UNIVERSITY OF
EXETER

LITERATURE REVIEW: A systematic review of the associations between

effortful control, repetitive negative thinking and depression in adolescence.

EMPIRICAL PAPER: Investigating associations between repetitive

negative thinking, stress, and effortful control, and the development and

maintenance of depression in adolescence: A follow-up study.

Submitted by **Erika Claire Baker**, to the University of Exeter

as a thesis for the degree of **Doctor of Clinical Psychology**, May 2018

Author's Declaration

The author completed the literature review independently. For the empirical work, participants in sample 1 were recruited at three time-points between March 2017 and July 2017, independently by the author. This study is part of a collaborative project with fellow trainee Clinical Psychologist, Claire Stephens. Her project entitled *"Exploring the relationships between executive functioning, repetitive negative thinking, stress and depression in adolescence: A brief longitudinal study"* recruited sample 2 between October 2016 and January 2017. Her study measured two follow-up waves (Baseline and Pre-exam). The author followed sample 2 up Post-exam to measure emotional recovery. Claire Stephens study also measured executive function tasks, which are not included in the current study. Data will also be shared for journal submissions to investigate temperament, cognition and depression in young people. As a result, the selection of questionnaires and assessments was collaborative and ethical approval was sought jointly for both parts of this project. The author completed all other components of the study including data entry, analysis and write-up independently.

Table of Contents

List of Tables

List of Figures

UNIVERSITY OF
EXETER

SCHOOL OF PSYCHOLOGY

DOCTORATE IN CLINICAL PSYCHOLOGY

LITERATURE REVIEW

A systematic review of the associations between effortful control, repetitive negative thinking and depression in adolescence.

Trainee Name:	**Erika Baker**
Primary Research Supervisor:	**Professor Ed Watkins**
	Professor of Experimental and Applied Clinical Psychology/ Director of Research for Professional Doctorates.
Secondary Research Supervisor:	**Dr Anna Adlam**
	Senior Lecturer, Deputy Director of Research for Professional Doctorates
Target Journal:	British Journal of Clinical Psychology
Word Count:	5935 words (excluding abstract, table of contents, list of tables and figures, captions, references, footnotes, appendices)

Submitted in partial fulfilment of requirements for the Doctorate Degree in Clinical Psychology, University of Exeter

Abstract

Background: Repetitive negative thinking (RNT) and the self-regulatory temperament, effortful control (EC), have been found to be important risk factors for the development of depressive symptoms. Furthermore, adolescence has been found to be a period of increased risk for developing depressive symptoms. The relationships between these risk pathways are not well understood during this period of development.

Objective: This systematic review aimed to evaluate the literature exploring the relationships RNT and EC have in accounting for depressive symptoms in adolescents. In particular, whether RNT and EC are associated with depressive symptoms, and whether EC moderates the effects of RNT on depressive symptoms.

Methods: Three databases and key journals were searched for studies measuring EC, RNT and depressive symptoms in 10-20 year olds. Study selection was undertaken by applying inclusion and exclusion criteria. The methodological quality of the included studies was assessed using a validated checklist. Inter-rater reliability was calculated for a random subsample of the search.

Results: Thirteen studies were selected for inclusion. There was evidence indicating that RNT was correlated with depressive symptoms both concurrently and prospectively. The evidence for a relationship between lower EC and higher levels of depressive symptoms was mixed. High quality studies concluded that EC and depressive symptoms are associated concurrently, but not over time. There is evidence that lower EC predicts RNT over time, and even spanning over childhood.

Some evidence was found for EC as a moderator between RNT and depressive symptoms and this was also found when the relationship was prospective.

Conclusions: Whilst the reviewed literature had many strengths, there were large differences in how EC in particular, was measured. This resulted in a challenge synthesising the results and making clear conclusions. Future research would benefit from considering self-report and behavioural measures, and recognising the potential impact of stressful life events.

Introduction

This review will look at two vulnerability factors implicated in the development

and maintenance of depressive symptoms in young people. Depressive disorders

are a significant mental health problems during adolescence (Twenge & Nolen-

Hoeksema, 2002). By early adulthood, over a quarter of individuals will have

experienced at least one episode of depression (Verstraeten, Vasey, Raes, &

Bijttebier, 2009). Adolescence and early adulthood is a developmental stage

associated with the formation of cognitive styles and functions (Hankin & Abramson,

2001), potentially representing a significant period in the development of

psychopathology (Mezulis, Simonson, McCauley & Vander Stoep, 2011).

Adolescence is a critical time for heightened vulnerability to depression. A

longitudinal study by Hankin and colleagues found that between 15 to 18 years of

age individuals show a peak in depressive symptoms (Hankin et al., 1998). It is

therefore an important stage to focus on to identify and treat vulnerability factors.

A process that has been widely evidenced as a risk factor for the development

and maintenance of emotional disorders, across the lifespan, is repetitive negative

thinking (RNT) (see Harvey, Watkins, Mansell, & Shafran, 2004 and Watkins, 2008

for reviews). Repetitive negative thought is defined "by the three process

characteristics that are common to all definitions, namely as repetitive thinking about

one or more negative topics that is experienced as difficult to control" (Ehring &

Watkins, 2008, p.193), the two main forms of which are rumination and worry. A

ruminative style of responding has been found to contribute to the onset, the severity

and the persistence of depressive symptoms (Nolen-Heoksema & Morrow, 1991;

see reviews by Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Nolen-Hoeksema &

Watkins, 2011).

Rumination increases from late childhood through adolescence (Hampel &

Petermann, 2005), and is predictive of concurrent depression in older children and

adolescents (Abela, Parkinson, Stolow & Starrs, 2009), with higher levels of

rumination predictive of future depressive symptoms in adolescence (Abela &

Hankin, 2011; Broderick & Korteland, 2004; Michl, McLaughlin, Sheperd & Nolen-

Hoeksema, 2013; Young, 2015). A range of terminology is used in the literature,

including rumination, worry and RNT, leading to difficulty synthesising results.

Furthermore, it is argued that both rumination and worry involve similar processes,

but focus on different content (Ehring & Watkins, 2008). RNT reflects processes

involved in both rumination and worry, and so for consistency RNT will be referred to

throughout.

Ruminative response style is associated with temperamental style (Nolen-

Hoeksema, 1991), with reactive aspects of temperament, such as positive affectivity

(PA) and negative affectivity (NA) being predominantly the focus of research.

However, of interest in the current review is the influence of self-regulatory

temperament, effortful control (EC).

EC describes a self-regulatory capacity of an individual to gain active control

over their behaviour and emotional responses (Rothbart, 1989). It emerges in

toddlerhood, developing across early life (Rothbart, 1989). It includes behavioural

regulation, such as the ability to inhibit behaviour effortfully as appropriate (inhibitory

control), or the ability to activate behaviour when needed (activation control), as well

as attentional control, such as the ability to voluntarily focus or shift attention when

needed (attentional control) (Posner & Rothbart, 2000; Kochanska, & Knaack, 2003;

Rothbart, 1989; Rothbart & Ahadi, 1994; Rothbart & Bates, 1998).

EC appears to be a central construct in the emergence of psychopathology

(e.g. Rothbart, 1989; Verstraeten et al., 2009). EC reflects an individual's ability to

act purposefully in modulating thoughts, emotions and behaviour, and therefore, has

broad-reaching implications for young people's adjustment. Evidence shows that EC

is a critical predictor of a range of indicators of children's adjustment (e.g. Rothbart,

1996).

Strategies to modulate emotional reactivity, comprising inhibitory, as well as

attentional processes (Rothbart, Ahadi, Hershey, & Fisher, 2001) are likely to be

involved in RNT, as individuals with low EC are susceptible to having difficulty

inhibiting negative thoughts or paying attention to other cues (Rothbart et al., 2001).

These processes are likely to contribute to the development of RNT (Rothbart et al.,

2001). Given this, it is important to understand how EC may be associated with RNT,

a cognitive component implicated in the development of depression.

Furthermore, EC has been found to moderate relationships between reactive

temperament, negative affect, and internalising symptoms in children (Muris, van

Brakel, Arntz, & Schouten, 2007; Oldehinkel, Hartman, Ferdinand, Verhulst, &

Ormel, 2007). It is theorised that EC may also moderate the relationship between

RNT and depressive symptoms, as individuals with low EC may not be able to inhibit

negative thoughts, resulting in ongoing RNT (Verstraeten et al., 2009). This inability

to disengage from negative thoughts may result in a vulnerability to the onset,

maintenance and/or recurrence of depressive symptoms (Nolen-Hoeksema, 2004).

Whilst the definition of EC is generally accepted, the measurement of EC is

not. In early to mid-childhood, EC is typically measured using a battery of cognitive

performance measures supported with parent and/or teacher reports of the child's

behaviour. Post-childhood, self-report questionnaires are commonly used to

measure EC. Questionnaire measures either combine all subcomponents of EC or

focus on specific subcomponents. Behavioural measures are also used to assess

executive attention, a core process theorised to underlie EC (Rothbart & Bates,

2006), however, currently there are no behavioural measures to our knowledge that

are used to assess other components of EC. The range of measurements used

results in difficulty synthesising the results, as results may reflect subcomponents of

EC.

EC and RNT are both indicated as vulnerability (or resilience) factors that are

associated with the maintenance of depression (Ho, 2004; Verstraeten et al., 2009;

Hoorelbeke, Koster, Vanderhasselt, Callewaert, & Demeyer, 2015). The purpose of

this review is to systematically identify all studies that have investigated EC and RNT

in young people with depressive symptoms, to determine whether EC and RNT are

implicated in an individual's vulnerability to developing depressive symptoms.

Clinically, this study will begin to better understand the roles of EC and RNT in the

development of depressive symptoms in young people, which may allow us a better

understanding of interventions for young people and begin to understand trajectories

of depression into adulthood.

The aim of this review is to examine the relationships RNT and EC have on depressive symptoms. Specifically, whether RNT and EC are associated with depressive symptoms, and whether EC moderates the effects of RNT on depressive symptoms.

Review questions: Are EC or RNT each associated with depressive symptoms? What is the evidence that EC acts as a moderator on the relationship between RNT and depressive symptoms?

Methods

This systematic review aims to summarise the evidence relating to the research question using a systematic and transparent approach to identify, select and critically evaluate relevant literature (CRC Guidance, 2009; Liberati et al., 2009). This review followed the Preferred Reporting Items for Systematic Review and Meta-analysis Protocol (PRISMA-P) to guide identification, screening, eligibility and synthesis of studies (Moher, Liberati, Tetzlaff, Altman, & the PRISMA Group, 2009; Moher et al., 2015).

Inclusion Criteria

Studies including both EC and RNT and a measure of depressive symptoms, in young people, were selected.

Participants

Males and females aged 10-20 years old (The World Health Organisation definition of adolescence, 1965; 1977; however, a recent study extended

adolescence to 24 years of age, Sawyer, Azzopardi, Wickremarathne, & Patton, 2018; period of significant neurobiological development, Ahmed, Bittencourt-Hewitt, & Sebastian, 2015). The age range and/or the mean of the sample must fall within this range.

Study Design

Prospective, cross-sectional, experimental and correlational designs were included.

Measures

Measures used focused on the temperament EC (as a broad measure of EC, or a measure of any of the subcomponents: attentional control, inhibitory control and activational control). These may have included self-report, parent or teacher report, or behavioural measures.

EC is operationalized with a number of self-report questionnaires. Two of the measures, the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007; 16-years onwards) and the Early Adolescent Temperament Questionnaire (EATQ-R; Capaldi & Rothbart, 1992; 9-15 year olds) were developed in the same laboratory, focusing on the three subcomponents of EC; activational, attentional and inhibitory control. The Effortful Control Scale (ECS; Lonigan & Phillips 2001; 9-18 year olds) is comprised of Persistence/Low Distractibility and a second related but distinguishable construct of Impulsivity. The Attentional Control Scale (ACS; Derryberry & Reed, 2002; 18-years onwards) is a measure of attentional control (AC) only and is formed of two subscales; The focusing subscale assesses the trait ability to concentrate on

goal-relevant tasks and inhibit distractions, whereas the shifting subscale assesses the trait ability to multi-task and easily switch from one task to another (Derryberry & Reed, 2002).

Many of the functions and core components of EC share similarities with the definition of Executive Functions, which involve a set of subcomponents and processes that exert control over one's attention, cognition, and behavioural tendencies (Blair, Zelazo, & Greenberg, 2005). Despite this, different fields use the terms as distinct separate processes, or even interchangeably (Zhou, Chen, & Main, 2012). In order to systematically assess the role of temperamental EC, any behavioural tasks must measure specific subcomponents of EC.

Behavioural measures include batteries of attention tasks which are predominantly used from early childhood, such as The Preschool Lab-Tab (Gagne, Van Hulle, Aksan, Essex, & Goldsmith, 2011; 3-5 years old) and the TEA-Ch (Manly, Robertson, Anderson, & Nimmo-Smith, 1999; 6-16 years old), both mimic everyday attention tasks (Planalp, Hulle, Gagne, & Goldsmith, 2017), and include tasks on dividing, focusing and shifting attention. The Preschool LAB-TAB is designed to measure dimensions of temperament, whilst TEA-Ch is described as a measure of attentional capacities. Other measures used in the literature focus on attention focusing, shifting and switching. The rationale for including studies focusing on behavioural measures of AC, was due to: a) study 4 labelled the measures as temperamental measures of EC, and so in order to remain consistent, attention measures were included under this assumption; b) regardless of the terminology, the tasks measured the construct of AC, a subcomponent of EC.

Measures of RNT must have focused on repetitive negative thoughts. These included rumination, brooding and worry, as these terms are more commonly used historically in the literature. The measures may have included self-report, parent or teacher report. Trait and state RNT may have been included, with experimental measures also included (e.g. RNT induction).

A widely used self-report measure is the Children's Response Styles Questionnaire (CRSQ; Abela, Rochon, & Vanderbilt, 2000). This is formed of two-factors; rumination factor and distraction/problem-solving and assesses how frequently the individual responds to a sad mood with rumination. The Rumination Response Scale (RRS; Nolen-Hoeksema & Morrow,1991) measures two-factors of rumination; brooding and reflective pondering, reporting responses to feeling upset. Brooding involves 'a passive comparison of one's current situation with some unachieved standard', whereas reflection refers to 'purposeful turning inward to engage in cognitive problem solving to alleviate one's depressive symptoms' (Treynor, Gonzalez, & Nolen-Hoeksema, 2003, p 256). The Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011) is a measure of RNT which focusses on thoughts being: repetitive, intrusive and difficult to disengage from. The Perseverative Attention to Negative Events questionnaire (PANE; Mezulis, Abramson, & Hyde, 2002) assesses ruminative responses to negative events.

Measures that include a focus on depressive symptoms were evaluated. These measures may also have included a measurement of other psychopathology (e.g. anxiety), however the discussion focuses on depressive symptoms. This may have been measured using self-report, parent or teacher report or interview. The

most commonly reported measure of depressive symptoms is the Children's

Depression Inventory (CDI; Kovacs; 2003) which measures depressive symptoms

during the past two weeks for seven to 17 year-olds. Beck Depression Inventory

(BDI-II; Beck, Steer, & Brown 1996) is used for 13-years and older and reports on a

range of depressive symptoms. The Mood and Feelings Questionnaire (MFQ;

Costello & Angold, 1988) is based on diagnostic criteria for depressive disorders for

eight to18 year-olds.

Exclusion Criteria

Papers that were not in English (due to a lack of translating resources),

results from unpublished papers or papers from non-peer reviewed journals, or

duplicated results from other papers.

Search Strategy

The first step was searching known key papers by complete reference and

identifying subject headings and key words, these then informed the search terms

(see Table 1). As an additional measure, all key words were mapped to subject

headings and entered in the search. The following databases were systematically

searched: PsychINFO, MEDLINE (1946 to present Epub Ahead of Print) and Web of

Science. No restrictions were placed on the search. See Appendix A for the full

search strategy of one database.

Table 1.

Search terms for systematic review

Subject of focus	Combinations
Effortful Control	effortful control, EC, attentional control, inhibitory control, activational control, self-regulation
RNT	repetitive negative thought/thinking, RNT, rumination, worry, anxiety
Depression	depressive symptoms, depression, internalising
Adolescence	adolescent, teen, youth, young

Papers were first screened on titles and abstracts, and then on full texts. To make sure no relevant study was overlooked, reference lists of the selected articles were checked and key journals were hand searched to ensure efficiency of search strategy. Finally, searches were repeated on internet databases (ScienceDirect and Google Scholar) to ensure that no paper had been missed.

To enhance reliability and rigour, an independent rater blindly reviewed a random 25% of the total sample of all titles and abstracts obtained. Inter-rater reliability of 98.5% with the primary rater was found, and only one disagreement. Furthermore, a random 25% of all full-text reports retrieved were rated with 100% agreement with the primary rater. Data were then extracted (see Appendix B for data extraction form).

Quality evaluation

The methodological quality of the studies was assessed using the National

Institute for Health and Care Excellence (NICE; 2012) quality appraisal checklist for

studies reporting correlations and associations (see Appendix C). This checklist had

four sections covering population, selection of variables, outcomes, and analysis.

Three questions concerning the selection of a comparison group and the benefits

and harms of an intervention were removed as these study design elements were

not relevant for any of the studies reviewed. Each checklist item was rated according

to how well it had been designed or conducted to reduce bias. These item ratings

were then used to inform the selection of one of three possible overall quality ratings

for each study (see Table 2). Studies were not excluded based on the basis of

quality but judgments were used to weigh up the evidential quality provided by the

studies within the synthesis.

Table 2.

Overall quality ratings from the NICE (2012) quality appraisal checklist for studies

reporting correlations and associations

Rating	Criteria
++	All or most of the checklist items have been fulfilled. Where they have not been fulfilled the conclusions are unlikely to alter
+	Some of the checklist items have been fulfilled, where they have not been fulfilled or not adequately described, the conclusions are unlikely to alter
-	Few or no checklist items have been fulfilled and the conclusions are likely to alter

To enhance reliability and rigour, an independent rater blindly reviewed a random 25% of the included studies assessing for quality, achieving 100% agreement with the primary rater.

Results

Initial searches revealed 386 potentially relevant articles. After applying inclusion and exclusion criteria, 269 articles remained. Following a review of the abstracts, a further 111 were eliminated as they did not meet the inclusion criteria. The majority of papers removed at this stage did not specifically focus on any aspect of EC, RNT or the sample did not fit our criteria. Thirty-eight full text articles were examined, with

13 articles accepted for review (see Table 3 for included papers, and Appendix D for

excluded papers).

```
                    ┌──────────────────────────┐
                    │ Records identified through│
                    │    database searching     │
                    │        (n = 386)          │
                    └──────────────────────────┘
                                 │
                                 ▼
                    ┌──────────────────┐        ┌──────────────────┐
                    │  Records after   │ ◄───── │ Citations excluded│
                    │ duplicates removed│        │    (n = 141)     │
                    │    (n =269)      │        └──────────────────┘
                    └──────────────────┘
                                 │
┌──────────────────┐            ▼
│ Additional records│   ┌──────────────────┐    ┌──────────────────┐
│identified through │──►│ Abstracts screened│◄───│ Citations excluded│
│   other sources   │   │    (n = 149)     │    │    (n = 111)     │
│    (n = 21)      │   └──────────────────┘    └──────────────────┘
└──────────────────┘            │
                                 ▼
                    ┌──────────────────┐    ┌───────────────────────────────────┐
                    │Full-text articles│    │Full text articles excluded (n = 25).│
                    │assessed for      │───►│Reasons:                            │
                    │eligibility       │    │  • 5 no measure of EC              │
                    │   (n = 38)       │    │  • 3 no measure of EC and RNT     │
                    └──────────────────┘    │  • 12 no measure of RNT           │
                                 │          │  • 3 population too old/young      │
                                 ▼          │  • 2 no empirical study design     │
                    ┌──────────────────┐    └───────────────────────────────────┘
                    │Studies included  │
                    │in the review     │
                    │   (n = 13)       │
                    └──────────────────┘
```

Figure 1. Flow-diagram of study selection process based on the guidelines for

preferred reporting items for systematic reviews and meta-analyses (PRISMA:

Moher et al., 2009).

