH difficulty and that they were not receiving support for this. This may reflect current difficulties for adolescents in accessing MH services in the UK (Royal College of Paediatrics and Child Health, 2023; National Health Service Digital [NHS], 2022). Alternatively, it may be indicative of the need to find more creative ways to support young people with their MH.

Future research should focus on a deeper and more thorough exploration of the benefits of increasing adaptive ER strategies in young people with depression (Young et al., 2019). There has been a recent pilot randomised control trial examining the efficacy of online ER training to support adolescents with mood disorders, which reported positive outcomes that included a reduction in anxiety and depressive symptoms (Wisman et al., 2023). Based on the current data, and previous literature, these trials should be advanced. Future research should also explore the links between EF, ER, and depressive symptoms in larger adolescent samples, and compare the effects between community and clinical samples. The present study found that EF predicted depression, but this was not moderated by ER. It may be the future research would benefit from exploring whether EF moderates the relationship between ER and depression. Related to this, it would be interesting to consider developmental differences in these relationships across early, mid, and late adolescence.

Conclusion

This study suggests that EF deficits are associated with increased depressive symptomology, and the increased use of maladaptive ER strategies and reduced use of adaptive ER strategies. These results highlight the significance of considering both cognitive and emotional processes underlying depression in order to improve assessment, prevention, and intervention outcomes.

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Chapter 5: Additional Methodology

This chapter describes supplementary methodological information for chapter 4 (empirical paper).

Additional Methodology Empirical Paper

Lay Summary

There are links made between the ways we think, manage our feelings and our mental health, but most of this work has been conducted with adults or relies on parent ratings of young people's feelings.

The aim of this study is to explore the relationship between how adolescents manage their feelings (emotion regulation), their thinking skills (e.g., memory) and their mood (e.g., depressive symptoms). We will work with young adolescents, a group rarely studied in this context, and we will ask them about their own feelings rather than relying on reports from adults. By increasing our understanding these relationships, we hope to contribute to how mental health support is tailored to children and young people, and to highlight what may need to be targeted as a priority in mental health interventions.

Empirical Project Design

The study used a quantitative observational individual differences design. There were no manipulated variables, and all participants completed the same measures at one time point. When planning the project, we considered different research designs e.g., experimental, or longitudinal, but felt that a study using online data collection at one time point would be more feasible within a clinical psychology doctoral project and more suitable for the participants. As they were school aged pupils, we felt that using online means would be more accommodating and flexible e.g., the study could be completed in a setting which was more comfortable. We were thoughtful about the structure and design of the online survey itself. We considered different measures based on their psychometric properties, age standardisation

and estimated time to complete each questionnaire. All measures were checked for suitability for research purposes. For the emotional regulation measure, the author was emailed for confirmation that this could be used for research purposes (see Appendix N)

Combined, the questionnaires selected were estimated to take no longer than 20 minutes therefore minimising study duration whilst being consciousness of fatigue effects and concentration. In addition, we felt that using an online survey may also reduce risk of coercion from researchers, teachers, or peers.

With further consideration of the uncertainty of the COVID-19 pandemic context at the time of planning the project, it allowed the study to continue and minimise possible limitations (researcher ill-health or governmental restrictions for safety purposes).

Recruitment

When planning the project, we were conscious about the moderate to large, estimated sample size. To combat this, we planned two recruitment methods (1) Advertising to parent/carer(s) within school settings, (2) Advertising to parent/carer(s) on online social media platforms (including parent forums). Of interest to future researchers, the majority of participants were recruited from within schools where a parent had seen the advertisement poster and contacted lead researcher (ZT) for further information. Within the project's timeframe, ZT readvertised the project in multiple waves to increase awareness and advertise at different time points.

As discussed in chapter four, unfortunately the present study did not meet its recruitment target in order to obtain the appropriate statistical power. However, we felt it was important to note that the conducted recruitment appeared successful as we had 93 parent/carer(s) express their interest in the study, with 62 completed consent forms which then translated into 52 completed surveys.

Ethical Considerations

Consent

British Psychological Society [BPS] outline research involving children is considered involving more than minimal risk (BPS, 2021). Due to sensitivity around age of participants, it was imperative that informed parental consent was obtained before any child's entry to the study. The participant information sheet (PIS) for parent/carer(s) provided clear information about their child's participation in the study. In order for a person to consent for a child to enter the study, the individual had to have parental responsibility.

Once this information had been read, a consent form had to be completed which outlined to parents that their child did not have to participate in this study, and it would be the child's choice to withdraw at any time. Once parents had completed and sent back a consent form, lead researcher sent unique ID code to access the study's weblink.

The first page of the online survey presented an easy-read PIS to be shared with the child participant in order for them to make an informed decision about participation in the study. This form outlined that they did not have to partake in the study even if parental informed consent was given and their right to withdraw was up to two weeks after submitting questionnaire responses. Participants were asked to click-to-tick a box to confirm assent and proceed with entry to the study.

Risk of coercion

Chance of coercion was managed as the parent/carer(s) could only access the study weblink if they consent for their child to participate. No incentives were used for either parents or child participants as per BPS guidelines (BPS, 2021). We considered the risk of coercion to child participants could have occurred if their parent coerced them to partake in this study. To manage this risk, there were two levels of consent/assent to ensure all parties

were informed about the nature of the study and had autonomy about their choice to participate.

Confidentiality

No personal identifiable information i.e., names, were captured as part of this study. Each participant was allocated a unique I.D. code to enter the study. Each unique I.D. code was stored alongside parent/carer(s) email addresses in a password protected excel spreadsheet that only the lead researcher (ZT) could access. This data was stored for the duration of recruitment and data collection period, as well as for safety/data withdrawal purposes. This data was destroyed after recruitment period (unless a parent had opted in for dissemination of findings).

Data management

The PIS informed participants that their data was non-identifiable from point of collection to any published outcomes. Data will be stored in archive for at least 10 years as per UEA Research Data Management policy (UEA, 2019).

Data storage and handling through JISC Online Surveys was compliant with GDPR. Data was downloaded for analysis purposes onto lead researcher (ZT) OneDrive account in accordance with UEA research data management policy (UEA, 2019). The JISC Online Surveys account was disabled, and data was deleted off the server now that data collection is completed.

Managing distress /disclosure

Risk of disclosure was deemed low as items on all questionnaires were pre-determined (no free text options) and method of data collection entailed no face-to-face contact. We considered that risk of distress may have occurred if participants felt upset by survey content e.g., being asked about their mental health (MH). MH support resources for local services and crisis line numbers were provided to both parent and child participants.

This information was included in the aftercare sheet provided to parents prior to the start of study and again to the participants at the end of the study.

Deception

There was a low assessed risk of deception as the true aims of study were outlined on both parent and child PIS.

Debriefing

All participants were debriefed after partaking in the study. This included reminder information of the aims of the study and an aftercare sheet as outlined. Lead Researcher contact details were also provided at the beginning of the study to parents and again during debrief.

Chapter 5: References

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Chapter 6: Additional Results

This chapter outlines additional results which are deemed supplementary to chapter 2 (systematic review and meta-analysis) and chapter 4 (empirical study).

Systematic review and meta-analysis

Sensitivity analyses (leave-one-out approach) were conducted for each emotional regulation strategy to see if there were any studies which influenced the overall pooled effect size more than others (Figures 9 -14).

