

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth



The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder.

Donna O'Connor

Supervised by
Dr Pierce O'Carroll
Dr Catrin Eames
Dr Gundi Kiemle

June 2017

Submitted in partial fulfilment of the Doctorate in Clinical Psychology,
University of Liverpool

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Acknowledgements

I would like to thank everyone who supported me in the completion of this project.

Thank you to my supervisors: Dr Pierce O'Carroll, Dr Catrin Eames, Dr Gundi Kiemle for all of their help, support, advice and feedback. Also thank you to Dr Valentina Lorenzetti for having the patience to explain statistics to me in a way I could comprehend, and to Andrew Jones for de-mystifying the process of conducting a meta-analysis. Finally, I would like to thank my classmates who have been an incredible source of support and friendship over the past three years, I've been honoured to be part of such a wonderful group.

Evaluating the evidence for the role of deliberate rumination in the development of
posttraumatic growth

Table of Contents

Introductory Chapter: Thesis Overview.....	1
References	5
Chapter 1: Literature Review	7
Abstract.....	8
Introduction	9
<i>Rationale for the review</i>	13
Method.....	14
<i>Protocol</i>	14
<i>Information Sources</i>	14
<i>Search Terms</i>	14
<i>Eligibility Criteria</i>	15
<i>Data Extraction</i>	17
<i>Quality Appraisal</i>	17
<i>Data Synthesis and Analysis</i>	18
Results	19
<i>Study Characteristics</i>	19
<i>Study Quality</i>	25
<i>Meta-analysis</i>	29
<i>Subgroup analysis: Quality analysis</i>	31
<i>Subgroup analysis: Trauma category</i>	32
Discussion.....	34
<i>Findings</i>	34
<i>Limitations of the studies</i>	34
<i>Strengths of the studies</i>	36
<i>Clinical implications</i>	37
<i>Limitations of the Review & Future Research</i>	38
<i>Conclusions</i>	39
References	40

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Chapter 2: Empirical Paper	48
Abstract.....	49
Introduction	50
<i>Trauma</i>	50
<i>Posttraumatic Growth</i>	51
<i>Cognitive Processes and Posttraumatic Growth</i>	53
<i>Spirituality</i>	53
<i>Current study and Hypotheses</i>	54
Method.....	56
<i>Participants</i>	56
<i>Design</i>	59
<i>Ethics</i>	59
<i>Statistical Power</i>	59
<i>Measures</i>	59
<i>Procedure</i>	62
<i>Data cleaning</i>	63
<i>Missing data</i>	63
<i>Testing assumptions</i>	63
<i>Data analysis</i>	64
Results	65
<i>Descriptive statistics</i>	65
<i>Correlations</i>	66
<i>Hierarchical regression</i>	71
<i>Moderation analysis</i>	72
Discussion.....	74
<i>Findings</i>	74
<i>Limitations</i>	76
<i>Implications</i>	78
<i>Future research</i>	79
<i>Conclusion</i>	80
References	81

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Appendix.....	91
---------------	----

List of Tables

Chapter 1.

<i>Table 1: Summary of study characteristics</i>	21
<i>Table 2: Quality Assessment of studies</i>	27
<i>Table 3: Mixed effect analysis of higher and lower quality subgroups</i>	31
<i>Table 4: Mixed effect analysis of trauma subgroups</i>	33

Chapter 2.

<i>Table 1: Description of participant demographics and trauma data</i>	58
<i>Table 2: Mean & SD scores of main variables</i>	66
<i>Table 3: Correlation matrix of all variables including subscales</i>	69
<i>Table 4: Linear model of predictors of PTG</i>	71
<i>Table 5: Summary of hierarchical regression models</i>	73

List of Figures

Chapter 1.

<i>Figure 1: Theoretical model of PTG (Calhoun & Tedeschi, 2006)</i>	12
<i>Figure 2: PRISMA flow diagram of articles included in meta-analysis</i>	16
<i>Figure 3: Forest Plot of the 13 studies suitable for meta-analysis</i>	30
<i>Figure 4: Funnel plot to check for publication bias</i>	30
<i>Figure 5: Forest plot of quality subgroup analysis</i>	32
<i>Figure 6: Forest plot of trauma subgroup analysis</i>	33

Chapter 2.

<i>Figure 1: Flow diagram of participation in the study</i>	57
<i>Figure 2: Simple slopes line graph of levels of spirituality</i>	73

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

List of Appendices

Appendix A: <i>PRISMA Protocol</i>	91
Appendix B: <i>QATOCC Quality assessment tool</i>	93
Appendix C: <i>Author guidelines for Journal of Positive Psychology</i>	95
Appendix D: <i>Ethical Approval</i>	96
Appendix E.: <i>The Posttraumatic Stress Diagnostic Scale</i>	97
Appendix F: <i>The Event Related Rumination Inventory</i>	99
Appendix G: <i>The Post Traumatic Growth Inventory – Short Form</i>	101
Appendix H: <i>The Expressions of Spirituality Inventory- Revised</i>	102
Appendix I: <i>Project Advertisement</i>	103
Appendix J: <i>Participant Information Sheet</i>	104
Appendix K: <i>Participant Consent Form</i>	106
Appendix L: <i>Demographic Questionnaire</i>	107
Appendix M: <i>Debrief Form</i>	109

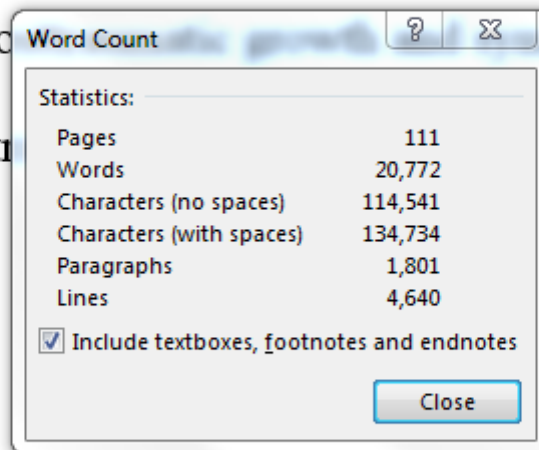
Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Word Count: 20, 772

the role of repetitive thinking and spirituality in the

development of posttraumatic growth symptoms of

posttraumatic



Supervised by
Dr Pierce O'Carroll
Dr Catrin Eames
Dr Gundi Kiemle

Introductory Chapter: Thesis Overview

Historically, emotion has been viewed as existing on a spectrum, from positive to negative, and traditionally psychology has focused mainly on negative affect. However, more recent theories of ‘dual emotional space’ (Vazquez, 2017, p.325), hypothesise that positive and negative emotions are independent of each other and can co-exist. Interest in the more positive dimension of psychology has grown in recent years (Seligman & Csikszentmihalyi, 2000). This is due to clinicians and researchers alike, beginning to recognise that investigating mental distress “without incorporating positive elements could be scientifically flawed” (Vazquez, 2017, p.325), and could potentially be experienced as invalidating by the service users and research participants with whom we work.

The shift in focus to the positive has occurred in many areas of psychology, one of which is the subject of trauma. It is a common held belief that “what doesn’t kill you makes you stronger”, and recently science has been able to provide empirical evidence to demonstrate that there is some truth to the proverb. The phenomenon has been termed ‘posttraumatic growth’ (PTG; Tedeschi & Calhoun, 1995). It has even been reported that the experience of PTG is far more common than the experience of psychological disorders in the aftermath of a trauma (Tedeschi, 1999). The development of PTG is associated with a particular type of thinking process known as deliberate rumination (DR), which involves purposefully and engaging in the cognitive processing of the event. Religion has been associated with both PTG and

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

DR (Bosson, Kelley & Jones, 2012). This is believed to be due to religion providing a framework with which to make sense of the world and find meaning in distress.

However, the Office for National Statistics (ONS; 2012) report that religious affiliation in England and Wales is decreasing, with the number of people who report having no religion almost doubling between 2001 and 2011 (from 14.8% to 25.1%).

To reflect the changing beliefs of the population, Bryan, Graham and Roberge (2015) argue that religion and spirituality need to be differentiated to be inclusive of those who hold meta-physical beliefs, unaffiliated with organized religion. To date no studies have examined the link between the cognitive processes involved in trauma outcomes and spiritual beliefs.

Literature Review

Chapter one of this thesis is a critical review of the literature and meta-analysis of recent quantitative empirical research, aimed at synthesising the evidence for the relationship between PTG and DR. Although it has been widely reported by many individual studies that DR is a major cognitive process involved in the development of PTG, no meta-analysis of the data exists to consolidate the research findings.

Fifteen studies were selected to be included in the systematic review and thirteen studies were entered into a meta-analysis. Two post-hoc sub-group analyses were also conducted to determine if the large variance found was due to either quality or trauma categorisation. The results of the meta-analysis demonstrated a significant relationship between PTG and DR. However, large variance was found across the studies, which the subgroup analysis revealed was most likely due to limitations in terms of methodological quality.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Empirical Paper

Chapter two of this study aimed to investigate if a relationship exists between spirituality DR in relation to PTG, and to test if spirituality moderates the relationship between these two constructs. In addition, the study explored if an association exists between spirituality and posttraumatic stress disorder (PTSD) and its associated cognitive process of intrusive rumination (IR). It also examined if spirituality moderates the relationship between PTSD and IR. Ninety-six students from the University of Liverpool completed four online questionnaires; The Posttraumatic stress Diagnostic Scale (Foa, 1995) the Event Related Rumination Inventory (Cann et al., 2011), the Posttraumatic Growth Inventory-Short Form (Cann et al., 2010), and the Expressions of Spirituality Inventory- Revised (MacDonald, 2000). The findings indicated that spirituality was significantly related to both DR and PTG and was a significant moderator in the relationship between the two. However, no relationship was found between spirituality and PTSD or IR and it did not moderate the relationship between them.

Main conclusions

The findings of the literature review section of this thesis have substantiated the existing literature regarding the relationship between DR and PTG, although it has also highlighted a number of methodological limitations in the available research. In addition, the empirical paper has provided evidence for spirituality being a moderator in the relationship between DR and PTG, with the strength of the association increasing as levels of spirituality increase. However, no relationship was found between spirituality and negative trauma outcomes.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Author's role

The author's interest in the subject of this thesis arises from personal experience of a trauma. The experience resulted in the loss of faith in a belief system which had previously provided me with a framework with which to make sense of the world, find meaning in experience, find the positives in distressing experiences and grow and develop psychologically. When I lost that framework, I struggled to find meaning in my life, I no longer believed in a benevolent and protective spirit, I became too angry to want to grow from my experience, psychologically I felt stuck and stagnant and as a result I developed mental health problems. When I first read about the concept of PTG, it reminded me of how much I used to believe in the old adage of "what doesn't kill you makes you stronger", and was curious to know why I no longer experienced this phenomenon in my own life. I believe that if I had managed to hold onto my faith during that time it could have assisted me in using the traumatic experience to help me grow and develop. As a result of this, I became interested in investigating the link between PTG and spirituality. This combined with my primary supervisor's interest in cognitive processes and thus the idea for this thesis emerged.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

REFERENCES

- Bosson, J. V., Kelley, M. L., & Jones, G. N. (2012). Deliberate cognitive processing mediates the relation between positive religious coping and posttraumatic growth. *Journal Of Loss And Trauma, 17*(5), 439-451.
- Bryan, C. J., Graham, E., & Roberge, E. (2015). Living a life worth living: Spirituality and suicide risk in military personnel. *Spirituality in Clinical Practice, 2*, 74– 78.
- Cann, A, Calhoun, L.G., Tedeschi, R.G., Taku, K., Vishnevsky, T., Triplett, K.N., & Danhauer, S.C. (2010). A short form of the Posttraumatic Growth Inventory. *Anxiety Stress Coping, 23*(2), 127-37.
- Cann, A., Calhoun, L. G., Tedeschi, R. G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C. M. (2011). Assessing posttraumatic cognitive processes: the Event Related Rumination Inventory. *Anxiety, Stress & Coping, 24*(2), 137-156.
- Foa, E. B. (1995). *Posttraumatic Stress Diagnostic Scale Manual*. United States of America: National Computer Systems, Inc.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

MacDonald, D. A. (2000). Spirituality: Description, Measurement, and Relation to the Five Factor Model of Personality. *Journal Of Personality*, 68(1), 153-197.

Office for National Statistics. (2012). *Religion in England and Wales, 2011*. London: Office for National Statistics. Available for download from <https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/religion/articles/religioninenglandandwales2011/2012-12-11>.

Overcash, W. S., Calhoun, L. G., Cann, A., & Tedeschi, R. G. (1996). Coping with crises: An examination of the impact of traumatic events on religious beliefs. *Journal of Genetic Psychology*, 157, 455–464.

Seligman, M., & Csikszentmihalyi, M. (2014). *Positive psychology: An introduction*. Netherlands: Springer.

Tedeschi, R. G. (1999). Violence transformed. Posttraumatic growth in survivors and their societies. *Aggression and violent behaviour: A Review Journal*, 4, 319-341.

Tedeschi, R. G., & Calhoun, L.G. (1995). *Trauma and transformation, growing in the aftermath of suffering*. Thousand Oaks, CA: Sage Publications.