Table 3

Papers included for review

Author/s and study number	Sample size/ age/ study design	Study Aims	Measures of: 1) RNT 2) depression 3) EC	Results	Effect sizes	Evaluation	Quality score
1. Arger, Sánchez, Simonson & Mezulis (2012)	315 undergraduate students aged 19 to 26 years (M_{age} = 20; SD = 1.2). 72% female. Cross-sectional design.	1. Investigating vulnerability factors (cognitive style, brooding, stress-reactive rumination) that mediate the relationship between NE and DS. 2. Investigating protective influence of EC	1) RRS (brooding questions only) 2) CES-D 3) ATQ	1. Brooding mediated between NE and DS 2. EC did not moderate between NE and cognitive style. 3. NE & EC did not predict brooding	EC & brooding r = -.25* EC & DS r = -.45* Brooding & DS r = .44* Medium to large	Strengths: 1. Moderate sample size. 2. Multiple vulnerability factors investigated. Limitations: 1. Only measured brooding, which is derived from five questions from the RRS. 2. Did not include EC as a vulnerability factor in the model 3. Limited information in results write up. 4. No prospective measures 5. EC was not a main focus of the study.	+
2. Bijttebier et al., (2017)	701 adolescents from public Flemish schools.	1. Investigating reliability and validity of PTQ-C	1) PTQ-C 2) CDI 3) ECS	1. RNT positively associated with concurrent and prospective depression.	RNT & DS r = .49* & r = .46* RNT & EC	Strengths: 1. Large sample size. 2. Analysis procedure detailed and thorough.	++

	9 to 14 years old (M_{age} = 11.81; SD = 1.13). 53% female. Follow up study, two waves over three months.	2. Explore whether RNT predicts DS, including whether RNT moderates stress and DS. 3. Explore whether NA, PA EC predict RNT, whether RNT mediates temperament and DS.		2. RNT moderated the positive association of stress with DS. 3. Lower levels of EC predicted increases in DS through heightened levels of RNT 3 months later. 4. Higher RNT predicted by lower EC. 5. Higher DS were predicted by higher levels of RNT. 6. EC did not predict DS 3 months later.	r = -.28* & r = -.31* EC & DS r = -.53* & r = -.46* Medium to large effects	Limitations: 1. Stress, a key variable, was measured using self report focussing only on the past 3 months. 2. Short duration between measurement waves. 3. No theoretical reason given for 3 month follow up. 4. No demographics or measurement of clinical/non-clinical. 5. EC not included in analysis predicting DS.	
3. Connolly et al., (2014)	200 adolescents 12 or 13 years old (M_{age} = 12.41; SD = .63) Longitudinal study on the emergence of depression in adolescence (Adolescent Cognition and Emotion; ACE) in the USA.	1. Explore whether rumination and DS would predict AC	1) CRSQ 2) CDI 3) TEA-Ch (attentional control)	1. DS positively correlated with RNT concurrently 2. DS predicted RNT at T2. 2. Baseline RNT was correlated with lower selective attention, attentional switching	DS & RNT r = .47** & r = .38** RNT & AC r = -.02 – r = .06 DS & AC r = -.05 – r = -.07 AC small effect sizes.	Strengths: 1. Longitudinal design over a year 2. Moderate sample size. 3. Thorough analysis write-up Limitations: 1. Appears to include participants based on racial group (African	+

				concurrently, one year later. 3. Not all AC tasks correlated with one another. 4. DS at baseline did not predict change in AC a year later. 5. DS not correlated with AC at either time point. 6. Lower levels of AC did not predict increased RNT a year later. 8. Lower levels of AC did not predict increased DS a year later.		American, Caucasian, or Biracial only) 2. Measures AC only.	
Two time points, 1 year apart.							
4. Hilt, Armstrong & Essex (2012)	337 adolescents 13 and 15 years old (M$_{age}$ = NR; *SD* = NR). 51% female. Longitudinal study following families from pregnancy. Follow up two time points at 13 and 15 years old.	1. Investigating the impact of early family risk factors on later RNT. 2. Investigating the impact of temperaments negative effect and EC on the development of RNT in adolescence.	1) RRS 2) MHBQ 3)Preschool Laboratory Temperament Assessment Battery (attentional control)	1. Low levels of EC in childhood were associated with high levels of RNT in adolescence. 2. EC moderated the positive relationship between over-controlling parenting and RNT in adolescence.	EC & RNT *r* = -.11* No other data available to report or calculate effect sizes.	Strengths: 1. The longitudinal design allowed for modelling the development of risk factors for rumination in adolescence. 2. Large sample size. Limitations: 1. EC only measured as AC. 2. EC only measured in early childhood.	+

				4. For children high in EC no association of negative affect with RNT. 5. Children high in NA also low in ECat greater risk for adolescent RNT.		3. Limited data on age of assessments 4. Data combined at age 13 and 15 to make a composite score, limiting our knowledge of development. 5. Although DS was measured, it was not a key component of the analysis. 6. Descriptive data and correlations not reported.	
5. Hilt, Leitzke & Pollak (2017)	92, 9- 14 year olds (M_{age} = 11.34; *SD* = 1.46). USA population. 72% female. Assessed during one laboratory visit.	1. Investigating whether RNT is associated with AC 2. Whether DS associated with AC.	1) CRSQ 2) CDI 3) Dot-probe task (attentional control)	1. RNT predicted longer time attending to stimuli. 2. RNT associated with AC but only with emotional stimuli. 3. No gender effects	AC & RNT *r* = .00 – *r* = .21* DS & RNT *r* = .45** AC & DS not reported Small to medium effect sizes	Strengths: 1. Findings give a different/unique perspective on the area. Limitations: 1. EC only measured as AC. 2. Only one task used to measure AC. 3. Limited range of analysis 4. Depression was measured but not used as a main variable in analysis. 5. Small sample size.	+
6. Mezulis & Rudolph (2012)	110 adolescents aged 14.08 to 19.33	1. Prospectively investigate	1) PANE (trait)	1. Event-specific RNT predicted	RNT & DS *r* = .34**	Strengths:	+

	years old (M_{age} = 16.40; SD = 1.33). 73% female. Recruited from three private high schools in USA. Follow up study using diary entries to record stress over 8 weeks.	relationships between NA, cognitive responses to stress, and depressive symptoms	EA-PANE (event-specific RNT) 2) CDI-S 3) EATQ-R	increase in DS the following week. 2. Event-specific RNT mediated the effect of NA on DS. 3. EC did not prospectively predict DS. 4. EC did not moderate the relationship between NA and depression.	RNT & EC r = .03 EC & DS r = -.22* Small to medium effect sizes	1. Analysis procedure detailed and thorough. Limitations: 1. The brief follow-up duration limits the predictive validity 2. The stress measure was limited. Participants were asked to identify 2 stressful episodes that week, which is subjective. 3. EATQ-R age limit is 15 years old, no explanation for using this measure outside of limits.	
7. Mezulis, Simonson, McCauley & Stoep (2011) .	423 adolescents. At baseline (M_{age} = 12.0; SD = NR), at T2 (M_{age} = 14.1; SD = NR), at T3 (M_{age} = 15.1). 3 assessments over 3 years. Longitudinal study investigating the development of depression. Recruited from	1. Investigating temperament, RNT and DS 2. Differentiating brooding from reflection as mediators between temperament and DS 3. Investigating EC as moderators of mediating models.	1. RRS 2. MFQ 3. EATQ-R	1. RNT (brooding) mediates the relationship between NE and DS. 2. EC did not moderate the association between DS and brooding. 3. EC did not moderate the association between NE and brooding.	RNT & DS r = .18** – r = .35** DS & EC r = -.05 EC & RNT r = .- .07 Small to medium effect sizes.	Strengths: 1. Analysis procedure detailed and thorough. 2. Large sample. Weaknesses: 1. All measures completed at different ages. No concurrent data. May be developmental differences. .. 2. Only measured brooding, which is derived from five	++

	public schools in USA.				questions from the RRS.	
8. Mills et al., (2016)	394 undergraduates from a University in USA, (M_{age} = 19.1; SD = 2.61). 73% female. Follow up study with two time points, 4.5 weeks apart.	1. Examine effects of AC on prospective relationships between RNT and symptoms, including RNT and DS	1.RRS 2.CES-D 3.ACS	1. T1 Focusing significantly positively affected the relationships between T1 RNT and DS T2. 2. T1 Focusing significantly positively affected T1 DS and RNT T2. 3. Total ACS did not affect T1 RNT and T2 DS 4. The shifting subscale of AC did not significantly affect relationships.	Indirect effect with T1 focussing: RNT K^2 = .05 DS K^2 = .05 Medium effect	Strengths: 1. Negative life events screen was used. 2. Large sample size. Limitations: 1. Duration of follow up 4.5 weeks, reasons for this is unknown. 2. Limited detail in results and procedures sections. 3. Only one aspect of EC explored.	+
9. Snyder & Hankin (2016) Study 1. .	360 children/adolescents aged 8 to 16 years old at first assessment (M_{age} = 12.06; SD = 2.35). 57.2% female. Follow up four times over three years: T1 = baseline; T2 (3-15 months into study) = combined scores of	1. Testing a new process model linking poor cognitive control to DS/anxiety symptoms. 2. Investigating stressful life events 3. Investigating RNT	1. CRSQ 2. CDI 3. EATQ-R	1. Lower EC (T1) predicts later DS (T4) 2. This effect is mediated by increased dependent stress (T2) and subsequent RNT (T3). 3. EC predicted dependent stress at T2, with lower	EC & DS r = -.09 EC & RNT r = -.05 RNT & DS r = .38* Small to medium effect sizes	Strengths: 1. Included both self report and interview measures of stress. 2. This study was followed up with executive function tasks (Study 2, below). 3. Thorough exploration of the aims of the study, Limitations:	++

	stress at 3-, 6-, 9-, 12-, 15- months; T3 = 18month; T4 = combined scores of DS at 21-, 24-, 27-, 30-, 33-, 36 month.			EC predicting more stressful life events. 2. RNT did not mediate low EC and DS. 4. RNT at T3 predicted an increase in DS at T4.		1. Although measured longitudinally, DS scores between 21-36 months were combined. 2. Although measured longitudinally, stress scores between 3-15 months were combined.	
10. Snyder & Hankin (2016). Study 2.	148 11 to 20 year olds (M_{age} = 16.29; SD = 2.46) (from Study 1). 56.8% female. Participants were invited to take part in an additional study after Study 1 ended. One laboratory visit.	1. Testing whether effects found in Study 1 extended to similar findings using behavioural measures. 2. Conceptual replication of Study 1.	1) CRSQ 2) CDI 3) Attention and working memory tasks (stroop, category switch, keep track working memory updating, spatial span forward/backward)	1. Lower EC was associated with higher DS. 2. This effect increased with age. 3. Age did not mediate the relationship between EC and DS. 4. Lower EC reported more dependent stress, which increased with age. 5. Higher levels of dependent stress was associated with higher RNT. 6. Higher levels of dependent stress and higher levels of RNT had	EC & RNT r = -.24* RNT & DS r = .42* EC & DS r = -.14 Small to medium effects.	Strengths: 1. Supports Study 1 exploring task related EC. 2. A number of EF tasks were used, with confirmatory factor analysis demonstrating adequate model fit. Limitations: 1. Tasks not completed at same time as questionnaires. 2. No data were used from Study 1 i.e. DS/RNT to measure prospective relationships.	++

				higher levels of DS. 7. RNT did not mediate EC and DS.			
11. Stange et al., (2016)	285 adolescents (M_{age} = 12.41; SD = .63). 53.2% female. Participants were part of the Adolescent Cognition and Emotion (ACE) longitudinal study in USA. Followed up twice over 4.75 years.	1. Evaluating attentional shifting and RNT as prospective predictors of depression onset. 2. Explore sex differences in these relationships.	1) CRSQ 2) CDI 3) TEA-Ch (AC)	1. No gender differences in levels of RNT or AC. 2. Girls more likely to experience onset of depression during study. 3. RNT and AC did not correlate. 4. RNT predicted a shorter time until first onset of MDD. 5. This was significant for males, not females. 6. Lower AC predicted a shorter time until the first onset of MDD. 7. AC did not moderate the relationship between RNT and time until first onset MDD.	No data available to report or calculate effect sizes.	Strengths: 1. Depression screening was used to include adolescents without previous depression episode. 2. Moderate sample size. Limitations: 1. AC was measured using attentional shifting task only. 2. Limited detail in analysis section.	+

				8. AC did not moderate RNT and sex predicting time until MDD onset.			
12. Verstraeten, Bijttebier, Vasey & Raes (2011)	138 9-13 year olds (M_{age} = 10.8; SD = .69). 52.9% female.

Cross-sectional design.

Recruited from 3 Belgian primary schools. | 1. Investigate associations between brooding, reflection and worry. 2. Their associations with depression and anxiety. 3. Examine NA, PA & EC and RNT with anxiety and depression. 4. Investigate different measures of EC | 1. CRSQ rumination subscale RRS reflection items (3 items each) 2. CDI 3. ACS & ECS | 1. RNT brooding was significantly associated with EC, but reflection was not. 2. EC did not predict RNT. 2. Higher levels of brooding (not reflection) was associated with higher levels of DS. 3. DS were predicted by lower EC. r = -.22 (study 6) to r = -.53 (study 2). 4. Activation control and inhibitory control predicted DS. AC predicted anxiety symptoms. 6. Girls reported more DS than boys. | ECS/ACS & RNT brooding r = -.24** & r = -.29**

ECS/ACS & RNT reflection r = -.14 & r = -.17

ECS/ACS & DS r = -.47** & r = -.35**

Brooding/reflection & DS r = .56** & r = .40**

Small to medium | Strengths: 1. Good description of method 2. Detailed analysis 3. Investigating different subtypes of RNT and EC

Limitations: 1. Relatively small sample 2. Cross-sectional designs do not allow investigation of the direction of effects. 3. EC not included in some analysis. 4.ACS adult measure (18+) with no reason given for using it with younger sample | ++ |
| **13.** Verstraeten, Vasey, Raes & Bijttebier (2009) | 304, 11-17 years old (M_{age} = 14.26; SD = 1.23). 58.8% female. | 1. Investigate the role of temperament; | 1. CRSQ 2. BDI-II 3. ECS | 1. Lower EC associated with higher DS concurrently. | EC & RNT r = -.22*** | Strengths: 1. Large sample 2. Detailed analysis | ++ |

| | Community sample recruited from schools in Belgium.

T2= 249

Longitudinal design (1 year follow up). | NA, PA & EC in DS.
2. Investigate whether EC moderates associations of NA & PA with DS.
3 .Investigate whether RNT mediates the association between NA and DS, with this indirect path being moderated by EC. | | 2. Higher NA was associated with DS only at lower levels of EC.
3. EC did not predict DS at T2
4. Significant association between RNT and DS.
5. RNT mediated the association between high NA and DS.
6. The previous effect was moderated by EC finding stronger at low levels of EC, than at high levels of EC.
7. Cross-sectional data (T1) EC moderated the association between NA and RNT.
8. Longitudinally EC moderated the association between RNT and DS at T2.
9. Lower PA associated with | EC & DS $r = -.39^{***}$ & $r = -.30^{***}$

RNT & DS $r = .62^{**}$ & $r = .35^{**}$

Small to medium effect seizes. | Limitations:
1. One broad measure of EC, not investigating different subtypes. | |

				DS only at lower levels of EC. 10. Girls reported higher DS and RNT levels			

AC = Attentional Control; ACS = Attentional Control Scale, Focusing and Shifting Subscales; ATQ = Adult Temperament Questionnaire; BDI-II = Beck Depression Inventory; CDI = Children's Depression Inventory; CDI-S = Children's Depression Inventory _ Short Form; CES-D = Center for Epidemiological Studies – Depression Scale; CRSQ = Children's Response Styles Questionnaire; DS = Depressive Symptoms; EA-PANE = Event Anchored Perseverative Attention to Negative Events scale; EATQ-R = Early Adolescent Temperament Questionnaire _ Revised; EC = Effortful Control; ECS = Effortful Control Scale; MDD = Major Depressive Disorder; MFQ = The Mood and Feelings Questionnaire; MHBQ = MacArthur Health and Behaviour Questionnaire; NA = Negative Affectivity; NE = Negative Emotionality; NR = Not Recorded; PA = Positive Affectivity; PANE = Perseverative Attention to Negative Events scale; Preschool Laboratory Temperament Assessment Battery; PTQ-C = Perseverative Thinking Questionnaire-Child Version; *RNT = Repetitive Negative Thinking; RRS = Ruminative Responses Scale; The Test of Everyday Attention for Children (TEA-Ch)

*RNT is also used to describe rumination. RNT is reported for consistency.

Critical Analysis

The aim of this review was to examine the relationships between RNT and EC
and depressive symptoms. Review questions: Are EC or RNT each associated with
depressive symptoms? What is the evidence that EC acts as a moderator on the
relationship between RNT and depressive symptoms?

Examining RNT and depressive symptoms

The association between RNT and depressive symptoms is well established
in the literature and was replicated in this review. Associations between RNT and
depressive symptoms (reported in 10 studies; 1-3, 5-7, 9, 10, 12 & 13) were all
significant and ranged from $r = .18$ (study 7) to $r = .56$ (study 12), with a mean of $r =$
.41. RNT was found to predict depressive symptoms over time (from eight weeks,
study 6; to over a year, study 3; $n = 6$). One study reported reciprocal effects, with
depressive symptoms and RNT predicting one another over four weeks (study 8).
One study found that depressive symptoms predicted RNT but this effect was not
reciprocated (study 3). Study 12 found a concurrent association, where the
relationship with depressive symptoms was specific to brooding, but not reflection.
These findings further support the relationship between RNT and depressive
symptoms in adolescence.

Examining EC and depressive symptoms

Significant associations between EC and depressive symptoms ($n = 5$; studies
1, 2, 6, 12 & 13) ranged from $r = -.22$ (study 6) to $r = -.53$ (study 2), with a mean of r
$= -.41$. A further four studies (3, 7, 9 & 10) reported non-significant associations

ranging from $r = -.05$ (study 6) to $r = -.14$ (study 2). All reported correlations were in the expected direction with lower EC associated with higher depressive symptoms.

No significant relationships were found over time between 3 months and a year later in studies 2, 3, 6 and 13. However, lower EC was associated with higher depressive symptoms concurrently (studies 10 & 11), and predicted first onset of depression, rather than symptoms, three years later (study 9).

The studies that did and did not find significant relationships both used a range of self-report and behavioural measures, with a range of samples and study designs. However, a number of high quality studies reported findings indicating that EC does not predict depressive symptoms over time. In addition, due to the high quality rating of studies 10 & 11, it appears that EC and depressive symptoms are associated concurrently. It may be possible that an individual's self-regulatory capabilities impact on current mood, but does not predict future mood. It may also mean that measures of EC and depressive symptoms are overlapping in what they are measuring.

Study 12 examined the individual subcomponents of EC (using the ECS and ACS), finding that activation and inhibitory control were more strongly associated with depressive symptoms, whereas AC predicted anxiety symptoms. Moriya and Tanno (2008) also found this link with young adults, and Lonigan and Vasey (2009) found this in younger children, where an attentional bias for threat cues is linked to low levels of AC, whereas activational control helps the individuals to overcome low levels of approach motivation associated with low PA. This is further supported, as two of the studies that did not find significant associations between EC and

depressive symptoms measured AC only, whereas none of the studies that found significant associations did. It is possible that AC is not associated with depressive symptoms.

EC and RNT

Significant negative associations between EC and RNT ($n = 7$; Studies 1, 2, 4, 5, 10, 12 & 13) ranged from $r = -.11$ (study 4) to $r = -.29$ (study 12), with a mean of $r = -.20$. A further four studies reported no significant association between EC and RNT (studies 3, 6, 7, 9). No significant effects were found concurrently (studies 1 & 12), or over a year (study 3). However, lower EC predicted higher levels of RNT over three months (study 2) and across childhood into adolescence (study 4).

Two of the three studies that did not find significant effects measured only brooding, whereas the studies that did find significant relationships used combined measures of RNT. It appears likely that whilst brooding and EC may be associated (as evidenced in the correlations), EC does not predict brooding. There is evidence from a high quality study that lower EC predicts RNT over time, and even spanning over childhood.

Differences between measures

There were differences in the size of effects of EC found across the measures. Whilst the studies using the ATQ ($n = 1$), ECS ($n = 3$) and ACS ($n = 1$) all found medium to large effects with RNT and depressive symptoms, the EATQ-R studies ($n = 3$) reported small effect sizes. This is shown to be consistent across the studies, despite quality ratings or sample sizes. Furthermore, correlations between

EC and measures of RNT and depressive symptoms were consistently more likely to be significant in measures other than EATQ-R. The EATQ-R measures all subcomponents and has been found to have good psychometric properties (Muris & Meesters, 2008). One limitation of the EATQ-R is that many items were about completing homework. It is possible that the large age ranges across these studies (8-19 years old), may highlight differences in attitudes towards homework completion, limiting the ecological validity of the measure. It may also be that the EATQ-R does not measures EC as well as other measures. Or it may be that items on other measures of EC overlap with items on RNT and depressive symptoms measures, resulting in stronger associations. Caution must be taken as this is an observed pattern in a very small number of studies, and also reflects the corresponding measure, however it serves to highlight that different measures appear to yield different results.

The behavioural studies that reported adequate data ($n = 3$), all reported small effect sizes for RNT and depressive symptoms. Furthermore, correlations between EC and measures of RNT and depressive symptoms were consistently more likely to be not significant. Again, caution is taken as this observation is based on very small numbers of studies, and also reflects the corresponding measure, however it serves to highlight that the effect sizes of self-reported EC appear to be higher on average.

Furthermore, only study 3 found no significant associations or predictions for RNT and depressive symptoms. This study measured AC with behavioural tasks from the TEA-Ch (Manly et al., 1999). None of the measures were inter-correlated

suggesting that they did not all measure a similar construct. These findings suggests

this is not a suitable measure of AC component of EC.

EC as a moderator

Few studies investigated the role of EC as a moderator between RNT and

depressive symptoms, with the majority of studies focusing on other aspects of

temperament as moderators, such as NA or PA. Several studies, of varying quality,

that did investigate this model found conflicting results. Study 13 found EC to be a

significant moderator between RNT predicting depressive symptoms over a year,

such that RNT was a stronger predictor of subsequent depression at lower levels of

EC. This study also found that RNT mediated the association between high NA and

depressive symptoms, and that this effect was moderated by EC, finding a stronger

relationship at lower levels of EC than at higher levels. This is a high quality study,

supporting evidence that EC moderates the association between RNT and

depressive symptoms.

Study 8 examined indirect effects of EC, finding that the focusing

subcomponent of AC (but not shifting), positively affected the relationships between

RNT and depressive symptoms (and vice versa). These findings may suggest that

low ability to concentrate and inhibit distractions may be important risk factors rather

than low attentional flexibility (shifting). This indicates that individuals low in focusing

have difficulties resisting distraction, leading these individuals as more susceptible to

experiencing RNT and/or other intrusive negative stimuli which could prolong RNT

(Mills et al., 2016).

However, study 7 found that EC was not a significant moderator for the relationship between brooding and depressive symptoms. Earlier results also saw that whilst EC and brooding are correlated, EC does not predict brooding. It appears that they are related, but brooding is not the key aspect of RNT that is important in the relationship with EC. Brooding involves 'a passive comparison of one's current situation with some unachieved standard' (Treynor et al., 2003, p 256), which may not capture the 'effortful' aspect of EC. However, study 12 found that EC was also correlated with brooding, but not with reflection, which is 'purposeful turning inward to engage in cognitive problem solving to alleviate one's depressive symptoms' (Treynor et al., 2003, p 256). This may be due to reflection being a skill that only individuals high in EC would be able to engage in, and more difficult for those low in EC due to the level of attention and inhibition involved. Study 11 found that although lower AC predicted a shorter time until the first onset of depressive disorder, AC did not moderate the relationship between RNT and time until first onset of depressive disorder. However, onset of depression was measured, rather than depressive symptoms.

Discussion

Measures of EC

A weakness of the literature was the wide range of measures used to assess EC. For example, a number of constructs are used to describe EC, such as self-regulation and self-control, and overlaps exist with other terminology, such as executive functions. This leads to researchers focusing on different components of EC in their measures. Furthermore, due to measures being tested in different

populations, age ranges and using different descriptions of EC, the factor structure of

EC is inconsistent (Sulik et al., 2009; Ho, 2004), with the majority of the exploration

undertaken in early childhood.

The studies in this review used four different self-report measures, and four

different behavioural tasks. Six of the studies measured the AC component of EC

only, five of these used behavioural measurements (studies 3, 4, 5, 10, 11), with one

using self-report (study 8). Self-report measures of EC are trait measures of

temperamental cognitive control that explore behaviour in complex real-world

situations, improving ecological validity of the reports. However, they are not without

their limitations, as they introduce self-report biases (e.g. negativity bias), ignore

contextual factors in the scenarios, and the behaviours being asked about often

involve multiple cognitive processes (Snyder & Hankin, 2016). Behavioural tasks,

which are commonly labelled as state measure executive function tasks (Connelly et

al., 2014), often measure task performance, which reduces self-reported biases, but

are limited in their generalisability as they may not reflect a range of everyday

situations. One of the challenges of the literature is the interchangeable terminology

and measures used. A strength of the self-report measures used in the literature is

that they all report good reliability and good internal consistency.

In this review, only one paper (which includes studies 9 and 10) explored both

self-report and behavioural measures of EC. Although the measures were not

collected at the same time, and no data were compared across studies, a subsample

of study 9 also took part in study 10. In both studies, a similar pathway linked lower

EC (self-report and behavioural) to higher levels of stress, RNT and depressive

symptoms (over time in Study 9). The similar findings found for risk pathways using

different ways of conceptualising and measuring EC provide support for including

both measures in future research. Despite the differing terminology and measures,

there are similarities in how they explore EC.

A small number of studies examined the individual subcomponents of EC

rather than the more commonly used combined measure of EC. Whilst investigating

subcomponents only may lead to difficulties in synthesising findings across studies,

additionally including subcomponents analysis is helpful to begin to unpick the role of

EC.

Measures of RNT

RNT was measured using self-report questionnaires. A strength of the

literature was that all of the measures of RNT used have reported good reliability and

good internal consistency. A range of terminology was used in the literature,

including rumination, brooding, and RNT. Whilst they are similar constructs, the

terms were not always clearly defined or consistently applied across the studies

reviewed resulting in variation in how RNT was conceptualised and measured.

Strengths

A strength of the literature was the range of investigations considered to

integrate affective and cognitive vulnerability models of depression using a good

theoretical rationale drawn across research areas, such as developmental and

cognitive neuropsychology. The designs of the studies were varied, but often

prospectively examined relationships among trait and state measures of temperament and cognitive vulnerabilities and their impact on depressive symptoms.