Figure 9

Leave-one-out sensitivity analysis for acceptance

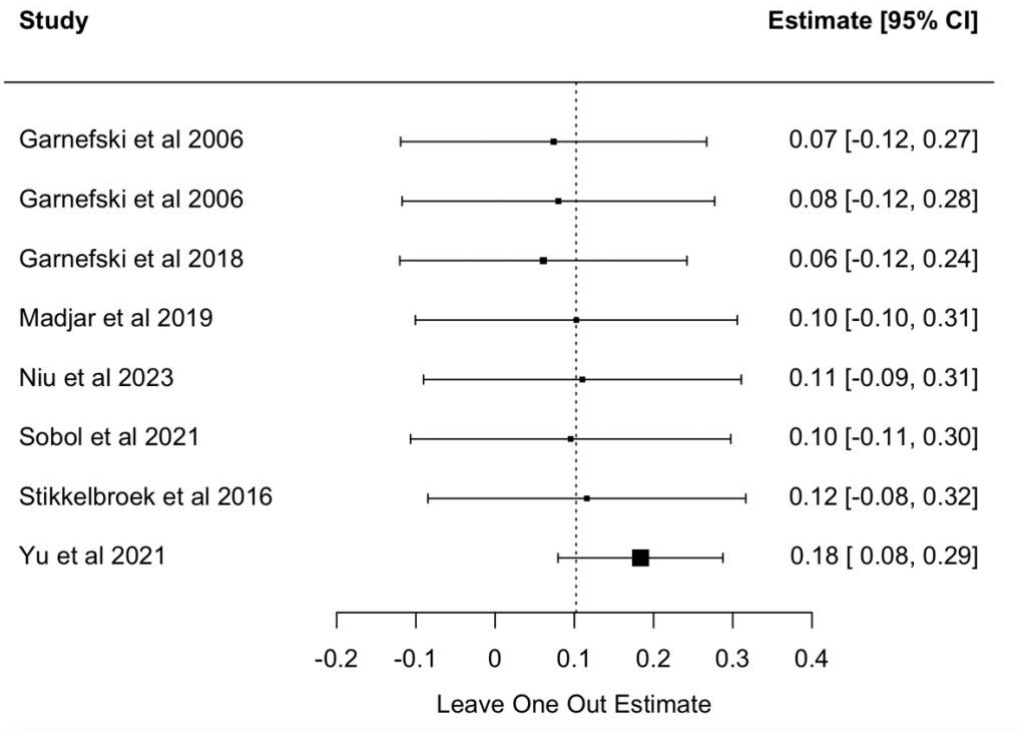


Figure 10

Leave-one-out sensitivity analysis for reappraisal

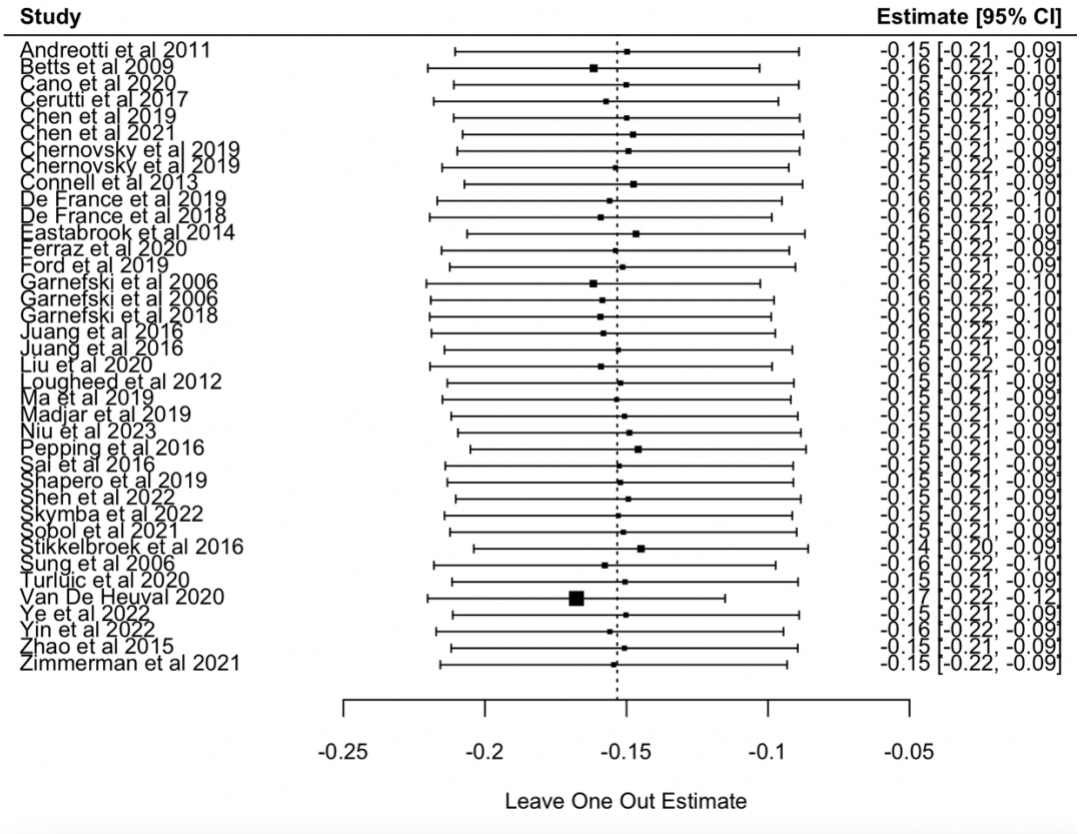


Figure 11

Leave-one-out sensitivity analysis for problem solving

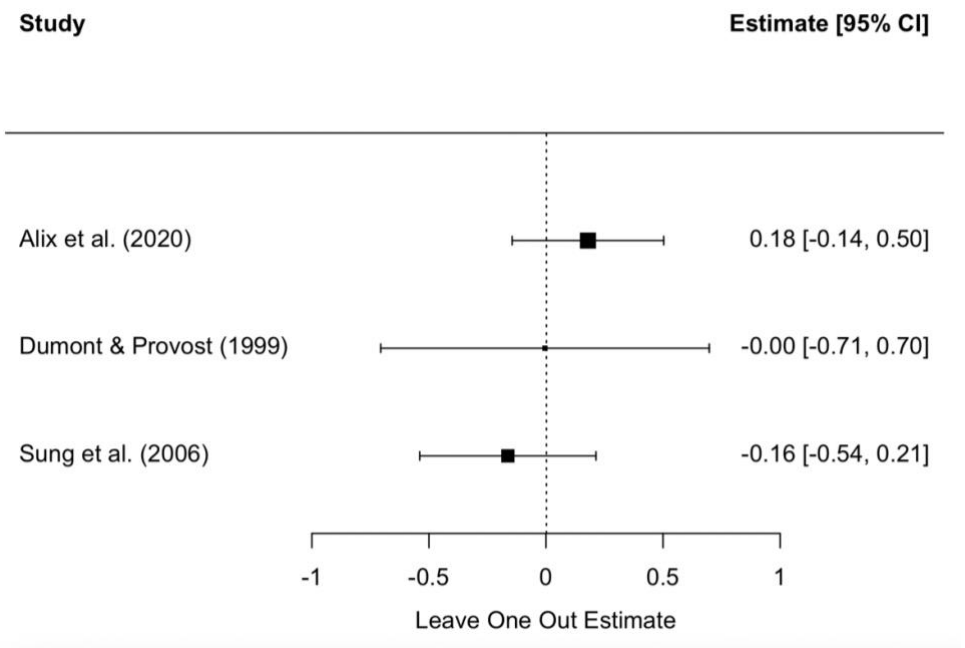


Figure 12

Leave-one-out sensitivity analysis for rumination

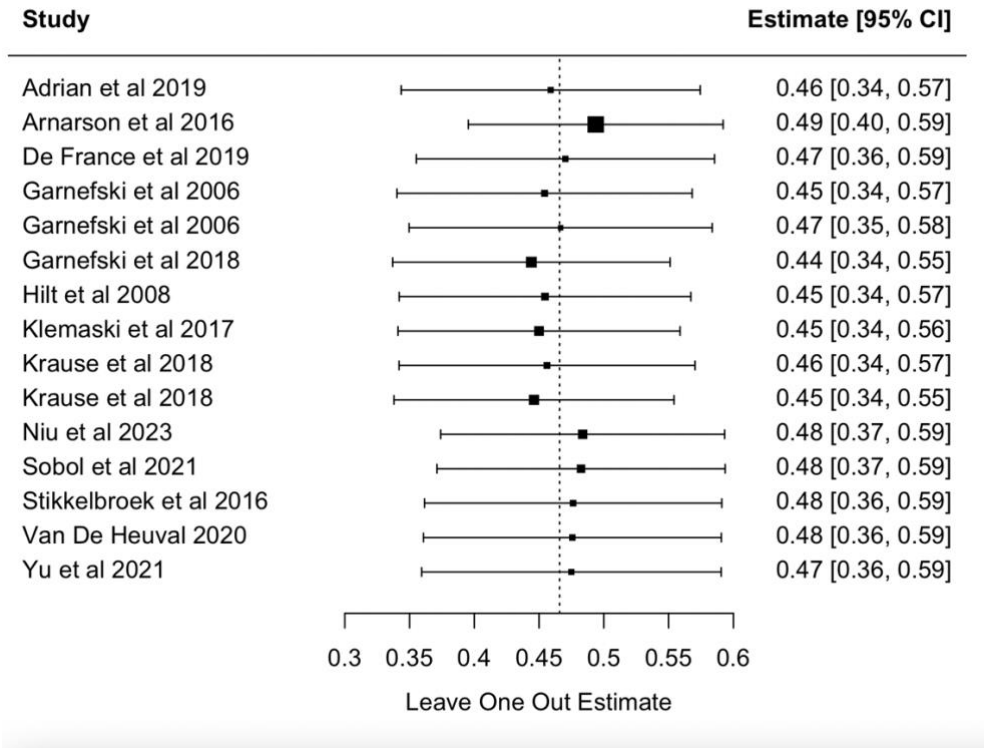


Figure 13

Leave-one-out sensitivity analysis for suppression

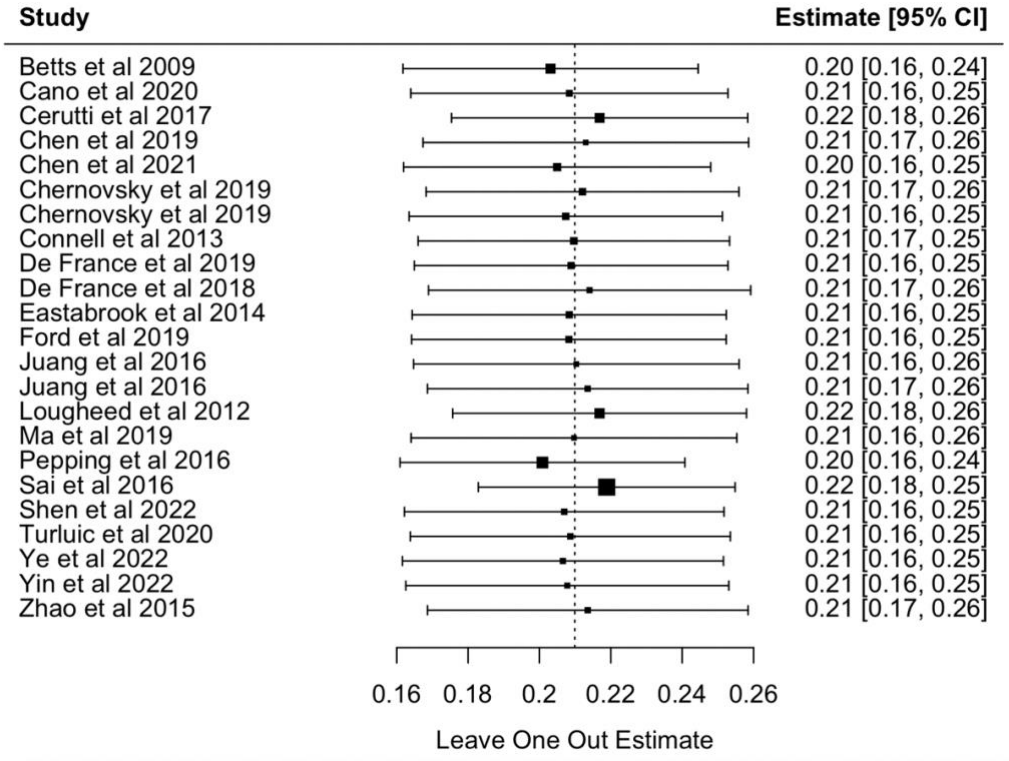
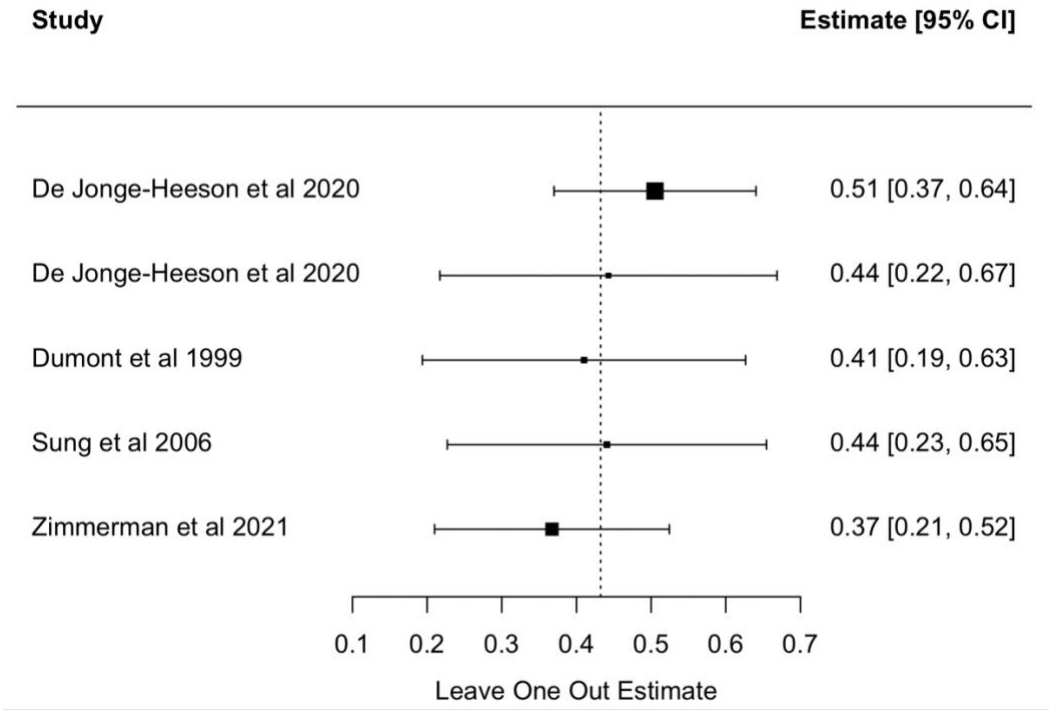


Figure 14

Leave-one-out sensitivity analysis for avoidance

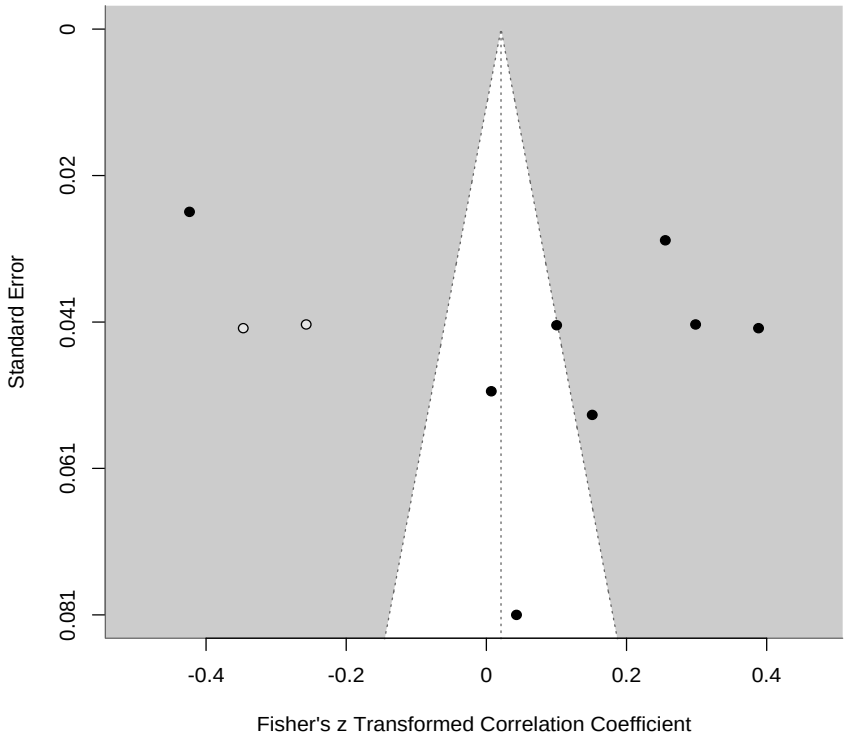


Publication bias

Visual inspections of funnel plots were used to detect possible publication bias using Duval and Tweedie's (2000) the trim-and-fill method. This method detects asymmetry in the included studies which may suggest publication bias and imputes an estimate number of studies needed to make the funnel plot more symmetrical. See figures 15 to 20 for funnel plots for each ER strategy.

Figure 15

Trim-and-fill funnel plot for acceptance



Note. White circles indicate the estimated number of missing or unpublished studies imputed to make the plot more symmetrical. Black circles represent the studies included in the meta-analysis.

Figure 16

Trim-and-fill funnel plot for problem-solving

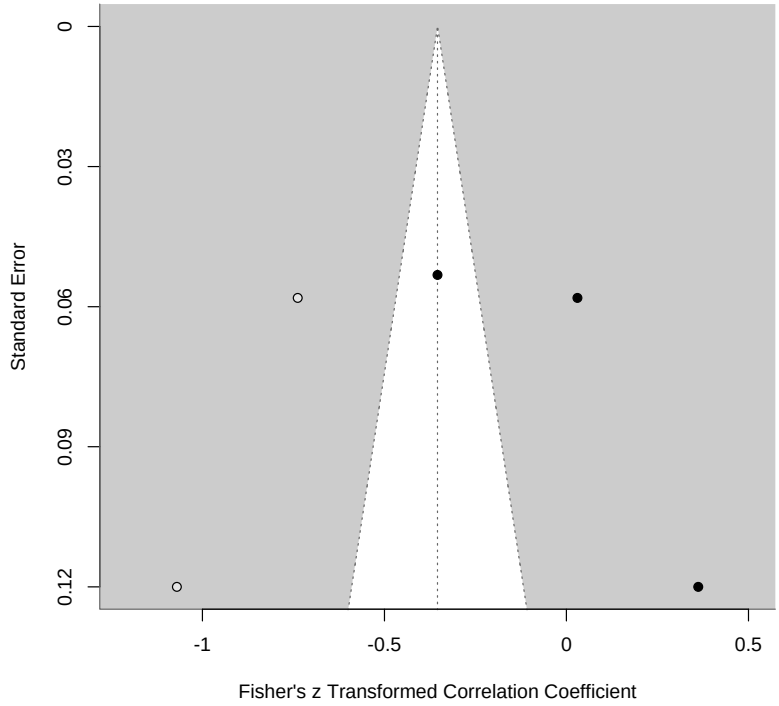


Figure 17

Trim-and-fill funnel plot for reappraisal

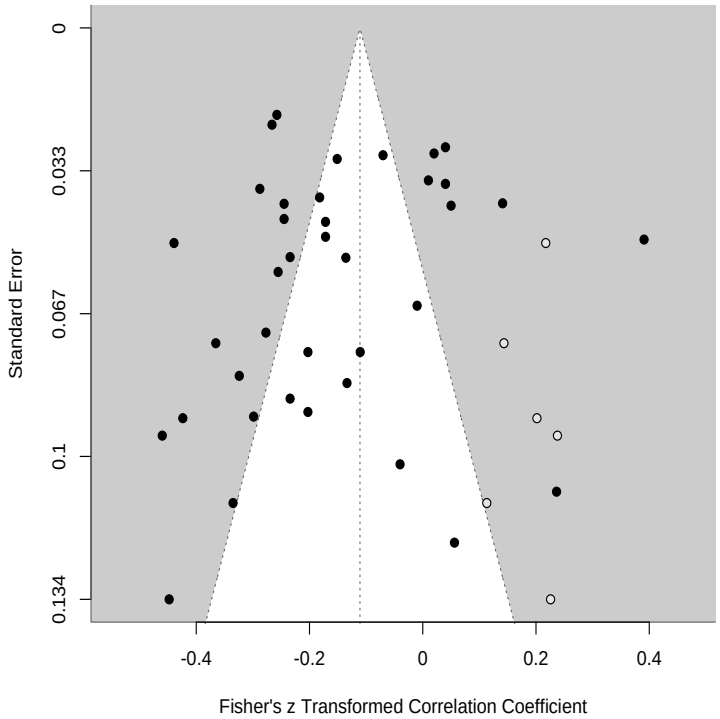


Figure 18

Trim-and-fill funnel plot for rumination

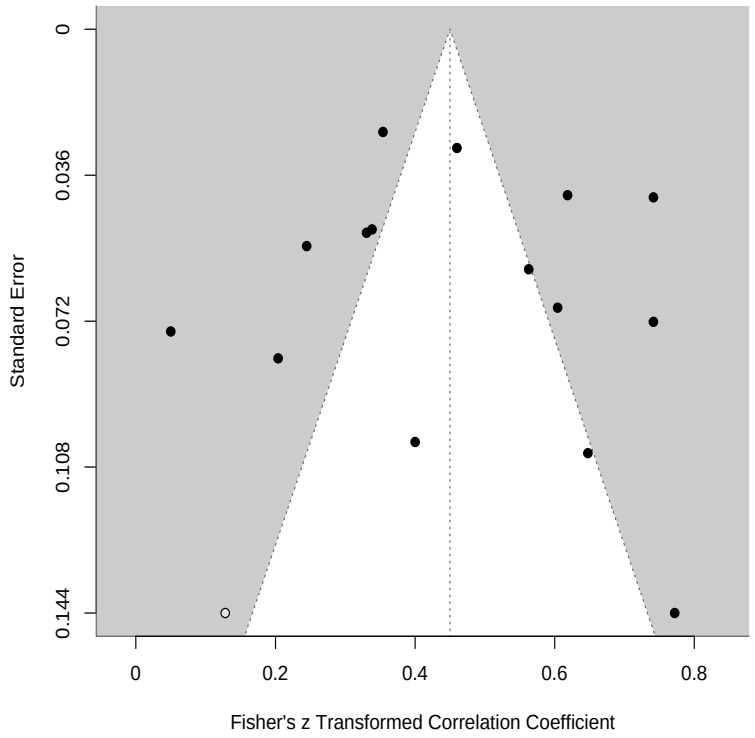


Figure 19

Trim-and-fill funnel plot for suppression

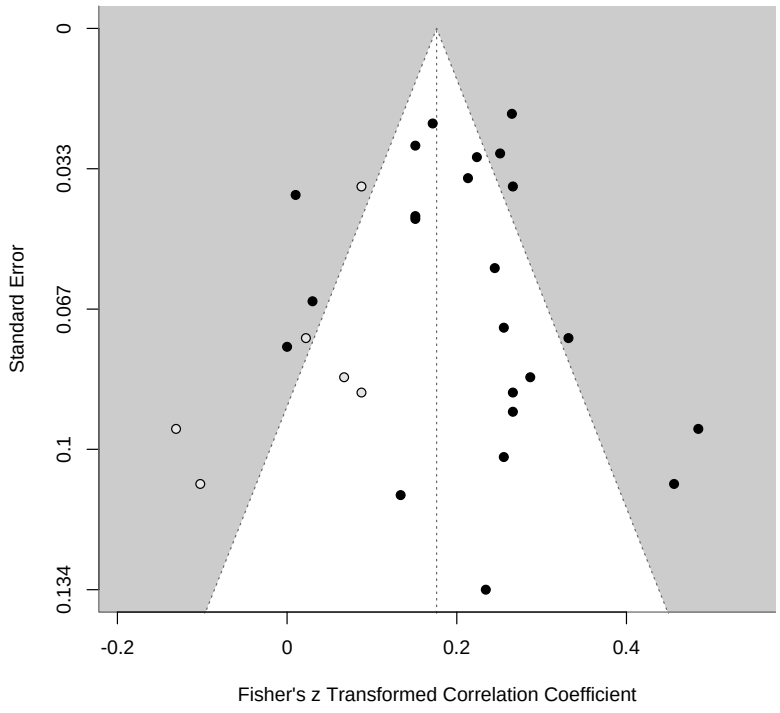
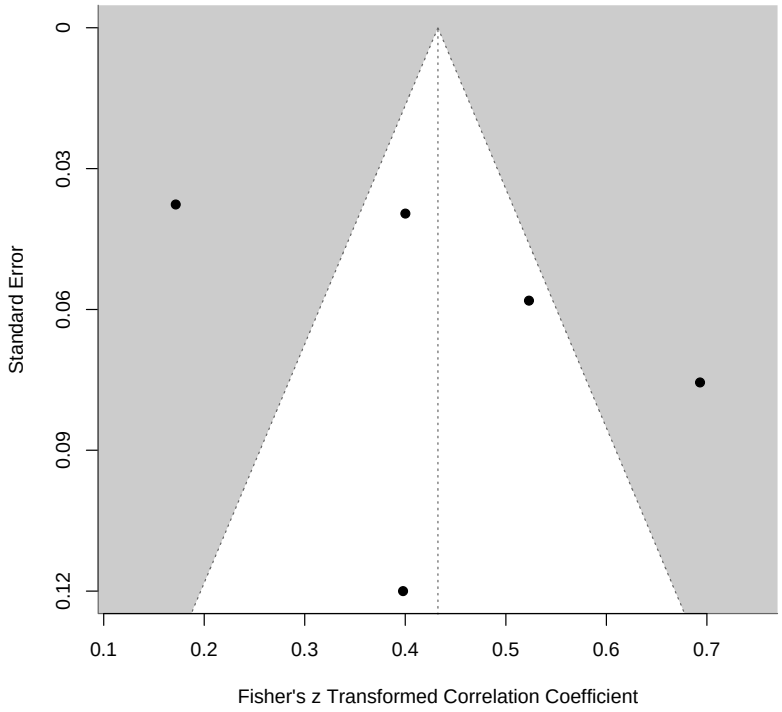


Figure 20

Trim-and-fill funnel plot for avoidance



Empirical study

As part of the stepped data-analytic plan for the empirical project, visual inspections of data were necessary to examine the normality and linearity of the data. Using SPSS, histograms were used to assess the distribution of age standardised scores for each of the measures. These are presented below. Visual inspection revealed the data were largely normally distributed.