Vazquez, C. (2017). What does Positivity Add to Psychopathology? An Introduction to the Special Issue on ‘Positive Emotions and Cognitions in Clinical Psychology’. *Cognitive Therapy And Research*, 1-10.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Chapter 1: Literature Review

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Abstract

The phenomenon of positive psychological consequences of trauma, known as posttraumatic growth (PTG), is believed to develop as a result of purposeful thinking about the event, known as deliberate rumination (DR). **Method:** A systematic review and meta-analysis was conducted on the empirical research, to provide a clearer picture of the strength of the association between these two constructs. Fifteen studies were identified as meeting the criteria for the review. **Results:** All studies reported evidence of a positive relationship between PTG and DR. Large variance was found across the studies in terms of their definition of trauma and timing criteria and many limitations of methodological quality were found. Thirteen studies were entered into a meta-analysis. A significant but moderate relationship ($r=0.486$, 95% CI = 0.40-0.56, $Z=9.66$, $p<0.0001$) was found to support this relationship. **Conclusions:** Issues of study quality and high variance suggest that more methodologically robust, empirical studies are recommended to further our understanding of the relationship between PTG and DR.

Keywords: Trauma, posttraumatic growth, deliberate rumination, cognitive processes, meta-analysis, systematic review.

Introduction

Positive psychology, first introduced by Seligman and Csikszentmihalyi (2000) is an emerging field which gives equal focus to the positive and negative consequences of psychological distress. Through clinical research and practice, it aims to expand the focus beyond the relief of suffering in order to understand and facilitate psychological potential (Wood & Tarrrier, 2010). One area in which this shift has occurred is in the study of trauma, where positive psychological change in the aftermath of a traumatic event has been reported to far outnumber reports of psychological disorders (Tedeschi, 1999). Beliefs regarding adversity being a catalyst for psychological growth are found in many cultures worldwide (Tedeschi & Calhoun, 1995), and over the past two decades, research has provided scientific evidence to support this belief, by investigating the positive psychological consequences of trauma, known as posttraumatic growth (PTG; Tedeschi & Calhoun, 1995). PTG is sometimes referred to in the literature as adversarial growth, stress-related growth, or benefit finding; however, the more common term of PTG will be used for the purpose of this review, unless otherwise specified by a particular paper.

PTG first requires the experiencing of a traumatic event, which the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-V*; American Psychiatric Association [APA], 2013) defines as an event in which an individual is directly or indirectly exposed to, or witness to, actual or threatened death, injury or violence. Tedeschi and Calhoun (2004) theorise that in order for PTG to occur, the traumatic event must also be ‘seismic’ enough to threaten an individual’s core beliefs and

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

assumptions about the self, others and/or the world (Janoff-Bulman, 1992). “It is through this process of struggling with adversity that changes may arise that propel the individual to a higher level of functioning than which existed prior to the event” (Linley & Joseph, 2004, p. 11). Higher levels of psychological functioning have been proposed to occur in the following five domains of life: 1) Greater appreciation of life and changed sense of priorities; 2) Warmer, more intimate relationships; 3) A greater sense of personal strength; 4) Recognition of new possibilities; and 5) Spiritual development (Tedeschi & Calhoun, 1996).

PTG has been linked with a broad range of positive physical and mental health and well-being outcomes (e.g. Helgeson, Reynolds & Tomich, 2006). It has been found to develop in the aftermath of a wide variety of traumatic events, particularly in relation to Type I traumas, i.e. incidents that occur once and then stop, for example war, bereavement, natural disasters, assault (Kira, Aboumediene, Ashby, Odenat, Mohanesh, & Alamia, 2013). Understanding the potential for positive growth following a trauma is important in a theoretical sense in order to gain a comprehensive understanding of the impact of trauma (Linley & Joseph, 2004). It is also important in a clinical sense for providing clients with a sense of hope and enabling therapists to identify and encourage the factors associated with PTG in order to assist its development.

Calhoun and Tedeschi (2006) developed a model of PTG (see Figure 1), illustrating the psychosocial mechanisms hypothesised to contribute to the development of PTG. The model proposes that subjective severity of a traumatic event activates emotional distress (Widows, Jacobsen, Booth-Jones & Fields, 2005). In an attempt to make

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

sense of and relieve the distress, ruminative thinking regarding the event and its meaning is required. Rumination is defined as “a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms” (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008, p. 400). Two types of rumination have been identified as playing a significant role in the development of PTG: intrusive and deliberate. Intrusive rumination (IR), defined by involuntary automatic thoughts, has been identified in the literature as being associated more with psychological distress. However IR is believed to prompt gradual engagement with more deliberate rumination (DR), which is considered to be a more purposeful engagement in the reflection process. DRs are hypothesised to facilitate meaning, rebuild shattered assumptions (Janoff-Bulman, 1992) and lead to the development of PTG (Kolokotroni, Anagnostopoulos & Tsikkinis, 2014). It is this link between deliberate rumination and PTG (highlighted in red in Figure 1) that this review aims to evaluate the existing evidence for.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

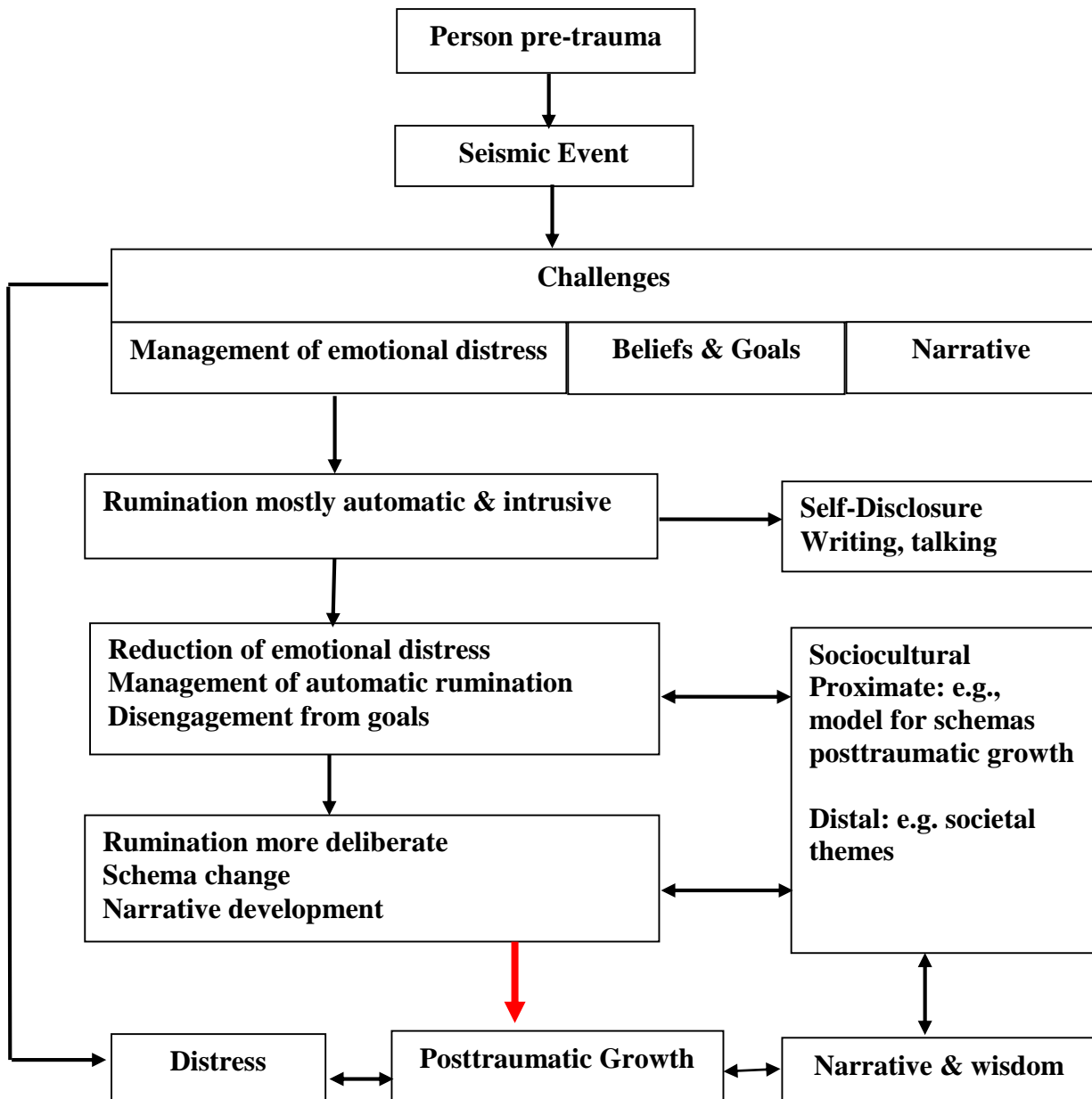


Figure 1. Calhoun and Tedeschi's (2006) theoretical model of Posttraumatic Growth

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Rationale for the review

A number of questionnaires exist that aim to measure rumination, e.g. the Ruminative Thought Style Questionnaire (Brinker & Dozois, 2009) and the Ruminative Responses Scale (Nolen-Hoeksema, 1991), and many papers have used these scales to measure the construct in relation to PTG. However most of these measure a general tendency to ruminate or measure rumination in response to depression. To date, there is only one questionnaire (which the author was able to find through a scoping search) that measures intrusive and deliberate rumination response to a specific and traumatic event: the Event Related Rumination Inventory (ERRI; Cann et al., 2011). As this is deemed to be the only measure found to be fit for purpose, it was therefore decided that only papers using this measure be included in the review.

Existing reviews have mainly investigated the phenomenon of PTG in relation to specific types of trauma such as cancer (Kolokotroni & Anagnostopoulos, 2014), HIV (Sherr, Nagra, Kulubya, Clucas, Catalan & Harding, 2011), bereavement (Michael & Cooper, 2013), brain injury (McGrath, 2011) and interpersonal trauma (Ulloa, Hammett, Guzman & Hokoda, 2015). These reviews have also looked at a combination of environmental, demographic and psychosocial factors. A scoping review of the literature revealed no published papers that focused solely on rumination across a range of trauma types and none that conducted a meta-analysis of the existing data regarding the relationship between DR and PTG. As the construct of PTG is now over 20 years old, a systematic review and meta-analysis evaluating the evidence for the role DR plays in the development of PTG across a range of trauma types is believed to be timely.

Method

Protocol

The Preferred Method for Reporting Systematic Reviews and Meta Analyses (PRISMA; Moher, Liberati, Tetzlaff & Altman, 2009) guidelines were followed in the search strategy and reporting of this review (see Appendix A for protocol).

Information Sources

Published and peer reviewed papers were identified using the following electronic databases: PsycINFO, PubMed, MEDLINE, Scopus, Web of Science. In addition, gray literature, unpublished dissertations, Google Scholar and the reference lists of each identified paper were used to source additional relevant papers.

Search Terms

As recommended in previous reviews of PTG (e.g., Prati & Pietrantonio, 2009), the following spelling and synonyms of posttraumatic growth were used as search terms: “PTG” OR “posttraumatic growth” OR “post traumatic growth” OR “post-traumatic growth” OR “positive life change” OR “positive growth” OR “psychological growth” OR “growth from adversity” OR “adversarial growth” OR “growth” OR “thriving” OR “benefit finding” OR “stress-related growth”. As the ERRI measure was identified as a necessary inclusion, the only search terms used for rumination were those relating to the “event related rumination inventory” OR “ERRI”. These two terms were searched by selecting the “Also search within the full-text of articles” option in the search engines to capture all papers using this measure. As the ERRI

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

(Cann et al., 2011) was published in 2011, only papers published after this time were included when searching all PTG and rumination terms. The search was carried out in December 2016.