A strength of the studies was that the majority used longitudinal designs to investigate the relationship between temperament, cognition and depressive symptoms. This was particularly salient in this area, as the aims of the studies were largely to identify vulnerabilities and risk factors for depressive symptoms, from a developmental perspective. Longitudinal designs are often preferred to cross-sectional designs in developmental research because they allow age-related developmental changes to be mapped more reliably (Schmidt & Teti, 2005). Furthermore, cautious interpretations can also be made about the causal relationships between these variables (Schmidt & Teti, 2005). The length of the follow-up varied across studies from 4.5 weeks (study 11), to months, to over four years (study 8), and across childhood and adolescence (approximately 10 years; study 4). Unfortunately, no rationale was given for the time periods chosen so it is difficult to comment on the appropriateness of the chosen time frame. Despite many of the studies making predictions across time, caution is required as the duration between time points may not be sufficient to determine developmental effects of depressive symptoms.

Another strength of the literature was that a number of studies created thorough models to test relationships between variables. A number of studies included exploration into reciprocal relationships between RNT and depressive symptoms. This was found in a short follow up in Study 8 suggesting that RNT and depressive symptoms may form a maladaptive cycle with each other over time.

Previous research in adolescence (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007)

found that after a depressive episode, the tendency to ruminate is higher, suggesting

that rumination is not only a vulnerability factor for depressive symptoms but it also

increases as a consequence of depressed mood. Looking at bidirectional effects

may lead to a more thorough understanding. Study 10 found a bidirectional pathway

between depressive symptoms and EC, with dependent stress mediating this

pathway, increasing depressive symptoms and decreasing EC. According to the scar

model (Clark, Watson, & Mineka, 1994) the experience of a depressive episode

changes personality. This could be especially pertinent in our age range, whilst

aspects of cognition are still developing. It may also require a measure of previous

depressive episodes to be controlled for in further studies.

Another strength of the literature was the majority of the studies had moderate

to large sample sizes ($M = 292.85$), with a range from 92 (study 5) to 701 (study 2).

This resulted in the majority of the studies being adequately powered, strengthening

the conclusions that can be made from the results.

Weaknesses

The description of the study sample was generally poor across studies. A high

proportion of studies did not report any inclusion or exclusion criteria, which is

problematic when comparing studies as the age and composition of the sample was

not always clear. A particular challenge in this review was the large age ranges of

the samples. Whilst the inclusion criteria focused on sample means between 10-20

year olds, in order to capture adolescence (Sawyer et al., 2018), a number of the

studies age ranges also included ages outside of this range. The aim was to focus

on results within the inclusion age range, however few studies reported age effects.

This made examining the developmental trajectory very limiting in the conclusions

that could be drawn. However, some findings are pertinent to discuss. Study 10

reported the effect of age, finding that the association between lower EC and higher

levels of depressive symptoms strengthened with age (in a sample of 11 to 20 year

olds). Furthermore, the relationship between low EC and stress increased with age.

It is difficult to know whether these effects are the result of poor EC beginning to

translate into behaviours, or whether environmental factors such as a reduction in

parenting input and school pressure changes over time. One study measured EC in

early childhood, predicting risk pathways into adolescence (study 4). Whilst the

measurement was outside our age range, this fit our inclusion criteria. Furthermore,

despite continuing development, EC has found to be a stable temperament across

childhood and adolescence (Eisenberg et al., 2005; Goldsmith, Buss, & Lemery,

1997; Kochanska & Knaack, 2003). Interestingly, low levels of EC in childhood

predicted high levels of RNT in adolescence, identifying EC as an early risk factor for

later RNT.

The wide heterogeneity of the studies by measure and sample limited the

ability to conduct a meta-analysis. Further research may wish to consider this in their

review, if possible.

Conclusions

This review supported further evidence for the well-established

relationship between RNT and depressive symptoms, concurrently, and

prospectively. Some evidence was also given for reciprocal relationships between

RNT and depressive symptoms, suggesting that a maladaptive cycle may form between RNT and psychopathology.

The evidence for a relationship between lower EC and higher levels of depressive symptoms was mixed. Whilst some studies found EC and depressive symptoms to be significantly associated, others did not. Conclusions were made from high quality studies, finding that EC and depressive symptoms are concurrently associated, however EC does not predict depressive symptoms over time. There is some evidence to suggest that activation and inhibitory control were more strongly associated with depressive symptoms (Study 12).

Associations between EC and RNT also found mixed results, with the majority of studies finding a significant association between low EC and higher levels of RNT. There is evidence from a high quality study that lower EC predicts RNT over time, and even spanning over childhood. It also appears likely that whilst brooding and EC may be associated, EC does not predict brooding.

Finally, very few studies investigated the moderating role of EC for the relationship between RNT and depressive symptoms and those that did found mixed results. Evidence from a high quality study (13), concludes that EC moderates RNT and depressive symptoms.

Strengths and weaknesses of this review

Strengths of this review were that it focused on a specific developmental period where young people are at a heightened risk for the development of depressive symptoms (Merikangas et al., 2010). The age range was purposefully

large in order to capture potential patterns or peaks in risk for depressive symptoms

over adolescence and into young adulthood. An objective quality assessment tool

was used that is specific to studies conducting tests of association.

A limitation of the review was that although the search terms aimed to

comprehensively capture the variety of definitions of EC, RNT and depressive

symptoms, this was particularly challenging for the wide range of terms used across

different research fields. It should also be acknowledged that there are many other

temperamental risk factors which are thought to be important risk factors for the

development of depressive symptoms during this time, which were beyond the scope

of this review to adequately assess. This review, therefore, does not provide a full

account of the temperamental factors important for the development of depressive

symptoms in young people.

Future directions

A small number of studies included a measure of dependent stress (stressful

life events) as a control variable, as heightened stress may impact on the

development of RNT or depressive symptoms (see Aldao, McLaughlin,

Hatzenbuehler, & Sheridan, 2014). Study 10 examined whether individual

differences in vulnerabilities related to depressive symptoms increased the risk for

self-generated stressful life events (the stress generation model; Conway, Hammen,

& Brennan, 2012), finding support for this theory. They found that poor EC can lead

to stress generation, which in turn can lead to an increase in RNT as individuals

dwell on these stressful life events (Conway et al., 2012). RNT may develop simply

due to having more negative events to dwell on, or as a coping mechanism by

preparing for the worst (Borkovec, 1994). Furthermore, an individual with optimal

levels of EC may have a number of processes available to them to cope with stress

(Eisenberg, Smith, & Spinrad, 2011). In order to adequately explore RNT and EC,

they should be measured under a stress induction, or stress should be accounted for

in all analysis. Future studies should recognise the importance that stress may have

on the individual's responding during assessment, but also on risk factors for coping

with every day stress which may impact on the development of depressive

symptoms.

Future studies should also select a meaningful and specific age group in order

to assess effects of age, and the development of depressive symptoms (Hankin et

al., 1998). Measures should incorporate all subcomponents of EC and RNT, in order

to fully understand the cognitive components that may better explain the risk

pathways (Ho, 2004).

References

Abela, J. R. Z., & Hankin, B. L. (2011). Rumination as a vulnerability factor to

depression during the transition from early to middle adolescence: A

multiwave longitudinal study. *Journal of Abnormal Psychology, 120,* 259-271.

Abela, J. R. Z., Parkinson, C., Stolow, D., & Starrs, C. (2009). A test of the

integration of the hopelessness and response styles theories of depression in

middle adolescence. *Journal of Clinical Child and Adolescent Psychology, 38,*

354–364.

Abela, J. R. Z , Rochon, A., Vanderbilt, E. (2000). The Children's Response Styles

Questionnaire. Unpublished questionnaire.

Ahmed, S. P., Bittencourt-Hewitt, A., Sebastian, C. L. (2015). Neurocognitive bases

of emotion regulation development in adolescence. *Developmental Cognitive

Neuroscience, 15,* 11-25.

Aldao, A., McLaughlin, K. A., Hatzenbuehler, M. L., & Sheridan, M. A. (2014). The

relationship between ruination and affective, cognitive, and physiological

responses to stress in adolescents. *Journal of Experimental Psychopathology,

5,* 272-288.

Arger, C. Sánchez, O., Simonson, J., & Mezulis, A. (2012). Pathways to depressive

symptoms in young adults: Examining affective, self-regulatory, and cognitive

vulnerability factors. *Psychological Reports: Mental & Physical Health, 111,*

335-348.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression

Inventory–II.* San Antonio, TX: Psychological Corporation.

Bijttebier, P., Bastin, M., Nelis, S., Weyn, S., Luyckx, K., Vasey, M. W., Raes, F.
(2017). Temperament, repetitive negative thinking, and depressive symptoms
in early adolescence: A prospective study. *Journal of Psychopathology and
Behavioural Assessment, 39,* 1-13.

Bijttebier, P., Raes, F., Vasey, M.W., Bastin, M., & Ehring, T. A. (2015). Assessment
of repetitive negative thinking in children: The perseverative thinking
questionnaire – Child version. *Journal of Psychopathology and Behavioral
Assessment, 37,* 164–170.

Blair, C., Zelazo, P. D., & Greenberg, M. T. (2005). The measurement of executive
function in early childhood. *Developmental Neuropsychology, 28,* 561-571.

Borkovec, T. D. (1994). The nature, functions, and origins of worry. In: Davey G. C.
L, & Tallis, F., (Eds.) *Worrying: Perspectives on theory, assessment and
treatment.* (pp. 5-33). Wiley; Oxford, England.

Broderick, P. C., & Korteland, C. (2004). A prospective study of rumination and
depression in early adolescence. *Clinical Child Psychology and Psychiatry*, *9*,
383-394.

Capaldi, D. M. & Rothbart, M. K. (1992). Development and Validation of an Early
Adolescent Temperament Measure. *Journal of Early Adolescence, 12,*153-
173

Clark, L. A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the
mood and anxiety disorders. *Journal of Abnormal Psychology, 103,* 103-116.

Costello, E. J., & Angold, A. (1988). Scales to assess child and adolescent
depression: Checklists, screens, and nets. *Journal of the American Academy
of Child and Adolescent Psychiatry, 27,* 726-737.

Connolly, S. L., Wagner, C. A., Shapero, B. G., Pendergast, L. L., Abramson, L. Y.,
& Alloy, L. B. (2014). Rumination prospectively predicts executive functioning
impairments in adolescents. *Journal of Behavior Therapy and Experimental
Psychiatry, 45,* 46-56.

Conway, C. C., Hammen, C., & Brennan, P. A. (2012). Expanding stress generation
theory: Test of a transdiagnostic model. *Journal of Abnormal Psychology,
121,* 754–766.

CRC Guidance. (2009). *Systematic reviews: CRD's guidance for undertaking
systematic reviews in health care.* Retrieved from:
http://www.york.ac.uk/inst/crd/pdf/Systematic_Reviews.pdf

Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and the
irregulation by attentional control. *Journal of Abnormal Psychology, 111,* 225–
236.

Evans, D.E., & Rothbart, M.K. (2007). Development of a model for adult
temperament. *Journal of Research in Personality, 41,* 868-888.

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic
process. *International Journal of Cognitive Therapy, 1,* 192-205.

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schönfeld, S., & Ehlers, A. (2011).
The Perseverative Thinking Questionnaire (PTQ): Validation of a content-
independent measure of repetitive negative thinking. *Journal of Behavioural
Therapy and Experimental Psychiatry, 42,* 225-232.

Eisenberg, N., Smith, CL., Spinrad, TL. (2011). Effortful control: Relations with
emotion regulation, adjustment, and socialization in childhood. In: Vohs, K. D.,

& Baumeister, R. F., (Eds.) *Handbook of self-regulation: Research, theory and applications. 2nd.* (pp. 263-283). New York, NY: Guilford Press.

Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R. A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development, 76,* 1055–1071

Essex, M. J., Boyce, W. T., Goldstein, L. H., Armstrong, J. M., Kraemer, H. C., Kupfer, D. J. & The MacArthur Assessment Battery Working Group. (2002). The confluence of mental, physical, social, and academic difficulties in middle childhood. II: Developing the MacArthur Health and Behavior Questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry, 41,* 588-603.

Gagne, J. R., Van Hulle, C. A., Aksan, N., Essex, M. J., & Goldsmith, H. H. (2011). Deriving childhood temperament measures from emotion-eliciting behavioural episodes: Scale construction and initial validation. *Psychological Assessment, 23,* 339-353.

Goldsmith, H. H., Buss, K. A., & Lemery, K. S. (1997). Toddler and childhood temperament: Expanded content, stronger genetic evidence, new evidence for the importance of environment. *Developmental Psychology, 33,* 891–905.

Hampel, P., & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence*, *34,* 73–83.

Hankin, B. L., & Abramson, L. Y. (2001). Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory. *Psychological Bulletin, 127,* 773-796.

Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., Angell, K. E. (1998). Development of depression from preadolescence to young adulthood: emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology, 107,* 128-140.

Harvey, A. G., Watkins, E., Mansell, W., & Shafran, R. (2004). *Cognitive behavioural processes across psychological disorders.* Oxford, United Kingdom: Oxford University Press.

Hilt, L. M., Armstrong, J. M., & Essex, M. J. (2012). Early family context and development of adolescent ruminative style: Moderation by temperament. *Cognition and Emotion, 26*, 916-926.

Hilt, L. M., Leitzke, B. T., & Pollak, S. D. (2017). Can't take my eyes off of you: Eye tracking reveals how ruminating young adolescents get stuck. *Journal of Clinical Child & Adolescent Psychology, 46,* 858-867.

Ho, A. C. (2004). *Effortful Control in early adolescence: Measure development and validation* (Doctoral dissertation). Retrieved from: http://rave.ohiolink.edu/etdc/view?acc_num=osu1084736869

Hoorelbeke, K., Koster, E. H. W., Vanderhasselt, M., Callewaert, S., & Demeyer, I. (2015). The influence of cognitive control training on stress reactivity and rumination in response to a lab stressor and naturalistic stress. *Behaviour Research and Therapy, 69, 1-10.*

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: antecedents, correlates, and consequences. *Journal of Personality, 71,* 1087-10112.

Kovacs, M. (2003). *Children's depression inventory: Technical manual.* New York:

    Multi-health Systems.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P.,

    & Moher, D. (2009). The PRISMA statement for reporting systematic reviews

    and meta-analyses of studies that evaluate health care interventions:

    Explanation and elaboration. *Annals of International Medicine*, *151,* 65-94.

Lonigan, C. J., & Phillips, B. M. (2001). Temperamental influences on the

    development of anxiety disorders. In M. W. Vasey & M. R. Dadds (Eds.), *The*

    Developmental Psychopathology of Anxiety (pp. 60-91). New York: Oxford

    University Press.

Lonigan, C. J., & Vasey, M. W. (2009). Negative affectivity, effortful control, and

    attention to threat-relevant stimuli. *Journal of Abnormal Child Psychology, 37,*

    387-399.

Manly, T., Robertson, I. H., Anderson, V., & Nimmo-Smith, I. (1999). *The Test of*

    Everyday Attention for Children (TEA-Ch). Bury St. Edmunds, England:

    Thames Valley Test Company.

Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S, Cui, L. …

    Swendson, J. (2010). Lifetime prevalence of mental disorders in US

    adolescents: Results from the National Comorbidity Study-Adolescent

    Supplement (NCS-A). *Journal of American Academy of Child and Adolescent*

    Psychiatry, 49, 980-989.

Mezulis, A. H., Abramson, L. Y., & Hyde, J. S. (2002). Domain specificity of gender

    differences in rumination. *Journal of Cognitive Psychotherapy, 16,* 421-434.

Mezulis, A. H., & Rudolph, M. E. (2012). Pathways linking temperament and

depressive symptoms: A short-term prospective diary study among

adolescents. *Cognition and Emotion, 26,* 950-960

Mezulis, A. H., Simonson, J., McCauley, E., & Vander Stoep, A. (2011) The

association between temperament and depressive symptoms in adolescence:

Brooding and reflection as potential mediators. *Cognition and Emotion, 25,*

1460-1470.

Michl, L. C., McLaughlin, K. A., Shepherd, K., & Nolen-Hoeksema, S. (2013).

Rumination as a mechanism linking stressful life events to symptoms of

depression and anxiety: Longitudinal evidence in early adolescents and

adults. *Journal of Abnormal Psychology, 122,* 339-352.

Mills, A. C., Grant, D. M., Judah, M. R., White, E. J., Taylor, D. L., & Frosio, K. E.

(2016). Trait attentional control influences the relationship between repetitive

negative thinking and psychopathology symptoms. *Psychiatry Research, 238,*

277-283.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & the PRISMA Group. (2009).

Preferred reporting items for systematic reviews and meta-analyses: the PRISMA

statement. *PLoS Medicine*, *6,* e1000097.

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

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

and meta-analysis protocols (PRISMA-P).

Moriya, J., & Tanno, Y. (2008). Relationships between negative emotionality and

attentional control in Effortful Control. *Personality and Individual Differences,*

44, 1348–1355.

Muris, P., van Brakel, A. M. L., Arntz, A., & Schouten, E. (2011). Behavioral inhibition

as a risk factor for the development of childhood anxiety disorders: A

longitudinal study. *Journal of Child and Family Studies, 20,* 157-170.

Muris, P., & Meesters, C. (2009). Reactive and regulative temperament in youths:

Psychometric evaluation of the Early Adolescent Temperament

Questionnaire-Revised. *Journal of Psychopathology and Behavioral*

Assessment, 31, 7-19.

National Institute for Health and Care Excellence (2012). *Methods for the*

development of NICE public health guidance (third edition): Quality appraisal

checklist – quantitative studies reporting correlations and associations.

Retrieved from: https://www.nice.org.uk/process/pmg4/chapter/appendix-g-

quality-appraisal-checklist-quantitative-studies-reporting-correlations-and

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the

duration of depressive episodes. *Journal of Abnormal Psychology, 100,* 569–

582.

Nolen-Hoeksema, S. (2004). Gender differences in risk factors and consequences

for alcohol use and problems. *Clinical Psychology Review, 24,* 981-1010.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and

posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta

earthquake. *Journal of Personality and Social Psychology, 61,* 115–121.

Nolen-Hoeksema, S., & Watkins, E. R. (2011). A heuristic for developing

transdiagnostic models of psychopathology: Explaining mulitfinality and

divergent trajectories. *Perspectives on Psychological Science, 6,* 589- 609.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3,* 400- 424.

Nolen-Hoeksema, S., Stice, E., Wade, E., & Bohon, C. (2007). Reciprocal relations between rumination and bulimic, substance abuse, and depressive symptoms in female adolescents. *Journal of Abnormal Psychology, 116,* 198-207.

Oldehinkel, A. J., Hartman, C. A., Ferdinand, R. F., Verhulst, F. C., & Ormel, J. (2007). Effortful control as modifier of the association between negative emotionality and adolescents' mental health problems. *Development and Psychopathology, 19,* 523–539.

Planalp, E. M., Hulle, C. V., Gagne, J. R., & Goldsmith, H. H. (2017). The infant version of the Laboratory Temperament Assessment Battery (Lab-TAB): Measurement properties and implications for concepts of temperament. *Frontiers in Psychology, 8,* 846-863.

Posner, M. J., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology, 12,* 427–441.

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

Rothbart, M. K. (1989). Behavioral approach and inhibition. In S. Reznick (Ed.), *Perspectives on behavioral inhibition* (pp. 139–157). Chicago: University of Chicago Press.

Rothbart, M. K. (1996). Social development. In M. J. Hanson (Ed.), *Atypical infant development* (2nd ed., pp. 273-309). Austin, TX: Pro-Ed.

Rothbart, M. K., & Ahadi, S. (1994). Temperament and the development of personality. *Journal of Abnormal Psychology, 103,* 55–66.

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of

temperament at three to seven years: the Children's Behavior Questionnaire.

Child Development, 72, 1394-1408.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon (Series Ed.), N.

Eisenberg (Volume Ed.), *Handbook of child psychology: Vol. 3, Social,*

emotional, and personality development (5th ed., pp. 105–176). New York:

Wiley.

Rothbart, M. K., & Bates, J. E. (2006). Temperament. In W. Damon, R. Lerner, & N.

Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional,*

and personality development (6th ed., pp. 99– 166). New York: Wiley.

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The

age of adolescence. *The Lancet Child and Adolescent Health, 2,* 223–228.

Schmidt, K.R.T., & Teti, D.M. (2005). Issues in the use of longitudinal and cross-

sectional designs. In D.M. Teti (Ed.). *Handbook of research methods in*

developmental science (pp. 3-20). Oxford: Blackwell Publishing Ltd.

Snyder, H. R., & Hankin, B. L. (2016). Spiralling out of control: Stress generation and

subsequent rumination mediate the link between poorer cognitive control and

internalizing psychopathology. *Clinical Psychological Science, 4,* 1047-1064.

Stange, J. P., Connolly, S. L., Burke, T. A., Hamilton, J. L., Hamlat, E. J., Abramson,

L. Y., & Alloy, L. B. (2016). Inflexible cognition predicts first onset of major

depressive episodes in adolescence. *Depression and Anxiety, 19,* 1002-1015.

Sulik, M. J., Huerta, S., Zerr, A. A., Eisenberg, N., Spinrad, T. L., Valiente, C. …

Taylor, H. B. (2009). The factor structure of effortful control and measurement

invariance across ethnicity and sex in a high-risk sample. *Journal of*

Psychopathology and Behavioral Assessment, 32, 8-22.

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered:

A psychometric analysis. *Cognitive Therapy and Research, 27,* 247–259.

Twenge, J. M., & Nolen-Hoeksema, S. (2002). Age, gender, race, socioeconomic

status, and birth cohort difference on the children's depression inventory: A

meta-analysis.*Journal of Abnormal Psychology, 111,* 578–588.

Verstraeten, K., Bijttebier, P., Vasey, M. W., & Raes, F. (2011). Specificity of worry

and rumination in the development of anxiety and depressive symptoms in

children. *British Journal of Clinical Psychology, 50,* 364-378.

Verstraeten, K., Vasey, M. W., Raes, F., & Bijttebier, P. J. (2009). Temperament

and risk for depressive symptoms in adolescence: Mediation by rumination

and moderation by Effortful Control. *Abnormal Child Psychology, 37,* 349–

361.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought.

Psychological Bulletin, 134, 163-206.

World Health Organization. *Health problems of adolescents. Technical report series*

308.

Geneva: World Health Organization, 1965. Retrieved from:

http://apps.who.int/iris/handle/10665/38425

World Health Organization. *Health needs of adolescents.* Geneva: World Health

Organization, 1977. Retrieved from:

http://apps.who.int/iris/handle/10665/41252

Young, C. C. (2015). Stressful life events, worry, and rumination predict depressive

and anxiety symptoms in young adolescents. *Journal of Child and Adolescent*

Psychiatric Nursing,

Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the

research on children's Effortful Control and Executive Function: A Call for an

Integrated Model of Self-Regulation. *Child Development Perspectives, 6,*

112–121.

Appendices

Appendix A - Full search strategy for one database

Appendix B - Data extraction form

Appendix C - Quality appraisal checklist

Appendix D - Table of excluded papers

Appendix E - Submission requirements for target journal

Appendix A - Full search strategy for one database

Subject of focus		Combinations
Effortful Control	1.	*Self-Regulation*
	2.	"effortful control" or EC or "attentional control or "inhibitory control" or "activational control" or "self-regulation"
	3.	1 OR 2
	4.	*Rumination (cognitive process)*
RNT	5.	"Repetitive negative thought" or "repetitive negative thinking" or RNT or ruminat* or worry or anxi*
	6.	3 OR 4
Depression	7.	*Major Depression*
	8.	"Depressive adj5 symptom*" or "depression adj5 symptom*" or internalis* or internaliz*
	9.	5 OR 6
Adolescence	10.	Adolescen* or teen* or youth* or young*
		3 and 6 and 9 and 10

Italicised terms indicate key words mapped to subject headings.