Figure 21

Assessment of normality for depression scores

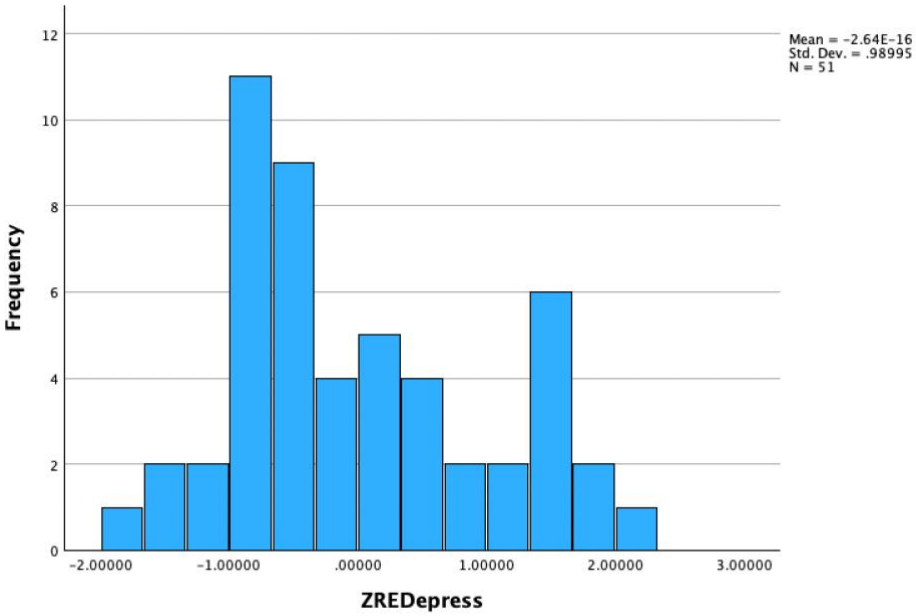


Figure 22

Assessment of normality for suppression scores

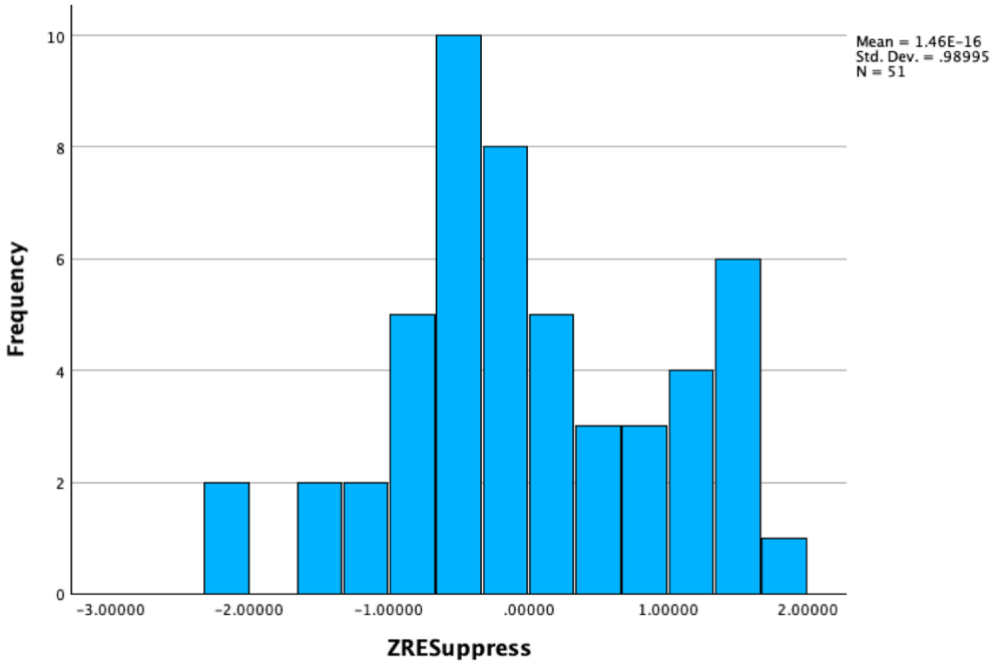


Figure 23

Assessment of normality for reappraisal scores

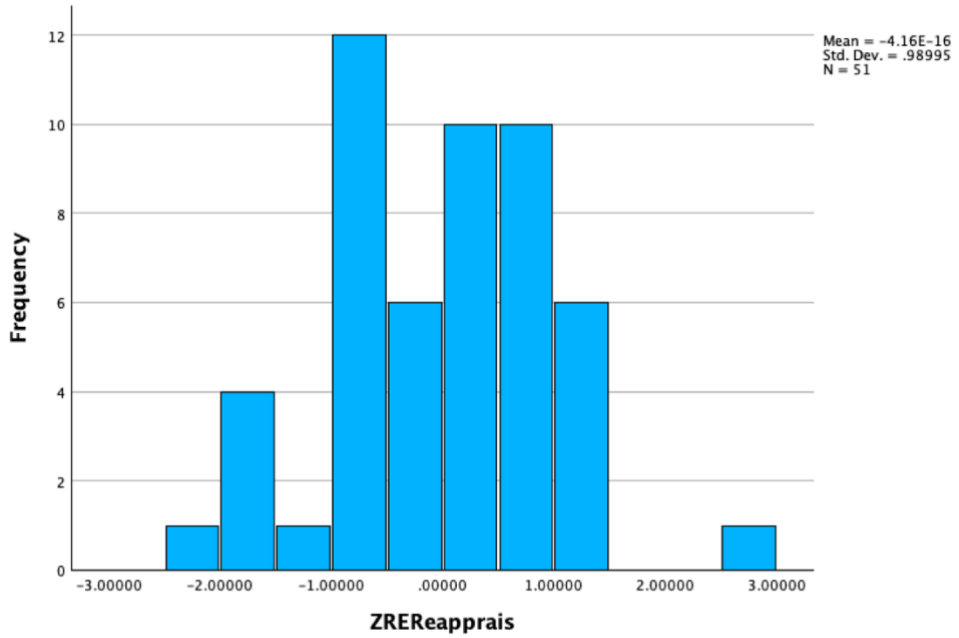


Figure 24

Assessment of normality for inhibit scores

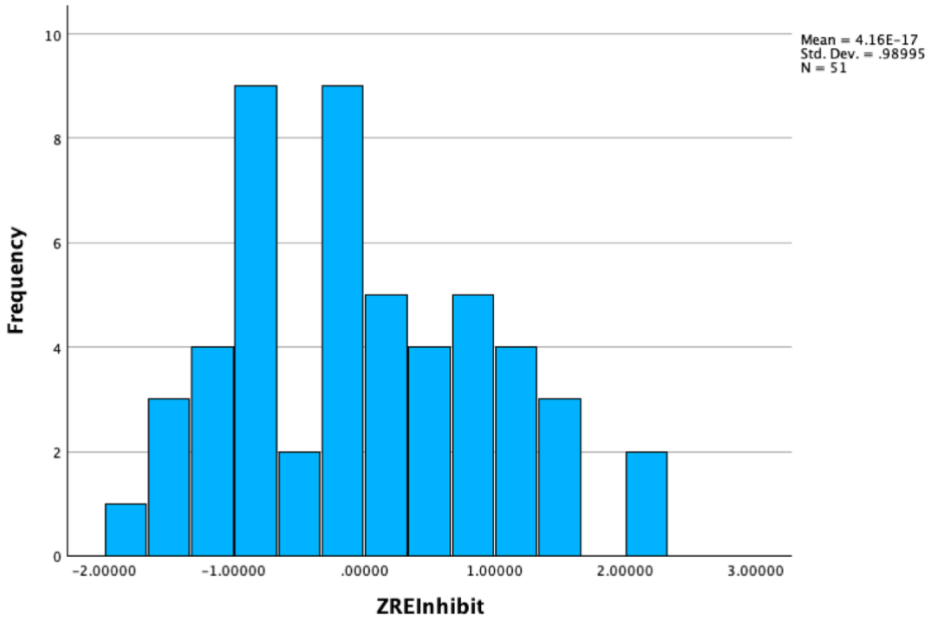


Figure 25

Assessment of normality for shift scores

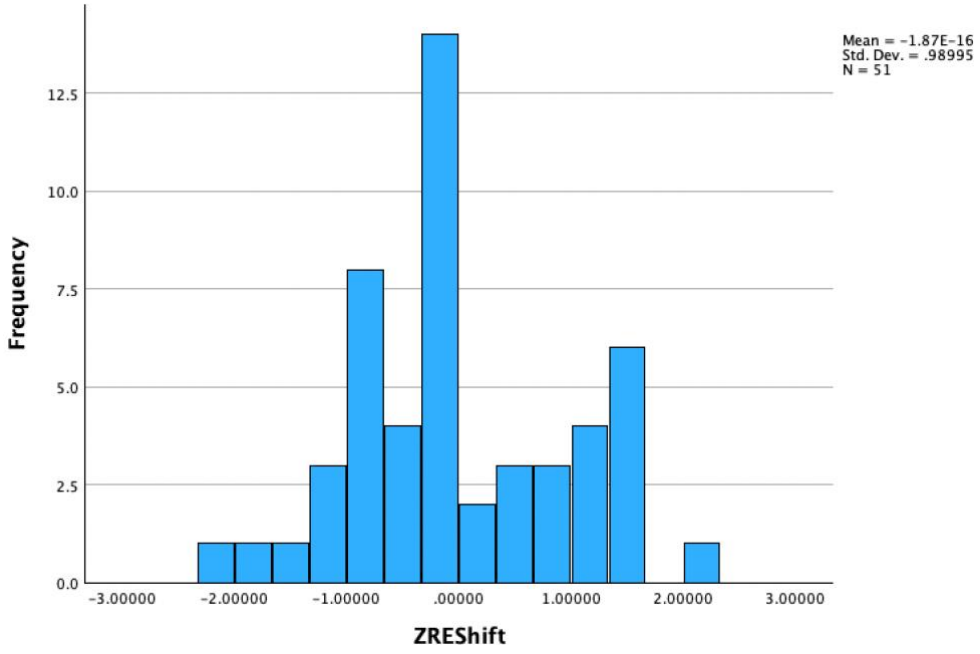
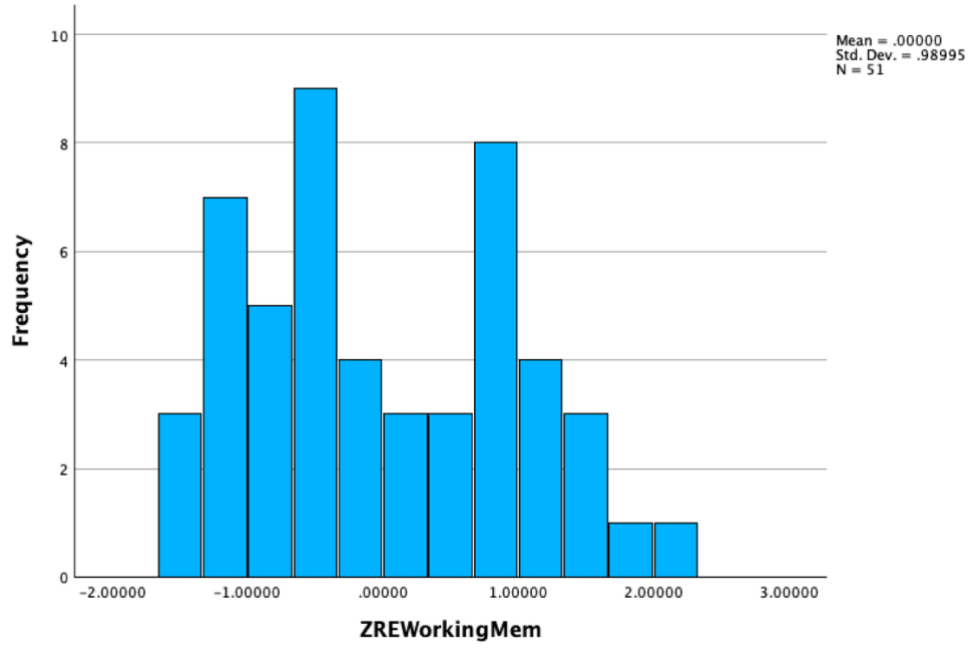


Figure 26

Assessment of normality for working memory scores



To examine the linearity of the data, scatterplots were used. See figures 27 to 37 for scatterplots created in SPSS for visual inspection. These revealed the data were largely linear for all variables.