Eligibility Criteria

Papers were initially screened by title and abstract, those making no clear reference to cognitive processes and posttraumatic growth were excluded. Following this, each article's full text was screened using the following eligibility criteria: Empirical papers were included provided they were i) quantitative in design, ii) cross-sectional, iii) English language text was available, iv) they included the 21 item version of the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), v) included the ERRI (Cann et al., 2011) and vi) used an adult sample. Exclusion criteria were i) qualitative designs, ii) data collected at more than one time point iii), anything that was not new data (for example other reviews and editorials), iv) studies including children or adolescent populations, v) papers reporting the psychometric properties of scales and vi) any version of the PTGI other than the 21 item version (for the purposes of a more robust investigation). Figure 2 illustrates the systematic selection process.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

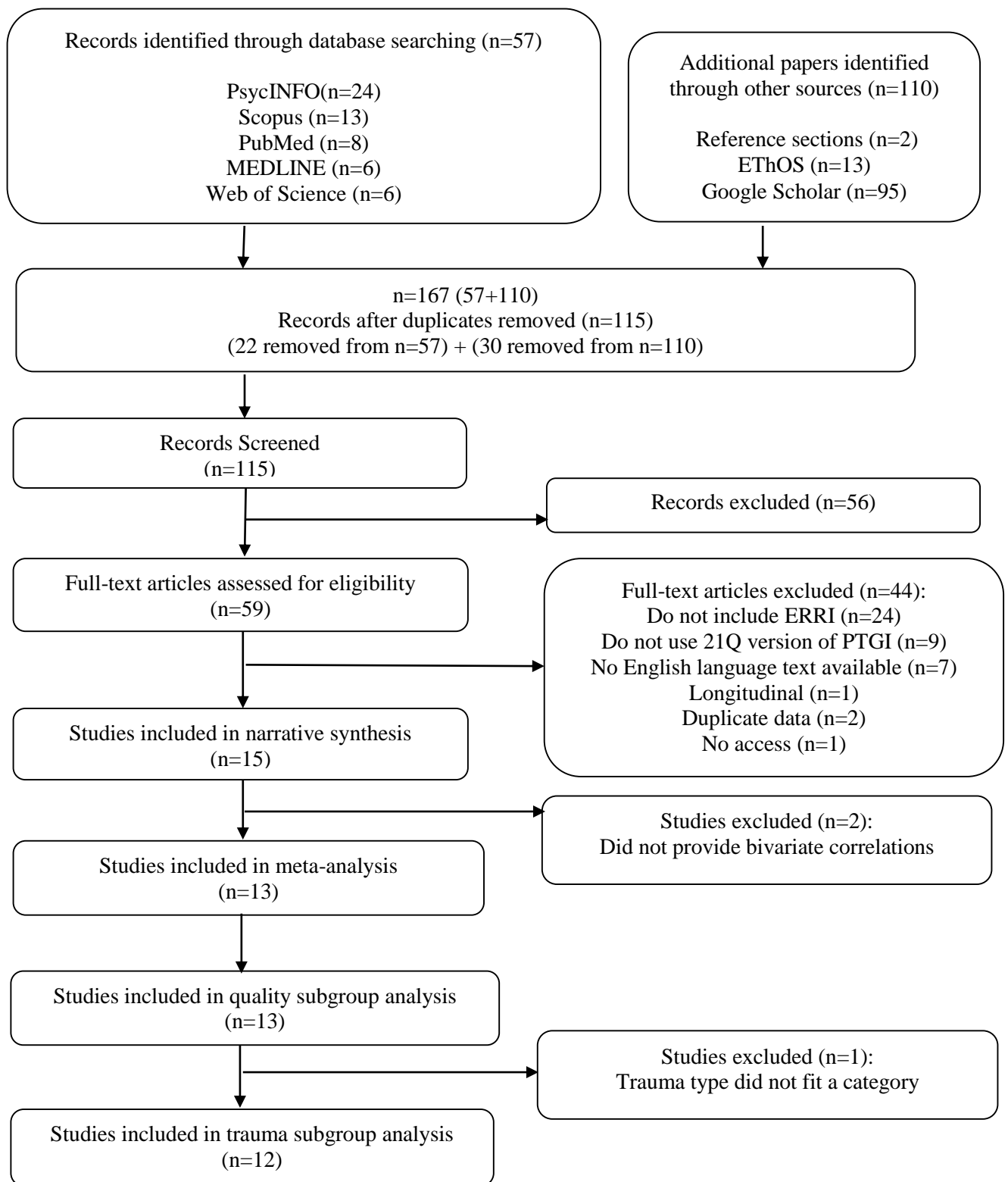


Figure 2: PRISMA flow diagram of articles included in meta-analysis

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Data Extraction

Data were extracted by the first author (DO) and an independent reviewer (AA). Inconsistencies between reviewers were resolved through discussion with the supervisor (CE). Extracted data included study details, namely author, date, location, aims, analysis, sample size, sample characteristics, trauma type, time since trauma and main findings of each study relevant to the review question.

Quality Appraisal

As all of the studies were cross-sectional in design, the National Institute of Health's Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (QATOCC; National Institute of Health [NIH], 2014), designed specifically for this purpose was chosen to assess the methodological quality of papers (see Appendix B). The tool's authors advised that two of the 14 items on the QATOCC scale do not apply to cross-sectional studies (items six and seven); these were therefore removed. As all of the papers were retrospective self-report studies, items 8, 10, 12 and 13 (regarding exposure levels, longitudinal data, blinding and attrition rates respectively) were also found not to be relevant and were removed. Each item was graded as 'Yes', 'No', 'Partial' (added in by the quality assessors as a non-dichotomous option was found to be necessary), NA (not applicable), NR (not reported) or CD (cannot determine). Numerical scores (Yes=1, Partial=.5, NA=0, No=0, NR=0 and CD=0) are not recommended by the authors of the tool; however, they have been used in previous reviews (e.g. Russo, Suen, Bedaiwy & Chen, 2016) as a guide for grading papers. This previously used grading system was scaled down to fit the adapted

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

version of the tool: *good* (total > 5.9), *fair* (<5.8 total > 3.1), or *poor* (total <3).

Quality ratings were compared by the two raters (DO and AA) and discrepancies were discussed and resolved with the primary supervisor (CE).

Data Synthesis and Analysis

Due to each paper using the same measures of PTG and DR, a meta-analysis was conducted to combine the data to produce meaningful results. The Hedges-Olkin random-effects model was deemed to be the most suitable model of meta-analysis for this data due to differences in participant characteristics (Borenstein & Higgins, 2013). Only papers that reported bivariate correlational data for the relationship between PTG and DR were included in the meta-analysis. Papers providing partial correlations in which the authors were unable to provide bivariate raw data were excluded from the meta-analysis. The data were analysed by entering the correlational data (r) and sample size of each study into the StatsDirect (version 3) software program to obtain the overall effect size. The variance due to heterogeneity rather than chance was calculated using the I^2 -statistic provided by the Stats Direct output. The lower the I^2 percentage value, the lower the heterogeneity. The Cochrane Collaboration Handbook for Systematic Review of Intervention guidelines (Higgins & Green, 2008) suggests using the following rough guide to estimate heterogeneity: 0-40% is low, 30-60% is 'moderate', 50-90% is 'substantial' and 75-100% is 'considerable'. Sub-group analysis was conducted in cases of high levels of heterogeneity, indicating further investigation of data is required.

Results

Following screening of the full texts, 15 papers were identified as meeting the criteria for the narrative synthesis, 13 were deemed suitable for the meta-analysis as well as the quality subgroup analysis and 12 were appropriate for the trauma-type subgroup analysis (see Figure 2).

Study Characteristics

A detailed summary of the characteristics of the 15 selected studies is presented in Table 1. The majority of studies were conducted in Europe (n=6) and North America (n=5), with the remainder conducted in South America (n=2), Australia (n=1) and Asia (n=1). In terms of demographics, a wide range of ages (the mean ranged from 19.4 years to 70 years old) and ethnicities (including Middle Eastern, Oriental and African American) were reported. Four studies used a student sample (Groleau et al., 2013; Lancaster et al., 2015; Shigemoto et al., 2016; and Taku et al., 2015). The majority of papers (n=10) had more female than male respondents. Three studies had more male respondents, one used an exclusively female sample (Bosson et al., 2012) and one was exclusively male (Morris et al., 2014). Sample sizes varied considerably between 38 and 740 participants. In terms of trauma types, four studies examined the trauma of experiencing a serious illness (such as cancer or HIV), four studies focused on the impact of natural disasters (such as earthquakes or hurricanes) and one evaluated parents' reactions to a premature birth. Six studies included mixed trauma types; the most prevalent traumas experienced within these studies were the sudden, unexpected or violent death of a loved one, serious illness in themselves or a close

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

other, serious accident, and sexual or physical assault. The studies varied considerably in terms of the time elapsed since the trauma, from within four weeks of the event up to 10 years later, with one study specifying no timeframe criteria. Investigation of the relationship between PTG and DR was the primary objective for six of the studies, in seven studies it was investigated as one of a number of cognitive processes and in the other two papers it was reported as a secondary outcome. In terms of results, all studies included reported evidence of a positive association between DR and PTG to varying degrees.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Table 1: Summary of study characteristics

	Author(s), Year, Country	Objective	Analysis	N	Sample Characteristics	Trauma Type	Time since occurrence of trauma	Summary of Findings
1	Bosson et al. (2012) USA	Is DR the mechanism through which positive religious coping leads to PTG?	Correlation & path analysis	85	Mothers of children between age 12-18 living in New Orleans at time of Hurricane Katrina 60% African American Mean age= 43.5 (SD=7.85)	Hurricane	40 months post hurricane	DR fully mediated the relationship between positive religious coping and PTG.
2	Galpin (2013) UK	Exploring the role of IR, DR in the development of PTG in parents of premature babies.	Correlation & regression	83 (30 Mother/ father pairs & 23 mothers)	Parents of premature infants 93% White British Age range= 20-45 years	Premature birth	4-8 weeks post birth	PTG found to be higher in parents with high DR and high IR compared to parents with high IR but low DR
3	García et al. (2015) Chile	Exploring if the subjective severity of a trauma affects PTS and PTG through direct means or through cognitive strategies.	Correlation & structural equation modelling (SEM)	351	Adults who experienced Chilean earthquake & tsunami in February 2010 63.2% Female Mean age=40.4 (SD = 15.29)	Earthquake & Tsunami	5 years post-earthquake & tsunami	DR found to fully mediate the relationship between subjective severity of trauma, brooding, and PTG.
4	Groleau et al. (2013) USA	Assessing the degree to which centrality of an event predicts PTG above and beyond other variables (such as cognitive processing).	Correlation & regression	187	Students 61.5% Female 66.3% Caucasian Mean age= 21.4 years (SD=4.95)	Mixed: Serious medical problem of a family member or friend (34.8%) unexpected or violent death of a family member or friend (27.3%), threat of death (6.4%)	Up to 2 years post event	The centrality of a traumatic event explains some variance in PTG even after controlling for other factors. IR & DR together accounted for 3% of the variance in PTG.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Author(s) Year, Country	Objective	Analysis	N	Sample Characteristics	Trauma Type	Time since occurrence of trauma	Summary of Findings
5 Gul (2014) Turkey	Exploring the individual and psychological factors that contribute to PTG	Correlation & regression	740	Adults living in Izmir, Turkey 64.3% were females Mean age=43.19 (SD = 15.17)	Mixed: Unexpected/-sudden death (73.1%) life-threatening illness (30.3%) Accident/fire/explosion (23.7%), Other (20.3%)	M =5.02 years post event Min=1 year Max=6 years	Higher levels of DR, leading to more active coping styles significantly predicted higher levels of PTG
6 Lancaster et al. (2015) USA	Examining an integrative model of the cognitive predictors of distress and growth	Correlation & path analysis	194	Students 113 females and 81 males 82% Caucasian Mean age=19.48 (SD=2.23)	Mixed: sudden nonviolent death of a loved one (29.9%) sudden violent death of a loved one (12.4%)	Not reported	DR significantly predicted self-reported PTG.
7 Leal-Soto et al. (2016) Chile	Testing a proposed model regarding severity of a natural disaster on outcomes of PTSD and PTG.	Correlation & path analysis	238	Adults who experienced Chilean earthquake & tsunami in April 2014 56% Female Mean age=29.15 (SD=11.5) 48.3% were students	Tsunami & Earthquake	2 years post tsunami & earthquake	The subjective severity of the event shows no significant direct effect on DR or on PTG. Medium direct effect of DR found on PTG.
8 Morgan (2015) USA	Examining if a greater challenge to core beliefs is associated with higher levels of IR & DR, and PTG	Correlation & SEM	197	Military Veterans 69.4% Male 82.7% White Mean age=36.01 (SD = 10.94)	Mixed: Loss of loved one (23.4%), financial hardship (20.3%), job loss 12.2%, divorce (5.6%), combat (5.6%)	Up to 3 years post event	Challenge to core beliefs was directly associated with IR which was found to act as a catalyst for DR which was found to lead to experiences of PTG.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

	Author(s) Year, Country	Objective	Analysis	N	Sample Characteristics	Trauma Type	Time since occurrence of trauma	Summary of Findings	
9	Morris et al. (Study 1) (2014) Australia	Identifying the psychosocial factors associated with developing a cancer survivor identity and if PTG is related to this	Correlation & regression	514	Adult Males 84.2 % Married or in a relationship Mean age=70yrs (SD=8.36)	Prostate Cancer	M= 7.50 years post diagnosis (SD = 4.66 years)	Higher DR was associated with a cancer survivor identity. Also higher levels of PTG associated with cancer survivor ID.	9
10	Noone (2015) UK	Investigating the role of cognitive processes in the relationship between unsupportive responses to HIV disclosure and PTG	Correlation & mediation	38 (Under-powered by 29 participants)	Adults with HIV 78.9% Male 81.5% White Mean age=26.62yrs (SD=8.8)	HIV	M= 10.2 years post diagnosis (SD=7.31)	PTG highly correlated with DR	
11	Oginska-Bulik (2016) Poland	Examining the role of IR & DR in the development of PTG.	Correlation & regression	227	Polish Adults 63.30% Female Mean age=40.12yrs (SD=13.28)	Mixed: Cancer patients (31.30%) DV (39.20%) Paramedics (29.50%).	Up to 5 years post event	Positive correlations between DR and PTG (Mainly in the domains of self-perception, but also In terms of relations with others and appreciation of life).	
12	Ogińska-Bulik, & Ciechomska (2016) Poland	Investigating the relationship between rumination and PTG in parents of adolescents diagnosed with cancer.	Correlation & regression	97	Parents of adolescents with cancer 49 Mothers' Mean age = 39.4, (SD = 3.14) 48 Fathers' Mean age = 40.7, SD = 3.76)	Cancer of a child	62%= less than 1 year post diagnosis 26%=1-2 years 10%= 2-3 years 2%= 3+ years	Positive association found between DR and PTG, in both mothers and fathers (mainly in the domain of relations with others)	