Appendix B - Data extraction form

Systematic review of the associations between effortful control and repetitive

negative thinking on depression in young people

Title

Author(s)

Source

Date: Vol.: Part: Pages:

Objective

Setting

Population

Study population – country, setting, location (urban, rural), population

demographics

Sampling method

Power Calculation?

Entry and exclusion criteria

Representativeness of sample

Explanatory variables

What are the explanatory variables? How defined?

Selection of explanatory variables based on theoretical basis?

Confounding variables – what? How controlled?

Timing of measures

Instruments used

EC

RNT

DS

Were instruments validated?

Length of follow up

Outcome measures

Measures reliable?

Outcome measures complete?

Analysis

Statistical analysis

Were confidence intervals, p values or effect estimates given?

Conclusions

Author's conclusions

Reviewer's comments

Appendix C – Quality appraisal checklist

National Institute for Health and Care Excellence (2012) quality appraisal checklist

items for studies reporting correlations and associations

Section 1: Population

1.1 Is the source population or source area well described?

☐ Was the country (e.g. developed or non-developed, type of health care system),

setting (primary schools, community centres etc), location (urban, rural), population

demographics etc adequately described?

1.2 Is the eligible population or area representative of the course population or

area?

☐ Was the recruitment of individuals, clusters or areas well defined (e.g.

advertisement, birth register)?

☐ Was the eligible population representative of the source? Were important groups

underrepresented?

1.3 Do the selected participants or areas represent the eligible population or

area?

☐ Was the method of selection of participants from the eligible population well

described?

☐ What % of selected individuals or clusters agreed to participate? Were there any

sources of bias?

☐ Were the inclusion or exclusion criteria explicit or appropriate?

Section 2: Method of selection of exposure group

2.1 Was the selection of explanatory variables based on a sound theoretical basis?

☐ How sound was the theoretical basis for selecting the explanatory variables?

2.2 How well were likely confounding factors identified and controlled?

☐ Were there likely to be other confounding factors not considered or appropriately adjusted for?

☐ Was this sufficient to cause important bias?

2.3 Is the setting applicable to the UK?

☐ Did the setting differ significantly from the UK?

Section 3: Outcomes

3.1 Were the outcome measures and procedures reliable?

☐ Were outcome measures subjective or objective (e.g. biochemically validated nicotine levels ++ vs self-reported smoking -)?

☐ How reliable were outcome measures (e.g. inter- or intra-rater reliability scores)?

☐ Was there are any indication that measures had been validated (e.g. validated

REVIEW: MATHEMATICAL PERFORMANCE IN CHILDREN 74

against a gold standard measure or assessed for content **validity**)?

3.2 Were the outcome measures complete?

☐ Were all or most of the study participants who met the defined study outcome

definitions likely to have been identified?

3.3 Were all the important outcomes assessed?

☐ Were all the important benefits and harms assessed?

☐ Was it possible to determine the overall balance of benefits and harms of the

intervention versus comparison? ***Non-applicable***

3.4 Was there a similar follow-up time in exposure and comparison groups?

☐ If groups are followed up for different lengths of time, then more events are likely

to occur in the group followed-up for longer distorting the comparison.

☐ Analyses can be adjusted to allow for differences in length of follow-up (e.g. using

person-years).

3.5 Was follow-up time meaningful?

☐ Was follow-up long enough to assess long-term benefits and harms?

☐ Was it too long, e.g. participants lost to follow-up?

Section 4: Analyses

4.1 Was the study sufficiently powered to detect an intervention effect (if one

exists)?

☐ A power of 0.8 (i.e. it is likely to see an effect of a given size if one exists, 80% of the time) is the conventionally accepted standard.

☐ Is a power calculation presented? If not, what is the expected effect size? Is the sample size adequate?

4.2 Were multiple explanatory variables considered in the analysis?

☐ Were there sufficient explanatory variables considered in the analysis?

4.3 Were the analytical methods appropriate?

☐ Were important differences in follow-up time and likely confounders adjusted for?

4.4 Was the precision of association given or calculable? Is association meaningful?

☐ Were confidence intervals or p values for effect estimates given or possible to calculate?

☐ Were Cis wide or were they sufficiently precise to aid decision-making? If precision is lacking, is this because the study is under-powered?

Appendix D – Table of excluded papers

Author	Population	Outcome 1)Rumination/ RNT 2)Depression/ anxious symptoms 3)Effortful Control	Reason for Exclusion
1. Burke et al., (2018)	590 adolescents (M_{age} = 19.14; SD = 1.41) taking part in a longitudinal study investigating vulnerability for bipolar spectrum disorder onset.	1) RRS 2) BDI 3)No measure	**No measure of EC. Measured "cognitive affective regulation strategies" (ruminative reflection and brooding), rather than self regulation.**
2. Chen et al., (2013)	1387 pairs of adolescent twins (M_{age} = 13.52; SD = 2.67) taking part in a longitudinal study investigating the environment and gene interplay in the etiology of emotional and behavioural problems in China.	1) Not reported 2)Not reported 3)Not reported	**Study protocol only, no results available**
3. Crockett et al., (2013)	1025 adolescents (M_{age} = 11.03; SD = .17) taking part in a longitudinal study investigating early child care and youth development in the USA.	1) No measure 2) CDI 3) No measure	**No measure of EC. No measure of RNT.**
4. Dinovo & Vasey (2011)	477 undergraduate students (M_{age} = 19.2; SD = 2.1). USA population.	1)No measure 2) MASQ 3) ECS-P/LD	**No measure of RNT**
5. Gulley, Hankin & Young (2016)	576 parents of children and adolescents (M_{age} = 12; SD = 2.4).	1)No measure 2)CDI 3)EATQ-R -P	**No measure of RNT**
6. Hankin et al., (2016)	Theoretical review paper.	Not applicable	**Not an empirical study.**
7. Hankin et al., (2017)	571 children and adolescents (M_{age} = 13.6; SD = 2.37) including parent reports.	1)No measure 2) CDI/ MASC/CBCL 3)EATQ-R	**No measure of RNT**
8. Helzer et al., (2009)	121 middle school children (M_{age} = 11.36; SD = NR). USA population.	1) No measure 2)EATQ-R 3)EATQ-R, AC subscale	**No measure of RNT**
9.Hopkins et al., (2013)	796 young children (M_{age} = 4.44).	1)No measure 2) DISC-YC 3) CBQ	**Population too young. No measure of RNT.**
10.Hsu et al., 2015	51 adult (M_{age} = 32.78; SD = 14.02) inpatients	1)RRS 2)CESD-10	**Population too old.**

	receiving psychological treatment.	3)ACS	
11.Hudson, Harding & Mezulis, (2015)	333 undergraduate students (M_{age} = 19.09; SD = 2.10)	1)EA-RRS 2)CES-D 3)No measure	**No measure of EC.**
12.Jones et al., (2009)	121 undergraduate students (M_{age} = 18.7; SD = 1.1).	1)RRQ 2)BDI 3)No measure	**No measure of EC.**
13.Koster, Lissnyder & De Raedt (2013)	27 undergraduate students (M_{age} = 20.63; SD = 1.78).	1)RRS 2)BDI-II 3)No measure	**No measure of EC.**
14. Lonigan & Vasey (2009)	104 children (M_{age} = 14.34; SD = 2.13).	1)No measure 2)No measure 3)ECS	**No measure of RNT. Measures anxiety, not DS.**
15. Moriya & Tanno (2008)	167 undergraduate students (M_{age} = 18.9; SD = .83).	1)No measure 2)SDS 3)ECS	**No measure of RNT**
16. Muris, Meesters & Rompelberg (2006)	145 children/adolescents (M_{age} = 10.9; SD = 0.9). Parent data collected.	1)No measure 2)RCADS 3)ACS	**No measure of RNT**
17.Oldehinkel et al., (2007)	1922 adolescents (M_{age} = 13.56; SD = 0.53).	1)No measure 2)CBCL 3) EATQ-R	**No measure of RNT**
18. Papadakis et al., (2006)	223 female adolescents (M_{age} = 14.50; SD = 1.44).	1)RSQ 2)CDI 3)No measure	**No measure of EC.**
19. Rudolph & Davis (2017)	636 children/adolescents (M_{age} = 11.96; SD = .37).	1)No measure 2)SMFQ 3)BRIEF	**No measure of RNT.**
20. Simonson et al., (2011)	87 undergraduate students (M_{age} = 20.58; SD = 1.35).	1)PANE 2)No measure 3)No measure	**No measure of EC or DS.**
21.Sportel et al., (2013)	1161 adolescents (M_{age} = 15.60; SD = .71) participating in a longitudinal early intervention study.	1)No measure 2)RCADS 3)ATQ	**No measure of RNT**
22. van Oort et al., (2011)	2188 adolescents aged 10-15 years old, taking part in a longitudinal study assessing the development of mental and physical health.	1)No measure 2)RCADS 3)EATQ-R	**No measure of RNT**
23. Vasey et al., (2013)	332 children/adolescents (M_{age} = 12.0; SD = 2.4)	1)No measure 2)BDI-II/RCADS 3)ECS	**No measure of RNT**
24. Vervoort et al., (2011)	74 adolescents (M_{age} = 14.49; SD = 1.64)	1)No measure 2)CBCL 3)EATQ-R	**No measure of RNT**
25. Waszczuk et al., (2015)	61 children (M_{age} = 9.23; SD = .57)	1)No measure 2)SMFQ 3)Attention tasks	**No measure of DS Sample too young**

ACS=Attentional Control Scale (Derryberry & Reed, 2002); ATQ=The Adult Temperament Questionnaire (Rothbart, Ahadi & Evans, 2000); BDI=Beck Depression Inventory; BRIEF=Behavior Rating Inventory of Executive Function (Gioia et al., 2000); CBCL=Child Behavior Checklist (Achenbach & Edelbrock, 1981); CBQ=The Children's Behavior Questionnaire (Rothbart et al., 2001); CDI=Children's Depression Inventory (Kovacs, 1992); CES-D= Center for Epidemiologic Studies Depression Scale (Radloff, 1977), CESD-10=Center for the Epidemiological Studies of Depression-10 (Andresen et al., 1994); CRSQ=Children's Response Style Questionnaire (Abela, Brozina & Haigh, 2002); CSI= The Child Symptom Inventory (Gadow & Sprafkin, 2000); DISC-YC=Diagnostic Interview Schedule for Children-Parent Scale -Young child version (Fisher & Lucas, 2006); EA-RRS= Event-Anchored Rumination Response Scale (Treynor et al., 2003); EATQ-R=The Early Adolescent Temperament Questionnaire – Revised Parent Report (Ellis & Rothbart, 2001); ECS=Effortful Control Scale (Lonigan & Phillips, 2002); ECS-P/LD= Effortful Control Scale – Persistence/Low Distractibility Subscale (Lonigan, 1998); MASC=Manifest Anxiety Scale for Children (March et al.,1997); MASQ=Mood and Anxiety Symptom Questionnaire (Watson & Clark, 1991); PANE=Perseverative Attention to Negative Events (Mezulis et al., 2002); RCADS=Revised Child Anxiety and Depression Scale (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000); RRS=The Ruminative Response Scale (Treynor et al., 2003); RRQ=Rumination/Reflection Questionnaire (RRQ) (Trapnell & Campbell, 1999); RSQ=Response Styles Questionnaire (Nolen-Hoeksema &Morrow, 1991); SDS=Self-rating depression scale (Zung, 1965); SMFQ=Short Mood and Feelings Questionnaire (Angold, Costello, Messer, & Pickles, 1995);

Appendix E – Submission requirements for target journal

Submission Requirements and Instructions for the British Journal of Clinical

Psychology

Author Guidelines

The British Journal of Clinical Psychology publishes original contributions to scientific knowledge in clinical psychology. This includes descriptive comparisons, as well as studies of the assessment, aetiology and treatment of people with a wide range of psychological problems in all age groups and settings. The level of analysis of studies ranges from biological influences on individual behaviour through to studies of psychological interventions and treatments on individuals, dyads, families and groups, to investigations of the relationships between explicitly social and psychological levels of analysis.

All papers published in The British Journal of Clinical Psychology are eligible for Panel A: Psychology, Psychiatry and Neuroscience in the Research Excellence Framework (REF).

The following types of paper are invited:

• Papers reporting original empirical investigations

• Theoretical papers, provided that these are sufficiently related to the empirical data

• Review articles which need not be exhaustive but which should give an interpretation of the state of the research in a given field and, where appropriate, identify its clinical implications

• Brief reports and comments

UNIVERSITY OF
EXETER

SCHOOL OF PSYCHOLOGY

DOCTORATE IN CLINICAL PSYCHOLOGY

EMPIRICAL PAPER

Investigating associations between repetitive negative thinking, stress, and effortful control, and the development and maintenance of depression in adolescence: A brief follow up study.

Trainee Name: **Erika Baker**

Primary Research Supervisor: **Professor Ed Watkins**

Professor of Experimental and Applied Clinical Psychology/ Director of Research for Professional Doctorates.

Secondary Research Supervisor: **Dr Anna Adlam**

Senior Lecturer, Deputy Director of Research for Professional Doctorates

Target Journal: Clinical Psychological Science

Word Count: 7976 words (excluding abstract, table of contents, list of tables, list of figures, acknowledgements, appendices, footnotes, and references.)

Submitted in partial fulfilment of requirements for the Doctorate Degree in Clinical Psychology, University of Exeter

Acknowledgements

I would like to thank a number of people for their support with this thesis. Firstly, to the schools who agreed to take part, and to all of the participants for taking part. This was particularly generous at such a busy time during exams. To Dr. Anna Adlam who originally supported Claire Stephens and me in developing the study protocol, and who supported me throughout. To Professor Ed Watkins for his guidance and support throughout the study. To Dr Claire Stephens who has shared in the process from the beginning and who has been encouraging and a good friend. Thank you to my friends and family for their support throughout my training. I would especially like to thank Simon for supporting me through yet another Doctorate, with a huge amount of patience and encouragement. Thank you Mum for your unwavering support and for going above and beyond with Nanna duties. And to Ben, for always making me smile.

Abstract

Background: Adolescence is a period of increased vulnerability for depressive symptoms (Twenge & Nolen-Hoeksema, 2002). Given the impact of emotional disorders on an individual, it is important to understand risk factors, and conversely, protective factors to inform effective interventions. Repetitive negative thinking (RNT) and the self-regulatory temperament, effortful control (EC), have been found to be important risk factors for the development of depressive symptoms and require further exploration in adolescence.

Objective: This study investigated whether RNT predicted changes in later depressive symptoms, and if so, whether this change was moderated by EC. The study examined these associations during emotional reactivity to a stressor (exams), and emotional recovery following the stressor.

Methods: Two samples with similar designs and measures were combined in this study. Two-hundred-and-fifty-five females completed Baseline questionnaires measuring life events, RNT, EC, and depressive symptoms. One-hundred-and-ninety-nine participants were followed up prior to their exams (Pre-exam), and 115 participants were followed up after their exams (Post-exam).

Results: The study first examined emotional reactivity to stress, finding that contrary to the literature, RNT did not predict depressive symptoms in response to stress, when controlling for Baseline depressive symptoms. EC did not significantly interact with RNT in predicting depressive symptoms. However, RNT was associated with emotional recovery from stress: RNT predicted levels of depressive symptoms following exams, when controlling for Pre-exam depressive symptoms. Furthermore,

EC moderated this relationship, however contrary to the literature and predictions, this was not in the expected direction, with high levels of EC associated with high levels of depressive symptoms.

Conclusions: These findings suggest that despite the strengths of the study design, including a large sample at Baseline and follow up over a period of stress, hypothesized associations were not found during emotional reactivity to stress, but hypothesized associations were found during emotional recovery from stress. Recommendations are made for future studies, including recruiting sufficient number of males to the study.

Introduction

By age 18 years-old, between 11% -15% of adolescents will have experienced depression (Avenevoli, Swendsen, Burstein, & Merikangas, 2014; Merikangas et al., 2010, respectively), making it one of the most prevalent mental health problems in young people (Twenge & Nolen-Hoeksema, 2002). A longitudinal study by Hankin and colleagues found that individuals show a peak in depressive symptoms between 15 to 18 years of age (Hankin et al., 1998). Furthermore, adolescent depression is associated with higher rates of depression in adulthood (Rutter, Kim-Cohen, & Maughan, 2006), higher relapse rates and impaired psychosocial functioning (Naicker et al., 2013). Given the impact of emotional disorders on an individual, it is important to understand risk factors, and conversely, protective factors to inform effective interventions.

There is little consistency in when adolescence occurs and adulthood begins. A general definition was the developmental period ranging from 14 to 24 years of age (Hall, 1904); alternatively the World Health Organisation (WHO) defines adolescence as 10 to 20 years of age (WHO, 1965; 1977). Research indicates that although brain volume and cortical folding are largely developed by mid-childhood (Armstrong, Schleicher, Omran, Curtis & Zilles, 1995; Giedd, Blumenthal & Jeffries, 1999; Reiss, Abrams, Singer, Ross & Denckla, 1996), areas that support integration of executive functions and emotion systems are not mature until the mid-20s (Simmonds, Hallquist, Asato, & Luna, 2014). Most recently, adolescence has been defined as 10-24 years old, to correspond to current adolescent growth and understandings of this life phase (Sawyer et al., 2018). This definition will be adopted in the current study.

A process that has been widely evidenced as a risk factor for the development

and maintenance of emotional disorders is repetitive negative thinking (RNT) (see

Harvey Watkins, Mansell, & Shafran, 2004; and Watkins, 2008 for reviews). RNT is

defined "as repetitive thinking about one or more negative topics that is experienced

as difficult to control" (Ehring & Watkins, 2008, p.193), the two main forms of which

are rumination and worry. Depressive rumination involves 'repetitively focussing on

the fact one is depressed; on one's symptoms of depression; and on the causes,

meanings and consequences of depressive symptoms' (Nolen-Hoeksema, 1991, p.

291), whilst worry refers to a series of relatively uncontrollable negative thoughts and

images, focussing on uncertainty, risks and negative outcomes in the future

(Borkovec, Robinson, Pruzinsky, & DePree, 1983). It is argued that both rumination

and worry involve similar processes, but focus on different content (Ehring &

Watkins, 2008). As the umbrella term for all these forms of thinking, RNT will be

referred to throughout this paper. It is accepted by most that the tendency to engage

in RNT is a relatively stable trait and individual differences can be found in RNT

(Nolen-Hoeksema & Morrow, 1993).

Stress and RNT

One factor that may increase an individual's engagement in RNT is exposure

to stress (Monroe, 2008). There is substantial evidence that stressful life events,

including trauma, early life adversity and chronic life stress is associated with the

development of emotional disorders (see Aldao, McLaughlin, Hatzenbuehler, &

Sheridan, 2014). Avenevoli and colleagues (2014) found that childhood adversity

(e.g. abuse, parental mental illness, family violence) accounted for 32.2% of

emotional disorders. Conceptual models exploring the aetiology of RNT argue that

the experience of stressful life events might lead to RNT not only about those events,

but also about many areas of an individual's life (Nolen-Hoeksema, 1991; Nolen-

Hoeksema, Larson, & Grayson, 1999). RNT may develop simply due to having more

negative events to dwell on, or as a coping mechanism by preparing for the worst

(Borkovec, 1994). Engaging in RNT can lead to stress generation, increasing the risk

for self-generated (i.e., dependent) stressful life events (e.g., achievement, failures),

as individuals dwell on these stressful life events (Conway, Hammen, & Brennan,

2012). Theorists have speculated that RNT increases maladaptive behaviours such

as withdrawal, inactivity, and avoidance that, in turn, exacerbate depression (Wisco

& Nolen-Hoeksema, 2008), resulting in RNT as a risk factor for depression during

emotional reactivity to stress. Therefore, stressful life events should be taken into

account when investigating the development of RNT within psychopathology.

Adolescence is a period of development during which significant cognitive

changes take place, but also transitional life events (Hankin, 2015). There is some

evidence to suggest that developmental outcomes may be more strongly associated

to daily stressors than to major life events (Valiente, Lemery-Chalfant, & Swanson,

2009), therefore an understanding of coping with daily stressors is critical. One such

stressor that has been found to play a key role in stress in adolescence, is school

and exam stress. Statistics from the National Society for the Prevention of Cruelty to

Children (NSPCC) highlight that for the first time, exams emerged as a top stressor

for adolescents, with a 200% increase in contact to their counselling service about

exam stress specifically (NSPCC, 2015), increasing year on year (NSPCC, 2017).

This study will investigate RNT across examinations to better understand the

influence stress has on depressive symptoms and RNT.

Research investigating autonomic nervous system responses to stressful

events found that some adolescents who engaged in higher levels of RNT did not

have higher levels of physiological reactivity during the stressor, but they did take

significantly longer to recover after the stressor (Aldao, et al., 2014). Similar results

were found with Hypothalamic Pituitary Adrenal-axis reactivity during stress in

adolescents, highlighting that individuals high in trait rumination showed a delayed

post-stressor recovery, whereas high trait distraction and problem-solving was

associated with more rapid recovery (Stewart, Mazurka, Bond, Wynne-Edwards, &

Harkness, 2013). This suggests that RNT maintains and prolongs the stress

response to an event by keeping it mentally active. Therefore, an individual's

recovery from the stressor will also be examined in this study.

Effortful control

Temperament has been widely proposed as a potential risk factor for later

psychopathology, as extreme levels of reactivity and regulation of emotions can be

dysfunctional (Rothbart & Bates, 2006). Of particular interest in the literature

examining RNT, is the self-regulatory temperamental dimension, Effortful Control

(EC). EC is defined as "the efficiency of executive attention—including the ability to

inhibit a dominant response and/or to activate a subdominant response, to plan, and

to detect errors" (Rothbart & Bates, 2006, p. 129). EC is multidimensional and

consists of the ability to inhibit behaviour effortfully as appropriate (inhibitory control),

the ability to activate behaviour when needed (activation control), and the ability to

voluntarily focus or shift attention when needed (attentional control) (Posner &

Rothbart, 2000; Kochanska, & Knaack, 2003; Rothbart, 1989; Rothbart & Ahadi,

1994; Rothbart & Bates, 1998).

EC is associated with the "anterior attentional system" located in the

midprefontal cortex (Posner & Rothbart, 1992), which is viewed as an executive

system involved in higher-level attentional control (Derryberry & Rothbart, 1997). It is

theorised that this system performs dual functions, where it remains active in

situations that require executive control, but is also able to regulate more reactive

motivational functions when necessary (Derryberry & Rothbart, 1997).

EC and RNT

Strategies to modulate emotional reactivity (Rothbart et al., 2001) are likely to

be involved in RNT, as individuals with low EC are susceptible to having difficulty

inhibiting negative thoughts or paying attention to other cues. These processes are

likely to contribute to the development of RNT. A study by Bijttebier and colleagues

(2017) found that low levels of EC predicted higher levels of RNT over three months.

Furthermore, a study by Hilt, Armstrong and Essex (2012) found that low EC in early

childhood predicted a greater risk for adolescent rumination. This study highlights

that EC may play an important role in the development of RNT, where limited

temperamental processes to inhibit or attend to cognitive processes may lead to the

development of RNT. The current study aims to contribute to the empirical evidence

by investigating the role of EC and RNT in response and recovery to stress, to better

understand how EC may impact on RNT and depressive symptoms when EC and

RNT processes are likely to be utilised to cope with the stress.