Figure 27

Assessment of linearity for depression and suppression scores

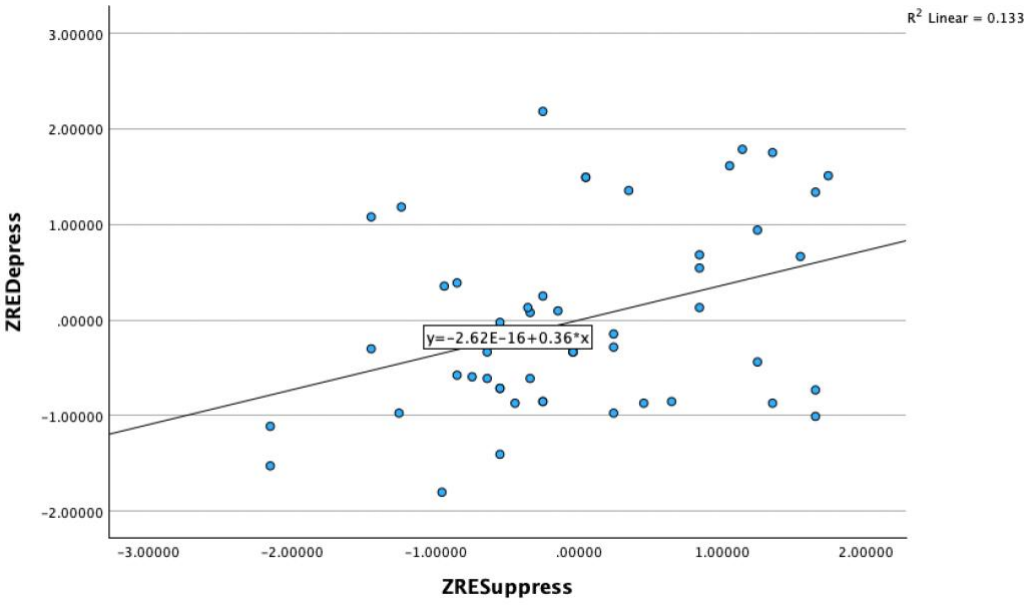


Figure 28

Assessment of linearity for depression and reappraisal scores

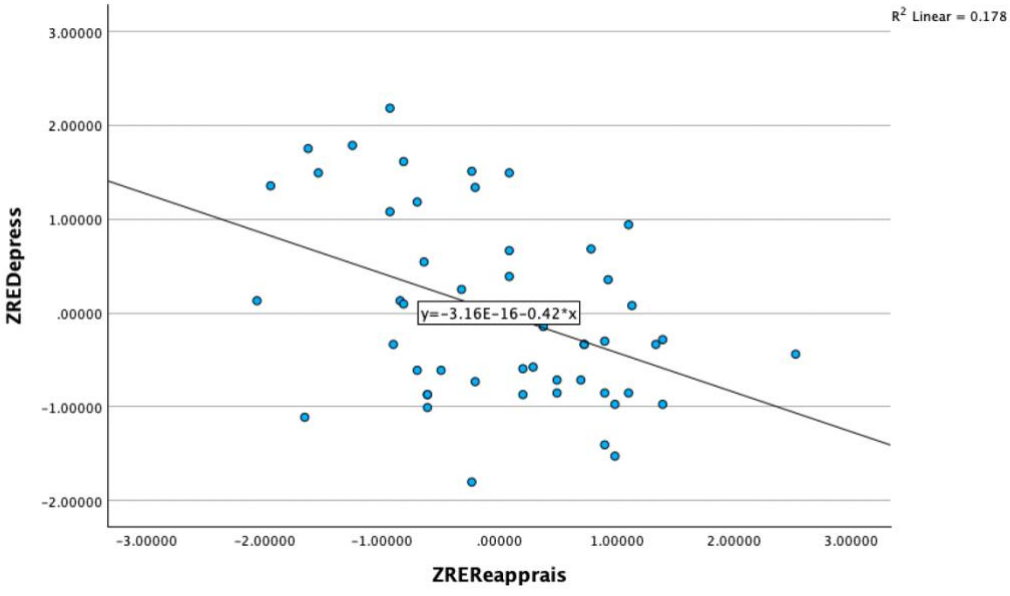


Figure 29

Assessment of linearity for depression and inhibit scores

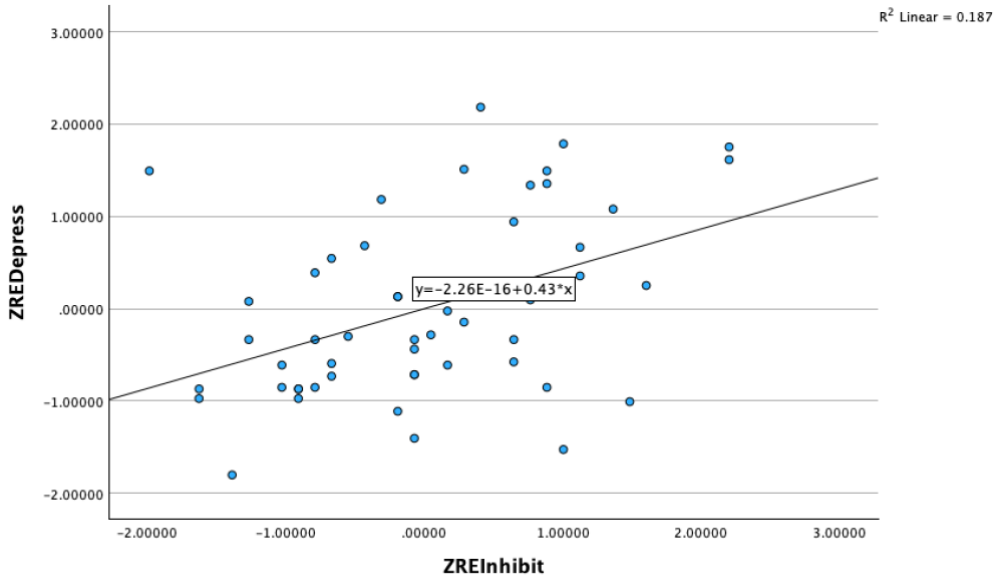


Figure 30

Assessment of linearity for depression and shift scores

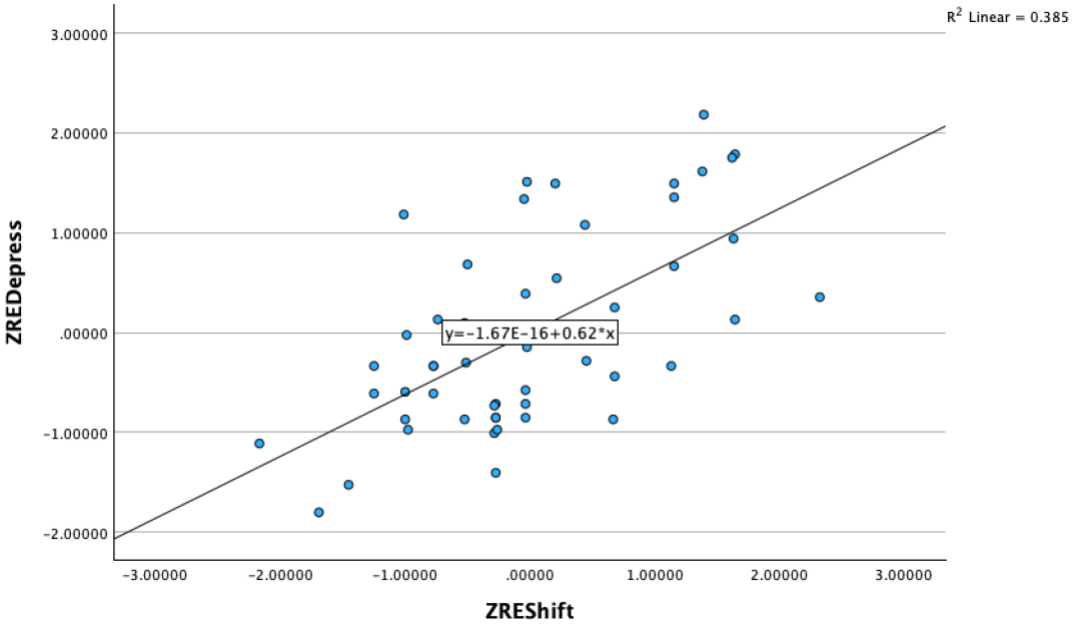


Figure 31

Assessment of linearity for depression and working memory scores

Figure 32

Assessment of linearity for suppression and inhibit scores

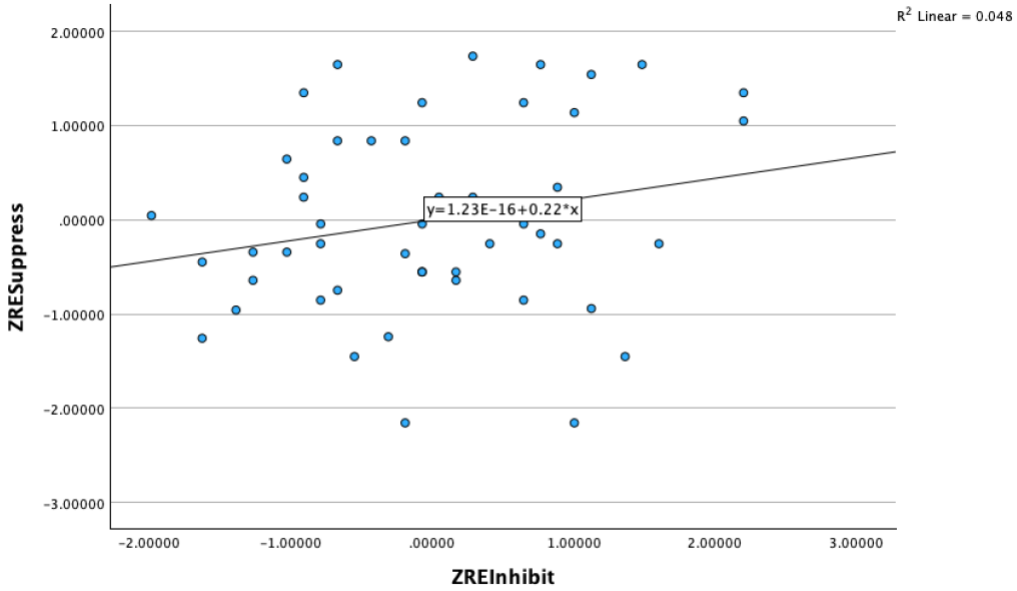


Figure 33

Assessment of linearity for suppression and shift scores

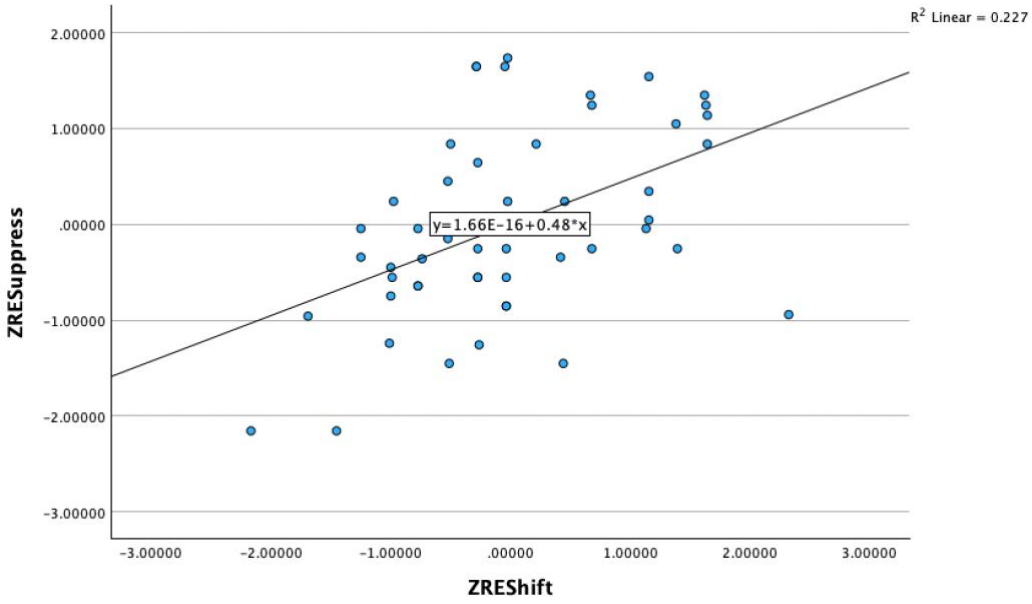


Figure 34

Assessment of linearity for suppression and working memory scores

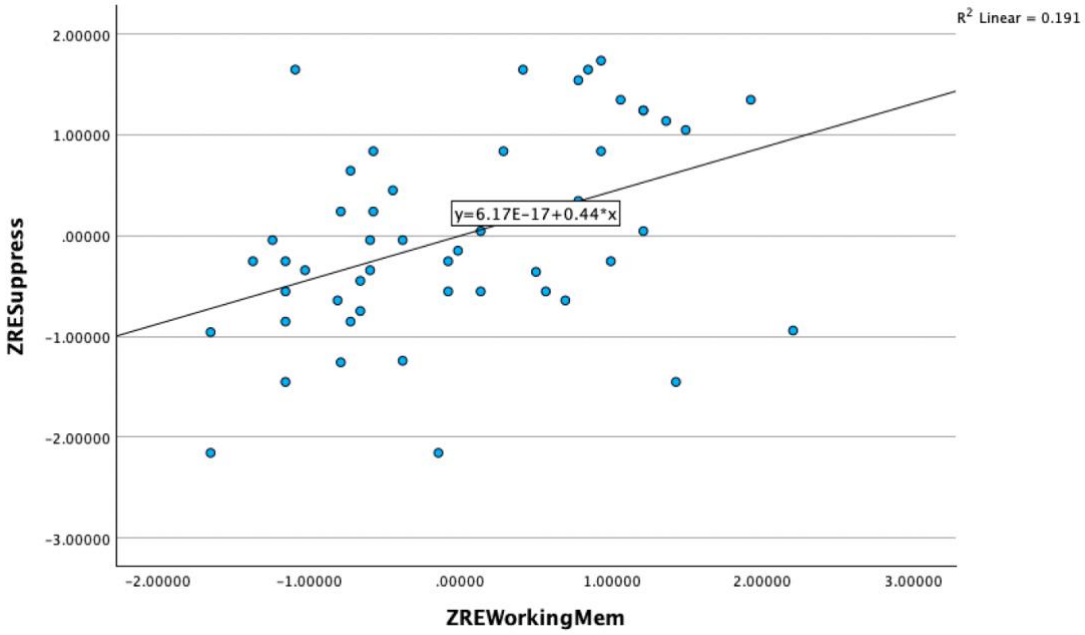


Figure 35

Assessment of linearity for reappraisal and inhibit scores

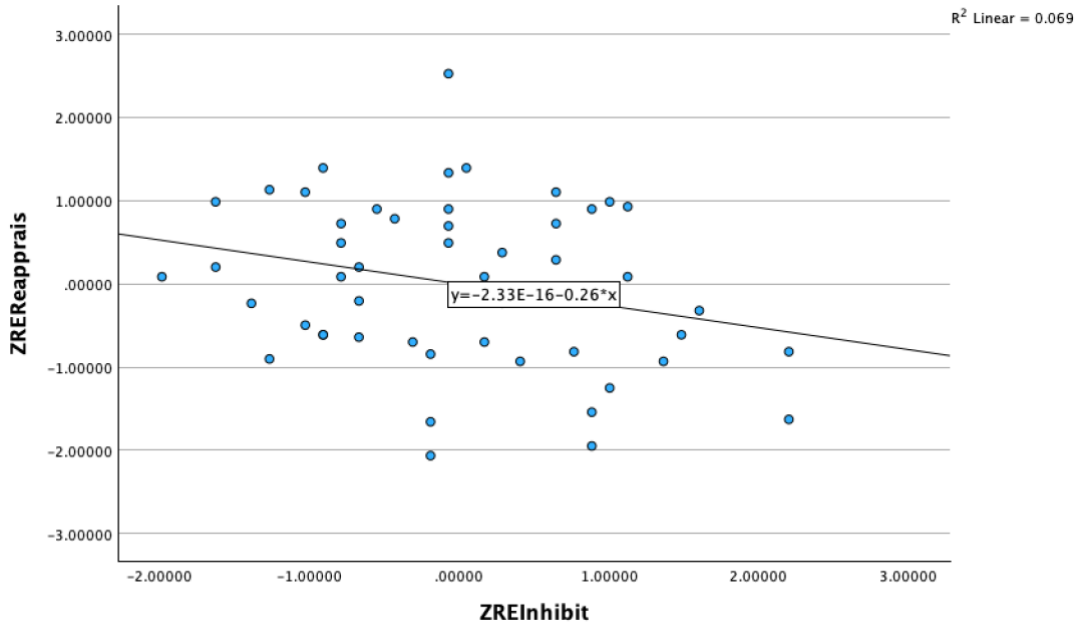


Figure 36

Assessment of linearity for reappraisal and shift scores

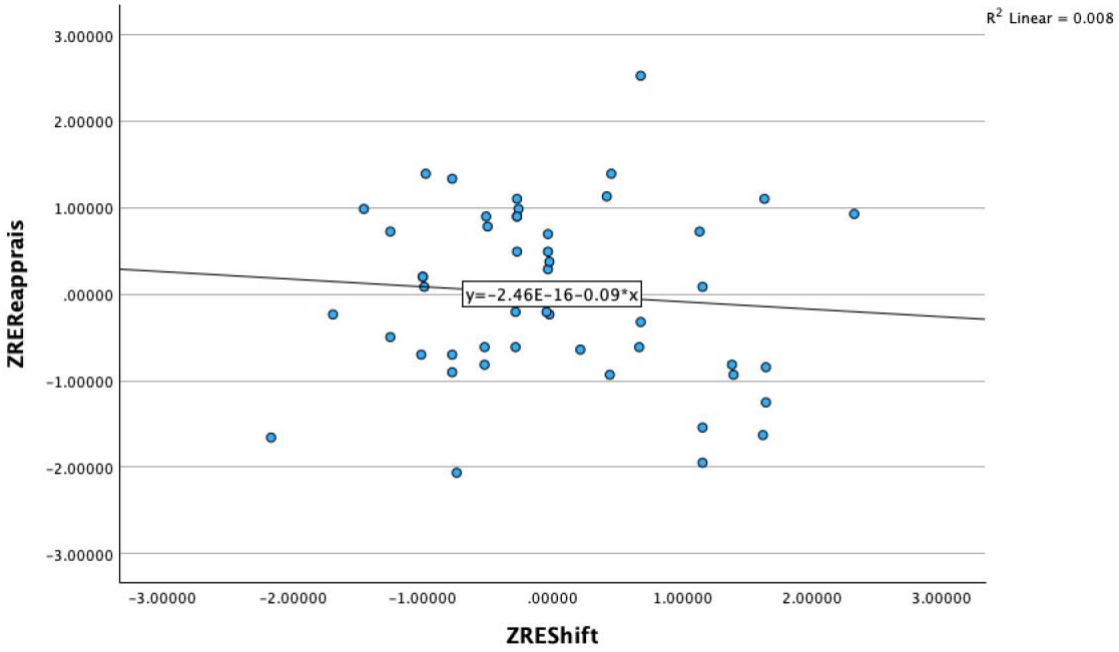
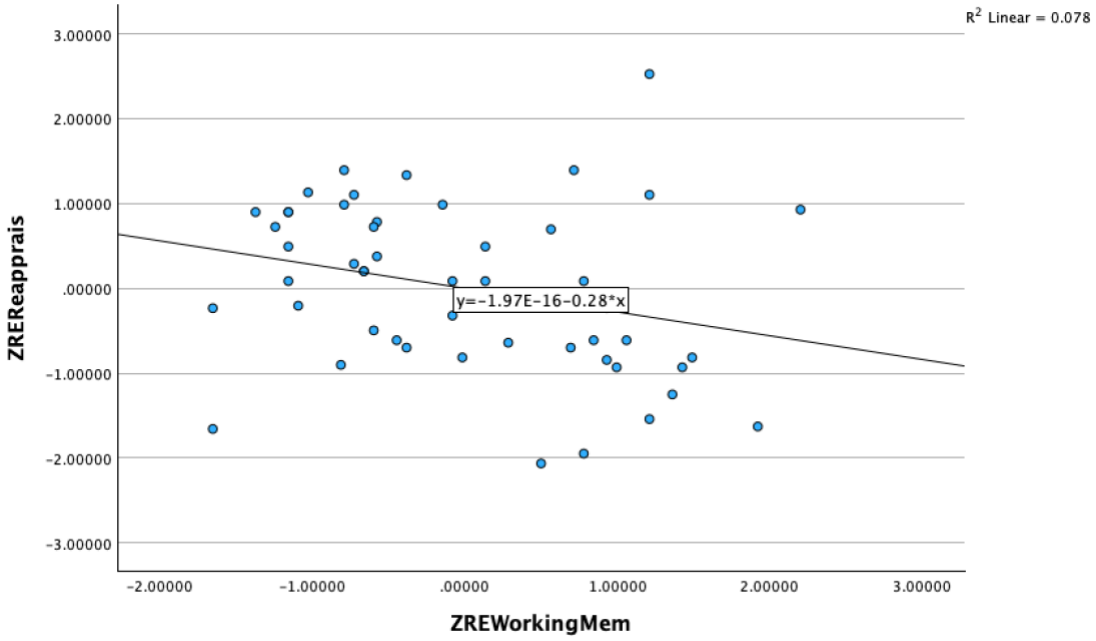


Figure 37

Assessment of linearity for reappraisal and working memory scores



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Chapter 7: Discussion and Critical Evaluation

This thesis portfolio aimed to explore the associations between emotional regulation (ER) and depression across the span of adolescence. It also considered the associations between cognitive processes (executive functions [EF]), ER and depression in early adolescence, a stage that is less explored in this field. This chapter gives an overview of the findings from both chapter 2 (meta-analysis) and chapter 4 (empirical study), whilst also offering a critical appraisal, recommendations for clinical practice and future directions of research based on this thesis as a whole.

Summary of findings

Systematic Review and Meta-analysis

Empirical studies have thus far examined ER skills and whether they are considered more helpful(adaptive) or unhelpful (maladaptive) in relation to depression (Folk et al., 2014; Gonçalves et al., 2019; Van Beveren et al., 2017; Van Beveren et al., 2018; Wante et al., 2017 ;Young et al., 2019). However, to our knowledge the meta-analysis in this thesis is the first attempt to look at whether ER strategies (both adaptive and maladaptive) change throughout the developmental period of adolescence, spanning from ages 10-25 years. Literature was systematically searched across three databases which resulted in 44 studies (92 effect sizes and a total 46,533 adolescents) being included in the review. Analysis showed that all maladaptive ER strategies were significantly positively related to depression with pooled small-medium effect sizes for rumination, suppression , and avoidance, consistent with previous reviews (Aldao et al., 2010; Kraft et al., 2023; Schäfer et al., 2017).

Cognitive reappraisal, a strategy considered to be adaptive was significantly negatively associated with depression with a small effect size. By contrast, analysis showed that acceptance and problem-solving were not significantly associated with depression. However, it should be noted that there were a limited number of studies included for these

respective ER skills which may have impacted on these findings. Moderator analyses showed no significant difference in use of ER skills across early (10-14 years), mid (15-18 years) and late (19-25 years) adolescence.

The evidence presented in the current review, alongside previous reviews highlights maladaptive ER strategies as vulnerability factor to depression and elevated depressive symptomology. In summary, these findings may indicate that identifying use of maladaptive ER strategies, may be beneficial in a treatment context with adolescents to help navigate and promote more adaptive strategies instead.

Empirical Study

It is identified that ER and depression are related to one another (Gross & Muñoz, 1995), and that EF and depression also have strong associations (Fuhrmann et al., 2020). Similarly, there are multiple accounts of empirical studies finding strong affiliations between EF and ER (Lantrip et al., 2016; Sudikoff et al., 2015) both having cognitive and emotional underpinnings. In adult cohorts, the relationships between EF, ER and depression have been more explored (Demeyer et al., 2012; Joorman & Gotlib, 2010). However, there is less exploration of the interactions between ER, EF and depression in adolescent populations. One paper found that ER mediates the relationship between EF and depressive symptoms in adolescents aged 10-16 years, however mediation does not indicate the strength and direction of this interaction (Wante et al., 2017). The empirical study in this thesis used a cross sectional design to explore the associations and moderation interactions between EF impairment (inhibit, shift and working memory), ER (suppression and reappraisal) and depression in adolescents aged 11-14 years using self-report measures.