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

	Author(s) Year, Country	Objective	Analysis	N	Sample Characteristics	Trauma Type	Time since occurrence of trauma	Summary of Findings
13	Redwood (2015) UK	Exploring how cognitive processes mediate the relationship between gender and PTG in survivors of colorectal cancer	Correlation & regression	123	Adults with colorectal cancer 60% female Mean age 62 (Range 26 to 93)	Colorectal Cancer	M =35.82 months post diagnosis (SD= 36.65 months)	DR identified as a significant predictor of PTG and found to be a mediator in the relationship between gender and PTG (with women engaging in more DR than men).
14	Shigemoto et al. (2016) USA	Investigating the cognitive and behavioural aspects of the personal growth inventory on PTG	Correlation & SEM	286	Students 64% Female 70% Caucasian Mean age=19.60 (SD=2.25)	Mixed: unexpected or violent death of close other (30.2%), close other serious medical problem of close other(26.7%), serious accident (8.4%), other (7.7%)	Within 1 year of the event	Positive indirect effect found between behavioral Personal Growth inventory and PTG through DR
15	Taku et al. (2015) Japan	Examining the relationship between the re-examining of core beliefs, IR & DR, and PTG following an earthquake.	Correlation & regression	314	Students who experienced Japanese earthquake in March 2011 158 men and 156 women Mean age = 19.40 (SD = 1.60)	Earthquake	2 years and 3 months post-earthquake	DR was positively correlated with PTG, but no more than IR was.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Study Quality

The quality assessment results of each paper are presented in Table 2. Agreement between reviewers was deemed moderate, with a kappa score of 0.79, ('moderate' level range between 0.60 and .79; Cohen, 1960) of inter-rater reliability. The combined agreed ratings were judged against the QATOCC quality assessment tool. Overall, the majority of studies were found to be of 'fair' quality (n=11) and four were assessed to be of 'good' quality, with Gul (2014) and Redwood (2015) scoring the highest in terms of quality rating. The major strengths noted in the reviewed papers were that the research aims were clearly stated in each case and every study used valid and reliable self-report questionnaires to measure both exposure and outcome variables. Most papers defined their population sample clearly in terms of demographics and trauma type; however those who received a 'partial' rating for this item did not provide a clear list of inclusion/exclusion criteria. As most studies used a self-selecting sample, the response rate item did not apply to these; however of the five papers to which it did apply, only two (Gul, 2014, and Morris et al., 2014) reported on the response rate received. Overall, the papers lacked quality in terms of recruitment; the majority received a 'partial' rating due a lack of clarity regarding recruitment strategy and the time frame during which the data was collected. A sample size power calculation was only provided by five of the studies: Galpin (2013), Gul (2014), Morgan (2015), Noone (2015) and Redwood (2015). Of these, one study (Noone, 2015) reported being considerably under-powered. Bosson et al. (2012) discussed having sufficient power but did not provide the calculation and the rest neglected to report it. There was a wide variance in terms of the inclusion of confounding variables; those who received a 'yes' used regression analysis to account

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

for a large number of confounders, those who were rated as 'partial' included one or two key variables and those who received a 'cannot determine' reported adjusting for confounders but it was not possible to determine which variables they adjusted for.

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

Table 2: Quality Assessment of studies

		*1. Was the research question or objective in this paper clearly stated?	2. Was the study population clearly specified and defined?	3. Was the participation rate of eligible persons at least 50%?	4. Were all the participants selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants?	5. Were a sample size justification, power description, or variance and effect estimates provided?	9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Quality Rating
1	Bosson et al. (2012)	Yes	Yes	NA	Partial	Partial	Yes	Yes	No	Fair
2	Galpin (2013)	Yes	Yes	NR	Yes	Yes	Yes	Yes	No	Good
3	García et al. (2015)	Yes	Yes	NR	Yes	No	Yes	Yes	No	Fair
4	Groleau et al. (2013)	Yes	Yes	NA	Partial	No	Yes	Yes	Partial	Fair
5	Gul (2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good
6	Lancaster et al. (2015)	Yes	Partial	NA	Partial	No	Yes	Yes	No	Fair
7	Leal-Soto et al. (2016)	Yes	Partial	NA	Partial	No	Yes	Yes	Partial	Fair
8	Morgan (2015)	Yes	Partial	NA	Partial	Yes	Yes	Yes	Partial	Fair

Evaluating the evidence for the role of deliberate rumination in the development of posttraumatic growth

		*1. Was the research question or objective in this paper clearly stated?	2. Was the study population clearly specified and defined?	3. Was the participation rate of eligible persons at least 50%?	4. Were all the participants selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	5. Were a sample size justification, power description, or variance and effect estimates provided?	9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Quality Rating
9	Morris et al. (Study 1)(2014)	Yes	Partial	Yes	Partial	No	Yes	Yes	Yes	Good
10	Noone (2015)	Yes	Yes	NA	Partial	Yes	Yes	Yes	CD	Fair
11	Oginska-Bulik (2016)	Yes	Partial	NA	Partial	No	Yes	Yes	No	Fair
12	Ogińska-Bulik, & Ciechomska (2016)	Yes	Partial	NR	Partial	No	Yes	Yes	No	Fair
13	Redwood (2015)	Yes	Yes	NA	Yes	Yes	Yes	Yes	Yes	Good
14	Shigemoto et al. (2016)	Yes	No	NA	Partial	No	Yes	Yes	Partial	Fair
15	Taku et al. (2015)	Yes	Yes	NA	Partial	No	Yes	Yes	Yes	Fair

*Note: Original numbers of the QATOCC items retained to illustrate which questions have been excluded

Meta-analysis

Thirteen studies provided suitable data (bivariate correlations) to contribute to the meta-analysis in order to obtain a weighted average of the results of the individual studies regarding the relationship between PTG and DR. The results of the meta-analysis are presented in a forest plot in Figure 3. Combining the results, the overall random effects pooled correlation indicate a significant positive correlation ($r=0.486$, 95% CI = 0.40-0.56, $Z= 9.66$, $p<0.0001$) between PTG and DR. This suggests a positive relationship exists between the two constructs. However, considerable levels of heterogeneity were found between studies at $I^2 = 88.9\%$ (95% CI= 83.3% - 92%) and the confidence intervals do not all overlap, suggesting that too much variability exists between the studies to be able to pool the results to draw any meaningful conclusion. A funnel plot (see Figure 4) was also created as a visual aid to detect publication bias in the studies (Egger, Smith, Schneider & Minder, 1997). Each dot represents one of the studies in the analysis. An inverted symmetrical shape created by the dots within the funnel would indicate that publication bias is unlikely. However, the asymmetrical graph indicates that the likelihood of publication bias in these papers is high. Also seven studies lie outside of the funnel area; these are deemed to be statistical outliers. The results of the funnel plot add more evidence to suggest that the results of this meta-analysis are unlikely to be reliable.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

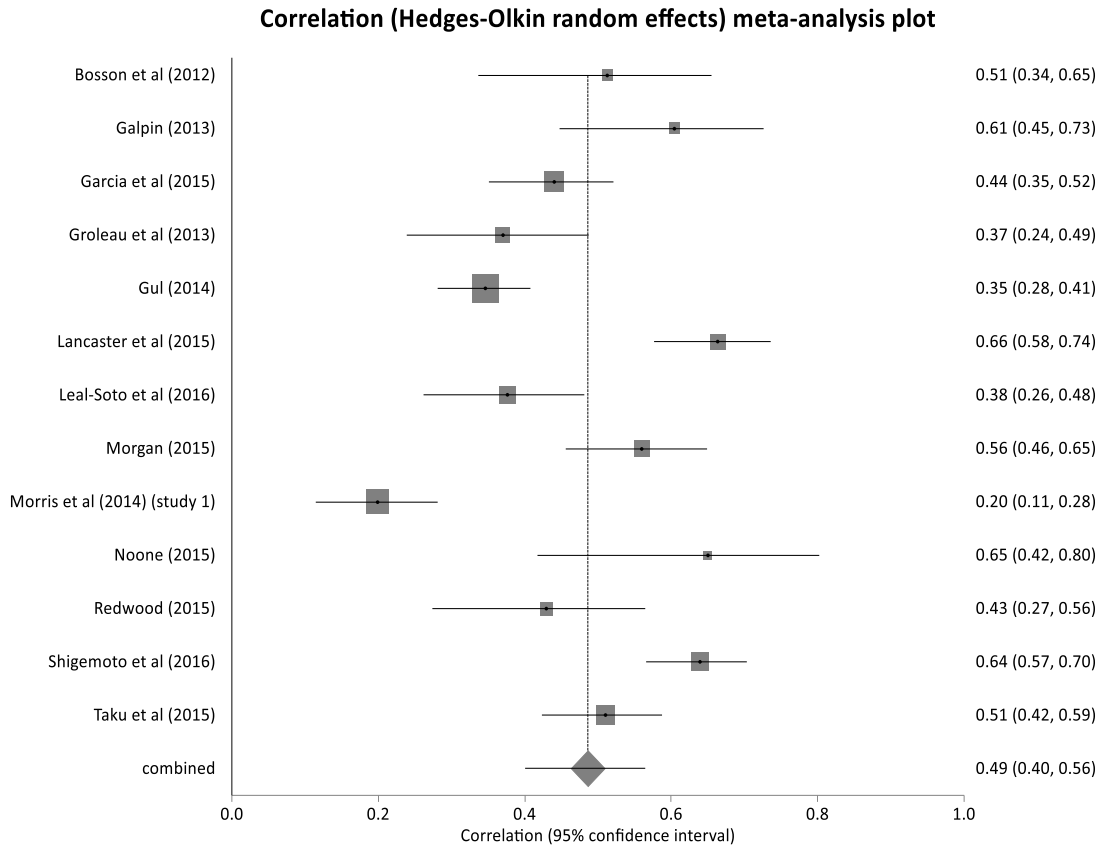


Figure 3: Forest Plot of the 13 studies suitable for meta-analysis

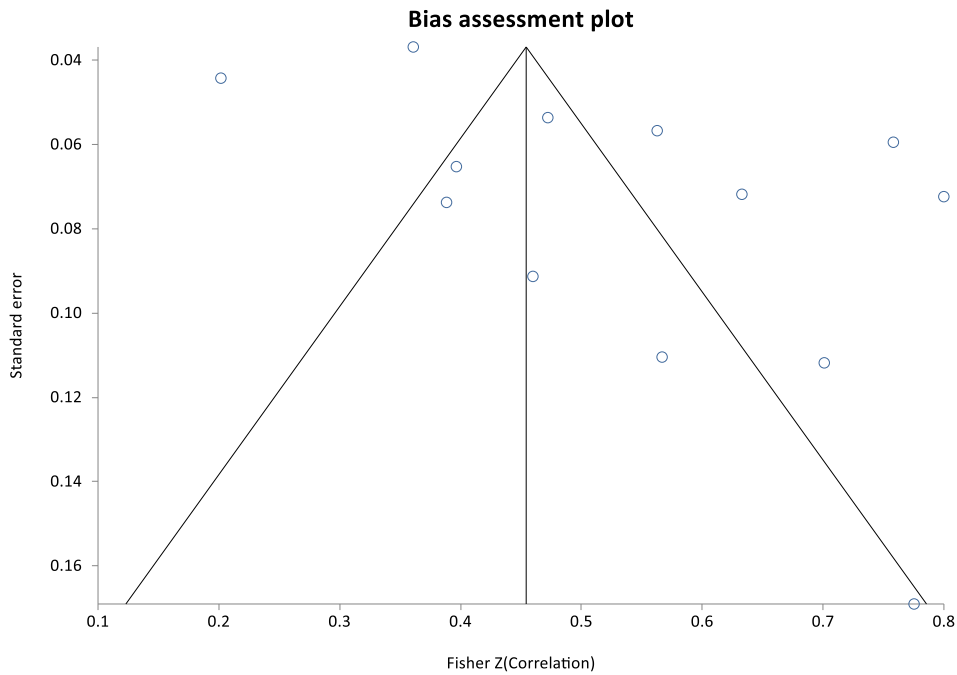


Figure 4: Funnel plot to check for publication bias

Subgroup analysis: Quality analysis

Due to the high levels of heterogeneity detected, a subgroup analysis was conducted using the online Comprehensive Meta-analysis program to identify if the large variance was attributable to the differing quality of the papers. Data from all 13 papers used in the meta-analysis were included in the subgroup analysis. The groups were divided into those that received a ‘good’ quality rating and those with a ‘fair’ quality rating. The subgroup effect was found not to be significant ($Q(1) = 3.338, p = 0.068$), indicating that the mixed results are not due to the quality of the papers (see Table 3). The forest plot of the subgroup analysis is presented in Figure 5. No overlap can be seen in the confidence intervals of the papers within the quality subgroups, indicating once again that levels of heterogeneity between the papers are considerable.