Furthermore, EC is not only implicated in the development of RNT, but has

also been found to moderate the relationship between RNT and depression. One

study found that attentional control positively affected the relationship between RNT

and depressive symptoms (Mills et al., 2016). This indicates that individuals low in

attentional control have difficulties resisting distraction, resulting in a susceptibility to

experiencing RNT and/or other intrusive negative stimuli, which could prolong RNT

(Mills et al., 2016). A study by Verstraeten and colleagues (2009) found that lower

levels of EC moderated the association between rumination and depressive

symptoms one year later. The authors of this study discussed that during high levels

of stress, whilst individuals with high EC may engage in some level of RNT, they

may have the capacity to be able to cope with them in the long term, therefore

protecting them from developing depressive symptoms. This study used a broad

measure of EC, which does not incorporate all subcomponents. Furthermore,

rumination was not included in the main analysis as a predictor for depression.

Therefore, the current study aims to address these issues.

Current Study

The present study is interested in identifying whether engaging in RNT

predicts levels of depressive symptoms as stress increases. Higher levels of EC may

allow reactively vulnerable adolescents to limit the extent that they attend to, and

dwell on, negative thoughts, which may reduce RNT and depressive symptoms.

Conversely, lower levels of the ability to shift attention effortfully from negative

thoughts may lead an individual to become susceptible to RNT and vulnerable to

depressive symptoms, especially during a time of stress. Furthermore, individuals

with high levels of RNT may continue to experience depressive symptoms whilst recovering from the stress as negative thoughts persist.

There is evidence suggesting that multiple variables may contribute to vulnerability for developing depression in adolescence. However, despite the identification of these potential vulnerability factors, research into the aetiology of depression is limited because it has tended to (a) study temperamental risk factors in younger children; (b) examine EC using inconsistent measures, often with a broad measure; (c) fail to induce stress regardless of the impact of stress on RNT and depression; (d) measure rumination and worry separately, or exclusively. Therefore, it is not known how these variables may interact with each other, or play a more significant role in the aetiology of depression.

Aims

Participants will be tested at three time points; Baseline, a neutral period; Pre-exam, a time of naturally induced stress for adolescents; and Post-exam, a time of proposed 'recovery'.

Aims: This research aims to investigate whether Baseline RNT predicts later depressive symptoms, and if so, whether this change is moderated by EC.

Research question: Does RNT predict later depressive symptoms? Does EC moderate the effects of RNT on subsequent depression symptoms during emotional reactivity to a real-life stress and emotional recovery from the stressor?

Hypotheses

Emotional reactivity pre-exam (Baseline to Pre-exam)

Hypothesis 1 (H1): Baseline RNT will predict depressive symptoms in response to stress (Pre-exam), controlling for Baseline depressive symptoms, negative life events and sample.

Hypothesis 2 (H2): EC at Baseline will interact with Baseline RNT in predicting variance in subsequent depression symptoms in response to stress (Pre-exam), controlling for Baseline depression symptoms, sample and negative life events. Higher levels of EC will decrease the emotional response to a subsequent stressor and, therefore, high levels of EC will reduce the effects of RNT predicting Pre-exam depression.

Emotional recovery post-exam (Pre-exam to Post-exam)

Hypothesis 3 (H3): Baseline RNT will predict depressive symptoms in recovery from stress (Post-exam), controlling for Pre-exam depressive symptoms, negative life events and sample.

Hypothesis 4 (H4): EC at Baseline will interact with Baseline RNT in predicting variance in subsequent depression symptoms in response to stress recovery Post-exam, controlling for Pre-exam depression symptoms, sample and negative life events. Higher levels of EC will improve the emotional recovery from a subsequent stressor and, therefore, high levels of EC at Baseline will reduce the effects of Baseline RNT at predicting ongoing depression Post-exam.

Method

Design

The prospective design follows the participants over a period of stress,
namely, school examinations. Data at Baseline was collected between two and a half
and three months before examinations (Sample 1: March 2017; Sample 2: October
2016) with Pre-exam data collected between one and two weeks before
examinations (Sample 1: May/June 2017; Sample 2: January 2017). Post-exam data
were collected between three and five weeks after examinations (Sample 1: July
2017; Sample 2: February 2017), prior to students receiving their examination
results.

Participants

The study recruited two samples using similar design and measures.
Recruitment source was a factor in all analyses.

Sample 1:

Two-hundred-and-seven participants were recruited into the study. All
participants were state school students in Year 11 or 13, completing GCSEs or A
Levels examinations, respectively. Year 10 and 12 were not included as the
consultation phase and participating schools indicated that students would not be
completing formal examinations at this time. Over 30 schools were approached, with
two schools participating and 600 potentially eligible pupils given access to the
questionnaires at Baseline. Individual's self-selected to participate in the study.

Participants were included if they were planning to sit their formal

examinations in May/June 2016, and were fluent in English. Participants were

excluded if they reported having a learning disability, head injury *(n = 1),* or who have

a current mental health diagnosis (*n = 2*). Six participants were excluded as they

completed the consent form, but did not fill out any of the Baseline questionnaire.

An opt-out procedure was used to invite parents or guardians who did not

wish for their child to participate in the study to return a signed form *(n = 14).*

Questionnaires were not distributed to the individuals who opted out. For those who

did not opt out, to ensure confidentiality, all adolescents were invited to complete

questionnaires, however they were informed of exclusion criteria and were told their

data would not be included if they met exclusion criteria. Participants were able to

opt out of the study, prior to, or on the day of data collection.

Only twenty-three males were recruited (11%). Historically, and currently

there is often a reporting bias in research, where findings based on the study of one

sex (or predominantly one sex) is then generalised and applied to both (Hinton,

Zweifach, Oishi, Tang, & Unutzer, 2006). The vast discrepancy in males and females

mean that males were not included in the analysis (see Appendix A for male

descriptive data).

The demographics of the participants' parents reported that 85% of parents

were married, and had completed college or further training (mothers = 28%; fathers

= 25.2%), or University education (mothers = 60%; fathers = 61.1%), higher than the

national average (27%, Office for National Statistics; ONS, 2011). The majority were

employed for wages, including homemaker (mothers = 90.5%; fathers = 93.7%),

which is higher than the national average (75.2%, ONS, 2017).

Sample 2:

One-hundred-and-eight self-selected participants were recruited into the study

using printed and online advertisements within the University of Exeter. All

participants were first year undergraduate psychology students and were included if

they were sitting their formal University examinations in January 2016. Participants

were excluded if they reported having a learning disability, head injury ($n = 2$), or who

have a current mental health diagnosis ($n = 3$). Additionally, participants were

excluded for this thesis who were over 20 years of age ($n = 2$). Participants were

able to opt out of the study on the day of data collection.

As in Sample 1, a disproportionate majority of the sample was female, with

only twenty one males recruited (19.44%), and as such, males were not included in

the analysis.

Measures

Demographic questionnaires. Self-report questionnaires gathered key

demographic information including dates of birth, gender and socioeconomic status

(Appendix B).

Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011). The

PTQ, typically used with adults is a measure of trait RNT. Questions assess features

of RNT including thinking that is repetitive, intrusive and unproductive, capturing

individuals' mental capacity (see Appendix C). Communication with Thomas Ehring

(Ludwig Maximilian University, Munich) indicated that the task was appropriate to

use with our sample (see Appendix D). Participants were asked to rate 15

statements (based on RNT process characteristics) on a 4-point scale from '0'

(*never*) to '4' (*almost always*). Internal consistency for the measure was excellent

(total score: α = .95; subscales of core characteristics of RNT: α=.92-.94; Ehring et

al., 2011). Test-retest reliability over a 4-week interval for total scores were good

(total score: *r*=.69; subscales:.66-.69; Ehring et al., 2011).

The PTQ was selected for this study as the focus is on RNT, rather than

separate measures assessing rumination and worry. The measure is free to use

which makes it widely accessible and commonly used in the research field.

Child and Adolescent Survey of Experience: child version (CASE; Allen,

Rapee & Sandberg, 2012). A 38-item checklist of life events with additional space to

add life events by respondents (Appendix E). Respondents indicated whether each

event had occurred within the previous 12 months, rating each event on a six-point

scale from positive to negative in relation to how it made them feel where '1 = *really*

good' and '6 = *really bad'* with no neutral point. The CASE has demonstrated good

test-retest reliability, with estimates comparable to other checklists. As the number of

life events and impact of life events correlated so highly (*r*=.96, *p*<.01), impact of

negative life events was used as the predictor in the model for analyses.

This measure was selected to assess life stressors, as it assess the

individual's perceived impact of life events, rather than the frequency of events which

is subjective. This measure is free to use and so it has the possibility to be widely

used. Administered at each stage of the study.

Perceived stress check. To assess the ecological validity of examinations as

a period of elevated stress (Treuba, Smith, Auchus, & Ritz, 2013), four items

measured perceived stress on a 10-point scale from '0' (*no stress*) to '10' (*highest*

levels of stress; Appendix F), at each stage of the study. Internal consistency was

good at Baseline (α=.80), Pre-exam (α=.77) and Post-exam (α=.74).

Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim,

Moffitt, Umemoto, & Francis, 2000). A self-report measure including 47 items (see

Appendix G) assessing symptoms of anxiety and depression in adolescents (8-to-18

years). Items are scored using a four-point scale from '0' (*Never*) to '3' (*Always*).

Internal consistency for the subscales are good (MDD: α=. 87; anxiety subscales:

α=.78-.84). For the purposes of this study, the subcomponent depression was used

in analysis. Two-week test-retest reliability coefficients were found to be favourable

(r=.65-.86; Ebesutani et al., 2011). The RCADS was administered at each stage of

the study.

This measure was selected for the current study as it gives a measure of

levels of symptoms, rather than focussing on clinical diagnosis. It is free to use,

resulting in its wide use in the research field, and child and adolescent service use.

Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007). The

ATQ is valid for 16-85 years old. Correspondence with the Author's team confirmed

that the ATQ is appropriate to use with the age range, more so than the Early

Adolescent Temperament Questionnaire (EATQ-R; Capaldi & Rothbart, 1992) (see

Appendix H). It includes multiple constructs of temperament, including EC. In this

study, only the EC subscale was used, which is comprised of 35 questions

(activation control 12 items, attention control 12 items, and inhibitory control 11

items; see Appendix I). There is good internal consistency for Total EC (α=.78), and

for each subscale: inhibitory control (α=.60); activation control (α=.69); attentional

control (α=.73). The ATQ was collected at Baseline.

The ATQ includes measures from The Effortful Control Scale (ECS; Lonigan,

1998), which measures inhibitory and attentional control, and the Attention Control

Scale (ACS; Derryberry & Reed 2002). Neither the ECS or the ACS measure all

aspects of EC and so are often combined, however there is a lot of overlap. The

measure is free to use when authorisation is granted.

Procedure

The University of Exeter Ethics Review Board approved the study (Appendix

J). All participants were entered into a prize draw at each time point for a chance to

win £60 Amazon vouchers. Sample 2 also received course credits for their

participation at each time point.

For Sample 1, the author of this thesis supported the staff with recruitment

and was on hand to assist with any queries. Ongoing communication was

maintained with schools to enhance motivation to continue participation. Participants'

names were collected on the questionnaires to ensure the data were correctly linked

across time points. Names were requested in order to monitor potential safeguarding

concerns that may arise from responses. Responses were screened for potential

safeguarding concerns on the day of data collection. No safeguarding concerns were

raised in the study. Once the data were collected by the researcher, names were be

removed and codes were allocated. Participant names were securely stored and

only accessible to the research team.

Questionnaires were available in paper-form or online sent via a secure link

(Lime survey). Baseline questionnaires were distributed in paper-form and data were

entered manually (Sample 1 and 2). Pre-exam measures were completed either in

paper-form or online (online only for Sample 2), depending on the preference of the

school and individual. Post-exam data were collected online only (both samples), as

students had broken up from school for Summer holidays (Sample 1). Debriefing

information was offered to participants.

Analysis

The sample size was calculated a priori using G-power for both a correlational

analysis and a multiple regression. Assuming a Type I error rate of .05 and Type II

error rate of .20, the desired power is .80, in order to find a small-medium effect. The

target sample size for the study is n=146 (see Appendix K).

After conducting preliminary analysis to ensure all relevant assumptions have

been met, descriptive statistics and correlations were conducted for all data. All

hypotheses will be explored using hierarchal linear regressions (see Appendix L).

<center>**Results**</center>

Three-hundred-and-fifteen students were recruited to the study, with 255

students participating at Baseline, 199 participants completed Pre-Exam, with a

21.96% attrition rate from Baseline. 115 participants completed Post-Exams, with a

42.21% attrition rate from Pre-Exam, and an overall 54.90% attrition rate between

Baseline and Post-Exam. (see Figure 1 for participation and attrition for sample 1

and 2). Sample 1 were aged 15 to 19 years old (M=16.89, SD=1.05), sample 2 were

aged 17 to 20 years old (M=18.88, SD=.53). The combined study sample were 15-20

year old females (M=17.52, SD=1.30).
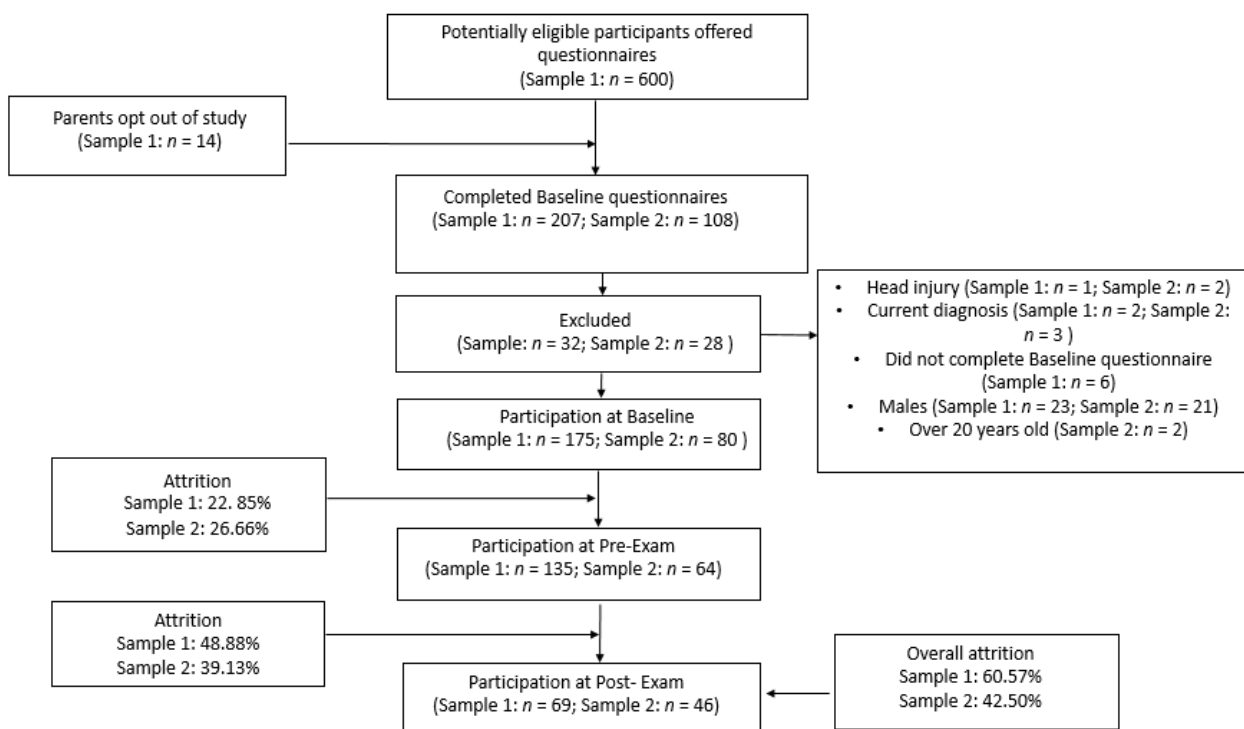
Figure 1. Diagram presenting recruitment and study participation for sample 1 and 2.

Outliers and influential statistics.

　　To explore the impact of the high attrition rate throughout the study, a dummy

variable was created to assess the randomness of missing data. Participants who

completed Baseline and Pre-exam assessments (n=199) had higher RNT scores

(t(253)=-2.05; p=.041; M=29.41; SD=10.48) than those who did not (n=56; M=26.21;

SD=9.59). Furthermore, participants who completed all stages of the study (*n*=115) had higher inhibitory control scores (*t*(253)=-2.70; p=.01; *M*=4.43; *SD*=.78) than those who did not (*n*=140; *M*=4.15; *SD*=.91).

The missing data for those who did take part was low across the study (ATQ=3.39%; RCADS=1.21 - 2.04%; CASE=0.1% - 4.14%; PTQ=3.47%). This was partly due to the online questionnaires being set to require a response. The missing data were less than 5% across the time points, which is considered to be inconsequential (Schafer, 1999) and unlikely to bias the data (Bennett, 2001). Responses on all items were needed to score the data. The normality of the distributions were assessed prior to imputation to reduce bias, with all variables normally distributed (Sterne et al., 2009). Multiple imputation was used to address the missing data. No imputation was conducted for participants who did not complete a time point, as attrition rates were high.

Sensitivity analysis was run following data imputation, comparing the results pre and post imputation, finding no significant differences in the results confirming the missing data did not have much impact.

Z-scores and boxplots were used to check for outliers. No outliers were found across the data. Cook's distance was used to check for the influence of single cases (<1) in the model as part of the regression analyses (Cook & Weisberg, 1982). Mahalanobis distances were used to measure leverage using recommended cut-off <15.6 (Barnet & Lewis, 1978) and DFBeta to measure the influence of a single case on regression parameter (< +/-0.33; Field, 2005). No influential cases were identified

following outlier analyses. All variables were standardised to reduce the impact of differing scales, and all predictors were mean-centred.

Parametric assumptions

Residuals of the regression model were approximately normally distributed. Standardised residuals were plotted against range of predicted values of the outcomes in the regression to examine linearity and homogeneity of variances. A nonlinear/curvilinear pattern was not observed (linearity assumption met) and no change in dispersion of the residuals at different predicted values of the outcome (no heteroscedasticity). Partial plots were linear and homoscedastic (plotting predictors against outcome following partialling out for the other predictors). Correlations between predictor variables did not exceed >.7 suggesting low levels of collinearity and allowing determination of individual predictors (Field, 2005).

Examining the stressor

The stressor was measured using questions asked at each time point, to measure how stressful the examination period was perceived to be. A repeated measures ANOVA found an overall increase in stress from Baseline to Pre-exam assessment $F(1, 197)=37.49$, $p<.001$, which did not differ between the samples $F(1, 197)=.10$, $p=.75$. There was an overall decrease in stress from Pre-exam assessment to Post-exam assessment $F(1, 106)=75.32$, $p<.001$, which did not differ between samples $F(1, 106)=3.02$, $p=.09$.

Descriptive Statistics

All demographic statistics for the samples are presented in Table 1.

Participants reported a number of significant negative life events at Baseline (e.g.,

losing a family member, failing an important exam) with 85 participants (42.71%)

reporting events occurring between Baseline and Pre-exam assessment, and 52

(45.22%) participants reporting events between Pre-exam and Post-exam

assessments.

Relationships among measures

To examine the hypotheses and explore correlations among variables, a

series of Pearson's *r* correlations were conducted (see Table 2). Findings indicated

that the subcomponents of EC moderately correlated with one another suggesting

they are related but independent measures of EC. All measures of EC negatively

correlated with depressive symptoms at Baseline and Pre-exam assessments;

however only activational control correlated with depressive symptoms at Post-exam

assessment. In support of the hypotheses, all measures of EC negatively correlated

with RNT.

Supporting H1 and H3, RNT correlated with depressive symptoms at each

time point. Depressive symptoms correlated across each time point.

Perceived exam stress at Baseline negatively correlated with inhibitory control

and total EC, however no significant correlations were found prospectively with exam

stress at Pre-exam or Post-exam assessments. Baseline exam stress also

correlated with RNT at Baseline and Pre-exam assessments, but not at Post-exam

assessments. Exam stress correlated with depressive symptoms at all time points.

Negative life events at Baseline correlated with depressive symptoms at Baseline

and Pre-exam assessments, and with RNT.

Table 1.

Descriptive statistics at Baseline, Pre-exams and Post-exams for sample 1, sample 2 and the combined study sample.

	Sample 1		Sample 2		Combined sample	
Demographics:	**M**	*SD*	**M**	*SD*	**M**	*SD*
Age	16.54	*2.74*	19.11	*.95*	17.35	*2.62*
Negative life events						
Baseline	14.60	*7.90*	4.45	*2.64*	11.42	*6.22*
Pre-exam	.47	*.98*	.39	*.66*	.45	*.89*
Post-exam	.35	*.80*	1.20	*1.93*	.68	*1.42*
EC:						
Inhibitory control	4.24	*.80*	4.36	*.98*	4.28	*.86*
Activational control	4.19	*.99*	3.46	*.88*	3.96	*1.01*
Attentional control	3.75	*.97*	3.96	*.73*	3.82	*.90*
Total EC	4.06	*.78*	3.97	*.65*	4.03	*.74*
RNT	28.91	*10.64*	28.26	*9.75*	28.71	*10.35*
DS						
Baseline	9.91	*5.98*	8.33	*5.07*	9.41	*5.74*
Pre-exam	11.88	*6.98*	11.00	*8.01*	11.60	*7.32*
Post-exam	8.94	*5.33*	10.88	*8.14*	9.72	*6.64*
Perceived stress:						
Baseline	6.73	*2.23*	5.52	*2.18*	6.35	*2.28*
Pre-exam	7.69	*1.57*	7.86	*1.21*	7.75	*1.46*
Post-exam	4.66	*3.07*	5.37	*2.43*	4.94	*2.84*

Note. DS = Depressive Symptoms; EC = Effortful Control; M = Mean; RNT = Repetitive Negative Thinking; SD = Standard Deviatio

Table 2.

Correlations between all study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Age	-	-.02	-.00	.26**	.17**	-.03	.18**	.14*	-.05	-.09	.04	.17	-.10	.12	.21*
2 CASE T1		-	.00	-.05	.05	.06	-.00	.04	.18**	.20**	.24**	-.00	.09	.02	.14
3 CASE T2			-	.26**	-.18*	-.10	-.09	-.15*	.09	.14	.03	.07	-.02	.08	.22*
4 CASE T3				-	-.10	-.12	-.03	-.10	-.19*	-.00	-.02	.14	-.04	.13	.14
5 EC: InC					-	.49**	.48*	.81**	-.31**	-.29**	-.14*	-.07	-.13*	-.08	.06
6 EC: ActC						-	.45**	.80**	-.30**	-.34**	-.20**	-.34**	-.02	-.12	.08
7 EC: AttC							-	.80**	-.38**	-.31**	-.14*	-.01	-.18**	-.01	.14
8 EC Total	.							-	-.41**	-.39**	-.20**	-.17	-.14*	-.08	.12
9 RNT									-	.69**	.42**	.36**	.38**	.26**	.12
10 DS T1										-	.62**	.61**	.38**	.28**	.28**
11 DS T2											-	.43**	.36**	.32**	.26**
12 DS T3												-	.23*	.22*	.26**
13 Stress T1													-	.35**	.24**
14 Stress T2														-	.23*
15 Stress T3															-

Note. CASE = Child and Adolescent Survey of Experience (negative life events subscale); DS = depressive symptoms from Revised Children's Depression Subscale; EC subscales: InC= inhibitory control, ActC= activational control, AttC= attentional control; RNT = PTQ Perseverative Thinking Questionnaire; Stress = Stress Validity Check exam question; Times; T1 = Baseline, T2 = Pre-exam, T3 = Post-exam
**$p < .01$; *$p < .05$

Emotional response pre-exam

A hierarchical linear regression (Table 3) was conducted to explore H1 and H2, controlling for sample, depressive symptoms at Baseline and negative life events at Baseline. Depressive symptoms Pre-exam were not predicted by sample or negative life events. The step 2 model was significant, where sample and Baseline depressive symptoms predicted pre-exam depression *F(2, 197)=57.70, p<.001*, with an R^2 of .37. Depressive symptoms at Baseline predicted depressive symptoms at Pre-exam assessment at every step of the model. RNT was entered in step 4, and did not predict changes in depressive symptoms at any step of the model. Therefore, H1 was not supported.