Fifty-one adolescents completed an online survey to measure their depressive symptomology, problem-solving skills (EF), and coping strategies (ER). This sample was not the desired recruitment target, so all findings were preliminary. Post-hoc power analysis were

run which indicated some findings may have been sufficiently powered. Despite recruiting from a community sample, over a third of the participants (35.3%) considered themselves to have a mental health (MH) difficulty and an additional 9.8% had in fact been formally diagnosed with a MH disorder.

Significant correlations were found between depression, and all measured ER and EF variables. There were significant positive correlations found between suppression and depression, and a significant negative correlation between reappraisal and depression, revealing similar findings to the meta-analysis in this thesis. There were also significant positive associations found between shift and working memory with suppression, suggesting that some EF deficits are associated with greater use of maladaptive ER strategies. Comparatively, a significant negative correlation was indicated between inhibit, working memory and reappraisal, suggesting that use of adaptive ER strategies may be associated with less EF impairments. Further results showed that EF impairment (inhibit, shift and working memory) predicted depression, but this relationship was not moderated by ER.

In summary, this may highlight the importance of earlier identification of EF impairments as a preventative strategy against onset of depression in adolescents. It may also indicate the intercorrelations between cognitive and emotional processes being underlying mechanisms to vulnerability to depression in youth.

Taken together, both the meta-analysis and empirical paper present evidence that maladaptive ER strategies are associated with elevated depression symptoms, whilst adaptive ER strategies are associated with lesser depressive symptoms.

Strengths and Limitations

Systematic Review and Meta-Analysis

Firstly, the biggest strength of this review was that to our knowledge, it was the first meta-analysis to consider the associations between theoretically grounded ER strategies and depression across the whole adolescent age range (10-25 years).

However, it should be acknowledged that whilst the findings of the meta-analysis are helpful, these findings are based on correlational data which may limit the interpretations which can be drawn from the overall pooled effect sizes. This field largely has conducted cross-sectional designs to assess the links between ER and depression, but this does not infer causality. Therefore, future research designs need to be considered in order to assess true effects of ER and depression in young people. This said, the current review alongside other similar reviews have all found consistent findings which points to the large body of evidence that ER and depression are strongly related to one another (Aldao et al., 2010; Schäfer et al., 2017; Kraft et al., 2023).

Another possible limitation to the meta-analysis was the assessed large heterogeneity, which is typically anticipated in psychological research but indicates variation in study methodologies and comparability (Cuijpers, 2016). However, to try and increase homogeneity, separate meta-analyses were run for the six ER strategies of interest.

When screening and assessing for eligibility in the overall meta-analysis, a stringent inclusion criteria were used which indirectly influenced the level of included study's quality e.g., studies had to have a valid measure of ER and depression- a strength of this review. This also further reflected in overall risk of bias (ROB) and quality ratings of the included studies which resulted in all studies being assessed as fair/good. Having a second reviewer (JB) improved the overall rigour of the review by having JB assess 10% of papers at both abstract/title screening, as well as full-text eligibility screening. In addition, further good practice was undertaken by JB completing the ROB quality assurance too.

Related to this, selecting an appropriate ROB tool did not come without challenges. Many existing ROB tools are designed to consider longitudinal or randomised-control trials (RCT's) which limited our options. ROB tools which assess cross-sectional designs vary greatly and thus we used an adapted version of Newcastle-Ottawa Scale which is well respected tool and recommended by Cochrane collaboration which is often viewed as the 'gold standard' (Lo et al., 2014). This process also helped guide the lead researcher (ZT) to consider what is constituted as 'good quality' and formed a strong basis of what to include when planning and reporting the empirical research, as there were common gaps recognised in the assessment of the studies included in the meta-analysis.

Empirical Study

This paper provided some helpful tentative findings in relation to EF being a predictive factor for depression. However, these findings were exploratory and further investigation into this relationship needs to be considered. One of the main limitations of the empirical study was that the recruitment target was not achieved which consequently resulted in some findings being statistically underpowered. However, the outlined recruitment method appeared successful with a total of 93 parent/carer(s) expressing their interest in the study, with 62 completed consent forms which then translated into 52 completed surveys.

One other limitation is that the empirical paper did not measure or control for any co-morbid conditions (both mental and physical health). It may have been useful to collect this type of data in order to consider possible relationships or variables that may have influenced the ER strategies and level of EF participants self-reported.

Similarly, we recognise that when selecting our measures in the planning phase of the project, we did not consider that the self-report Behaviour Rating Inventory for Executive Functions (BRIEF-SR) is scored using both age and gender normed scores. This presented as an issue when scoring for participants who had identified as transgender or did not disclose

their gender. This highlights a wider issue in research and practice with gender norming scores whereby this measure (and others) overlook gender diversity and inclusion (Cameron & Stinson, 2019; Hyde et al., 2019). To overcome this, the research team populated standardised scores for all variables whilst controlling only for age, feeling more ethical and promoting inclusivity.

Another possible strength of the design of this project was using an online survey platform in order to offer flexibility and reduce potential risk of coercion. Using online surveys with adolescents has its advantages such as some adolescents may find it easier to answer questions in this way rather than face to face (Hill, 1997; Goodman, 2013). Furthermore, the National Institute for Health and Care Excellence (NICE) outline using computerised and person-centred methods to assess mood and feelings in young people (NICE, 2019). However, it also may raise issues of selection bias (Heiervang & Goodman, 2009) or exclude cohorts of adolescents who may not have strong literacy skills (Fargas-Malet et al., 2010). We acknowledge that the project may have benefitted from consulting young people and their parents to find out their ideas and preferences for engaging in mental health (MH) research.

Lastly, the empirical study presented supporting evidence of the relationship between depression and two ER strategies– suppression and cognitive reappraisal in adolescents, informing both research and clinical practice. This said, we acknowledge that there are other ER skills (particularly adaptive ER) such as acceptance and problem-solving which need further exploration as identified in the systematic review and meta-analysis paper.

Future research directions

There has been some debate about the validity of self-report accounts from young people in relation to their MH and well-being, with some literature encouraging this (Harwood, 2010; Sturgess et al., 2002) whilst others emphasise its limitations (Bentley et al.,

2019; Deighton et al., 2014). A future direction for both empirical studies and future meta-analyses should be to combine reports from multiple informants and across different measurement scales (e.g., neural, social and cognitive) in order to draw comparisons between perspectives as well as further explore the validity of the effects found.

Cross-sectionally, the relationships between ER, EF and depression are well-established, however there is less examination of the underlying mechanisms of these constructs altogether. Similarly, developmental differences between ER, EF and depression across the span of adolescence appear to be less considered. One recommendation would be to examine the longitudinal differences of EF and ER across stages of adolescence and thus in turn psychopathology. However, it is acknowledged that this would present with its own challenges such as attrition rates and possible demand on adolescents to engage with longer-term research.

It has been well established that the use of maladaptive ER is associated with increased depressive symptomology, whilst limited use of adaptive ER is associated with less depressive symptomology (Young et al., 2019). However, there is little exploration of the effects of increasing adaptive ER skills on depressive symptomology which may be a direction for future empirical studies.

In addition, more recent attempts have been made to consider what happens when targeting ER in psychological interventions, and whether employing cognitive strategies helps mediate the impact of interventions for mood disorders such as depression and anxiety (Daros et al., 2021; Moltrecht et al., 2021; Young et al., 2019).

Clinical Implications

Across both the meta-analysis and empirical study in this thesis, evidence is presented that maladaptive ER skills (rumination, suppression, and avoidance) are significantly positively related to greater depressive symptomology. A core component of therapies such

as Cognitive Behavioural Therapy (CBT) is to help an individual identify their negative thought patterns (e.g., maladaptive ER) and feelings. As such, by identifying use of these habitual maladaptive ER skills in adolescents, it may help guide practitioners/clinicians to identify these as part of therapeutic treatment interventions.

Furthermore, there is strong evidence alluding to the importance of addressing elevated depressive symptoms and/or suicidality rather than the commonly held perception that asking about such matters could increase suicidal tendencies (Dazzi et al., 2014). The findings presented in this thesis support the existing evidence that talking about thoughts and feelings with young people is more beneficial than suppressing these in order to improve MH outcomes e.g., reducing depressive symptomology (van Bodegom et al., 2023). It is hoped these findings presented would encourage and improve practitioners' confidence to explore adolescents' thoughts and feelings explicitly.

Promoting more adaptive ER e.g., reframing, and cognitive reappraisal, may also be a helpful clinical tool to reduce depressive symptomology. As identified in the meta-analysis, further exploration is needed of other adaptive ER strategies such as acceptance and problem-solving, which interestingly are core components of other evidence-based therapies such as Acceptance and Commitment Therapy (Hayes, 2011) or Solution-Focused therapy (de Shazer et al., 1986).

Moreover, the empirical study highlighted that EF deficits are related to use of maladaptive ER strategies, as well as the influence of EF impairment on depression. Screening for these deficits in earlier adolescence may aid clinicians in assessing those who are at an increased risk of depression. These findings may also be applicable to cohorts of people who have existing identified difficulties with EF, such as attention deficit hyperactivity disorder ([ADHD], Fenesy et al., 2021; Mayer et al., 2021; Silverstein et al.,

2018; Townes et al., 2023) indicating that EF deficits are associated with increased use of maladaptive ER strategies, a strong vulnerability factor to depression.

In a treatment context, it also emphasises the importance of supporting adolescents with their cognitive functioning and ability to cope e.g., targeted interventions designed to improve EF such as working memory (Beloe & Derekshan, 2019; Leone de voogd et al., 2016).

Lastly, the empirical paper captured that for the total of participants who reported having a MH diagnosis or considered themselves to have a MH difficulty, only 19.6% stated that they were receiving support for their MH. Compounded by the COVID-19 pandemic, the landscape of NHS child and adolescent MH services has become more challenging, with increases in reported MH difficulties (Kauhanen et al., 2022; Viner et al., 2022), highlighting the need for MH services and resources to be more creative and accessible in order to reach more young people who are struggling with their MH e.g., online-based interventions (Gratz et al., 2015; Ma et al., 2018).

Conclusions

The meta-analysis and empirical study provide complimentary findings that there are relationships between ER and depression in adolescence. Moreover, taken together, these outcomes provide evidence consistent with existing literature that maladaptive ER is associated with greater depressive symptomology, whilst adaptive ER may be associated with less symptomology (Kraft et al., 2023; Schäfer et al., 2017; Wante et al., 2017). Similarly, the empirical project demonstrates further preliminary findings that poor EF is predictive of depressive symptomology. These overall findings provide directions for future research and have implications for clinical practice; encouraging clinicians to identify and support young people with their ER and EF in order to promote positive MH and reduce likelihood of onset of depression.

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Appendices

Appendix A: Journal of Adolescence Author Guidelines

Submission and Peer Review Process

Free format submission

Journal of Adolescence follows APA form for final publications (see format exceptions below). However, we will accept Free Format submission for a simplified and streamlined submission process.

Before you submit, you will need:

- Your manuscript: this should be an editable file including text, figures, and tables, or separate files—whichever you prefer. All required sections should be contained in your manuscript, including title page, abstract, introduction, methods, results, conclusions, and references. Figures and tables should have legends. Figures should be uploaded in the highest resolution possible. References may be submitted in any style or format, but must be consistent throughout the manuscript. Supporting information should be submitted in separate files. If the manuscript, figures or tables are difficult for you to read, they will also be difficult for the editors and reviewers, and the editorial office will send it back to you for revision. Your manuscript may also be sent back to you for revision if the quality of English language is poor.
- An ORCID ID, freely available at https://orcid.org. *(Why is this important? Your article, if accepted and published, will be attached to your ORCID profile. Institutions and funders are increasingly requiring authors to have ORCID IDs.)*
- The title page of the manuscript, including:
    - Your co-author details, including affiliation and email address. *(Why is this important? We need to keep all co-authors informed of the outcome of the peer review process.)*
    - Word count, excluding abstract, references, tables, figures or appendices.
    - Statements relating to our ethics and integrity policies. *(Why are these important? We need to uphold rigorous ethical standards for the research we consider for publication)* This includes:
        - data availability statement*
        - funding statement*
        - conflict of interest disclosure*
        - ethics approval statement*
        - patient consent statement
        - permission to reproduce material from other sources
        - clinical trial registration
    - * Required

Important: the journal operates a double-blind peer review policy. Please anonymize your manuscript and supply a separate title page file. Manuscripts that have not been anonymized will be returned. Please ensure that all comments have been removed from your manuscript prior to submission.

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Title Page

The title page should contain**:**

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    a. Country of data collection or cultural identity of participants should not be included in the title unless it is the focus of the manuscript (e.g., the focus of the study is an explicit cultural comparison or ethnicity and cultural context is central to the study's purpose);
ii. A short running title of less than 40 characters;
iii. The full names of the authors;
iv. The author's institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted;
v. Complete postal and email address for the corresponding author;
vi. Acknowledgments.
vii. Word count, excluding abstract, references, tables, figures or appendices.

(Important: the journal operates a double-blind peer review policy. Please anonymize your manuscript and prepare a separate title page containing author details.)

Main Text File

Journal of Adolescence operates using a double-blind peer review process. Please ensure that all identifying information such as author names and affiliations, acknowledgements or explicit mentions of author institution in the text are on a separate page.

i. Authors citing their own previously published work or relying on shared data sources should be careful to blind any citations that may compromise anonymity during the review procedure.
ii. Please check that all comments and notes have been removed from the manuscript prior to submission.

Manuscripts can be uploaded either as a single document (containing the main text, tables and figures), or with figures and tables provided as separate files for initial review. Should your manuscript reach revision stage, figures and tables must be provided as separate files. The main manuscript file can be submitted in Microsoft Word (.doc or .docx) or LaTex (.tex) format.

If submitting your manuscript file in LaTex format via Research Exchange, select the file designation "Main Document – LaTeX .tex File" on upload. When submitting a Latex Main Document, you must also provide a PDF version of the manuscript for Peer Review. Please upload this file as "Main Document - LaTeX PDF." All supporting files that are referred to in the Latex Main Document should be uploaded as a "LaTeX Supplementary File."

The main text file should be in Word or LaTeX and include:

- Title page (see requirements above);
- Abstracts
    - Abstracts should have four headers, each comprising a short separate paragraph: Introduction, Methods, Results & Conclusions.
    - Abstracts should be 200-250 words long, concise and factual.
    - Abstracts must be able to stand alone, and are often presented separately from the article
    - References should be avoided, but if essential, they must be cited in full, without reference to the reference list.
    - All abstracts must include basic information about the sample, including country of data collection, year of data collection, sample size, and relevant demographics. Numerical age and gender of participants are required.
    - Method of data collection should be indicated (e.g., qualitative analysis of interview material, surveys administered to parents and adolescents) and whether the study is cross-sectional or longitudinal
- Maximum of six keywords, listed immediately after the abstract. Avoid general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Only abbreviations firmly established in the field may be eligible. Keywords will be used for indexing purposes.
- Main body: formatted as introduction, materials & methods, results, discussion, conclusion. Please consult the APA Style Manual for publication guidelines.
    - Introduction: The Introduction should provide a clear statement of the paper's goal and a strong grounding in the literature, including all key constructs. It is important that the introduction clearly frames the study in a developmental framework.
    - Material and Methods: Methods must provide a clear description of recruitment, sampling methods, and final sample, including the year(s) and country of data collection. All measures must be fully described and cited appropriately, including appropriate descriptive statistics. Methods for handling missing data (at the measure and analysis level) should be described. A statement of compliance with ethical guidelines and review must be included.
    - Results: Results should reflect the problem statement in the Introduction, use the same names for constructs used in the Methods section, accurately

describe the analytic techniques used, and refer to clearly tabled results and/or figures. Please table descriptions of complex multivariable analyses rather than reporting them in the text. Per APA guidelines, effect sizes should be reported whenever possible.
    - Discussion and Conclusion: Discussion of the results should clearly reflect back on the literature cited in the introduction, draw a clear conclusion, and suggest future areas of research. Limitations of the current work should be clearly and succinctly described.
- References;
- Tables (each table complete with title and footnotes);
- Figure legends: Legends should be supplied as a complete list in the text. Figures should be uploaded as separate files (see below).

Biased and Offensive Language

The Journal of Adolescence is an international journal. Please use inclusive language throughout your work and avoid sexist, racist, and offensive language and descriptions. The APA Style Guide provides extensive guidance on current usage.

Reference Style

This journal uses American Psychological Association reference style. The journal offers Free Format submission (see above), but it is imperative that authors use a consistent style throughout. Reference style guidelines can be found here

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Article Types

Article Type	Description	Word Limit	Abstract / Structure	Other Requirements
Research article	Report of new research findings, including evaluations of interventions. Articles should clearly make a new contribution to the existing literature and advance our understanding of adolescent development.	Up to 5,000 words excluding abstract, references, tables, figures or appendices. Qualitative research papers may require additional words in lieu of tables. Please consult with the editor.	250 word structured abstract.	Data availability statement.
Review article	Critical review of the literature in the field of adolescence,	Up to 8,000 words excluding abstract, references,	250 word unstructured abstract.	If authors would like to discuss their plans for a review or methodology article, please contact the

	including systematic review and meta-analysis. The journal is not prescriptive about how reviews should be undertaken, but the methods used should be clear. We also encourage reviews of and practical guidelines for developmental methodology .	tables, figures or appendices		Editor through the journal mailbox joa.office@wiley.com
Brief report	A report of research findings that are strongly data based and require only a brief literature review to provide context. These might include findings from the early stages of a program of research, registered replications (including failures to replicate)	Up to 3,000 words excluding abstract, references, tables, figures or appendices	250 word structured abstract.	

	previously reported findings in novel contexts, or extentions of previously published work.		
International Research Note	A very brief report of research replications from developing countries and places with a less well supported adolescence research field, where it may be difficult to find international publication outlets and bring the work to the attention of a wider audience.	Up to 1000 words excluding abstract, references, tables, figures or appendices	250 word structured abstract.