Table 3: Mixed effect analysis of higher and lower quality subgroups

Groups	Number of studies	Effect size and 95% interval			Test of null (2-tailed)		Heterogeneity		
		Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value
Fair	9	0.526	0.446	0.597	10.972	0.000			
Good	4	0.384	0.239	0.513	4.919	0.000			
Total Between							3.338	1	0.068
Overall	13	0.486	0.417	0.550	11.884	0.000			

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

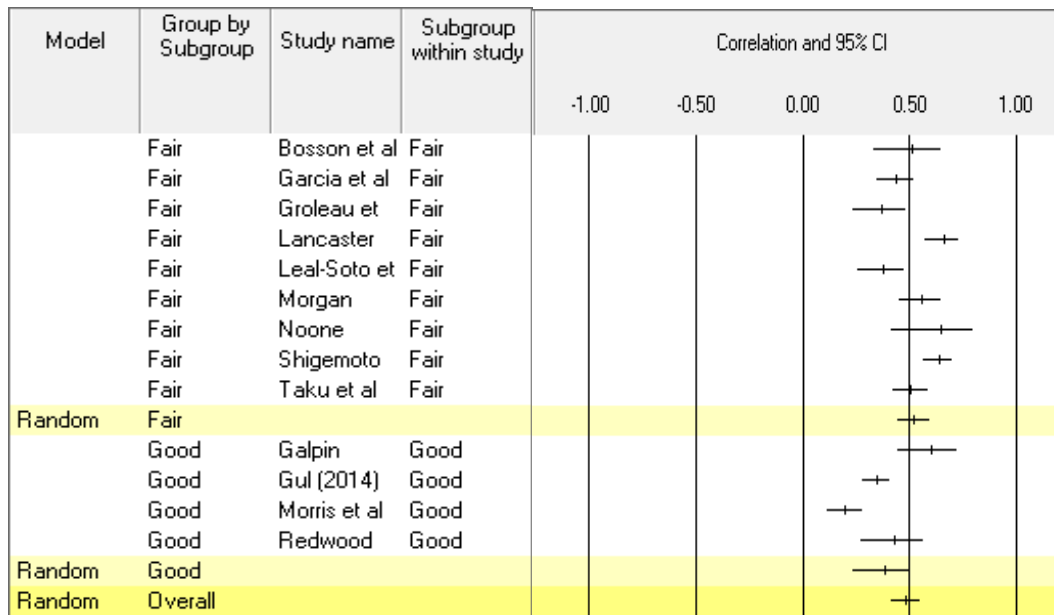


Figure 5: Forest plot of quality subgroup analysis

Subgroup analysis: Trauma category

Further subgroup analysis was conducted to identify if the large variance was attributable to trauma type. Data from 12 of the 13 papers was used (Galpin’s [2013], study of PTG in parents of premature babies was excluded from the analysis as it did not fit any of the specified categories). Three subgroups of trauma type were identified: natural disasters (ND; n=4), illness (n=3) and mixed trauma i.e. studies investigating a number of different traumatic events (n=5). The subgroup effect was found not to be significant ($Q(2) = 0.940, p = 0.625$), indicating that the mixed results of the meta-analysis are not attributable to the type of trauma experienced (see Table 4). The forest plot of the subgroup analysis is presented in Figure 6. Some overlap in the confidence intervals of the papers investigating natural disasters is evident, but this is not the case for the other two categories, suggesting that the results of the natural disaster subgroup are more homogenous than the illness or mixed subgroups.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Table 4: Mixed effect analysis of trauma subgroups

Groups	Number of studies	Effect size and 95% interval			Test of null (2-tailed)		Heterogeneity		
		Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value
Illness	3	0.416	0.152	0.625	2.997	0.003			
Mixed	5	0.527	0.372	0.653	5.882	0.000			
ND	4	0.455	0.392	0.514	12.442	0.000			
Total Between							0.940	2	0.625
Overall	12	0.462	0.406	0.516	14.052	0.000			

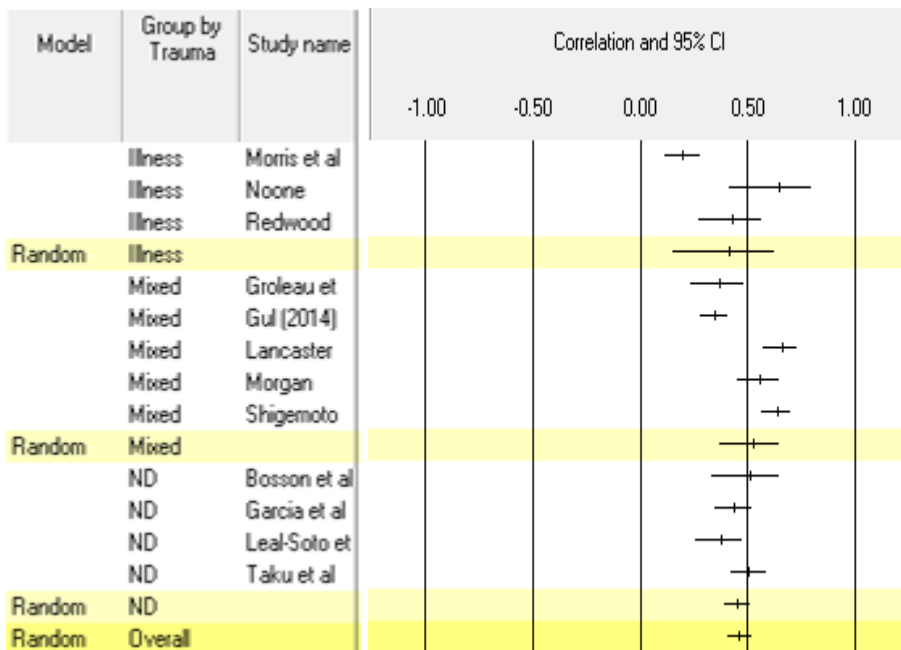


Figure 6: Forest plot of trauma subgroup analysis

Discussion

Findings

As hypothesised, the evidence provided by the meta-analysis suggests that a positive relationship does exist between PTG and DR. The overall effect size between the two constructs was moderate ($r=0.486$), which suggests a medium level of shared variance between PTG and DR. This provides some support for the link between the two constructs in Tedeschi and Calhoun's theoretical model of PTG (2004). However, caution needs to be exercised when interpreting the results, due to problems with study quality as well as high levels of heterogeneity and identification of publication bias. The high heterogeneity found in the studies supports the choice of a random effect model; however, when there is too much variation in the studies, the Cochrane Collaboration caution against the interpretation of pooling the results (Higgins & Green, 2008). Grouping the studies into categories did not provide an explanation for the variance, as subgroup analysis found no significant difference between the different quality papers ($p = 0.068$) or the different trauma subgroups ($p = 0.625$). The possible clinical and methodological reasons for the large variance found are explored below.

Limitations of the studies

A number of methodological limitations and measurement issues were found in the reviewed papers. As is common in PTG research, the use of retrospective self-report measures were used in every study identified for this review. This limits objectivity and introduces the risk of recall bias, distortion and socially desirable responses (Logan, Claar, & Scharff, 2008).

However, attempts were made to minimise this in some papers by asking about current experiences in relation to past events.

The trajectory of PTG over time is poorly understood; some studies have found it to require many years to develop (Schaefer & Moss, 1998), while others found that it intensifies in the short term but decreases over time (Dekel, Ein-Dor, & Solomon, 2012). The reviewed papers in this study varied widely in terms of the time lapse since the trauma and the assessment of PTG (from four weeks to 10 years post-event). Therefore it is possible that some studies may have been conducted too early to allow for PTG to emerge, and others conducted too late after the event to capture the effect. Another timing issue relates to the ERRI asking participants to indicate how often they experienced a list of thoughts “during the weeks immediately after the event”. It can be argued that the accuracy and validity of responses four weeks after an event and responses 10 years later are incomparable (Noone, 2015) and are therefore likely to impact on the reported findings.

The analysis performed on the quality subgroup was much closer to being significant than the trauma subgroup ($p = 0.068$ compared to $p = 0.625$). Therefore the variance is more likely to be explained by the differences in quality. A number of problems with quality were identified, particularly with regard to the ‘fair’ quality papers: Only one third of the papers reported a power calculation and one of these only met half the sample size required for power, making it difficult to draw any firm conclusions from the results; a wide range of sample sizes were used by the reviewed articles; an over-representation of female participants could impact on the findings as research suggests they are significantly more likely to engage in DR and to develop PTG than males (Helgeson et al., 2006). Most of the lower quality papers failed to report the time frame during which recruitment took place, which could

introduce procedural bias. The ‘fair’ quality papers were also less likely to adjust for confounding variables, compared with those found to be of ‘good quality’. All of the articles used either self-selection or convenience sampling methods and only two of five reported the rates on non-responders, which may limit generalisability, as Redwood (2015) suggests people may have been more likely to respond if they experienced positive changes and therefore they may not be representative of the populations studied.

One of the main differences between the ‘good’ quality and ‘fair’ quality papers was the lack of clarity in terms of the inclusion/exclusion criteria regarding the classification of the traumatic experience. There is much debate regarding what constitutes a ‘traumatic event’; the DSM –V criterion A defines it as being directly or indirectly exposed to, or witness to, “actual or threatened death, serious injury, or sexual violence” (APA, 2013, p.280); while others argue that the psychological distress of shattered assumptions is the trauma, rather than the event itself (Noone, 2015). The reviewed articles varied widely in their definition of a ‘trauma’; most focused on life threatening incidents such as natural disasters and illnesses, while one paper (Morgan, 2015) included events such as financial hardship and divorce. An unspecified category of ‘other trauma’ was included in two of the studies (comprising 20.3% of the total sample in one case); however, there was a lack of information regarding the content of this category. Although the subgroup analysis of the different trauma types suggests that the variance is not due to this, it is difficult to draw firm conclusions from literature that differs widely in terms of clear categorisation regarding a core concept.

Strengths of the studies

The identified strengths of the reviewed papers included clear research aims and the use of valid and reliable measures. In addition, the heterogeneity of the sample populations used can

be considered to be a strength, as the proportion of student samples in this review is low, compared to the populations commonly used in this area of research (Helgeson et al., 2006). The prevalence of traumatic experiences among students has been argued to be similar to the general population. However, Linley and Joseph (2004) argue that the ages and education level of students are not comparable to the general population and this can affect the results. Instead, the reviewed papers represent a wide range of ages, ethnicities, professions and nationalities, providing evidence to suggest the relationship between DR and PTG may exist cross-culturally.

Clinical implications

The evidence demonstrating the relationship between DR and PTG could be used to support clinicians to facilitate deliberate rumination when exploring trauma with a client. An awareness of the potential to function at a higher level post-trauma could be motivating for a client; however addressing this would obviously have to be carefully timed and balanced with validation of their distress. Noone (2015) suggests this approach could fit with any treatment model but may fit best with narrative therapy when constructing alternative interpretations of life events. It has been argued that ethically a clinician's role is to support the client until they move to a place of well-being, and facilitating PTG is outside of their remit (Noone, 2015). However, Wood and Tarrrier (2010) argue that positive and negative psychological outcomes interact, exist on a continuum, and cannot be explored in isolation. Noone (2015) also suggests another possible clinical tension, scarcely discussed in the literature, is that one of the aims of therapeutic trauma work is to reduce intrusive rumination. However, as this prompts the process of DR, by reducing it we may be reducing the possibility of PTG. If this is true, it may be possible that clinicians are in danger of sacrificing a long-term benefit to the client in exchange for short-term relief.

Limitations of the Review & Future Research

Further investigation into the relationship between DR and PTG is required to address the methodological concerns outlined above. In an attempt to produce a more robust analysis of the data, the review used cross-sectional design as an inclusion criterion for the selection of studies. However, as the trajectory of PTG is not well understood, reviews of experimental studies and longitudinal data are recommended to determine causality and direction of effect between DR and PTG and to track the relationship between the two constructs over time. Additionally, as the relationship between PTG and DR was found to be of moderate strength, it suggests that a mediator(s) may exist between them. Therefore future work should investigate this to further understand the mechanisms that underlie the relationship between the two variables. More stringent categorisation of trauma is also recommended when conducting future research. Even within the identified categories of this review, considerable levels of heterogeneity were found to exist, most obviously in the mixed trauma group, but also in the illness subgroup. Trauma responses are likely to be confounded by issues of shame, responsibility and regret in HIV that are less likely to be present when the illness is cancer (Bennett, Traub, Mace, Juarascio, & O'Hayer, 2016). The findings that the natural disaster subgroup was more homogenous than the others fit with existing literature on PTG being linked more with Type I trauma (Kira et al., 2013), and supports the notion that clearer categories of trauma are important to ensure homogenous samples are being evaluated. Also, future reviews may benefit from studies that use a tighter time frame and base their inclusion criteria on Helgeson and colleagues' meta-analysis (2006) findings that PTG is most likely to manifest two years post-trauma. In terms of quality assessment, the QATOCC tool was chosen due to being recommended for cross-sectional studies (NIH, 2014), however many of the questions were found to be more applicable to observational and cohort studies rather

than cross-sectional studies. It was also noted that some important quality considerations, such as handling of missing data, were not included in the assessment. Although the subgroup analysis of the different quality papers suggested that the variance was not due to quality, the findings were nearing significance ($p = 0.068$). It is possible that a more stringent quality assessment tool may have identified clearer qualitative distinctions between the papers. It is therefore recommended that future reviews use a more comprehensive quality assessment tool and repeat the quality subgroup analysis.