In the subsequent steps of the regression (Table 3), H2 was investigated. EC as a moderator was explored, entering an interaction variable in step 6. EC did not interact with RNT in predicting depressive symptoms, finding no moderation, therefore H2 was not supported.

Finally, sample was entered as an interaction with the main variables, to assess whether sample interacted with the model's coefficients. No significant interactions were found.

Table 3.

Hierarchical Regression Analyses for Hypotheses 1 & 2.

	B	SE B	β	p	Variance Explained
Depression symptoms Pre-exam					
Step 1					
Sample	.03	.04	.05	.52	$R^2_{adjusted}$ = -.01, p = .52
Step 2					
Sample	-.05	.03	-.09	.13	
DS Baseline	.57	.05	.62	**.001**	R^2 Change = .37, $R^2_{adjusted}$ = .37, **p = .001**
Step 3					
Sample	-.05	.04	-.09	.22	
DS Baseline	.57	.05	.62	**.001**	
Neg events Baseline	-.01	.06	-.01	.93	R^2 Change = .00, $R^2_{adjusted}$ = .36, p = .93
Step 4					
Sample	-.05	.04	-.09	.20	
DS Baseline	.60	.07	.66	**.001**	
Neg events Baseline	-.01	.06	-.01	.93	
RNT	-.04	.06	-.05	.54	R^2 Change = .00, $R^2_{adjusted}$ = .36, p = .54
Step 5					
Sample	-.06	.04	-.10	.17	
DS Baseline	.61	.08	.67	**.001**	
Neg events Baseline	.01	.06	.01	.99	
RNT	-.03	.06	-.04	.64	
EC	.05	.07	.05	.48	R^2 Change = .00, $R^2_{adjusted}$ = .36, p = .48
Step 6					
Sample	-.06	.04	-.10	.15	
DS Baseline	.60	.08	.66	**.001**	
Neg events Baseline	.01	.06	.01	.98	
RNT	-.02	.06	-.03	.71	
EC	.04	.07	.04	.54	

EC X RNT	-.01	.01	-.05	.43	R^2 Change = .00, $R^2_{adjusted}$ = .36, p =.43
Step 7					
Sample	-.07	.04	-.11	.12	
DS Baseline	.98	.32	1.08	**.002**	
Neg events Baseline	-.01	.06	-.01	.87	
RNT	-.28	.22	-.36	.21	
EC	-.28	.27	-.27	.31	
EC X RNT	-.01	.01	-.06	.32	
Sample X DS	-.06	.05	-.43	.22	
Sample X RNT	.06	.05	.36	.23	
Sample X EC	.05	.04	.32	.23	R^2 Change = .01, $R^2_{adjusted}$ = .36, p =.29
Step 8					
Sample	-.06	.04	-.10	.18	
DS Baseline	.96	.32	1.06	**.003**	
Neg events Baseline	-.01	.06	-.01	.92	
RNT	-.28	.22	-.37	.21	
EC	-.34	.28	-.33	.23	
EC X RNT	-.07	.08	-.35	.34	
Sample X DS	-.06	.05	-.41	.24	
Sample X RNT	.06	.05	.36	.23	
Sample X EC	.05	.04	.38	.17	
Sample X EC X RNT	.03	.04	.30	.42	R^2 Change = .002, R^2 adjusted = .36, p =.42

Standarised coefficients reported

Emotional recovery post-exam

A hierarchical linear regression (Table 4) was conducted to explore H3 and H4, controlling for sample, depressive symptoms at Pre-exam assessment and negative life events at Pre-exam assessment. Depressive symptoms Post-exam were not predicted by sample or negative life events. The step 2 model was significant, where sample and Pre-exam depressive symptoms predicted

Post-exam depression $F(2, 107)=13.68$, $p<.001$, with an R^2 of .19. Depressive symptoms at Pre-exam assessment predicted depressive symptoms at Post-exam assessment at every step of the model.

The step 4 model with sample, depressive symptoms Pre-exam and RNT is a significant model $F(2, 107)=8.81$, $p<.001$, with an R^2 of .23, showing that RNT predicts additional variance above and beyond depressive symptoms, supporting H3.

In the subsequent steps of the regression (Table 4), H4 was investigated. In step 6, EC as a moderator was explored, finding no significant interactions. The step 7 model was significant $F(9,107)=7.53$, $p =.001$, with an R^2 of .36, which included all previous predictors, the interaction between EC and RNT, and interactions between sample the and predictor variables to control for the effect of sample. EC was found to moderate the relationship between RNT and depressive symptoms Post-exam. The pattern of results (Figure 2; ModGraph-I; Jose, 2013) suggests that individuals with higher EC have higher levels of depressive symptoms, which is in the opposite direction to H4.

A further two interactions were found to be significant. In the first, sample moderated the effect of RNT. Figure 3 (ModGraph-I; Jose, 2013) presents the pattern of the interaction, indicating that there is a greater association between RNT and depressive symptoms in recovery from stress, when RNT is high, in Sample 1, compared to Sample 2. Secondly, sample moderated the effect of depressive symptoms. Figure 4 (ModGraph-I; Jose, 2013) presents the pattern of the interaction, indicating that there is a greater association between higher

levels of depressive symptoms Pre-exam and in recovery from stress, in

Sample 1, compared to Sample 2.

Table 4.

Hierarchical Regression Analyses for Hypotheses 3 & 4

	B	SE B	β	p	Variance Explained
Depression symptoms Post-exam					
Step 1					
Sample	-.03	.05	-.06	.52	$R^2_{adjusted}$ = -.00, p = .53
Step 2					
Sample	-.07	.05	-.13	.15	
DS Pre-exam	.44	.08	.46	**.001**	R^2Change = .21, $R^2_{adjusted}$ = .19, **p < .001**
Step 3					
Sample	-.07	.05	-.13	.15	
DS Pre-exam	.45	.09	.47	**.001**	
Neg events Pre-exam	-.08	.20	-.04	.68	R^2Change = .00, $R^2_{adjusted}$ = .19, p = .68
Step 4					
Sample	-.08	.05	-.16	**.04**	
DS Pre-exam	.38	.09	.40	**.001**	
Neg events Pre-exam	-.12	.20	-.065	.56	
RNT	.17	.07	.22	**.02**	R^2Change = .04, $R^2_{adjusted}$ = .23, **p = .02**
Step 5					
Sample	-.08	.05	-.15	.10	
DS Pre-exam	.37	.09	.39	**.001**	
Neg events Pre-exam	-.15	.20	-.07	.47	
RNT	.16	.07	.21	**.03**	
EC	-.10	.10	-.09	.33	R^2Change = .01, $R^2_{adjusted}$ = .23, p = .33
Step 6					
Sample	-.07	.05	-.13	.16	
DS Pre-exam	.36	.09	.37	**.001**	
Neg events Pre-exam	-.10	.20	-.04	.61	

RNT	.13	.07	.17	**.04**	
EC	-.09	.10	-.08	.34	
EC X RNT	.05	.03	.16	.07	R^2Change = .02, $R^2_{adjusted}$ = .25, p =.07
Step 7					
Sample	-.06	.04	-.11	.17	
DS Pre-exam	.24	.09	.24	**.02**	
Neg events Pre-exam	-.17	.19	-.08	.37	
RNT	.55	.21	.72	**.01**	
EC	.36	.36	.33	.32	
EC X RNT	.06	.03	.21	**.02**	
Sample X DS	.08	.02	.50	**.04**	
Sample X RNT	-.14	.05	-.87	**.01**	
Sample X EC	-.07	.05	-.45	.18	R^2Change = .12, $R^2_{adjusted}$ = .36, **p =.001**
Step 8					
Sample	-.08	.04	-.14	.09	
DS Pre-exam	.24	.09	.26	**.01**	
Neg events Pre-exam	-.18	.19	-.08	.34	
RNT	.50	.21	.65	**.02**	
EC	.55	.38	.51	.16	
EC X RNT	.20	.10	.65	**.04**	
Sample X DS	.08	.02	.48	.05	
Sample X RNT	-.13	.05	-.78	**.01**	
Sample X EC	-.09	.05	-.59	.09	
Sample X EC X RNT	-.08	.06	-.45	.17	R2Change = .11, R2adjusted = .36, **p = .001**

Standarised coefficients reported
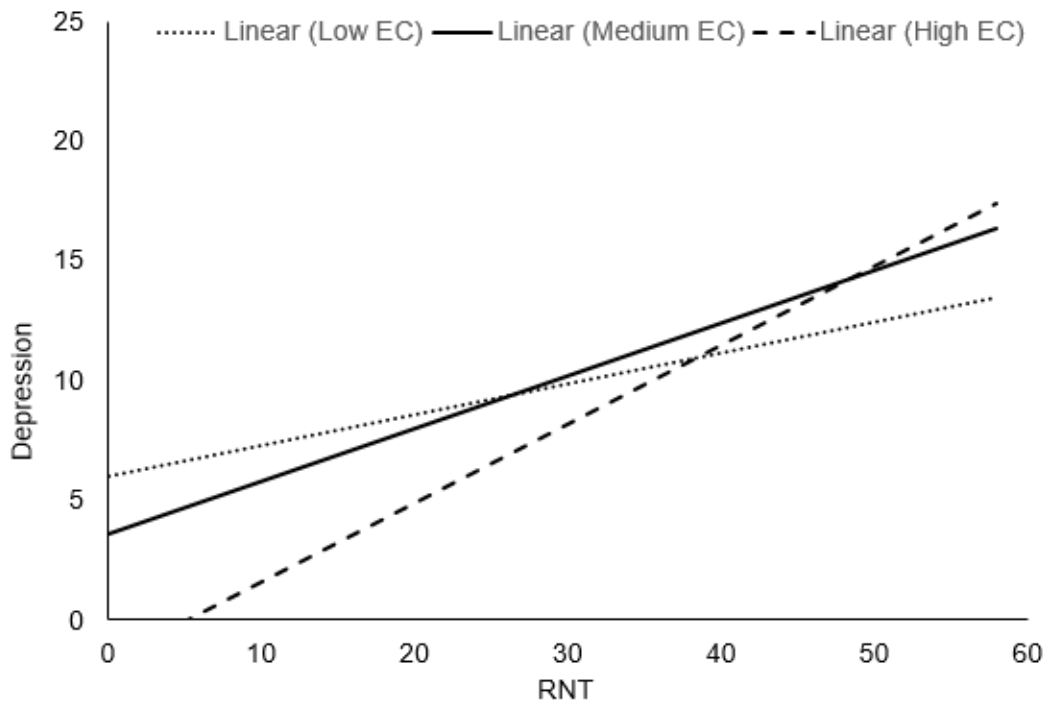
*Figure 2.*The interaction between EC, RNT and depressive symptoms post-exam.
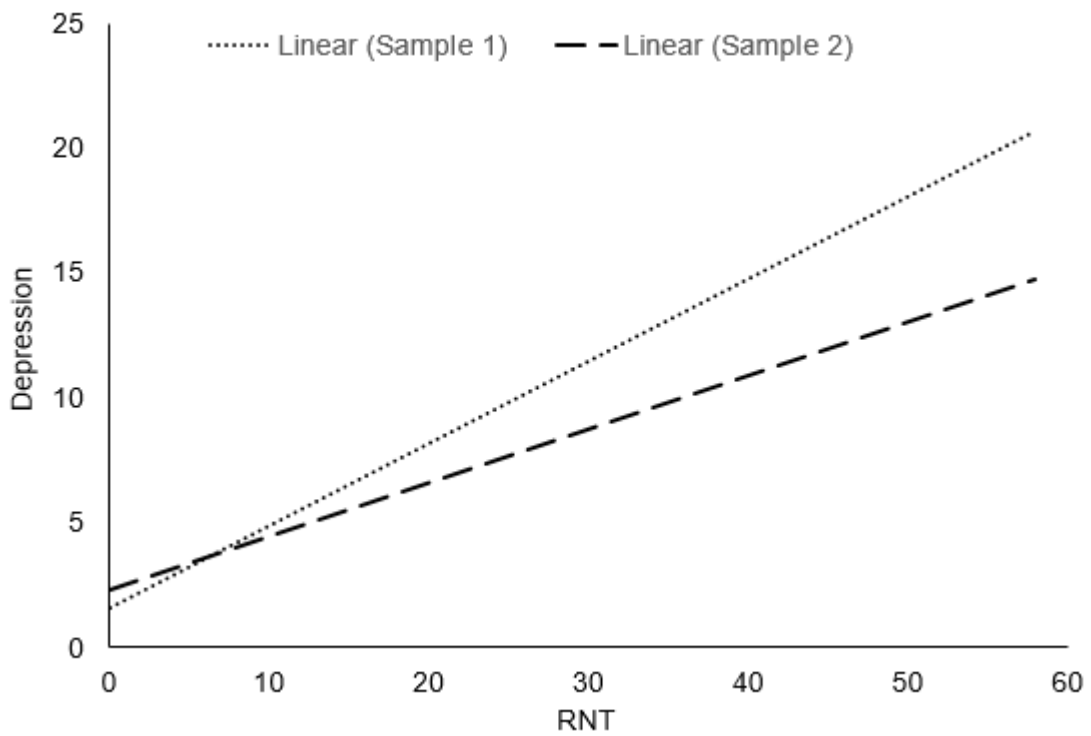
Figure 3. The interaction between RNT and depressive symptoms Post-exam for Samples 1 and 2.
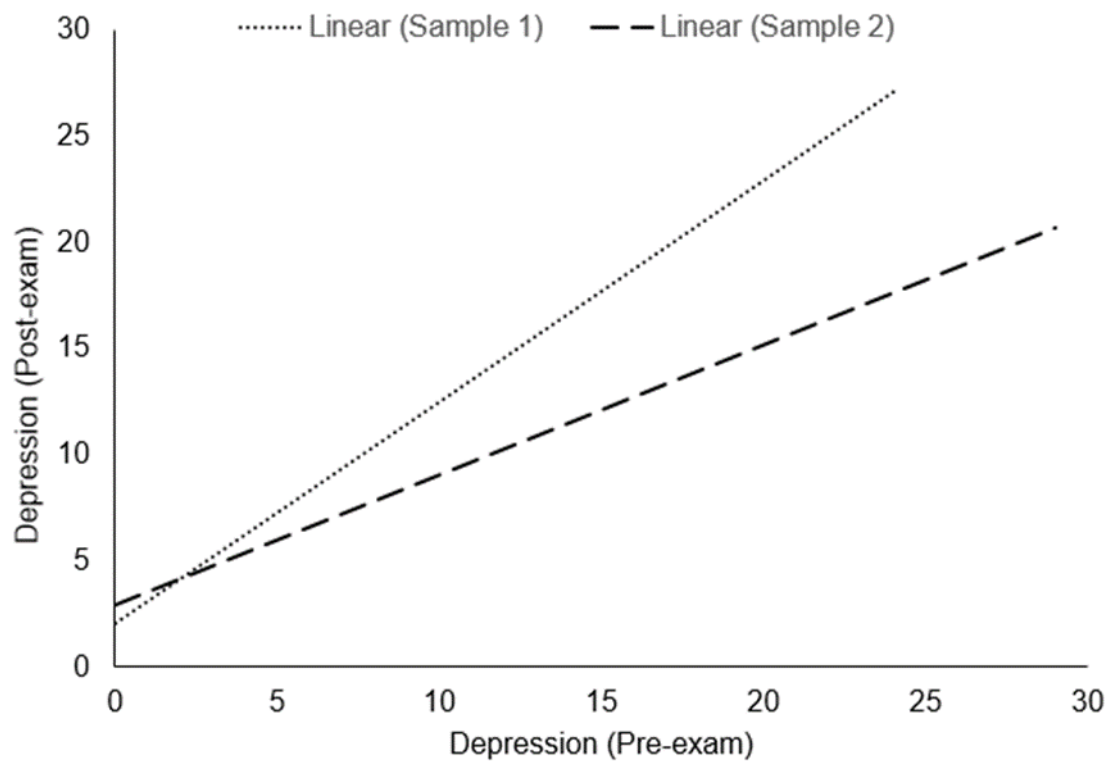
Figure 4. The interaction between depressive symptoms Pre-exam and Post-exam for Samples 1 and 2.

Discussion

This study investigated associations between RNT, EC and depressive symptoms over a period of natural stress, at three time points (Baseline, Pre-exam and Post-exam) in a non-clinical sample of adolescent females. The study was designed to explore these constructs in reactivity to, and recovery from stress. The study also explored whether EC moderated the relationship between RNT and depressive symptoms during reactivity to, and in recovery from stress.

The study first examined emotional reactivity to stress. Hypothesis 1, that Baseline RNT would predict subsequent depression at the Pre-exam assessment was not confirmed, once baseline depressive symptoms were controlled for. This was unexpected as there is a large evidence base indicating how those with higher tendency to ruminate are more likely to experience higher levels of depressive symptoms (e.g., Abela et al., 2002; Ehring & Watkins, 2008; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Other studies have found support for this hypothesis in adolescents, across three months (Bijttebier et al., 2017) and seven months (Snyder & Hankin, 2016). Another study that found this significant relationship only found the brooding subtype predicted depressive symptoms, not reflection (Verstraeten, Bijttebier, Vasey, & Raes, 2011). It is possible that a measure weighted towards brooding items was required to find this association. Our study used a measure of trait RNT, rather than a measure of rumination (such as the RRS; Treynor et al., 2003) which explore responses to sad mood. The measure used in the current study (PTQ) was unable to further explore potential subcomponents of rumination as part of

RNT, which may or may not have predicted subsequent changes in depressive/anxious symptoms.

As there was no significant relationship in the model between RNT and depressive symptoms Pre-exam, EC did not significantly interact with RNT in predicting depressive symptoms. Therefore, H2 investigating EC as a moderator, was not supported. There have been mixed findings in the literature. One study found EC to be a significant moderator between RNT predicting depressive symptoms over a year, such that RNT was a stronger predictor of subsequent depression at lower levels of EC (Verstraeten, Vasey, Raes, & Bijttebier, 2009). However, another study found that EC was not a significant moderator for the relationship between brooding and depressive symptoms (Mezulis, Simonson, McCauley, & Stoep, 2011).

Next, the study investigated emotional recovery from stress. Hypothesis 3, that Baseline RNT would predict subsequent depression at the Post-exam assessment was confirmed, once baseline depressive symptoms were controlled for. Baseline RNT was significantly associated with depressive symptoms Post-exam, and predicted levels of depressive symptoms when controlling for Pre-exam depressive symptoms. The significant relationship found for RNT and depressive symptoms for recovery and not reactivity to stress, is an interesting finding. One study investigating autonomic nervous system responses to stressful events in adolescents, found that some adolescents who engaged in higher levels of RNT did not have higher levels of physiological reactivity during the stressor, but they did take significantly longer to recover after the stressor (Aldao, et al., 2014). It is possible that individuals

high in RNT show a delayed post-stressor recovery, indicating that RNT

maintains and prolongs the stress response to an event by keeping it mentally

active. Another possibility is that the follow up period was not long enough

between Baseline and Pre-exam for RNT to predict depressive symptoms.

Finally, Hypothesis 4 predicted that EC at Baseline will interact with

Baseline RNT in predicting variance in subsequent depression symptoms in

response to stress recovery Post-exam. The findings show that high levels of

EC interacted with high levels of RNT to predict more depressive symptoms.

This is an unexpected result, and is a finding opposite to our prediction. This

finding is inconsistent with the wider literature, and so conclusions that can be

drawn are limited. One possible explanation is that the items on the ATQ are

capturing other aspects of temperament, such as conscientiousness and

perfectionism, both of which have been linked to rumination and depressive

symptoms (Flett, Nepon, & Hewitt, 2015; Klein, Kotov, & Bufferd, 2011). Future

studies may wish to use an alternative measure of EC, or include questions to

measure participants motivation or perceived importance of the exams. Further

research is needed to explore this effect, with a larger sample needed to

improve the power.

Whilst some hypotheses were supported, the majority were not. One

explanation is that exam rumination may be a specific stressor that is difficult to

predict and was not captured in the general measure of trait RNT. The data

indicated that the study had good ecological validity, as shown by the significant

increases in the levels of stress leading up to exams, and significant reduction

following the exams, however effects may have been larger with a clinical

sample, as their responses to stress would be predicted to be greater.

The inclusion of control interactions to examine whether effects are

different between the samples, found a positive interaction during emotional

recovery from stressor. A second interaction found that there is a general effect

of pre-exam depressive symptoms predicting recovery from the stressor and

this effect is stronger in the younger sample (Sample 1).One explanation is that

is that younger people are more sensitive to exam results, as they are less

familiar with them, and may perceive them to be more important. This

interaction may indicate an effect of age rather than sample (Snyder & Hankin,

2016).

Strengths and limitations

A limitation of this study was that significantly more females were

recruited to the study. In both samples, identical recruitment procedures were

used to invite males and females to participate, and whilst some males

participated across the follow-up waves, this was only a small percentage in

comparison to females. The vastly uneven number of males participating meant

their data were excluded from analysis, in order to reduce reporting bias, where

findings based predominantly on one population are generalised and applied to

both (Holtcroft, 2007).

The inclusion of females only has significant limitations on the

conclusions that can be drawn from the results. A longitudinal study by Hankin

and colleagues (1998) found that between 15 to 18 years of age female rates of

depression rises to double the prevalence rate for males (Hankin et al., 1998).

This suggests that depressive symptoms may be overrepresented in this

sample of females only, and the inclusion of males may have reduced the

overall effects of associations with depressive symptoms.

A number of reasons are proposed for the difficulty in recruiting males

into our study. In discussions with the schools, they reported that the males

were less likely to show an interest in the research around their peers.

Furthermore, they observed that males were less interested in the emotion

aspect of the research. Whilst this is an anecdotal observation, the societal

norm for males to be less emotionally open compared to women, also termed

'normative male alexithymia' (Levant, Hall, Williams, & Hasan, 2009) may

explain the barriers to recruitment. One study that also reported difficulties

recruiting males suggested that discussing depressive symptoms was

associated with stigma in males and so were less likely to participate (Hinton,

Zweifach, Oishi, Tang, & Unutzer, 2006). Other studies have also found that

males with a mental health difficulty were less likely to seek psychological

services due to stigma (Andrews, Issakidis, & Carter, 2001). In line with this, an

important consideration when measuring depressive symptoms is that males

may underreport on self-report and interviews compared to females, as females

may be more open to reporting their emotions (Hankin et al., 1998), thus

skewing our perception of gender differences.

Another limitation was that ethnicity was not reported in the study.

However, the demographics of the recruitment areas for both samples was

predominantly White British. Assuming these results are primarily based on

white British females, this limits the generalisability of the results and limits what

we can learn about the development of depressive symptoms outside of this

sample. Some differences have been found between prevalence rates of

depressions in adolescents based on ethnicity (e.g. Hayward, Gotlib,

Schraedley, & Litt, 1999; Roberts & Sobhan, 1992), however there is a paucity

of information on the prevalence of mental disorders among minority groups

especially in adolescence. This is an important consideration for future studies.