Appendix B: PRISMA Checklist

PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	14
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	15
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	19, 20
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	20, 21
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	21
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	22
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	21, 24
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	21, 22, 171
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	22, 23, 24

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	25
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	25-35
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	36
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	36
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	36,37

Page 1 of 2

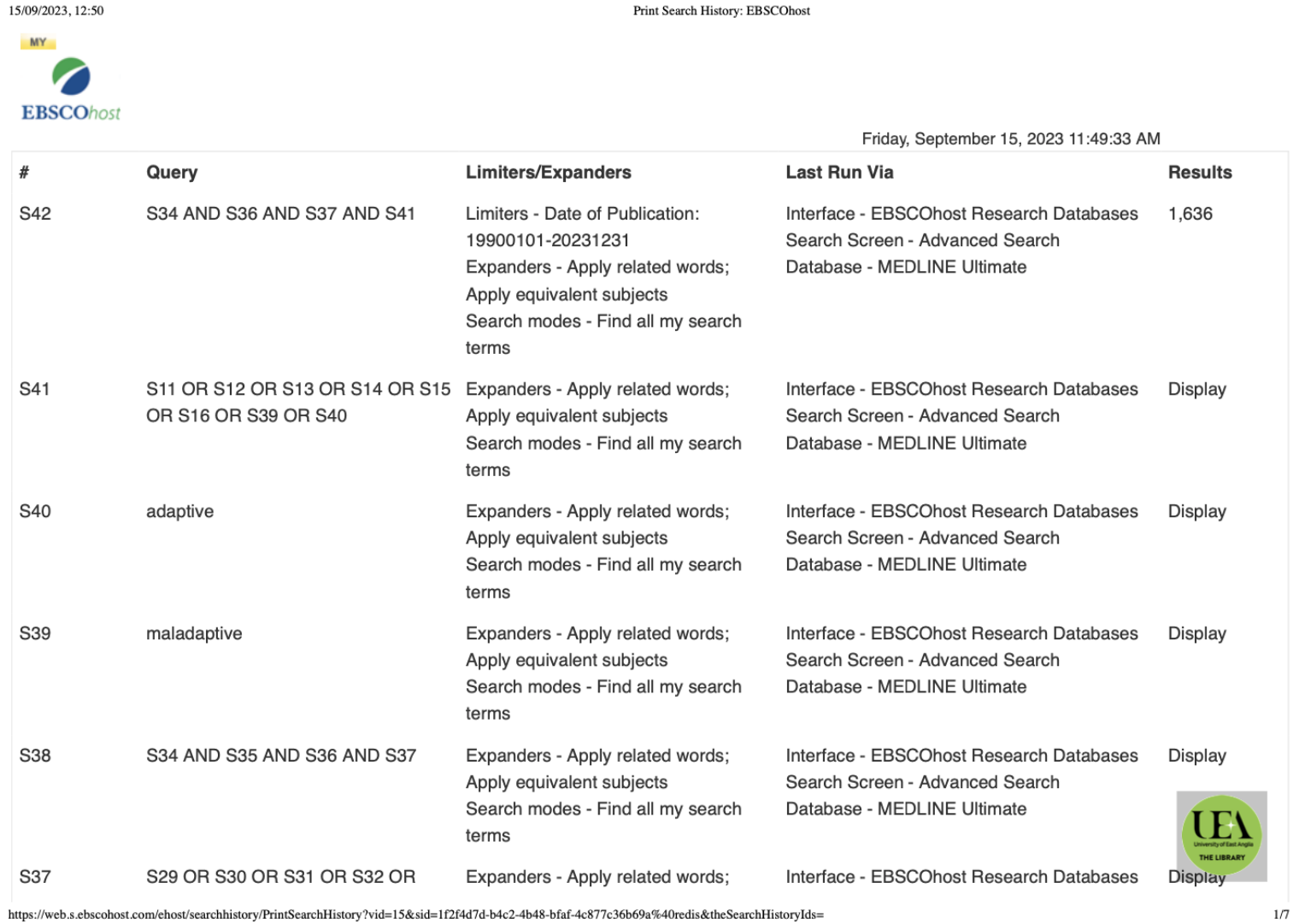
Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	46-52
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	39, 45, 46, 125-132
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	24, 37
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	26-35, 58-76
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	46-51
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	38-45
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	38

Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	46-51
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	45, 46, 125-132
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	53-56
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	56-57
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	57
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	14

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

Appendix C: Electronic Search Strategy Screenshot for one database (MEDLINE)



15/09/2023, 12:50 Print Search History: EBSCOhost

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Friday, September 15, 2023 11:49:33 AM

#	Query	Limiters/Expanders	Last Run Via	Results
S42	S34 AND S36 AND S37 AND S41	Limiters - Date of Publication: 19900101-20231231 Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	1,636
S41	S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S39 OR S40	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S40	adaptive	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S39	maladaptive	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S38	S34 AND S35 AND S36 AND S37	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S37	S29 OR S30 OR S31 OR S32 OR	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Display

https://web.s.ebscohost.com/ehost/searchhistory/PrintSearchHistory?vid=15&sid=1f2f4d7d-b4c2-4b48-bfaf-4c877c36b69a%40redis&theSearchHistoryIds= 1/7

	S33	Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S36	S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S35	S11 OR S12 OR S13 OR S14 OR S15 OR S16	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S34	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S33	"depressive symptoms"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S32	"low mood"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S31	"depressive disorder"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S30	depress*	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Disp

		Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S29	(MM "Depression") OR (MH "Depressive Disorder") OR (MH "Depressive Disorder, Major")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S28	juvenile	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S27	kid*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S26	student*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S25	"young adult"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S24	"young people"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S23	teen*	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Disp

		Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S22	child*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S21	adolescen*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S20	youth	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S19	(MM "Child")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S18	(MM "Young Adult")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S17	(MM "Adolescent")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S16	ruminat*	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Dis

		Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S15	"problem solv*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S14	avoid*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S13	suppress*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S12	acceptance	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S11	reapprais*	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S10	"emotion* self regulation"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S9	"mood regulation"	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Dis

		Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S8	"affect regulation"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S7	"regulation of emotion*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S6	"emotion* regulation"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S5	"coping strateg*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S4	"coping skill*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S3	"emotion* regulat* skill*"	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display
S2	"emotion* regulat* strateg*"	Expanders - Apply related words;	Interface - EBSCOhost Research Databases	Disp

		Apply equivalent subjects Search modes - Find all my search terms	Search Screen - Advanced Search Database - MEDLINE Ultimate	
S1	(MM "Emotional Regulation")	Expanders - Apply related words; Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE Ultimate	Display

Appendix D: Newcastle-Ottawa Scale (Cross-sectional adapted version)

NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE

(adapted for cross sectional studies)

Selection: (Maximum 5 scores)

1) Representativeness of the cases:

a) Truly representative of the HCC patients (consecutive or random sampling of cases). 1 score

b) Somewhat representative of the average in the HCC patients (non-random sampling) . 1 score

c) Selected demographic group of users. 0 score

d) No description of the sampling strategy. 0 score

2) Sample size:

a) Justified and satisfactory (≥ 400 HCC included). 1 score

b) Not justified (<400 HCC patients included). 0 score

3) Non-Response rate

a) The response rate is satisfactory (≥95%). 1 Score

b) The response rate is unsatisfactory (<95%), or no description. 0 Score

4) Ascertainment of the screening/surveillance tool:

a) Validated screening/surveillance tool. 2 scores

b) Non-validated screening/surveillance tool, but the tool is available or described. 1 score

c) No description of the measurement tool. 0 score

Comparability: (Maximum 1 stars)

1) The potential confounders were investigated by subgroup analysis or multivariable analysis.

a) The study investigates potential confounders. 1 score

b) The study does not investigate potential confounders. 0 score

Outcome: (Maximum 3 stars)

1) Assessment of the outcome:

a) Independent blind assessment. 2 scores

b) Record linkage. 2 scores

c) Self report. 1 score

d) No description. 0 score

2) Statistical test:

a) The statistical test used to analyze the data is clearly described and appropriate. 1 score

b) The statistical test is not appropriate, not described or incomplete. 0 score

Appendix E: Journal of Cognition and Emotion Author Guidelines

Instructions for authors

Thank you for choosing to submit your paper to us. These instructions will ensure we have everything required so your paper can move through peer review, production and publication smoothly. Please take the time to read and follow them as closely as possible, as doing so will ensure your paper matches the journal's requirements.

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Contents

About the Journal

Cognition and Emotion is an international, peer-reviewed journal publishing high-quality, original research. Please see the journal's Aims & Scope for information about its focus and peer-review policy.

Please note that this journal only publishes manuscripts in English.

Cognition and Emotion accepts the following types of article:

- Full Article
- Brief Article
- Registered Reports (RR)
- Theory Papers (TP)

The Journal also considers literature reviews as long as these form a major contribution to our understanding of the interplay between emotion and cognition. Manuscripts that describe the findings of one experiment should typically be submitted as a Brief Article.

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- Should contain an unstructured abstract of 200 words.
- Should contain between 1 and 5 **keywords**. Read making your article more discoverable, including information on choosing a title and search engine optimization.

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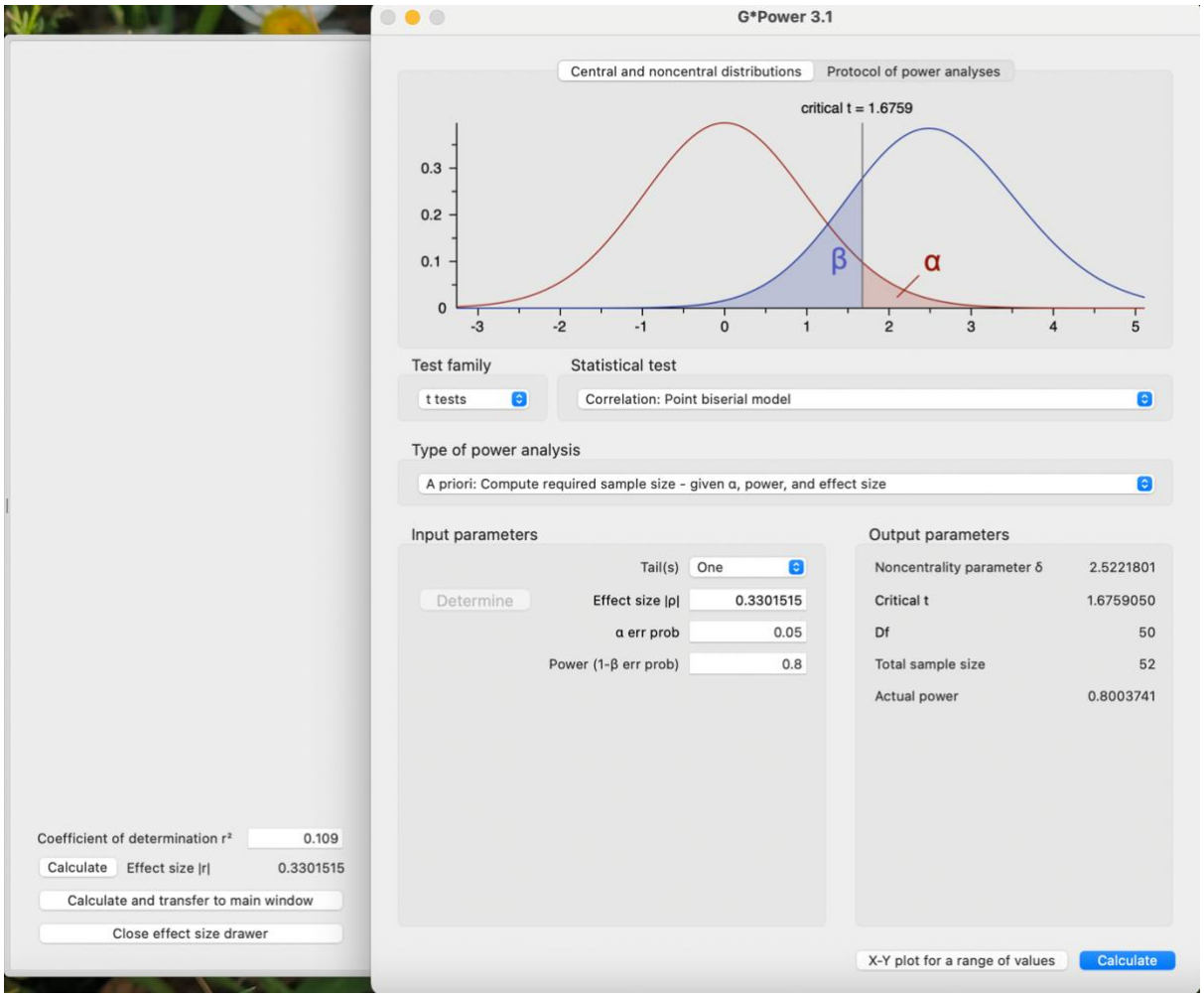
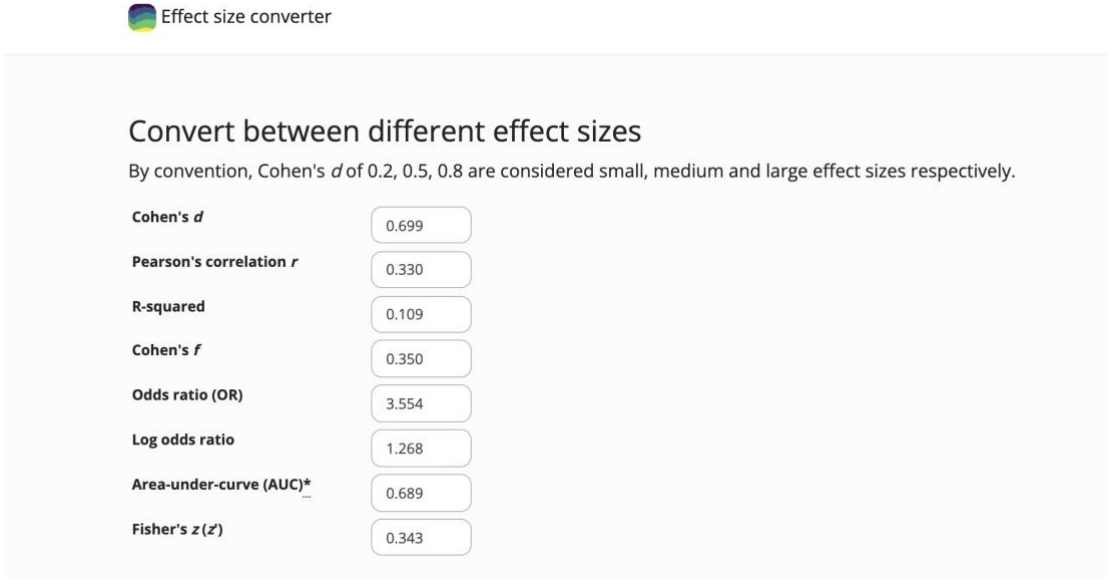
Updated 24-11-2021

Appendix F: G*Power a-priori sample size estimation

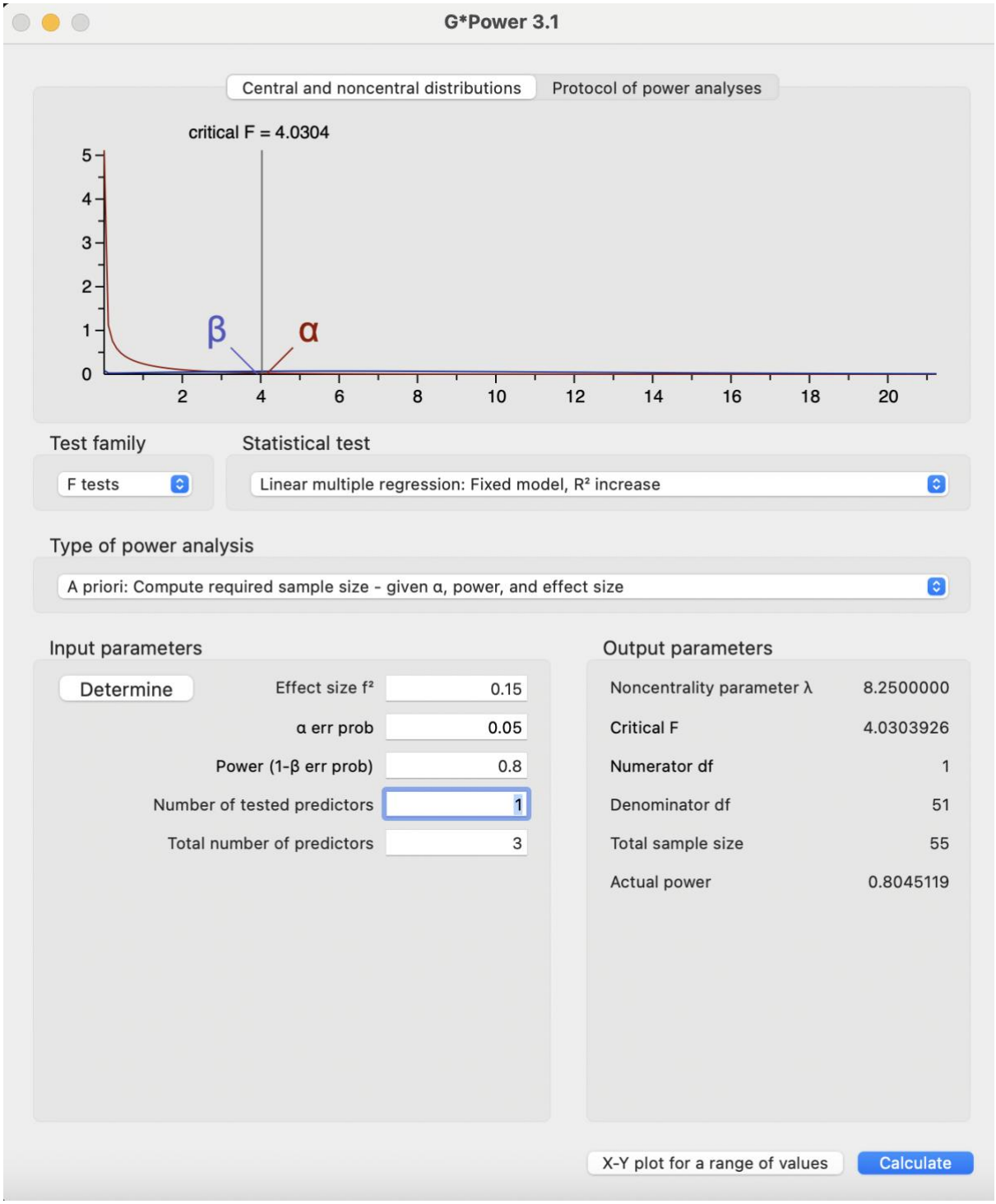
The below output displays the calculations conducted to determine the sample size needed to detect a moderate-large effect. Wante et al., 2016 outlined they found a significant correlation between EF and depression with an r of 0.33**. The Pearson's r (0.33) was converted using Escal into a Cohen's f (0.350) which is equivalent to Cohen's d effect size (0.699) which is a medium-large effect (Lin, 2022). This converted effect size has informed the use of G power to calculate the estimated sample size. In order to detect a moderate relationship with a medium effect size and statistical power of .8, the estimated sample size is 52 participants.