Conclusions

This review aimed to synthesise the available evidence for the relationship between PTG and DR to provide a clearer picture of the strength of the association between these two constructs. A moderate but significant relationship was found to support this relationship. However due to issues of study quality, high variance and publication bias found in the articles reviewed, the publication of higher quality, more methodologically robust empirical studies is recommended before performing another meta-analysis in order to produce reliable synthesised data to further our understanding of the relationship between PTG and DR.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Bennett, D. S., Traub, K., Mace, L., Juarascio, A., & O'Hayer, C. V. (2016). Shame among people living with HIV: a literature review. *AIDS Care*, *28*(1), 87-91.
- Borenstein, M., & Higgins, J. (2013). Meta-Analysis and Subgroups. *Prevention Science*, *14*(2), 134-143.
- Bosson, J. V., Kelley, M. L., & Jones, G. N. (2012). Deliberate cognitive processing mediates the relation between positive religious coping and posttraumatic growth. *Journal Of Loss And Trauma*, *17*(5), 439-451.
- Brinker, J. K., & Dozois, D. J. A. (2009). Ruminative thought style and depressed mood. *Journal of Clinical Psychology*, *65*, 1-19.
- Calhoun, L. G., & Tedeschi, R. G. (2006). The foundations of posttraumatic growth: An expanded framework. In L. G. Calhoun & R. G. Tedeschi (Eds.), *The handbook of posttraumatic growth: Research and practice* (pp. 1-23). Mahwah, NJ: Lawrence Erlbaum.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Cann, A., Calhoun, L. G., Tedeschi, R. G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C.

M. (2011). Assessing posttraumatic cognitive processes: The Event Related Rumination Inventory. *Anxiety, Stress & Coping: An International Journal*, 24(2), 137-156.

Cohen J. (1960). A coefficient of agreement for nominal scales. *Educational and*

Psychological Measurement, 20, 37–46.

Dekel, S., Ein-Dor, T., & Solomon, Z. (2012). Posttraumatic Growth and Posttraumatic

Distress: A Longitudinal Study. *Psychological Trauma-Theory Research Practice And Policy*, 4(1), 94-101.

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in Meta-Analysis

Detected by a Simple, Graphical Test. *BMJ: British Medical Journal*, 315, 629-634.

Galpin, J. (2013). *Posttraumatic stress and growth symptoms in parents of premature infants:*

the role of rumination type and social support (Unpublished doctoral dissertation).

University of East Anglia, U.K.

García, F. E., Cova, F., Rincón, P., & Vázquez, C. (2015). Trauma or growth after a natural

disaster? The mediating role of rumination processes. *European Journal Of*

Psychotraumatology, 6, 26557.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Groleau, J. M., Calhoun, L. G., Cann, A., & Tedeschi, R. G. (2013). The role of centrality of events in posttraumatic distress and posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, And Policy*, 5(5), 477-483.

Gul, E. (2014). *Prevalence rates of traumatic events, probable PTSD and predictors of posttraumatic stress and growth in a community sample from Izmir* (Unpublished doctoral dissertation). Middle East Technical University, Turkey.

Helgeson, V. S., Reynolds, K. A., & Tomich, P. L. (2006). A meta-analytic review of benefit finding and growth. *Journal of Consulting and Clinical Psychology*, 74, 797–816.

Higgins, J. P. T., & Green, S. (Eds.). (2008). *Cochrane handbook for systematic reviews of interventions*. Chichester, England; Wiley-Blackwell.

Janoff-Bulman, R. (1992). *Shattered assumptions*. New York: The Free Press.

Kira, I., Aboumediene, S., Ashby, J., Odenat, L., Mohanesh, J., & Alamia, H. (2013). The Dynamics of Posttraumatic Growth Across Different Trauma Types in a Palestinian Sample. *Journal Of Loss & Trauma*, 18(2), 120-139.

Kolokotroni, P., Anagnostopoulos, F., & Tsikkinis, A. (2014). Psychosocial Factors Related to Posttraumatic Growth in Breast Cancer Survivors: A Review. *Women And Health*, 54(6), 569-592.

- Lancaster, S. L., Klein, K. R., Nadia, C., Szabo, L., & Mogerma, B. (2015). An integrated model of posttraumatic stress and growth. *Journal Of Trauma & Dissociation, 16*(4), 399-418.
- Leal-Soto, F., Carmona-Halty, M., & Ferrer-Urbina, R. (2016). Rumination in posttraumatic stress and growth after a natural disaster: a model from northern Chile 2014 earthquakes. *European Journal of Psychotraumatology, 7*, 316-38.
- Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress, 17*, 11–21.
- Logan, D. E., Claar, R. L., & Scharff, L. (2008). Social desirability response bias and self-report of psychological distress in pediatric chronic pain patients. *Pain, 136*(3), 366-372.
- McGrath, J. (2011). Posttraumatic growth and spirituality after brain injury. *Brain Impairment, 12*(2), 82-92.
- Michael, C., & Cooper, M. (2013). Post-traumatic growth following bereavement: A systematic review of the literature. *Counselling Psychology Review, 28*(4), 18-33.
- 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 Med 6*(7).
- Morgan, J.K. (2015). *Examining Growth Outcomes in Military Veterans: Posttraumatic Growth, Core Beliefs, and Temporality* (Unpublished doctoral dissertation). North Carolina State University, USA.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

- Morris, B. A., Lepore, S. J., Wilson, B., Lieberman, M. A., Dunn, J., & Chambers, S. K. (2014). Adopting a survivor identity after cancer in a peer support context. *Journal Of Cancer Survivorship*, 8(3), 427-436.
- National Institute of Health. (2014). Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. Retrieved from <https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/cohort>. Accessed December 5, 2016.
- Nolen-Hoeksema, S. (1991). "Responses to depression and their effects on the duration of the depressive episode". *Journal of Abnormal Psychology*. 100(4), 569–582.
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3(5), 400–24.
- Noone, E. K. (2015). *Cognitive processing pathways to posttraumatic growth* (Unpublished doctoral dissertation). Canterbury Christ Church University, U.K.
- Ogińska-Bulik, N. (2016). The role of rumination in the occurrence of positive effects of experienced traumatic events. *Health Psychology Report*, 4(4), 321-331.
- Ogińska-Bulik, N., & Ciechomska, M. (2016). Posttraumatic growth of parents struggling with cancer disease of their child – the role of rumination. *Postepy Psychiatrii i Neurologii*, 25(2), 99-110.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Prati, G., & Pietrantonio, L. (2009). Optimism, social support, and coping strategies as factors contributing to posttraumatic growth: A meta-analysis. *Journal of Loss and Trauma, 14*(5), 5364-388.

Redwood, K. (2015). *An exploration of gender differences in post-traumatic growth in survivors of colorectal cancer* (Unpublished doctoral dissertation). School of Psychology, University of Southampton, U.K.

Russo, M., Suen, M., Bedaiwy, M., & Chen, I. (2016). Review Article: Prevalence of Uterine Myomas Among Women with 2 or More Recurrent Pregnancy Losses: A Systematic Review. *The Journal Of Minimally Invasive Gynecology, 23*, 702-706.

Schaefer, J., & Moos, R. (1998). The context for posttraumatic growth: Life crises, individual and social resources, and coping. In R.Tedeschi, C.Park, & L.Calhoun (Eds.), *Posttraumatic growth: Positive changes in the aftermath of crisis* (pp. 99–126). Mahwah, NJ: Erlbaum.

Seligman, M., & Csikszentmihalyi, M. (2014). *Positive psychology: An introduction*. Netherlands: Springer.

Sherr, L., Nagra, N., Kulubya, G., Clucas, C., Catalan, J., & Harding, R. (2011). HIV infection associated post-traumatic stress disorder and post-traumatic growth - A systematic review. *Psychology, Health And Medicine, 16*(5), 612-629.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

- Shigemoto, Y., Ashton, M. W., & Robitschek, C. (2016). Predictors of growth in the aftermath of traumatic events: The role of personal growth initiative. *Journal Of Loss And Trauma, 21*(5), 399-409.
- Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2015). Core beliefs shaken by an earthquake correlate with posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, And Policy, 7*(6), 563-569.
- Tedeschi, R. G. (1999). Violence transformed. Posttraumatic growth in survivors and their societies. *Aggression and violent behaviour: A Review Journal, 4*, 319-341.
- Tedeschi, R. G., & Calhoun, L.G. (1995). *Trauma and transformation, growing in the aftermath of suffering*. Thousand Oaks, CA: Sage Publications.
- Tedeschi, R. G. & Calhoun, L.G. (1996). The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal Of Traumatic Stress, 9*, 455–71.
- Tedeschi, R. G., & Calhoun, L.G. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. *Psychological Inquiry, 15*(1), 1–18.
- Ulloa, E. C., Hammett, J. F., Guzman, M. L., & Hokoda, A. (2015). Psychological growth in relation to intimate partner violence: A review. *Aggression And Violent Behavior, 25*(Part A), 88-94.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Widows, M. R., Jacobsen, P.B., M. Booth-Jones, M., & Fields, K. K. (2005). Predictors of posttraumatic growth following bone marrow transplantation for cancer. *Health Psychology, 24*, 266–73.

Wood, A., & Tarrier, N. (2010). Positive Clinical Psychology: A new vision and strategy for integrated research and practice. *Clinical Psychology Review, 30*(7), 819-829.

Chapter 2: Empirical Paper

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder.¹

¹ Prepared for submission to the Journal of Positive Psychology (see Appendix C)

Abstract

Both posttraumatic growth (PTG) and posttraumatic stress disorder (PTSD) are associated with spirituality and different kinds of repetitive thinking, such as deliberate rumination (DR) and intrusive rumination (IR) respectively. This study aimed to examine if spirituality modifies the relationship between types of rumination and trauma outcomes. **Method:** Ninety-six students from the University of Liverpool completed an online survey of four questionnaires: The Posttraumatic stress Diagnostic Scale, the Event Related Rumination Inventory, the Posttraumatic Growth Inventory-Short form and the Expressions of Spirituality Inventory-Revised. **Results:** Correlations revealed that spirituality was related to DR and PTG, but not to IR or PTSD symptoms. Moderation analysis showed that spirituality significantly moderated the relationship between PTG and DR, but not the relationship between PTSD and IR. **Conclusions:** The findings suggest that although spirituality has no relationship with negative outcomes of trauma, it may help individuals to ruminate in a constructive manner in order to develop positive outcomes.

Keywords: trauma, posttraumatic growth, posttraumatic stress disorder, rumination, cognitive processes, spirituality.

Introduction

Traditionally, psychology has focused disproportionately on negative psychological factors with the aim of reducing distress. However, recently a movement towards positive psychology has begun which aims to redress the balance and give equal weight to the more positive aspects of existence. Wood and Tarrrier (2010) argue that positive and negative characteristics cannot be explored in isolation as they exist on the same continuum, often interact clinically, and positive characteristics can be used as buffers against the development of distress. One area of psychological research in which the balance has begun to shift towards positive factors is that of trauma. Researchers have come to recognize that in addition to the negative consequences experienced by individuals following a trauma, there is also the potential for positive psychological change to occur. This phenomenon has been termed posttraumatic growth (PTG) by Tedeschi and Calhoun (1995).

Trauma

A traumatic event as defined by Criterion A of the diagnostic criteria for posttraumatic stress disorder (PTSD) in the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychological Association [APA], 2000, p.463), is one in which an individual directly or indirectly experiences or is witness to an event(s) that involves “actual or threatened death or serious injury” to self or others, AND it must elicit a response of intense fear, helplessness, or terror. Trauma can be categorised as Type I, i.e. sudden, short-term events such as earthquakes, and Type II trauma, i.e. incidents that are chronic and sustained, such as childhood sexual abuse. Regardless of the type of event, the experience of a trauma can invalidate an individual’s existing understanding and view of the world and as a result, can have an extensive impact on a person’s identity (Janoff-Bulman & Frantz, 1997). Often

the distress this causes can prompt individuals to engage in trying to make sense of the meaning of the traumatic event(s) (Courtois, 2015) and failure to find meaning has been found to be associated with poor psychological outcomes, including depression and PTSD (Woo & Brown, 2013).

Posttraumatic Growth

In contrast, finding meaning in the aftermath of trauma has the potential to lead people to experience profound positive psychological transformation and higher levels of psychological functioning than prior to the event(s). This process is known as PTG. Tedeschi and Calhoun (2004) identified five domains of life in which the positive effects of PTG may occur: improvements in relationships, a greater appreciation for life, new opportunities in life, a greater sense of personal strength, and spiritual development. PTG and PTSD are not mutually exclusive and often co-exist, as an individual can experience distress whilst simultaneously growing (Kaijun, Yuqing, Zhengkui, Peiling & Chuguang, 2015). Some studies report a linear relationship between the two constructs, where the level of psychological growth experienced is directly proportional to the severity of the trauma (Aldwin, Levenson & Spiro, 1994); however, more recent empirical evidence (e.g. Solomon & Dekel, 2007) indicates that a curvilinear relationship may exist in which an optimum level of suffering is required for growth, but excessive levels of distress may impede its development (Butler et al., 2005).