The power calculation conducted prior to recruiting participants indicated

that in order for the study to meet adequate power to detect small to medium

effect sizes using correlational analysis and multiple regression 146 participants

would need to be recruited, accounting for a 20% attrition rate at each time

point. The study was able to recruit above the sufficient number at Baseline

(n=255), and despite attrition levels of 21.96% between the first two time points,

power was achieved at Pre-exam (n=199). However, a high level of attrition

after the exams (42.21%) resulted in having an underpowered sample Post-

exam (n=115). The reasons for the high attrition rate (54.90% between Baseline

and Post-exam) was likely due to multiple factors. Increased stress, and

academic priorities prior to exams were likely to impact on participant's

voluntarily giving their time to research. Secondly, due to the nature of the

project, it was not possible to reimburse participants for their time (although a

prize draw was used to thank participants), which may reduce motivation at an

already busy time. Secondly, the majority of follow-up data were collected via

an online link sent to the participants email address, which many of them opted

to give their school email address. Post-exam data collection fell at the end of

term with reminders sent around the start of the Summer holidays and so it is

assumed that many participants did not receive the follow-up email, or may

have been away. Future studies using online links should ensure they have

additional follow-up details. So whilst the majority of data analysis is sufficiently

powered, analysis including the Post-exam wave, or all three time points (due to

pairwise deletion) are underpowered. This high rate of attrition resulted in the

study only having power to detect large effect sizes Post-exam rather than the

more realistic moderate effects that would be expected for a study of this kind

(Cohen, 1992). Consequently, the null effects reported by the study may have

occurred as a result of a lack of power rather than indicating a lack of

association between variables and significantly limiting the generalisability of

findings. Future research should plan for higher rates of attrition when

investigating stress.

The collaborative nature of this project (incorporating sample 2) meant

that data were collected across a wider sample, increasing our exploration

across later adolescence. Future research may choose to focus their

exploration of RNT, depressive symptoms using multiple measures of

depression, as well as subtypes of RNT and EC, to explore the mechanisms

involved in potential relationships.

Clinical Implications

This sample is a non-clinical sample of females, and so the clinical

implications drawn from these findings are tentative. However, the study

highlights a number of potential areas that may be of interest to researchers in

the areas of preventative strategies and early interventions for adolescents.

The measures in this study indicate that during exam period, levels of RNT and depressive symptoms increase significantly for adolescents. This is a known period of elevated stress for adolescents, and as such schools should recognise this to be able to put strategies in place to support students.

Whilst the results also show that there is a reduction in stress following the exams, findings also show that high levels of RNT continue to predict high rates of depressive symptoms following the stressor. Further research is needed to explore the moderating role of EC to RNT and depressive symptoms in order to understand the clinical implications of this relationship.

Future research that is concerned with populations vulnerable to developing depressive symptoms may wish to consider students during exam time, as results from this study indicate this is a significant period of naturally elevated stress. This time may be advantageous for developing strategies to manage stress, RNT and increase effortful processes.

Conclusion

This study explored the prospective associations between RNT, EC, and depressive symptoms in a sample of students following a period of naturally induced stress. The study first examined emotional reactivity to stress, finding that contrary to the literature, RNT did not predict depressive symptoms in response to stress, when controlling for Baseline depressive symptoms. Subsequently, EC did not significantly interact with RNT in predicting depressive symptoms. The study examined emotional recovery from stress, finding that RNT predicted levels of depressive symptoms following exams,

when controlling for Pre-exam depressive symptoms. It was found that EC

moderated, however contrary to the literature and out predictions, this was not

in the expected direction, with individuals high in EC having high levels of

depressive symptoms. Further research is needed to explore and understand

this finding within clinical populations, including males and females.

References

Abela, J. R. Z., Brozina, K., & Haigh, E. P. (2002). An examination of the response style theory of depression in third- and seventh- grade children: a short-term longitudinal study. *Journal of Abnormal Child Psychology*, *30*, 515–527.

Aldao, A., McLaughlin, K. A., Hatzenbuehler, M. L., & Sheridan, M. A. (2014). The relationship between rumination and affective, cognitive, and physiological responses to stress in adolescents. *Journal of Experimental Psychopathology, 5,* 272-288.

Allen, J. L., Rapee, R. M., & Sandberg, S. (2012). Assessment of maternally reported life events in children and adolescents: A comparison of interview and checklist methods. *Journal of Psychopathology and Behavioral Assessment, 34,* 204–215.

Andrews, G., Issakidis, C., & Carter, G. (2001). Shortfall in mental health service utilisation. *British Journal of Psychiatry, 179,* 417-425.

Armstrong, E., Schleicher, A., Omran, H., Curtis, M., & Zilles, K. (1995). The ontogeny of human gyrification. *Cerebral Cortex, 5,* 56–63.

Avenevoli, S., Swendsen, J., He, J. P., Burstein, M., Merikangas, K. (2014). Major depression in the national comorbidity survey-adolescent supplement: prevalence, correlates, and treatment. *Journal of American Academy of Child Adolescent Psychiatry, 54,* 37-44.

Barnett, V., & Lewis, T. (1978). *Outliers in statistical data*. New York: Wiley.

Bennett, D. A. (2009). How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health, 25,* 464-469.

Bijttebier, P., Bastin, M., Nelis, S., Weyn, S., Luyckx, K., Vasey, M. W., Raes, F.

(2017). Temperament, repetitive negative thinking, and depressive

symptoms in early adolescence: A prospective study. *Journal of*

Psychopathology and Behavioural Assessment, 39, 1-13.

Borkovec, T. D. (1994). The nature, functions, and origins of worry. In: G. Davey

& F. Tallis (Eds.). *Worrying, perspectives on theory assessment and*

treatment (pp. 5-33). Sussex, England: Wiley & Sons.

Borkovec, T. D., Robinson, E., Pruzinsky, T., & Depree, J. A. (1983).

Preliminary exploration of worry: Some characteristics and processes.

Behaviour Research and Therapy, 21, 9–16.

Capaldi, D. M. & Rothbart, M. K. (1992). Development and Validation of an

Early Adolescent Temperament Measure. *Journal of Early Adolescence,*

12, 153-173F

Chorpita, B. F., Yim, L., Moffitt, C. E., Umemoto, L. A., & Francis, S. E. (2000).

Assessment of symptoms of DSM- IV anxiety and depression in children:

A Revised Child Anxiety And Depression Scale. *Behaviour Research and*

Therapy, *38*, 835–855.

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*, 155.

Conway, C. C., Hammen, C., & Brennan, P. A. (2012). Expanding stress

generation theory: Test of a transdiagnostic model. Journal of Abnormal

Psychology, 121, 754–766.

Cook, D. R., & Weisberg, S. (1982). *Residuals and influence in regression.* New

York: Chapman and Hall.

Derryberry, D, & Reed, M. A. (2002). Anxiety-related attentional biases and their

regulation by attentional control. *Journal of Abnormal Psychology, 111*,

225–236.

Derryberry, D., & Rothbart, M. K. (1997). Reactive and effortful processes in the

organization of temperament. *Development and Psychopathology*, *9,*

633–652.

Ebesutani, C., Chorpita, B. F., Higa-McMillan, C. K., Nakamura, B. J., Regan,

J., & Lynch, R. E. (2011). A psychometric analysis of the Revised Child

Anxiety and Depression Scales—Parent version in a school sample.

Journal of Abnormal Child Psychology, *39*, 173-185.

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a

transdiagnostic process. *International Journal of Cognitive Therapy, 1,*

192-205.

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schönfeld, S., & Ehlers, A.

(2011). The Perseverative Thinking Questionnaire (PTQ): Validation of a

content-independent measure of repetitive negative thinking. *Journal of

Behavioural Therapy and Experimental Psychiatry, 42,* 225-232.

Evans, D. E., & Rothbart, M. K. (2007). Developing a model for adult

temperament. *Journal of Research in Personality, 41*, 868–888.

Field, A. (2005). *Discovering statistics using SPSS*. London: SAGE.

Flett, G. L., Nepon, T., & Hewitt, P. L. (2015). Perfectionism, worry, and

rumination in health and mental health: A review and a conceptual

framework for a cognitive theory of perfectionism. *Perfectionism, Health

and Well-Being, 4,* 121-155.Giedd, J. N., Blumenthal, J., Jeffries, N. O.

(1999). Brain development during childhood and adolescence: a

longitudinal MRI study. *Nature Neuroscience, 2,* 861–63.

Hall, G. S. (1904). *Adolescence: its psychology and its relations to physiology,*

anthropology, sociology, sex, crime, religion and education. New York: D

Appleton.

Hankin, B. J. (2015). Depression from childhood through adolescence: Risk

mechanisms across multiple systems and levels of analysis. *Current*

Opinion in Psychology, 4, 13–20.

Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., Angell, K.

E. (1998). Development of depression from preadolescence to young

adulthood: emerging gender differences in a 10-year longitudinal study.

Journal of Abnormal Psychology, 107, 128-140.

Harvey, A. G., Watkins, E., Mansell, W., & Shafran, R. (2004). *Cognitive*

behavioural processes across psychological disorders. Oxford, United

Kingdom: Oxford University Press.

Hayward, C., Gotlib, I. H., Schraedley, P. K., & Litt, I. F. (1999). Ethnic

differences in the association between pubertal status and symptoms of

depression in adolescent girls. *Journal of Adolescent Health, 25,* 143-

149.

Hilt, L. M., Armstrong, J. M., & Essex, M. J. (2012). Early family context and

development of adolescent ruminative style: Moderation by

temperament. *Cognition and Emotion, 26*, 916-926.

Hinton, L., Zweifach, M., Oishi, S., Tang, L., & Unutzer, J. (2006). Gender

disparities in the treatment of late-life depression: qualitative and

quantitative findings from the IMPACT trial. American Journal of Geriatric

Psychiatry, *14,* 884–892.

Holtcroft, A. Gender bias in research: How does it affect evidence based

medicine? *Journal of the Royal Society of Medicine, 100,* 2-3.

Jose, P.E. (2013). *ModGraph-I: A programme to compute cell means for the

graphical display of moderational analyses: The internet version, Version

3.0.* Victoria University of Wellington, Wellington, New Zealand.

Retrieved from: https://psychology.victoria.ac.nz/modgraph/

Klein, D. N., Kotov, R., & Bufferd, S. J. (2011). Personality and depression:

Explanatory models and review of the evidence. *Annual Review Clinical

Psychology, 7,* 269-295.

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality

characteristic of young children: antecedents, correlates, and

consequences. *Journal of Personality, 71,* 1087-10112.

Levant, R. F., Hall, R. J., Williams, C. M., & Hasan, N. T. (2009). Gender

differences in alexithymia. *Psychology of Men & Masculinity, 10,* 190-203

Lonigan, C. J. (1998). *Development of a measure of effortful control in school

age children.* Unpublished raw data. Florida State University.

Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L.,

Benjet, C., Georgiades, K., & Swendsen, J. (2010). Lifetime Prevalence

of Mental Disorders in U.S. Adolescents: Results from the National

Comorbidity Survey Replication–Adolescent Supplement (NCS-A).

Journal of the American Academy of Child & Adolescent Psychiatry, 49,

980–989.

Mezulis, A. H., Simonson, J., McCauley, E., & Vander Stoep, A. (2011) The

associaton between temperament and depressive symptoms in

adolescence: Brooding and reflection as potential mediators. *Cognition

and Emotion, 25,* 1460-1470.

Mills, A. C., Grant, D. M., Judah, M. R., White, E. J., Taylor, D. L., & Frosio, K.

E. (2016). Trait attentional control influences the relationship between

repetitive negative thinking and psychopathology symptoms. *Psychiatry

Research, 238,* 277-283.

Monroe, S (2008). Modern approaches to conceptualization and measurement

of human stress. *Annual Review of Clinical Psychology, 4,* 33-52.

Naicker, K., Galambos, N. L., Zeng, Y., & Senthilselvan, A. (2013). Social,

demographic, and health outcomes in the 10 years following adolescent

depression. *Journal of Adolescent Health, 52,* 533-538.

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the

duration of depressive episodes. *Journal of Abnormal Psychology, 100,*

569–582.

Nolen-Hoeksema, S., Larson, J., & Grayson, C. (1999). Explaining the gender

difference in depressive symptoms. *Journal of Personality and Social

Psychology, 77,* 1061-1072.

Nolen-Hoeksema, S., & Morrow, J. (1993). Effects of rumination and distraction

on naturally-occurring depressed mood. *Cognition and Emotion, 7,* 561–

570.

Nolen-Hoeksema, S., Stice, E., Wade, E., & Bohon., C. (2007), Reciprocal

relations between rumination and bulimic, substance abuse, and

depressive symptoms in female adolescents. *Journal of Abnormal*

Psychology, 116, 198-207.

NSPCC (2015). *Fighting for childhood.* Retrieved from:

http://www.nspcc.org.uk/fighting-for-childhood/news-opinion/childline-

reveals-a-200-increase-in-exam-stress-counselling-last-

year/?_t_id=1B2M2Y8AsgTpgAmY7PhCfg%3d%3d&_t_q=stress&_t_tag

s=language%3aen%2csiteid%3a7f1b9313-bf5e-4415-abf6-

aaf87298c667&_t_ip=77.102.81.113&_t_hit.id=Nspcc_Web_Models_Pa

ges_NewsPage/_f66d9fef-1fe1-4fec-b1cc-41732b73d33a_en-

GB&_t_hit.pos=2

NSPCC (2017). *Exam stress overwhelming for thousands of children.*

Retrieved from:

https://www.nspcc.org.uk/what-we-do/news-opinion/exam-stress-

overwhelming-for-thousands-of-

children/?_t_id=1B2M2Y8AsgTpgAmY7PhCfg%3d%3d&_t_q=exam+stre

ss&_t_tags=language%3aen%2csiteid%3a7f1b9313-bf5e-4415-abf6-

aaf87298c667&_t_ip=193.60.198.37&_t_hit.id=Nspcc_Web_Models_Pa

ges_NewsPage/_bdfc386f-48d1-4aba-902f-12057b328a9c_en-

GB&_t_hit.pos=2

Office for National Statistics (2011). *2011 Census Data.* Retrieved from:

https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmi

gration/populationestimates/bulletins/2011censuskeystatisticsforengland

andwales/2012-12-11

Office for National Statistics (2017). *Employment and labour market.* Retrieved

from:

https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/empl
oymentandemployeetypes.

Posner, M. J., & Rothbart, M. K. (2000). Developing mechanisms of self-
regulation. *Development and Psychopathology, 12,* 427–441.

Posner, M. I. & Rothbart, M. K. (1992). Attention and conscious experience. In:
A. D. Milner & M. D. Rugg. *The neuropsychology of consciousness.*
London: Academic Press.

Reiss, A. L., Abrams, M. T., Singer, H. S., Ross, J. L., & Denckla, M. B. (1996).
Brain development, gender and IQ in children. A volumetric imaging
study. *Brain, 119,* 1763–74.

Roberts, R. E., Sobhan, M. (1992). Symptoms of depression in adolescence: A
comparison of Anglo, African, and Hispanic Americans. *Journal of Youth
and Adolescence, 21,* 639-651.

Rothbart, M. K. (1989). Behavioral approach and inhibition. In S. Reznick (Ed.),
Perspectives on behavioral inhibition (pp. 139–157). Chicago: University
of Chicago Press.

Rothbart, M. K., & Ahadi, S. (1994). Temperament and the development of
personality. *Journal of Abnormal Psychology, 103,* 55–66.

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations
of temperament at three to seven years: the Children's Behavior
Questionnaire. *Child Development, 72,* 1394-1408.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon (Series
Ed.), N. Eisenberg (Volume Ed.), *Handbook of child psychology: Vol. 3,
Social, emotional, and personality development* (5th ed., pp. 105–176).
New York: Wiley.

Rothbart, M. K., & Bates, J. E. (2006). Temperament. In: W. Damon &N. Eisenberg, (Eds). *Handbook of child psychology (Vol. 3.).* New York: Wiley.

Rutter, M., Kim-Cohen, J., & Maughan, B. (2006). Continuities and discontinuities in psychopathology between childhood and adult life. *Journal of Child Psychology and Psychiatry, 47,* 276-295.

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. *The Lancet Child and Adolescent Health, 2,* 223–228.

Schafer, J. L. (1999). Multiple imputation: A primer. *Statistical Methods Research, 8,* 3-15.

Simmonds, D. J., Hallquist, M. N., Asato, M., & Luna, B. (2014). Developmental stages and sex differences of white matter and behavioral development through adolescence: A longitudinal diffusion tensor imaging (DTI) study. *Neuroimage, 92,* 356–68.

Sterne, A. C., White, I. R., Carlin, J. B., Spratt, M., Royston, P., & Kenward, M. G. (2009). Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *British Medical Journal, 338,* 2387-2393.

Snyder, H. R., & Hankin, B. L. (2016). Spiralling out of control: Stress generation and subsequent rumination mediate the link between poorer cognitive control and internalizing psychopathology. *Clinical Psychological Science, 4,* 1047-1064.

Stewart, J. G., Mazurka, R., Bond, L., Wynne-Edwards, K. E., & Harkness, K. L. (2013). Rumination and impaired cortisol recovery following a social

stressor in adolescent depression. *Journal of Abnormal Child Psychology, 41*, 1015-1026.

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research, 27,* 247–259.

Treuba, A. F., Smith, N. B., Auchus, R. J., & Ritz, T. (2013). Academic exam stress and depressive mood are associated with reductions in exhaled nitric oxide in healthy individuals. *Biological Psychology*, *93*, 206-212.

Twenge, J. M., & Nolen-Hoeksema, S. (2002). Age, gender, race, socioeconomic status, and birth cohort difference on the children's depression inventory: A meta-analysis. *Journal of Abnormal Psychology, 111,* 578–588.

Valiente, C., Lemery-Chalfant, K., & Swanson, J. (2009). Prediction of kindergartners' academic competence from their Effortful Control and negative emotionality: Evidence for direct and moderated relations. *Journal of Educational Psychology, 102,* 550-560.

Verstraeten, K., Bijttebier, P., Vasey, M. W., & Raes, F. (2011). Specificity of worry and rumination in the development of anxiety and depressive symptoms in children. *British Journal of Clinical Psychology, 50,* 364-378.

Verstraeten, K., Vasey, M. W., Raes, F., & Bijttebier, P. J. (2009). Temperament and risk for depressive symptoms in adolescence: Mediation by rumination and moderation by Effortful Control. *Abnormal Child Psychology, 37,* 349–361.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought.

   Psychological Bulletin, 134, 163-206.

Wisco, B. E., & Nolen-Hoeksema, S. (2008). Ruminative response style. In:

   Dobson, K. S.; Dozois, D. J. A., (eds). *Risk Factors in Depression.* San

   Diego, CA: Academic Press; 2008. p. 221-236.

World Health Organization. *Health problems of adolescents. Technical report*

   series 308.

Geneva: World Health Organization, 1965. Retrieved from:

   http://apps.who.int/iris/handle/10665/38425

World Health Organization. *Health needs of adolescents*. Geneva: World Health

   Organization, 1977. Retrieved from:

   http://apps.who.int/iris/handle/10665/41252

Appendices

Appendix A - Descriptive data for males recruited from samples 1 and 2.

Appendix B - Demographic Questionnaire

Appendix C - Perseverative Thinking Questionnaire (PTQ)

Appendix D - Email Conversations with Professor Ehring

Appendix E - Child and Adolescent Survey of Experiences (CASE)

Appendix F - Perceived Stress Check

Appendix G - Revised Children's Anxiety and Depression Scale (RCADS)

Appendix H- Email correspondence with the EATQ-R research team

Appendix I – Adult Temperament Questionnaire

Appendix J- University ethics approval

Appendix K- Power analysis

Appendix L- Analysis Plan

Appendix M- Submission requirements for target journal

Appendix A- Descriptive data for males recruited from samples 1 and 2.

	Male sample		Female sample	
Demographics:	**M**	**SD**	**M**	**SD**
Age	17.03	2.48	17.35	2.62
Negative life events				
Baseline	4.62	2.36	11.42	6.22
Pre-exam	.38	.92	.45	.89
Post-exam	.10	.44	.68	1.42
EC:				
Inhibitory control	4.82	.77	4.28	.86
Activational control	4.06	1.21	3.96	1.01
Attentional control	4.21	.75	3.82	.90
Total EC	4.39	.67	4.03	.74
RNT	24.00	10.24	28.71	10.35
DS				
Baseline	7.19	4.03	9.41	5.74
Pre-exam	9.33	10.62	11.60	7.32
Post-exam	6.10	6.24	9.72	6.64
Perceived stress:				
Baseline	3.62	2.58	6.35	2.28

Pre-exam	6.24	*2.83*	7.75	*1.46*
Post-exam	1.33	*2.17*	4.94	*2.84*

Appendix B- Demographic Questionnaire

Please tick boxes where appropriate

Below are 4 questions (a-d) that ask whether you are able to take part in the study. It will say below the questions whether you are able to take part.

a) **Do you have a diagnosed mental health difficulty (e.g. depression, anxiety. Diagnosis given by a trained professional, e.g. CAMHS, your GP)?**

Yes ☐   No ☐

If you answered yes to this question, you may still take part although we may not be able to include your information in the study.

b) **Do you have a learning difficulty? (not including dyslexia)**

Yes ☐   No ☐

If you answered yes to this question, you may still take part although we may not be able to include your information in the study.

c) **Have you had a head injury (in sports, or a car crash etc.) that made you dizzy and confused, or left you knocked out?**

Dazed/confused ☐   Knocked out ☐

If you answered yes to this question, you may still take part although we may not be able to include your information in the study.

d) **Are you fluent in English?**

Yes ☐   No ☐

If you answered no to this question, you may still take part although we may not be able to include your information in the study.

If any of your answers suggest that we might not be able to use your data, you can stop taking part in the study now. However, if you would still like to continue taking part for any reason, please do, but please be aware that your information may not be included in the final study.

If your answers suggest you can take part in the study, please continue answering our questions below.

1) Date of birth (dd/mm/yy):

....

2) Sex:

Female ☐   Male ☐

3) Year of school:

....

4) Marital status- Mother

Single ☐   Married ☐   Separated ☐

Divorced ☐   Remarried ☐   Widowed ☐

Other (please state)

....

5) Marital status- Father

Single ☐   Married ☐   Separated ☐

Divorced ☐   Remarried ☐   Widowed ☐

Other (please state)

....

6) Number of people living in your home:

....

Other (Please state)

....

11) Current employment status- Father:

Self-employed ☐   Homemaker ☐   Student ☐

Retired ☐   Unable to work ☐   Employed for wages ☐

Unemployed ☐   Volunteer ☐

Other (Please state)

....

12) Current occupation- Mother (only if employed):

....

13) Current occupation- Father (only if employed):

....

7) People living in your home (e.g. brother, sister etc.):

....

....

....

....

8) Highest level of education completed- Mother:

Primary school ☐   Secondary school ☐   College (16-18) ☐

Further training ☐   Undergraduate degree ☐   Postgraduate degree ☐
(E.g. NVQ)

Other (Please state)

....

9) Highest level of education completed- Father:

Primary school ☐   Secondary school ☐   College (16-18) ☐

Further training ☐   Undergraduate degree ☐   Postgraduate degree ☐
(E.g. NVQ)

Other (Please state)

....

10) Current employment status-Mother:

Self-employed ☐   Homemaker ☐   Student ☐

Retired ☐   Unable to work ☐   Employed for wages ☐

Unemployed ☐   Volunteer ☐

14) Does your Mother or Father have a diagnosed mental health difficulty?   (e.g. depression)?

Yes ☐   No ☐

Thank you for completing this questionnaire. Please turn to the next one.