Escal conversion of effect sizes



The below output displays the calculations conducted to determine the sample size needed to detect a moderate effect for the planned regression analyses (Green, 1991; Maxwell, 2000).



Appendix G: Participant Information Sheet (PIS) Parent Carer Version

PARTICIPANT INFORMATION SHEET (Version 1) [7th February 2023]

Study Title: How are coping skills and the way people think linked with mood and feelings?

I would like to introduce myself; my name is Zoe Thompson, and I am a Trainee Clinical Psychologist conducting this study as part of my Doctorate in Clinical Psychology at the University of East Anglia (UEA) alongside my colleagues Professor Joni Holmes and Dr Hannah Crook.

I would like to invite you and your child to take part in a study that is investigating the relationship between mood, emotional regulation (the ability to understand and express emotions) and problem-solving in young people. You do not have to make an immediate decision for you and your child to take part in this online study. Please take some time to read the information below.

What is the purpose of this study?

We know that the ability to regulate and manage emotions is related to a person's mental health. This ability can vary from person to person. Some people like to talk about their feelings, while others use other strategies to process their feelings. This is known as emotional regulation. A person's emotion regulation skills are also related to their abilities to process information and solve problems.

In this project we want to explore how problem-solving relates to emotion regulation, and how these relate to a person's mood (i.e., are they feeling happy or sad). By improving our understanding of these relationships, we hope to improve the way we support young people's mental health.

What would my child have to do if we took part?

We would like your child to complete an online questionnaire that asks about how they manage their emotions, about their wellbeing (do they feel happy or sad), and how they go about everyday activities (e.g., how they plan their day, how well they can remember things they have to do). Your child will not have to provide any identifiable information - we will provide you with a unique I.D. code and weblink, so your child does not have to provide their name. The questionnaire should take no longer than 30 minutes to complete.

What information will be collected?

We will collect the following information:

- Your child's gender, age, and ethnicity
- A measure of your child's understanding about their emotional wellbeing
- A measure of your child's understanding about their coping strategies when they are feeling difficult emotions.
- A measure of your child's understanding about their problem-solving skills

What would I have to do if we took part?

You will have to let us know if you want to take part by completing a consent form. If you consent to your child taking part, we will send you a weblink and unique I.D. code for your child, which will grant access to the online study. You, together with your child, will need to click this weblink and enter the unique I.D. code. The study will then start by asking your child to tick a box to indicate that they agree to taking part in this study. Your child will then be able to answer the questions, as described above.

Who can take part?

We are asking parent/carer(s) of children and young people aged 11-14 to participate in this study. You must be the legal guardian in order to consent for your child to participate in this study. Children and young people with uncorrected sight impairments will not be suitable for this study.

Do I or my child have to take part?

No, it is your choice whether you would like your child to take part or not. If you decide to do so, you will need to complete the attached consent form. If you do not wish to continue, you do not need to read any further. Please keep in mind that even if you consent to your child's participation in this study, it is also their choice whether they wish to participate in this study. Your child will be asked about whether they want to participate. Your child will be able to withdraw from this study at any time without explanation and can withdraw their data up until 2 weeks from the date after the submission of their responses.

What are the possible risks or disadvantages of taking part?

We do not expect that the study will cause your child any harm or risk by taking part. It may be possible that the study causes them to think about upsetting personal matters including difficult thoughts and feelings. Every child will receive an aftercare sheet that includes a list of local support services that you and / or your child can contact for extra support. If your child withdraws from the study, this aftercare sheet can be downloaded from **here** now.

We will not store personal information about your child online, but the research team will have a key that links the unique ID we send you to the email address you supplied on your expression of interest form. Only Zoe Thompson and Joni Holmes will have access to this information. It is necessary for us to have this because we will be checking the responses given to the questionnaires and want to be able to reach out to any parent / guardian who has a child who is showing high levels of distress. If the primary researcher feels there are any concerns, you will be contacted, and we will work with you to ensure we are keeping your child safe.

What will happen to mine and my child's information?

You and your child will not be asked to provide any identifiable information via the online weblink. The data your child provides will be linked only to a unique ID code that we will provide to you. The data will be held securely by the research team at the University of East Anglia on encrypted servers.

The email address you supplied on your expression of interest form will be linked to a unique ID code that only Zoe Thompson and Joni Holmes will have access to. This email address will only be used to get in contact with you in the event of distress or a disclosure from your child in their responses to the questions asked in the online study. This measure ensures we are keeping your child safe and that we can provide further details of available support

where necessary. Your email address will be stored securely for the duration of the study and then destroyed after the study has finished.

What if me or my child change our minds about participation or data in this study?

Your child can withdraw from the study at any time without reason, up until they submit their responses to the questionnaires. After this, they will have 2 weeks to withdraw their responses. You can ask your child to withdraw from the study, or withdraw their responses, at any point up to this 2-week deadline.

What will happen to the results and outcome of this study?

The study outcomes will be presented in a peer-reviewed journal, at conference presentations and via social media. All results will be reported anonymously and for groups of people. No participants will be identifiable in any of these formats.

If you would like to receive a copy of the final findings, please outline this on the consent form. A written leaflet will also be available to you to share with your child that will summarize these findings in an easy read style.

Who is organising this research?

This study is being organised by Zoe Thompson, Professor Joni Holmes and Dr Hannah Crook at the University of East Anglia.

Who has reviewed this study?

This study has been independently reviewed by colleagues and granted ethical approval by Faculty of Medical Health Sciences Research (FMH) at the University of East Anglia (UEA).

How can I find out more?

If you have any questions, you may ask them now or later, even after the study has started. If you wish to ask questions, you can contact the research team using the below details:

Zoe Thompson

Zoe.Thompson@uea.ac.uk

Professor Joni Holmes

Joni.Holmes@uea.ac.uk

Appendix H: Consent form for Parent/Carers

CONSENT FORM

Study title: How are coping skills and the way people think linked with mood and feelings?

Name of researchers: Zoe Thompson, Professor Joni Holmes and Dr Hannah Crook.

Please read the following statements carefully:

1. I can confirm that I am a parent/carer/guardian of a child aged 11-14 years or that I am the legal guardian of a child aged 11-14 years. ☐
2. I confirm that I have read the information sheet dated 7th February 2023 (version 1) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
3. I understand that my child's participation is voluntary and that they are free to withdraw at any time without giving any reason. I understand that my child is free to withdraw their data 2 weeks from the date of submitting their responses. ☐
4. I understand that the information gathered during the study will be treated as strictly confidential and handled in accordance with EU General Data Protection Regulation (GDPR) (2018). I understand that confidentiality may be breached, and the relevant authorities may need to be informed in the research team are significantly concerned about risk to my child or others. ☐
5. I understand that my child's anonymous research data will be stored securely by the research team and may be accessed for other research in the future and may be shared anonymously with other researchers. ☐
6. I agree for my child to take part in the above study. ☐
7. I would like to receive a copy of this studies findings. YES/NO

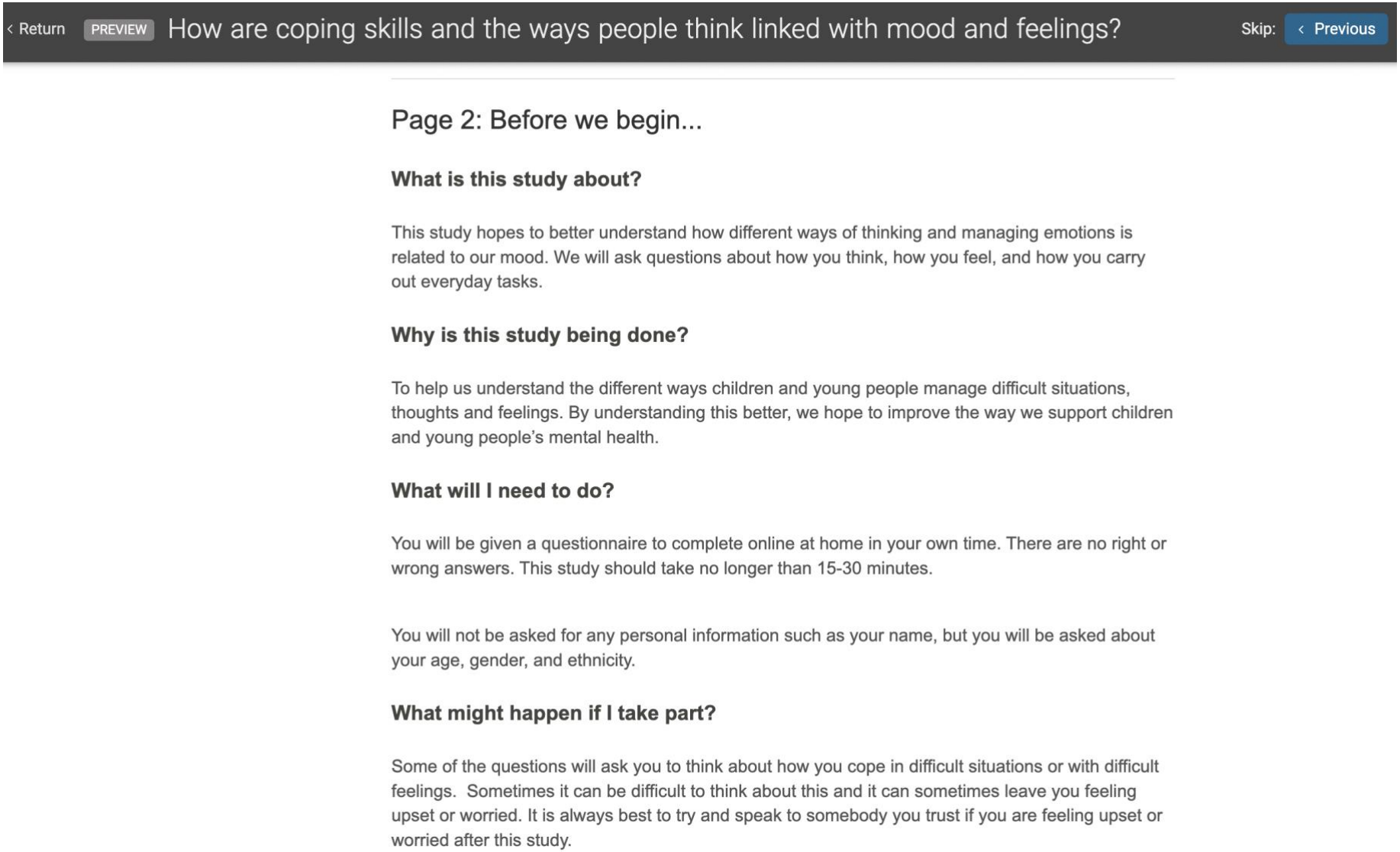
By signing this document, you are confirming that you agree with all of the above statements. Once you have signed this document and returned this to the primary researcher, you will be sent the weblink and unique I.D. code to access the study for your child.

Your Name	Date	Signature
_____	_____	_____
Name of Person	Date	Signature

seeking consent

Zoe Thompson

Appendix I: Participant Information Sheet (PIS) Adolescent Version



PREVIEW How are coping skills and the ways people think linked with mood and feelings? Skip: ‹ Previous Next › 2 / 11

Do I have to take part?

No, it is completely your choice whether you take part. You do not have to take part, you can just say 'No'. No one will be cross with you and you will not be treated differently.

Even if your parent/carer has said it is ok to take part, it is still your choice.

Who will know I am taking part?

The people in the research team who are doing this study will know. The people in the research team are Zoe Thompson, Joni Holmes and Hannah Crook. Your parent or carer will also know that you have taken part in this study. No one else will know unless you wish to tell them.

What happens with the information I give?

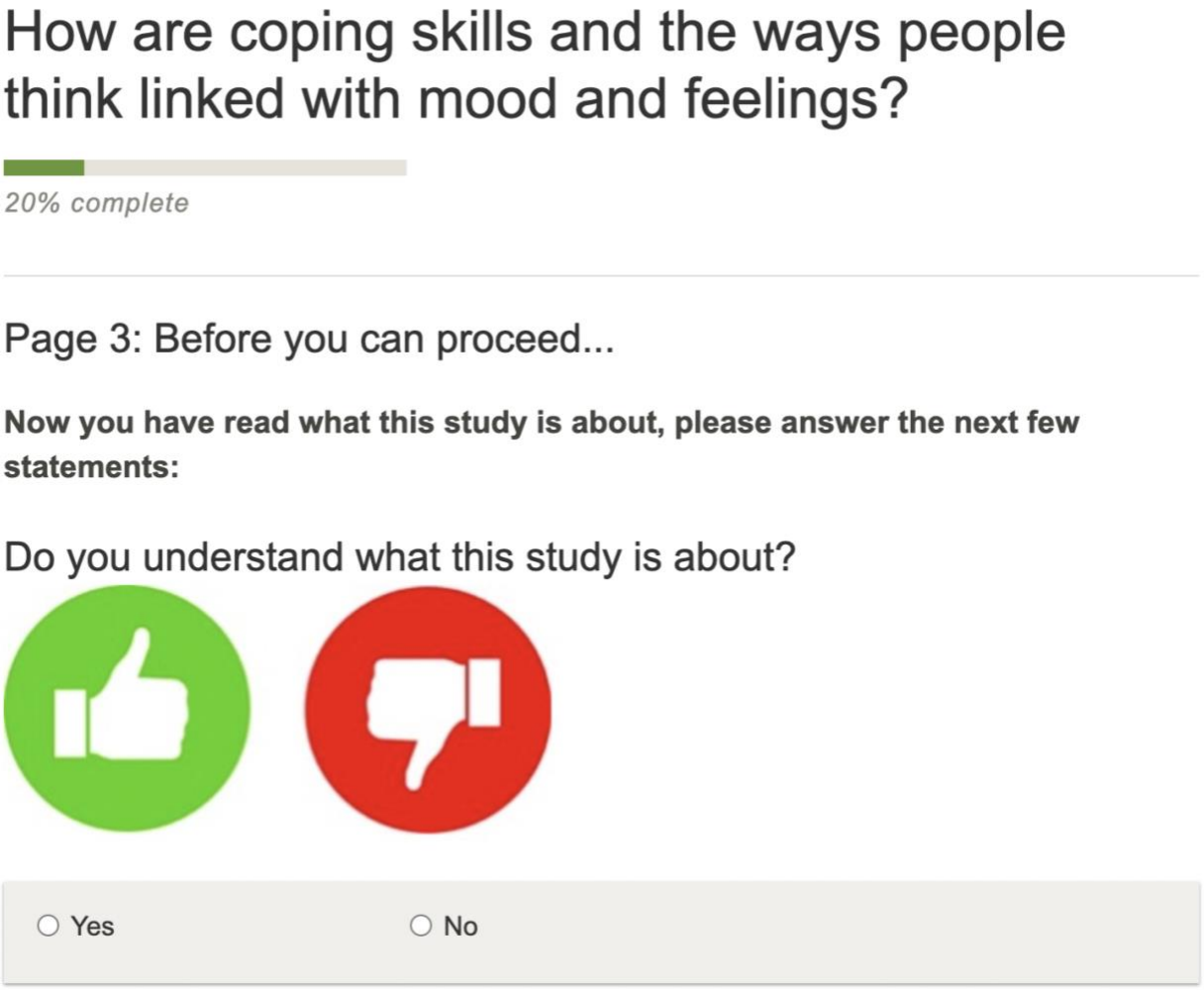
The information you give will be kept safe in a secure place that only the researchers can see. We will write about this study so that other people may learn from our research but will not mention any single person and nothing we say will be linked to you. We will also be creating a leaflet that will tell you about what we found , and this will be given to you and any parents or carers that want it. You will not be named at any point.

How can I find out more?

This study has been checked to make sure it is safe. If you have any further questions about this, your parent/carer may be able to answer some of these. If they are not sure, they can also ask us any questions.

Thank you for reading this!

Appendix J: Click to Tick Assent for Adolescents



How are coping skills and the ways people think linked with mood and feelings?

30% complete

Page 4: Before you can proceed...

Have you asked all the questions you want?

○ Yes ○ No

How are coping skills and the ways people think linked with mood and feelings?

40% complete

Page 5: Before you can proceed...

Have you had all your questions answered in a way you understand?

○ Yes ○ No

How are coping skills and the ways people think linked with mood and feelings?