PTG has been found to be associated more with incidents of Type I trauma, rather than Type II (Kira et al., 2013). The phenomenon has been found to occur following a wide range of Type I traumatic events, e.g. natural disasters (Leal-Soto, Carmona-Halty & Ferrer-Urbina, 2016), road traffic accidents (Wu, Leung, Cho & Law, 2016), illnesses (Kolokotroni,

Anagnostopoulos, & Tsikkinis, 2014), and interpersonal violence (Elderton, Berry & Chan, 2017). A meta-analysis on the relationship between PTG and gender indicates that women are more likely to experience PTG than men (Vishnevsky, Cann, Calhoun, Tedeschi & Demakis, 2010). Culture has been found to influence levels of PTG, with participants from studies conducted in the USA reporting higher levels of PTG than other samples, possibly due to the social pressure of needing to respond to challenges with positivity (Zoellner, Rabe, Karl & Maercker, 2008). Also, minority ethnic groups (e.g. African-American and Hispanic populations) report higher levels of PTG than white samples; partially attributed to being mediated by religiosity (Bellizzi et al., 2010). The empirical literature has produced conflicting results regarding the relationship between PTG and age; some report an association but differ in terms of the direction of the relationship (Tallman, Shaw, Schultz & Altmaier, 2010; Widows, Jacobsen, Booth-Jones, & Fields, 2005), while others have found no significant relationship between these variables (Lelorain, Bonnaud-Antignac & Florin, 2010). Student populations have been found to experience similar levels of traumatic events in relation to the general public (Purves & Erwin, 2002). The relationship between PTG and time since trauma appears to be poorly understood, with some studies finding a positive relationship between the two variables (e.g. Manne et al., 2004) and others finding no significant relationship between time and PTG (Bellizzi & Blank, 2006). Those who found an association report conflicting time frames in terms of emergence; some report that it can begin within weeks of the event (Galpin, 2013), however most agree that it takes time, sometimes many years, to develop (Dong, Gong, Liu, Jiang, & Deng, 2015).

Cognitive Processes and Posttraumatic Growth

Tedeschi and Calhoun (2004) state that in order for PTG to occur following trauma, the event must be ‘seismic’ enough to threaten previously held core beliefs, and it is the distress caused by the resulting cognitive dissonance and the “struggle with the new reality in the aftermath of trauma that is crucial in determining the extent to which posttraumatic growth occurs” (p. 5). Individuals may initially find themselves experiencing ‘intrusive rumination’ (IR), described by Cann et al. (2011) as being unwanted, repetitive thoughts about the traumatic event, which are often resisted, involuntary, difficult to control, and associated with attempts to avoid the thoughts. IR is a necessary diagnostic criterion for PTSD (Ehring, Szeimies, & Schaffrick, 2009). These intrusive thoughts can then prompt the individual to progress to processing the trauma in a more conscious and voluntary cognitive manner; this type of thinking has been termed ‘deliberate rumination’ (DR) by Cann et al. (2011). It is a form of repetitive, active, reflective thinking about the event and its meaning that promotes the capacity to reflect on and re-assess one’s existing schema and assumptions in light of the new experience and rebuild one’s view of the world (Janoff-Bulman, 1992). Several studies have found DR to be a crucial cognitive mechanism for both meaning making and the development of PTG (Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012); conversely, low levels of engagement in DR have been found to be associated with greater posttraumatic distress (Stockton, Hunt & Joseph, 2011).

Spirituality

Belief in a higher power is one factor that has been explored as a protective factor when trauma is encountered. Theoretically, this is attributed to the frameworks that belief systems can provide to assimilate challenging life circumstances into one’s existing core beliefs (Overcash, Calhoun, Cann & Tedeschi, 1996). Studies report mixed results in terms of its benefits, with belief systems

found to be associated with both positive and negative health outcomes (e.g. Pargament, Smith, Koenig & Perez, 1998). However many of these studies examined religious beliefs and Bryan, Graham and Roberge (2015) argue the need for differentiation between religion and spirituality. Although spirituality is a difficult concept to define, Pargament (1999) recommends that for the purpose of research, a working definition of “*the search for the sacred*” (p.12) be used.

MacDonald et al. (2015) have expanded on this definition to include the following: "*spirituality is a natural aspect of human functioning which relates to a special class of non-ordinary experiences and the beliefs, attitudes, and behaviours that cause, co-occur, and/or result from such experiences. The experiences themselves are characterized as involving states and modes of consciousness which alter the functions and expressions of self and personality and impact the way in which we perceive and understand ourselves, others, and reality as a whole*" (p.5).

Spirituality has been found to be a moderator of distress; with higher levels of spirituality being associated with lower levels of distress, and lower levels of spirituality being associated with higher levels of distress (Shapiro, Lopez, Schwartz, Bootzin & Figueredo, 2001).

Current Study and Hypotheses

There has been no research to date looking specifically at the interactive relationships of spirituality with the subtypes of repetitive thinking in relation to PTG and PTSD. As both high levels of DR and high levels of spirituality are associated with PTG, it hypothesized that spirituality may play a modifying role in this relationship. The current study aims to test if this relationship exists. In addition, the study will also explore if the relationship between IR and PTSD is moderated by spirituality. However, the possibility of this relationship existing is less clear from the literature, therefore the predictions within this model are more tentative:

Hypotheses Relevant to PTG:

1. Controlling for demographic variables, PTSD and IR, it is predicted that time since trauma, DR and spirituality will all show unique positive associations with PTG.
2. Additionally, it is predicted that spirituality will moderate the relationship between DR and PTG, with high levels of spirituality showing a stronger positive relationship compared to low levels of spirituality.

Hypotheses Relevant to PTSD:

3. Controlling for demographic variables, PTG, DR and time since trauma, it is predicted that intrusive rumination will show positive associations with PTSD. It is also predicted that spirituality will show negative associations with PTSD.
4. Additionally, it is predicted that spirituality will moderate that relationship between intrusive rumination and PTSD, with high spirituality showing a weaker positive relationship compared to low spirituality.

It is hoped that the findings from this study will inform clinical practice, in terms of assessment and formulation of individuals with spiritual beliefs who experience trauma, and may increase understanding of the mechanisms that can promote adaptive outcomes following exposure to traumatic events.

Method

Participants

Ninety-six eligible participants took part in an online survey and were included in the final data analysis (see Figure 1 for participant retention at each stage). The majority of participants identified as female (68.8%), White British (64.6%), post-graduate (54.2%), home students (71.9%). Participants ranged in age from 19-59 years, and the mean age was 26.10 years ($SD=7.71$). The year in which the traumatic event occurred ranged from 1997 to 2016 and mean time since trauma was 57.45 months ($SD=46.64$) or 4 years and 9 months, with the majority of traumas experienced after 2010 (67.4%). See Table 1 for full demographic details of participants.

Inclusion criteria: Students at the University of Liverpool were eligible to take part in the survey if they were over 18 years old, and had experienced a traumatic life event after the age of 16 years. This age limit was chosen in an attempt to capture incidents of Type I trauma (rather than complex Type II trauma such as childhood sexual abuse), and also to ensure that participants have cognitively processed the trauma as adults and not as children. Also, the identified event experienced by the participant must meet Criterion A of the DSM-IV (APA, 2000) definition of a traumatic experience.

Exclusion criteria: Participants who experienced a traumatic event within the past 4 months were excluded to avoid distressing respondents in the acute phase of trauma.

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

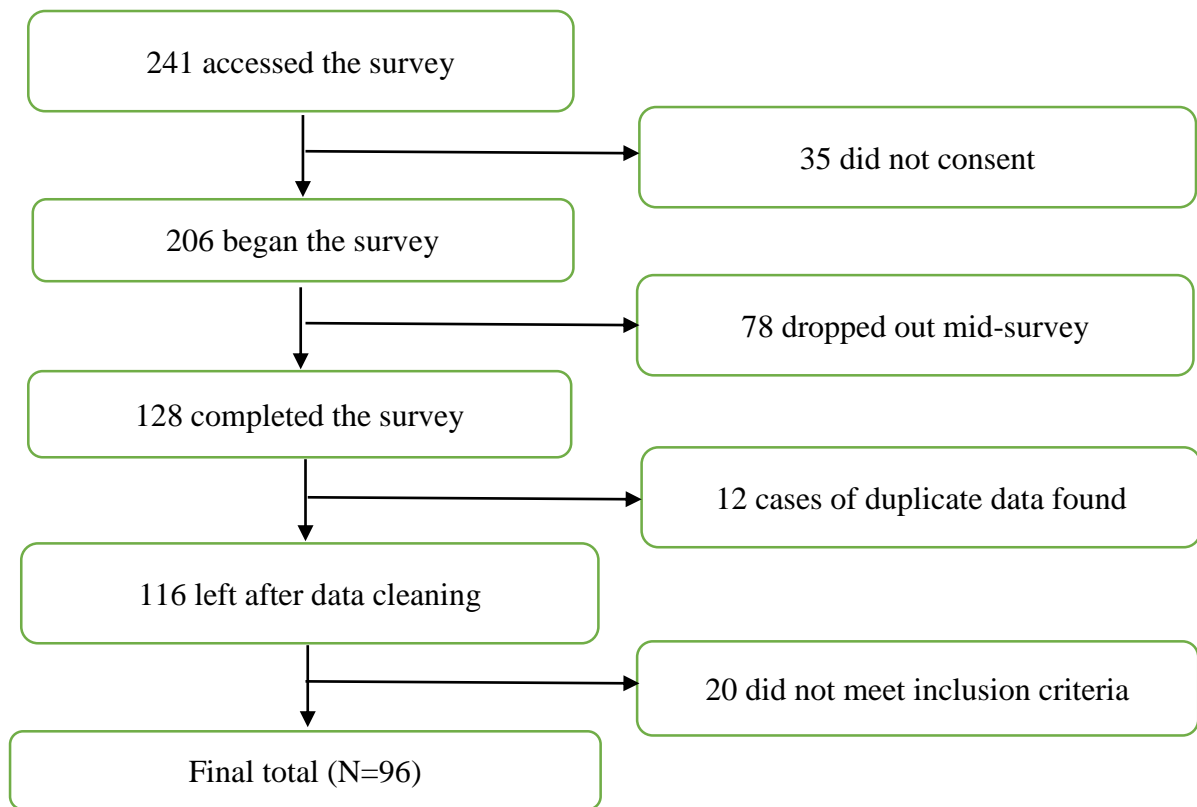


Figure 1: Flow diagram of participation in the study

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

Table 1: Description of participant demographics and trauma data.

		N	% of sample
Gender	Male	30	31.3%
	Female	66	68.8%
Ethnicity	White British	62	64.6%
	White Irish	3	3.1%
	White Other	9	9.4%
	British Asian	5	5.2%
	Indian	2	2.1%
	Pakistani	2	2.1%
	Bangladeshi	1	1.0%
	Chinese	3	3.1%
	Asian (other)	2	2.1%
	Black Caribbean	1	1.0%
	Black British	1	1.0%
	Black (other)	1	1.0%
	White & Black Caribbean	1	1.0%
	Other mixed background	1	1.0%
Arab	2	2.1%	
Student category	Home	69	71.9%
	European Union	7	7.3%
	International	14	14.6%
Year of study	Undergraduate	41	45.8%
	Masters	23	24.0%
	Doctorate	29	30.2%
Potential traumatic event	Serious accident	37	38.5%
	Natural disaster	11	11.5%
	Assault by someone known	10	10.4%
	Assault by stranger	21	21.9%
	Sexual assault by someone known	7	7.3%
	Sexual assault by stranger	8	8.3%
	Military combat	3	3.1%
	Sexual contact while under ag	5	5.2%
	Illness	25	26.0%
Other	16	16.7%	
Met symptom criteria for PTSD	Yes	59	61.5%
	No	37	38.5%
Symptom severity of total sample	Mild	35	36.5%
	Moderate	27	28.1%
	Moderate-severe	26	27.1%
	Severe	8	8.3%
Symptom onset	Immediately post event	44	49.4%
	1 week post event	14	15.7%
	1 month post event	11	12.4%
	After 6 months	8	4.5%
Therapy received	Yes	19	19.8%
	No	76	79.2%

Design

The study was cross-sectional in design. Data was collected via an online survey.

Ethical approval

Ethical approval for the current study was granted by the Institute of Psychology, Health and Society Committee on Research Ethics at the University of Liverpool (reference number IPHS-1516-LB-145; see Appendix D).

Statistical Power

An *a priori* power calculation was conducted using G-Power software. Three predictors (DR, IR & spirituality) plus four potential control variables (gender, age, ethnicity and time since trauma) were entered into the calculation. Based on a moderate effect size of $f^2=0.15$ (Cohen, 1992), power of 0.8 and probability error of $\alpha =0.05$, it was indicated that a sample size of 103 participants would be required to achieve statistical power.

Measures

Demographic questionnaire: The following demographic information was asked of all participants: gender, age, ethnicity, student category (home or international) and year of study.