Appendix C - Perseverative Thinking Questionnaire (PTQ)

Instruction: In this questionnaire, you will be asked to describe how you typically think about negative experiences or problems. Please read the following statements and rate the extent to which they apply to you when you think about negative experiences or problems.

		never	rarely	some-times	often	almost always
1.	The same thoughts keep going through my mind again and again.	0	1	2	3	4
2.	Thoughts intrude into my mind.	0	1	2	3	4
3.	I can't stop dwelling on them.	0	1	2	3	4
4.	I think about many problems without solving any of them.	0	1	2	3	4
5.	I can't do anything else while thinking about my problems.	0	1	2	3	4
6.	My thoughts repeat themselves.	0	1	2	3	4
7.	Thoughts come to my mind without me wanting them to.	0	1	2	3	4
8.	I get stuck on certain issues and can't move on.	0	1	2	3	4
9.	I keep asking myself questions without finding an answer.	0	1	2	3	4
10.	My thoughts prevent me from focusing on other things.	0	1	2	3	4
11.	I keep thinking about the same issue all the time.	0	1	2	3	4
12.	Thoughts just pop into my mind.	0	1	2	3	4
13.	I feel driven to continue dwelling on the same issue.	0	1	2	3	4
14.	My thoughts are not much help to me.	0	1	2	3	4
15.	My thoughts take up all my attention.	0	1	2	3	4

Appendix D- Email Conversations with Professor Ehring

Query regarding the PTQ-C   Report message · Block user

Erika Baker   Sep 27, 2015

Dear Professor Ehring,

Thank you very much for allowing me access to your paper assessing the
PTQ in children. I am developing a research study at the University of Exeter,
investigating RNT in adolescence and am interested in using the PTQ-C.
Would it be possible to have authorisation to use this measure, and if so, a
copy of the measure? I am aware you have investigated the use in
adolescents up to 15 years old, could I check whether any work has been
undertaken on older adolescents (to to 18 years?).
Many thanks and best wishes,

Erika Baker (PhD, Trainee Clinical Psychologist)

Thomas Ehring to you   Sep 28, 2015

Dear Erika
The child version was developed by Patricia Bijttebier at KU Leuven. If you
are interested in using this measure, you can best approach her for a copy.
When testing older adolescents, we have always used the original PTQ,
which works perfectly fine for adolescents, too. I think that the PTQ-C is
mainly useful for younger children.
Best,
Thomas

Erika Baker   Sep 29, 2015

Dear Professor Ehring,

Thank you very much, that's very helpful. We are testing older adolescents
and so the original PTQ sounds like the most appropriate measure. We would
be keen to use this in our study, would you be happy to authorise this, and if
so, direct me to where I can find a copy of the PTQ?

Many thanks,

Erika

Thomas Ehring to you   Sep 30, 2015

Please find attached a copy of the questionnaire. You are of course very
welcome to use it in your research.

Appendix E- Child and Adolescent Survey of Experiences (CASE)

1

Child and Adolescent Survey of Experiences: Child version (CASE)

This is questionnaire asks about events people may find bad or upsetting, as well as events people may find good or enjoyable. If an event **DID** happen to you in the **LAST 12 MONTHS**, tick the box under the word '**YES**'. You also need to tick a box to say **HOW GOOD** or **HOW BAD** the event was for you. If the event **DID NOT** happen to you, tick the box under '**NO**' and just skip to the next question. If you make a mistake, just cross out your answer and tick the correct box. <u>DO NOT use a pencil or liquid paper</u>.

Remember: if "Yes", the event did happen to you, also tick a box to show *how good or how bad* the event was for you. Write down the date 12 months ago:_____ In the last 12 months …	Yes	No	Really good	Quite good	A little good	A little bad	Quite bad	Really bad
1. We moved house…………………………………	☐	☐	☐	☐	☐	☐	☐	☐
2. I (or my team) won a prize, award or contest (e.g., school, sports, music, dance)………………	☐	☐	☐	☐	☐	☐	☐	☐
3. My parent(s) stayed away from home overnight (e.g., hospital, holiday, work)…………………	☐	☐	☐	☐	☐	☐	☐	☐
4. I got a new boyfriend or girlfriend………………	☐	☐	☐	☐	☐	☐	☐	☐
5. My parent(s) started a new job…………………	☐	☐	☐	☐	☐	☐	☐	☐
6. Someone special to me moved away……………… (who is <u>not</u> in your family)	☐	☐	☐	☐	☐	☐	☐	☐
7. Someone in my family was really sick or injured.	☐	☐	☐	☐	☐	☐	☐	☐
8. My parent(s) had a baby / found out they are going to have a baby…………………………	☐	☐	☐	☐	☐	☐	☐	☐
9. My parent(s) had to see my school principal……	☐	☐	☐	☐	☐	☐	☐	☐
10. I stayed away from home overnight (e.g., camp, trip, hospital)……………………	☐	☐	☐	☐	☐	☐	☐	☐
11. Someone came to live with our family………………	☐	☐	☐	☐	☐	☐	☐	☐
12. I was teased or bullied………………………………	☐	☐	☐	☐	☐	☐	☐	☐
13. My pet died, got sick, lost or injured………………	☐	☐	☐	☐	☐	☐	☐	☐
14. I had a big argument with someone in our family.	☐	☐	☐	☐	☐	☐	☐	☐
15. I was really sick or injured………………………	☐	☐	☐	☐	☐	☐	☐	☐
16. My parent(s) split up…………………………………	☐	☐	☐	☐	☐	☐	☐	☐
17. I did well in an important test or exam……………	☐	☐	☐	☐	☐	☐	☐	☐
18. My parent(s) lost their job…………………………	☐	☐	☐	☐	☐	☐	☐	☐
19. I broke up with a boyfriend or girlfriend…………	☐	☐	☐	☐	☐	☐	☐	☐

Running head: Effortful control, repetitive negative thinking
and depression in adolescence
139

2

		Yes	No	Really good	Quite good	A little good	A little bad	Quite bad	Really bad
	Write down the date 12 months ago:_____								
	In the last 12 months ...								
20.	I had a big argument with someone special to me (who is not in your family)..........................	□	□	□	□	□	□	□	□
21.	I made a new special friend..............................	□	□	□	□	□	□	□	□
22.	I saw something bad happen (e.g., car accident, someone being robbed)........	□	□	□	□	□	□	□	□
23.	I changed schools..	□	□	□	□	□	□	□	□
24.	Someone in my family died...............................	□	□	□	□	□	□	□	□
25.	People in my family had a big fight or argument (not including me)...	□	□	□	□	□	□	□	□
26.	My mum got married, engaged or began seeing someone else...	□	□	□	□	□	□	□	□
27.	Someone broke into my house...........................	□	□	□	□	□	□	□	□
28.	Someone in my family left home.........................	□	□	□	□	□	□	□	□
29.	I was in a fight (not with people in my family).......	□	□	□	□	□	□	□	□
30.	I did badly in an important test or exam...............	□	□	□	□	□	□	□	□
31.	Someone special to me died (who is not in your family).................................	□	□	□	□	□	□	□	□
32.	I was chosen to be class monitor, prefect or school captain...	□	□	□	□	□	□	□	□
33.	I was seriously told off or punished by a teacher.	□	□	□	□	□	□	□	□
34.	I took up a new hobby / sport / activity................	□	□	□	□	□	□	□	□
35.	I found out that I had to repeat a grade in school.	□	□	□	□	□	□	□	□
36.	Someone special to me was really sick or injured (who is not in your family).......................	□	□	□	□	□	□	□	□
37.	My dad got married, engaged, or began seeing someone else...	□	□	□	□	□	□	□	□
38.	I went on a special holiday (e.g., overseas, around Australia)......................	□	□	□	□	□	□	□	□
	Other upsetting or good events (please list):								
39.		□	□	□	□	□	□	□	□
40.		□	□	□	□	□	□	□	□

Appendix F- Perceived Stress Check

How are you currently feeling about your upcoming exams?

Question 1: *How stressed have you been feeling over the last couple of days?* (0= no stress, 10= highest levels of stress)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Question 2: *How stressed are you feeling about your exams?*

(0= no stress, 10= highest levels of stress)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Question 3: *How stressed are you currently feeling about other aspects of your life (not exam related)?*

(0= no stress, 10= highest levels of stress)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Question 4: *How much time do you currently spend worrying/feeling stressed about your exams?* (0= no time, 10= all of my time)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Appendix G- Revised Children's Anxiety and Depression Scale (RCADS)

Date: _____

Name/ID: _____

RCADS

Please put a circle around the word that shows how often each of these things happen to you. There are no right or wrong answers.

1. I worry about things	Never	Sometimes	Often	Always
2. I feel sad or empty	Never	Sometimes	Often	Always
3. When I have a problem, I get a funny feeling in my stomach	Never	Sometimes	Often	Always
4. I worry when I think I have done poorly at something	Never	Sometimes	Often	Always
5. I would feel afraid of being on my own at home	Never	Sometimes	Often	Always
6. Nothing is much fun anymore	Never	Sometimes	Often	Always
7. I feel scared when I have to take a test	Never	Sometimes	Often	Always
8. I feel worried when I think someone is angry with me	Never	Sometimes	Often	Always
9. I worry about being away from my parents	Never	Sometimes	Often	Always
10. I get bothered by bad or silly thoughts or pictures in my mind	Never	Sometimes	Often	Always
11. I have trouble sleeping	Never	Sometimes	Often	Always
12. I worry that I will do badly at my school work ..	Never	Sometimes	Often	Always
13. I worry that something awful will happen to someone in my family	Never	Sometimes	Often	Always
14. I suddenly feel as if I can't breathe when there is no reason for this	Never	Sometimes	Often	Always
15. I have problems with my appetite	Never	Sometimes	Often	Always
16. I have to keep checking that I have done things right (like the switch is off, or the door is locked)	Never	Sometimes	Often	Always
17. I feel scared if I have to sleep on my own.	Never	Sometimes	Often	Always
18. I have trouble going to school in the mornings because I feel nervous or afraid	Never	Sometimes	Often	Always
19. I have no energy for things	Never	Sometimes	Often	Always
20. I worry I might look foolish	Never	Sometimes	Often	Always
21. I am tired a lot	Never	Sometimes	Often	Always
22. I worry that bad things will happen to me	Never	Sometimes	Often	Always

Page 1

© 1996 Bruce F. Chorpita, Ph.D.

23. I can't seem to get bad or silly thoughts out of my head.	Never	Sometimes	Often	Always
24. When I have a problem, my heart beats really fast	Never	Sometimes	Often	Always
25. I cannot think clearly	Never	Sometimes	Often	Always
26. I suddenly start to tremble or shake when there is no reason for this	Never	Sometimes	Often	Always
27. I worry that something bad will happen to me . .	Never	Sometimes	Often	Always
28. When I have a problem, I feel shaky	Never	Sometimes	Often	Always
29. I feel worthless	Never	Sometimes	Often	Always
30. I worry about making mistakes	Never	Sometimes	Often	Always
31. I have to think of special thoughts (like numbers or words) to stop bad things from happening. . .	Never	Sometimes	Often	Always
32. I worry what other people think of me	Never	Sometimes	Often	Always
33. I am afraid of being in crowded places (like shopping centers, the movies, buses, busy playgrounds)	Never	Sometimes	Often	Always
34. All of a sudden I feel really scared for no reason at all	Never	Sometimes	Often	Always
35. I worry about what is going to happen	Never	Sometimes	Often	Always
36. I suddenly become dizzy or faint when there is no reason for this	Never	Sometimes	Often	Always
37. I think about death	Never	Sometimes	Often	Always
38. I feel afraid if I have to talk in front of my class	Never	Sometimes	Often	Always
39. My heart suddenly starts to beat too quickly for no reason	Never	Sometimes	Often	Always
40. I feel like I don't want to move	Never	Sometimes	Often	Always
41. I worry that I will suddenly get a scared feeling when there is nothing to be afraid of	Never	Sometimes	Often	Always
42. I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)	Never	Sometimes	Often	Always
43. I feel afraid that I will make a fool of myself in front of people	Never	Sometimes	Often	Always
44. I have to do some things in just the right way to stop bad things from happening	Never	Sometimes	Often	Always
45. I worry when I go to bed at night	Never	Sometimes	Often	Always
46. I would feel scared if I had to stay away from home overnight	Never	Sometimes	Often	Always
47. I feel restless	Never	Sometimes	Often	Always

Page 2

Appendix H- Email correspondence with the EATQ-R research team

Sat 19/09/2015 21:05
Baker, Erika
Query- EATQ-R

To   lellis@westminstercollege.edu

Dear Lesa Ellis,

I am designing a research study investigating effortful control with the University of Exeter, in 15-18 year olds and am interested in using one your research group's self report measures. I notice the EATQ-R is validated for use with 9-15 years olds, and the ATQ is with 18+. Do you have any validated measures for 15-18 year olds, or research that supports the use of these measures for this age range?

Many thanks and best wishes,

Erika

Erika Baker
Trainee Clinical Psychologist

Mon 21/09/2015 21:53
Lesa K. Ellis <lellis@westminstercollege.edu>
Re: Query- EATQ-R

To   Baker, Erika

Action Items   + Get more app

Hi Erika. I have used the EATQ-R with 16 and 17 year olds, and it worked well. It does have a lot of questions that are school related, however. The short version of the ATQ would probably work very well also. It is quite easy to understand. I don't know if anyone has published any studies using it in that age group, however.

I would probably look at both measures and pick the one that you feel would be most appropriate for your sample.

Lesa K. Ellis, Ph.D.

_____

Professor and Chair of Interdisciplinary Program in Neuroscience
Westminster College
(801)832-2425

Appendix I – Adult Temperament Questionnaire

(VERSION 1.3)

Directions

On the following pages you will find a series of statements that individuals can use to describe themselves. There are no correct or incorrect responses. All people are unique and different, and it is these differences which we are trying to learn about. Please read each statement carefully and give your best estimate of how well it describes you. Circle the appropriate number below to indicate how well a given statement describes you.

circle #:	if the statement is:
1	extremely untrue of you
2	quite untrue of you
3	slightly untrue of you
4	neither true nor false of you
5	slightly true of you
6	quite true of you
7	extremely true of you

If one of the statements does not apply to you (for example, if it involves driving a car and you don't drive), then circle "X" (not applicable). Check to make sure that you have answered every item.

EFFORTFUL CONTROL

Inhibitory Control

13.   If I want to, it is usually easy for me to keep a secret.

28.   It is easy for me to hold back my laughter in a situation when laughter wouldn't be   appropriate.

41R.   When I see an attractive item in a store, it's usually very hard for me to resist buying it.

55.   I can easily resist talking out of turn, even when I'm excited and want to express an idea.

64.   When I decide to quit a habitual behavioral pattern that I believe to be undesirable, I am usually successful.

86R.   When I'm excited about something, it's usually hard for me to resist jumping right into it   before I've considered the possible consequences.

107.   Even when I feel energized, I can usually sit still without much trouble if it's necessary.

128R.   I often avoid taking care of responsibilities by indulging in pleasurable activities.

140R. At times, it seems the more I try to restrain a pleasurable impulse (e.g., eating candy), the more likely I am to act on it.

147R. I usually have trouble resisting my cravings for food drink, etc.

172.   It is easy for me to inhibit fun behavior that would be inappropriate.

Activation Control

32.   I usually finish doing things before they are actually due (e.g., paying bills, finishing homework, etc.).

50R.   I am often late for appointments.

62R.   I often make plans that I do not follow through with.

84.   As soon as I have decided upon a difficult plan of action, I begin to carry it out.

96.   If I think of something that needs to be done, I usually get right to work on it.

109.   I can make myself work on a difficult task even when I don't feel like trying.

117R. Even when I have enough time to complete an activity today, I often tell myself that I will do it tomorrow.

138R. If I notice I need to clean or wash something (e.g., car, apartment, laundry, etc.), I often put it off until tomorrow.

149R. I hardly ever finish things on time

153.   I usually get my responsibilities taken care of as soon as possible.

156R. When I am afraid of how a situation might turn out, I usually avoid dealing with it.

177.   I can keep performing a task even when I would rather not do it.

Attentional Control

Attentional Shifting from Punishment

43R.   When I am sad about something, it is hard for me to keep my attention focused on a task.

71R.   When I am anxious about the outcome of something, I have a hard time keeping my attention focused on a task.

112R. It is very hard for me to focus my attention when I am distressed.

Attentional Shifting from Reward

15R.   When I am happy and excited about an upcoming event, I have a hard time focusing my attention on tasks that require concentration.

89R.   When I am especially happy, I sometimes have a hard time concentrating on tasks that require me to keep track of several things at once.

131R. When I hear good news, my ability to concentrate on taking care of my responsibilities goes out the window.

Attentional Focusing

6R.   When I am trying to focus my attention, I am easily distracted.

24R.   When trying to focus my attention on something, I have difficulty blocking out   distracting thoughts.

53R.   When trying to study something, I have difficulty tuning out background noise and concentrating.

Attentional Shifting

35.   When interrupted or distracted, I usually can easily shift my attention back to whatever I was doing before.

68.   I am usually pretty good at keeping track of several things that are happening around me.

175R. It's often hard for me to alternate between two different tasks.

Appendix J- University ethics approval

apache@exeter.ac.uk on behalf of Ethics Approval System <D.M.Salway@exeter.ac.uk>   👍   ↱ Reply all | ∨
Wed 3/23/2016, 12:10 PM
Stephens, Claire ∨

You forwarded this message on 4/30/2017 5:59 PM

Action Items

Ethical Approval system

Your application (2016/1166) entitled Exploring the relationship between executive functions, effortful control, repetitive negative thinking and depression in mid-late adolescence, during and following exam stress has been conditionally accepted

Please visit http://www.exeter.ac.uk/staff/ethicalapproval/

Please click on the link above and select the relevant application from the list. The conditions are as follows:

Please indicate where participants will provide contact details (phone number) and the tick box about being happy to be contacted on the basis of their RCADS score.Please confirm that participants who do the behavioural measures will be debriefed subsequently.

Appendix K- Power analysis

The sample size was calculated a priori using G-power for both a

correlational analysis and a multiple regression (fixed model, R² increase).

Assuming a Type I error rate (α) of .05 and Type II error rate (β) of .20, the

desired power is .80. Power was assessed for the maximum number of

predictors in the model (N= 6). Previous studies investigating relevant

hypotheses have found a range of effect sizes in their results and most employ

correlational designs. As a result, few studies utilise hierarchical linear

regression to explore the relationships between RNT, EC, depression and

stress in adolescents. Muris and colleagues found that self report measures of

EC in 207 non-clinical older children (8-12 years olds) were negatively

correlated with self report anxiety (r = -.62, p<.001) and depression (r = -.57,

p<.001) (Muris, van der Pennen, Sigmond, & Mayer, 2008), which indicate large

effect sizes (Cohen, 1992). A study by Verstraeten and colleagues found small

to medium effect sizes with correlations of self report EC and self report

depressive symptoms (r = -.39, p<.001), and self report rumination (r = -.22,

p<.001) in 12-18 year olds (Verstraeten, Vasey, Raes, & Bijttebier, 2009). In a

study investigating EC and depression and anxiety in 18 year olds, they found

small to medium effect sizes (depression, r = - .16, p<.05; anxiety, r = -.28,

p<.001). These findings highlight small to large effects, however as they are

correlational and the current study is using a regression analysis, it is difficult to

make inferences on the power required for the current study.

The study by Verstraeten and colleagues (2009) also investigated EC as

a moderator of negative effect and depression, finding a small effect size (f2 =

.015, calculated by an R2 increase= .01 and R2 =.34). However, other

predictors were also included in this step, and so not all variance is explained

by EC. Hilt and colleagues (2012) investigated the role of EC on the

development of rumination and depression in adolescence, with a longitudinal

design. Using regression analysis, they found a small-medium effect (f2 = .07,

calculated by an R2 increase= .06 and R2 =.16), however again this is based

on multiple interactions in one step. Based on the effect sizes in these studies,

and our knowledge that interactions are often small-medium in size in

psychology research (Ferguson, 2009), a small-medium effect size will be

adopted in this study. There is a risk that the due to other similar studies

including multiple interactions at each step, and therefore our target variables

not accounting for all of the variance in the step, that we will not achieve the

power of .80. Due to the longitudinal design, a conservative estimate of attrition

across the time points of 20% (based on consultation discussions) will be

incorporated into the calculation, and the study will aim to over-recruit to

increase power. The target sample size for the study is N= 146. This sample

size has been achieved in previous DClinPsy research using a questionnaires

design (personal communication with Dr Chan).

Appendix L- Analysis Plan

ANOVAs. Repeated measures ANOVAs will be used to explore

perceived stress over time.

Correlations. Pearson's rank correlations will be performed across time

points to examine associations between variables and across time points.

Correlations will also be performed to explore the associations between

demographic factors and variables across time.

Hierarchical Linear Regression. Separate hierarchical linear regression

analyses were run to test hypotheses for emotional reactivity to stress and

emotional recovery from stress.

1.   A hierarchal linear regression exploring whether levels of EC at T1

will interact with RNT at T1 to predict depression symptoms at T2 (criterion

variable): T1 depressive symptoms, sample and adverse life events, RNT at T1,

EC at T1, T1 EC moderation interaction with Trait RNT T1, control sample

interactions.

2.   A hierarchal linear regression exploring whether levels of EC at T1

will interact with RNT at T1 to predict depression symptoms at T3 (criterion

variable): T2 depressive symptoms, sample and adverse life events, RNT at T1,

EC at T1, T1 EC moderation interaction with RNT T1, control sample

interactions.

Moderation Analysis. Moderation analysis exploring whether EC at

Baseline will interact with Baseline RNT in predicting variance in subsequent

depression symptoms, for emotional reactivity and recovery.

Appendix M- Submission requirements for target journal

Submission requirements for Clinical Psychological Science

Clinical Psychological Science publishes advances in clinical

science and provides a venue for cutting-edge research across a wide

range of conceptual views, approaches, and topics. This bimonthly

journal encompasses many core domains that have defined clinical

psychology, but also boundary-crossing advances that integrate and

make contact with diverse disciplines and that may not easily be found in

traditional clinical psychology journals. Among the key topics are research

on the underlying mechanisms and etiologies of psychological health and

dysfunction; basic and applied work on the diagnosis, assessment,

treatment, and prevention of mental illness; service delivery; and

promotion of well-being. Articles are published in OnlineFirst before they

are assigned to an issue. This journal is a member of the <u>Committee on

Publication Ethics (COPE)</u>.

Submission of Manuscripts and Journal Emphases

Before submitting a manuscript to *Clinical Psychological Science*,
please read the journal's <u>Aims and Scope</u>, Alan E. Kazdin's <u>January 2014
editorial</u>, and Scott Lilienfeld's <u>2016 editorial</u>, as well as the guidelines
below.
Manuscripts must be submitted through *Clinical Psychological
Science*'s submission website at <u>http://mc.manuscriptcentral.com/cpx</u>.

The journal does not require masked review, i.e., that the authors names be omitted from the submitted manuscript. Thus, authors' names and affiliations should be listed on the manuscript title page.

The manuscript will be evaluated in relation to the advancement of and contribution to clinical psychological science. To facilitate this evaluation, authors are asked to answer the following questions during the "Details & Comments" stage of the online submission process:

- What is the substantive, conceptual, or methodological contribution to knowledge that this work provides to the literature?

- How does this contribution and any conclusions or recommendations derived from it add to clinical psychological science?

To wit, authors should indicate precisely what in the submitted manuscript makes an important scientific contribution to clinical psychology and related fields (e.g., psychiatry, counseling psychology, social work, public health). The answers to these questions will help editorial staff and reviewers attend to the issues the authors see as the salient contribution. As importantly, the questions are designed to help authors to include the thrust of the question in the storyline of the manuscript itself and to decide whether the journal is the most appropriate outlet.