50% complete

Page 6: Before you can proceed...

Are you happy to take part in this study?

○ Yes ○ No

*Once you have clicked yes, you will be taken to the first part of this study.

Appendix K: Demographic Questionnaire

DEMOGRAPHIC QUESTIONNAIRE

For the following items please select the most appropriate option which best describes you or fill in as appropriate.

1. Age: [to select from drop down field]

2. Which of the following most accurately describe(s) you?

Male
Female
Non-Binary
Transgender
Intersex
Let me type..
I prefer not to say

3. **What is your ethnic group?**

Choose the option that best describes your ethnic group or background:

White
1.English/Welsh/Scottish/Northern Irish/British
2.Irish
3.Gypsy or Irish Traveller
4.Any other White background, please describe
Mixed/Multiple ethnic groups
5.White and Black Caribbean
6.White and Black African
7.White and Asian
8.Any other Mixed/Multiple ethnic background please describe
Asian/Asian British
9.Indian
10.Pakistani
11.Bangladeshi
12.Chinese
13.Any other Asian background, please describe
Black/African/Caribbean/Black British
14.African
15.Caribbean
16.Any other Black/African/Caribbean background, please describe
Other ethnic group
17.Arab
18.Any other ethnic group, please describe

For the next series of questions (Question 4-6), please select the most appropriate response from ‘Yes’ or ‘No’.

These questions are completely optional to answer. If you do not wish to answer these questions you can click ‘skip’ to move to the next page and you will still be able to continue with the study.

4. Have you ever been diagnosed with a mood disorder such as anxiety or depression? YES/NO

5. Do you consider yourself to have mental health difficulties? YES/NO

6. If YES to either question 4 or 5, are you currently receiving support for your mental health? YES/NO

Appendix L: Aftercare Information Provided to Parent/Carer(s)/Debrief Information Provided to Participants

Aftercare Sheet

The aim of this study was to better understand different ways of thinking to see whether this was related to how we manage emotions and how we feel.

The outcomes of this study will not include any information that is identifiable to your child.

Your child has two weeks from today to change their mind about the data they have submitted. If they wish to withdraw their data, please let us know so we can arrange this.

If you or your child have any further questions about this study, please contact Zoe on Zoe.Thompson@uea.ac.uk.

You may feel this study has left you feeling worried or upset**. If you feel overwhelmed, worried or upset** support is available for you to talk things through. You may wish to talk to an adult you trust or call one of the helplines below, you deserve help as soon as you need it.

To talk with someone confidentially about how you feel, you can:

- **Ring** HOPELINEUK on 0800 068 4141 or the Samaritans on 116 123.
- **Text** YM to YoungMind's Textline on 85258.

If you feel like you may attempt suicide, or you have seriously hurt yourself, this is an emergency. You can:

- Call **999** and ask for an ambulance.
- Tell an adult you trust and ask them to call 999 for help.

Mental health emergencies are serious. You aren't wasting anyone's time.

We have included other resources that you or your child may find helpful:

Kooth
Safe, anonymous online community and counselling for young people. Check on the website if it's available in your area. kooth.com

NHS Every Mind Matters
Information and advice on mental health and wellbeing for young people. Includes videos about dealing with change, social media and sleep.
nhs.uk/every-mind-matters/mental-wellbeing-tips/youth-mental-health

Reading Well
Self-help books to help people understand and manage their mental health and wellbeing. Also available in Welsh.
reading-well.org.uk/resources/young-people

Anna Freud website (Self care top tips)
Information and support for children and young people to understand more about mental health and well-being.
https://www.annafreud.org/on-my-mind/self-care/

Thank you for participating in this research!

The aim of this study was to better understand different ways of thinking to see whether this was related to how we manage emotions and how we feel.

The outcomes of this study will not include any information that is identifiable to you.

You have two weeks from today to change your mind about the data you have submitted. If you wish to withdraw your data, please tell your parent/carer so we can arrange this.

If you or your parent/carer have any further questions about this study, please contact Zoe on Zoe.Thompson@uea.ac.uk.

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NHS Every Mind Matters
Information and advice on mental health and wellbeing for young people. Includes videos about dealing with change, social media and sleep.
nhs.uk/every-mind-matters/mental-wellbeing-tips/youth-mental-health

Reading Well
Self-help books to help people understand and manage their mental health and wellbeing. Also available in Welsh.
reading-well.org.uk/resources/young-people

Anna Freud website (Self care top tips)
Information and support for children and young people to understand more about mental health and well-being.
https://www.annafreud.org/on-my-mind/self-care/

Appendix M: UEA Faculty of Medicine and Health Sciences (FMH) ethics approval letter

University of East Anglia
Norwich Research Park
Norwich. NR4 7TJ

Email: ethicsmonitor@uea.ac.uk
Web: www.uea.ac.uk

Study title: Do Emotional Regulation Skills Moderate the Relationship Between Depression and Executive Functioning in Adolescents?

Application ID: ETH2223-1559 (significant amendments)

Dear Zoe,

Your application was considered on 27th February 2023 by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee).

The decision is: **approved**.

You are therefore able to start your project subject to any other necessary approvals being given.

If your study involves NHS staff and facilities, you will require Health Research Authority (HRA) governance approval before you can start this project (even though you did not require NHS-REC ethics approval). Please consult the HRA webpage about the application required, which is submitted through the IRAS system.

This approval will expire on **30th September 2024**.

Please note that your project is granted ethics approval only for the length of time identified above. Any extension to a project must obtain ethics approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) before continuing.

It is a requirement of this ethics approval that you should report any adverse events which occur during your project to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) as soon as possible. An adverse event is one which was not anticipated in the research design, and which could potentially cause risk or harm to the participants or the researcher, or which reveals potential risks in the treatment under evaluation. For research involving animals, it may be the unintended death of an animal after trapping or carrying out a procedure.

Any amendments to your submitted project in terms of design, sample, data collection, focus etc. should be notified to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) in advance to ensure ethical compliance. If the amendments are substantial a new application may be required.

Approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) should not be taken as evidence that your study is compliant with the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. If you need guidance on how to make your study UK GDPR compliant, please contact the UEA Data Protection Officer (dataprotection@uea.ac.uk).

Please can you send your report once your project is completed to the FMH S-REC (fmh.ethics@uea.ac.uk).

I would like to wish you every success with your project.

On behalf of the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee)

Yours sincerely,

Dr Paul Linsley

Appendix N: Emotional Regulation Questionnaire Child Version (ERQ-CA) and email of author authorisation.

ERQ-CA

Below are a number of statements. Please read each statement, and then **circle** the **choice that seems most true for you**. Some of the statements may seem the same but they are different in important ways, so be sure to read carefully.

1. When I want to feel happier, I think about something different.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
2. I keep my feelings to myself	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
3. When I want to feel less bad (e.g., sad, angry or worried), I think about something different.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
4. When I am feeling happy, I am careful not to show it.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
5. When I'm worried about something, I make myself think about it in a way that helps me feel better.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
6. I control my feelings by not showing them	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
7. When I want to feel happier about something, I change the way I'm thinking about it.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
8. I control my feelings about things by changing the way I think about them.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
9. When I'm feeling bad (e.g., sad, angry, or worried), I'm careful not to show it.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree
10. When I want to feel less bad (e.g., sad, angry, or worried) about something, I change the way I'm thinking about it.	Strongly Disagree	Disagree	Half and half	Agree	Strongly Agree

Re: ERQ-CA permissions

EG

Eleonora Gullone <eleonora.gullone@gmail.com>

Tuesday, 6 December 2022 at 03:13

To: Zoe Thompson (MED - Postgraduate Researcher)

This message is flagged for follow-up.

Warning: This email is from outside the UEA system. Do not click on links or attachments unless you expect them from the sender and know the content is safe.

Dear Zoe,
you ca use the measure for research purposes. Please find it and related information at the link below.
Regards, Eleonora

On Tue, 6 Dec 2022 at 2:37 am, Zoe Thompson (MED - Postgraduate Researcher) <Zoe.Thompson@uea.ac.uk> wrote:

> Good afternoon Eleonora,
>
> Firstly I wanted to introduce myself, I am trainee clinical psychologist on the University of East Anglia clinical psychology doctorate.
>
> I am currently planning my thesis project and was hoping to use the ERQ-CA within my online survey to look at young people's emotional regulation skills. Is this measure authorised to use for research purposes?
>
> Look forward to hearing from you,
>
> Best wishes,

Appendix O: Mood and Feelings Questionnaire (MFQ) Short Version

Child Self-Report

MOOD AND FEELINGS QUESTIONNAIRE: Short Version

This form is about how you might have been feeling or acting **recently**.

For each question, please check (✓) how you have been feeling or acting ***in the past two weeks.***

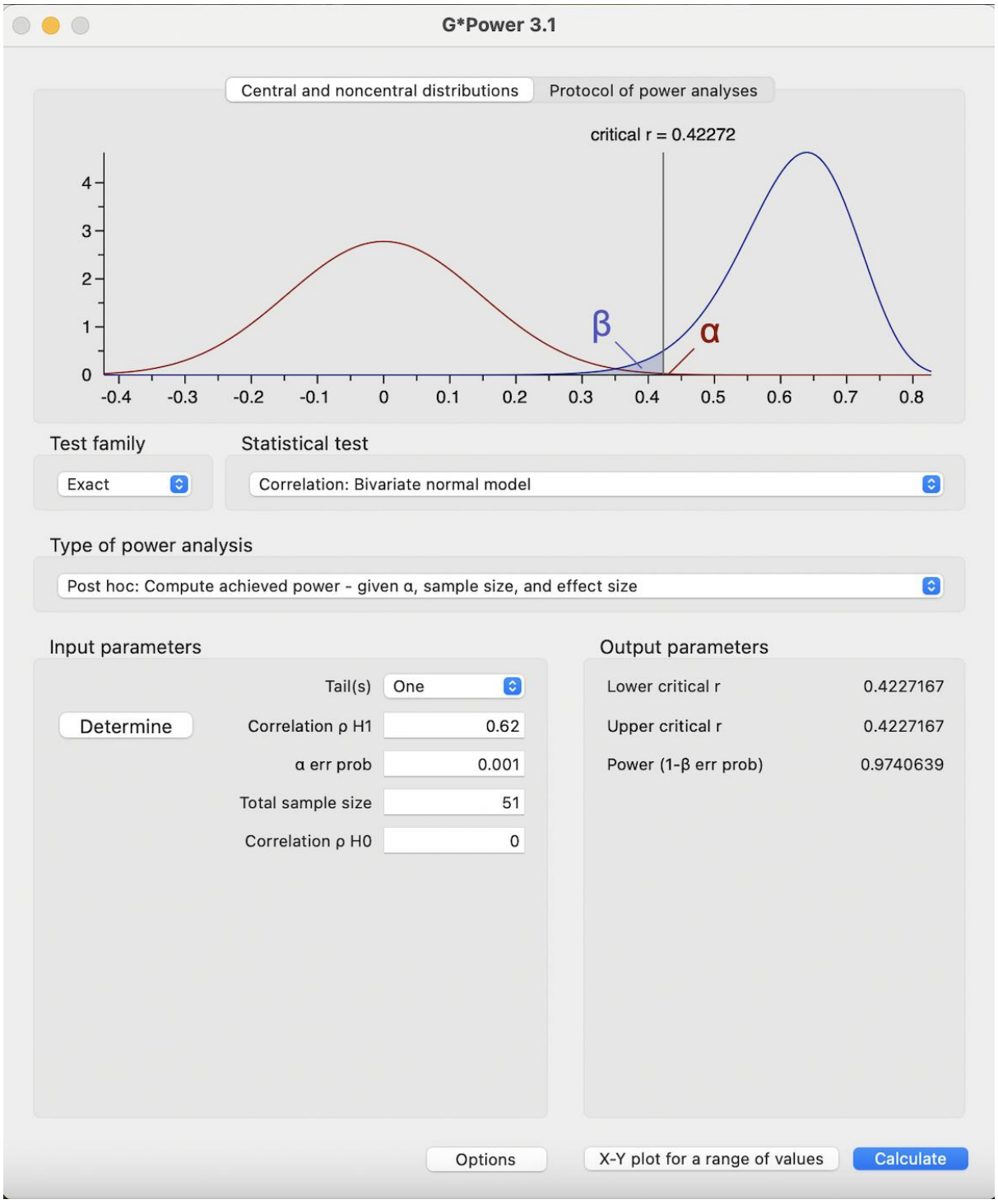
If a sentence was not true about you, check NOT TRUE.
If a sentence was only sometimes true, check SOMETIMES.
If a sentence was true about you most of the time, check TRUE.

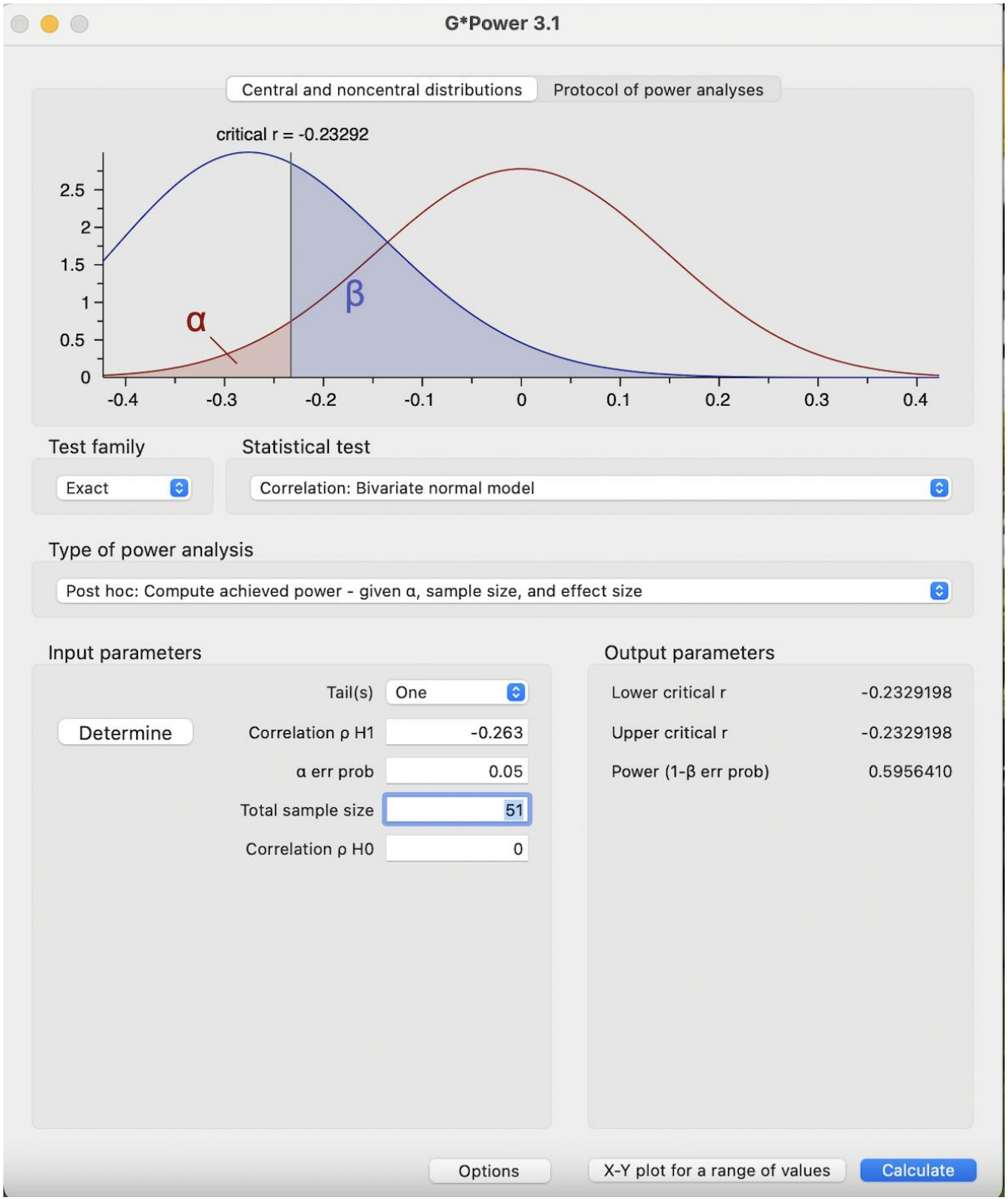
Score the MFQ as follows:
NOT TRUE = 0
SOMETIMES = 1
TRUE = 2

To code, please use a checkmark (✓) for each statement.	**NOT TRUE**	**SOME TIMES**	**TRUE**
1. I felt miserable or unhappy.			
2. I didn't enjoy anything at all.			
3. I felt so tired I just sat around and did nothing.			
4. I was very restless.			
5. I felt I was no good anymore.			
6. I cried a lot.			
7. I found it hard to think properly or concentrate.			
8. I hated myself.			
9. I was a bad person.			
10. I felt lonely.			
11. I thought nobody really loved me.			
12. I thought I could never be as good as other kids.			
13. I did everything wrong.			

Appendix P: G*Power Post-Hoc Power Analysis

The following outputs represent the post-hoc power analysis conducted for the largest effect and smallest observed within our data set. See empirical paper for further explanation of these analyses.




G*Power 3.1
Central and noncentral distributions
Protocol of power analyses
critical r = -0.23292
2.5
2
1.5
1
0.5
0
α
β
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
Test family
Exact
Statistical test
Correlation: Bivariate normal model
Type of power analysis
Post hoc: Compute achieved power - given α, sample size, and effect size
Input parameters
Tail(s)
One
Determine
Correlation ρ H1
-0.263
α err prob
0.05
Total sample size
51
Correlation ρ H0
0
Output parameters
Lower critical r
-0.2329198
Upper critical r
-0.2329198
Power (1-β err prob)
0.5956410
Options
X-Y plot for a range of values
Calculate