The Posttraumatic stress Diagnostic Scale (PDS; Foa, 1995) gathers information about the nature of the traumatic event experienced (see Appendix E). Part 1 of the measure checks that criterion A of the DSM-IV (APA, 2000) for trauma is met by providing a checklist of 13 potentially traumatic events (PTEs), one of which is labelled ‘other’ that participants can use to describe an event which does not fit one of the pre-specified categories. Part 2 asks participants

who select multiple traumas to indicate the most significant, and space is provided for respondents to describe the event. It asks respondents how long ago the event occurred (e.g. less than one month, between one to three months, etc.), however in the present study this item was changed to ask for the specific month and year in which the event occurred to increase accuracy. It also asks the following questions to which participants can respond with 'Yes' or 'No': Were they (or someone else) physically injured?; Did they believe their own or someone else's life was in danger?; and Did they feel helpless or terrified in response to the event?. The current study added two extra questions to ask if participants experienced a head injury during the event, and if they received any therapy in relation to the trauma as both factors were deemed important to include as confounders when measuring cognitive response to trauma. Part 3 of the PDS assesses levels of PTSD symptoms in response to exposure to the identified event. The symptom criteria for PTSD outlined in the PDS, states an individual must experience at least one out of five listed symptoms of re-experiencing (Criteria B), at least three out of seven symptoms of avoidance (Criteria C) at least one out of five arousal symptoms (Criteria D). All three subscales are summed to assess symptom severity. The measure has been normed on a variety of trauma populations, has high face validity, good reliability ($\alpha = .92$; Foa, 1995) and in terms of concurrent validity, significantly correlates with the Impact of Event Scale ($r = .78$; Horowitz, Wilner & Alvarez, 1979). In the current study, the PDS was found to have good reliability ($\alpha = 0.93$).

The Event Related Rumination Inventory (ERRI; Cann et al., 2011) is a 20-item scale used to assess levels of rumination during the weeks immediately following a highly stressful event (see Appendix F). Participants are asked to rate on a scale of 0 (not at all) to 3 (often), how often, if at all, they experienced thoughts related to the event. The first 10 items measure intrusive rumination (IR) and the final 10 measure deliberate rumination (DR). The ERRI has

been validated on a student sample and good internal reliability has been found for both intrusive ($\alpha = .94$) and deliberate ($\alpha = .88$) items, with both items being validated in relation to comparable variables, as well as correlating with posttraumatic distress and growth respectively. In the current study, the ERRI was found to have good internal consistency ($\alpha = 0.93$).

The Post Traumatic Growth Inventory – Short Form (PTGI-SF; Cann et al., 2010) is a shorter, revised form of the original 42-item PTGI (Tedeschi & Calhoun, 1996). The PTGI-SF (see Appendix G) contains 10 items in total, two from each of the five PTG subscales. It asks participants to rate the extent to which they experienced positive changes following trauma on a scale of 0 (I did not experience this change as a result of my crisis) to 5 (I experienced this change to a very great degree as a result of my crisis). The scores are summed for a total PTG score and each of the subscales can also be summed for a dimensional score. The PTGI-SF also asks about the nature of the trauma and the time since it occurred, however both of these items were removed to avoid repetition from the PDS measure. The scale has been validated on clinical samples, has good internal consistency (Cronbach's alpha of .90, test– retest reliability of .71) and replicable factor structure with the original measure (Kaler, Erbes, Tedeschi, Arbisi, & Polusny, 2011). In the current study, the PTGI-SF was found to have good internal consistency ($\alpha = 0.89$).

The Expressions of Spirituality Inventory- Revised (ESI-R; MacDonald, 2000; see Appendix H) is a short 30-item version of the original 100 item measure. Items 31 (This questionnaire appears to be measuring spirituality) and 32 (I responded to all statements honestly) were not included in the current study, as they do not contribute to the calculation of final scores. The ESI-R asks respondents to rate on a scale of 0 (strongly disagree) to 4

(strongly agree), the extent to which they agree with 30 statements pertaining to spirituality.

Macdonald et al. (2015) factor analysed an exhaustive range of items related to different facets of spirituality and did this across several cultures. Their analysis yielded five distinct factors or dimensions (of six questions each), which when combined produce a total spirituality score, and also enables sub-scale analysis for different facets of spirituality:

Cognitive Orientation toward Spirituality, Experiential/ Phenomenological, Existential Well-Being, Paranormal Beliefs and Religiousness. All of the Existential Well-Being items (items 3, 8, 13, 18, 23 & 28), and one of the Paranormal beliefs items (item 19) are reverse scored.

The ESI-R has been found to demonstrate good face validity as there is substantial agreement that it measures cross-cultural understandings of spirituality. Also, Cronbach's alpha reliability of the subdivisions was found to range between .72 and .89. In the current study, the ESI-R was found to have good internal consistency ($\alpha = 0.92$).

Procedure

Students at the University of Liverpool were recruited via internal advertisement (Appendix I) on the homepage of the university website, between March 2016 and March 2017. Links to information about participation in the project (Appendix J) and the nature of the research were made available on the internal university intranet and the inclusion and exclusion criteria made explicit. Participants were asked to sign a consent form online (Appendix K), anonymously complete demographic information (Appendix L) and then complete the battery of online self-report questionnaires detailed above. At the end, participants were provided with a debrief form (Appendix M) where information regarding student support services were provided along with the researchers email details should they wish to make contact. Participants were then directed to another link, unconnected to their responses to enter their email address in order to receive a £5 Amazon voucher to thank them for their time.

Data cleaning

Data were examined for accuracy and 12 cases of duplicate data were removed. These entries were identified when it was noted that multiple applications for Amazon vouchers were made from email addresses comprised of derivatives of the same username. The timings of these multiple voucher applications were matched with the timings of the data entries and all matching data were removed.

Missing data

The percentage of missing data for each measure were as follows: PDS (0.36%), ERRI (0.15%), PTGI (0.20%) and the ESI-R (0.27%). Little's 'missing completely missing at random' (MCAR) test was performed on the missing variables to determine that the data were missing at random. The series mean was substituted for missing data in cases where participants had missed 10% or less of items in one measure. According to Osbourne (2013) means can replace missing data without introducing bias, when internal reliability is above 0.90 and there is less than 10% of data missing for an item.

Testing Assumptions

For correlations, assumptions of normality were tested via histograms and Q-Q plot visuals, as well as Shapiro-Wilk tests for all measures. The PDS, PTGI and ERRI totals were found to be significantly not normal and remained so after attempts to transform the data and standardised z-scores. The ESI total was the only measure that met assumptions of normality for parametric testing. Therefore non-parametric tests (Spearman's rho) were used for the correlational analyses of all measures (Field, 2009). Prior to the regression analyses,

assumptions of normality were tested using tests for tolerance and variance inflation factors (VIF), neither of which detected any evidence of multicollinearity. No evidence of homoscedasticity was detected upon visual inspection of plots. All cases were within acceptable Cook's distance limits. Four cases were found to have a standardised residuals outside of the limits of -2 to +2, and one case was found to be above the cut-off point for Mahalanobis, however this is deemed acceptable for the sample size (Field, 2009).

Data analysis

Data were calculated using SPSS (22.0) statistical software. Descriptive data were computed via this software and are presented in Table 2. The PTGI means of those with and without head injuries, and those who did and did not receive therapy, were compared to check if they were confounding factors. No significant difference between the groups was found, therefore neither factor was added to the analysis as a co-variate. For the correlation analysis, bivariate correlations were conducted on all variables (point biserial correlations were performed on the nominal correlations that included gender and ethnicity). A Bonferroni correction was conducted in order to adjust for the effect of multiple correlations (0.5 divided by 276 coefficients gives a new alpha level of $p=.0018$). Only variables that were found to correlate with the dependent variables of PTG and PTSD were included as co-variables in the final moderation and regression analyses.

A moderation analysis of both the PTG and PTSD models was conducted using model one in PROCESS macro for SPSS (Hayes, 2012). Stepwise hierarchical regression analyses were performed to assess the predictive power of the variables on PTG. In the first block of the model, ethnicity was entered as a co-variate; the second block included DR as an independent variable; and spirituality was entered in the third block as a moderator. The PTG model was

found to be significant, therefore, further investigation of simple slopes for the relationship between DR and PTG were tested for low (-1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of spirituality. Stepwise hierarchical regression analyses were performed to assess the predictive power of the variables on PTSD. IR was entered as an independent variable in the first block and spirituality was entered in the second block as a moderator. The PTSD moderation model was non-significant, therefore, in line with recommendations by Wuensch (2016), simple slopes analysis was not performed in this case.

Results

Descriptive statistics

The descriptive results of the PDS, ERRI, PTGI-SF and ESI-R variables are presented in Table 2 with comparative means where possible. The results of the PDS indicate that the mean number of PTSD symptoms experienced was less than the normative PTSD patient sample, but the subscales were all considerably more than a non-clinical sample. Participants experienced less intrusive and deliberate ruminations and PTG than a comparative sample of American students (Lancaster, Klein, Nadia, Szabo & Mogerman, 2015). Participants experienced the most growth in the domains of ‘appreciation of life’ and the least in relation to ‘spiritual change’. The results of the ESI showed an average spirituality score of 48.42 (SD=22.66); no comparative total is available, however, participants scored lower on all subscales compared to the normative sample. The maximum score was found in all domains of spirituality except ‘paranormal beliefs’.

Table 2: Mean & Standard Deviation (SD) scores of the main variables

The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder

		Sample Mean & (SD)	Range	Comparative Mean & (SD)
PDS	Re-experiencing	4.69 (3.71)	0-15	1.02 (0.88) ¹
	Avoidance	6.74 (5.36)	0-21	0.75 (0.74) ¹
	Arousal	4.97 (4.41)	0-15	0.99 (0.98) ¹
	Total	16.41 (12.02)	0-48	23.41 (14.68) ²
ERRI	Intrusive	18.78 (8.44)	1-30	15.22 (8.75) ³
	Deliberate	14.60 (7.34)	2-30	14.16 (7.88) ³
	Total	33.38 (13.69)	4-60	-
PTGI	Relating to others	3.76 (3.03)	0-10	3.04 (1.12) ⁴
	Appreciation of life	5.65 (2.92)	0-10	3.38 (1.27) ⁴
	Personal strength	5.50 (2.93)	0-10	2.86 (1.23) ⁴
	Spiritual change	2.74 (3.19)	0-10	1.39 (1.39) ⁴
	New possibilities	3.72 (3.19)	0-10	1.85 (1.30) ⁴
	Total	21.40 (12.16)	2-50	31.84 (18.30) ³
ESI-R	Cognitive Orientation	10.96 (7.48)	0-24	15.21 (5.20) ⁵
	Experiential/phenomenological	7.17 (6.06)	0-24	10.62 (4.91) ⁵
	Existential well-being	12.84 (5.95)	0-24	15.05 (4.30) ⁵
	Paranormal beliefs	8.28 (5.41)	0-19	10.72 (4.68) ⁵
	Religiousness	9.14 (7.55)	0-24	14.64 (5.85) ⁵
	Total	48.42 (22.66)	0-106	-

Note: ¹ Gul (2014), ² Foa (1995), ³ Lancaster et al. (2015), ⁴ Redwood (2015), ⁵ MacDonald (2000).

Correlations

Bivariate correlations were used to test the PTG hypotheses which predicted that time since trauma, DR and spirituality would all be positively associated with PTG. Bivariate correlational analysis was also used to test the hypotheses that PTSD would be positively related to IR and negatively related to spirituality. The correlation matrix of the main study variables including all subscales is presented in Table 3. Spearman's rho data analysis revealed no significant relationship between time since trauma and PTG. As predicted, a

strong positive relationship was found between DR and PTG. This suggests that the more one engages in DR, the more growth one experiences. A moderately significant relationship was found between spirituality (ESI-R) and PTG, and significant correlations were found between spirituality and four subscales of the PTGI. This suggests that the more spiritual one is, the more growth one is likely to demonstrate in almost all domains, with the exception of 'new possibilities'. Furthermore, the PTGI total was significantly correlated with all spirituality subscales, except for existential well-being and paranormal beliefs, suggesting that the more growth one achieves, the more likely one is to score as spiritual in all but two domains.

As a moderate positive relationship was found between IR and symptoms of PTSD, this suggests that the more intrusive thoughts one has, the more likely one is to experience symptoms of PTSD. No significant relationship was found between spirituality and total symptoms of PTSD. However, the existential well-being subscale of the ESI-R was negatively and significantly correlated with the PDS total, all three PDS subscales and IR. These findings suggest that although no association was found between total levels of spirituality and symptoms of PTSD, an association was found between symptoms of PTSD and the domain of existential well-being. Thus greater levels of existential well-being are associated with fewer PTSD symptoms, and lower levels of existential well-being are associated with more PTSD symptoms.

In addition to the hypothesised relationships, a significant positive relationship was found between DR and spirituality. This suggests that the more spiritual an individual, the more likely they are to engage in DR, and vice versa, the more likely someone is to engage in DR, the more likely they are to report having spiritual beliefs. Gender was not significantly correlated with any of the variables. Significant positive relationships were found between ethnicity and total PTG, and the subscale of spiritual change; ethnicity was also positively correlated with total spirituality and the subscales of cognitive orientation and religiosity.

Table 3. Correlation matrix of all variables including subscales

Variable	1.±	2.	3.±	4.	5.	6.	7.	8.	9.	10.
1. Gender ±	-									
2. Age	-.071	-								
3. Ethnicity±	-.169	.001	-							
4. Time since trauma	-.124	.339*	.066	-						
5. PDS symptoms total	.061	-.113	.143	-.226	-					
6. PDS re-experiencing	.010	-.079	.018	-.296	.828*	-				
7. PDS avoidance	-.013	-.167	.176	-.163	.901*	.617*	-			
8. PDS arousal	.169	-.040	.088	-.146	.897*	.689*	.704*	-		
9. ERRI Total	.178	.275	.133	-.081	.525*	.479*	.389*	.536*	-	
10. Deliberate rumination	.116	.232	.244	-.077	.424*	.397*	.319	.400*	.833*	-
11. Intrusive Rumination	.181	.198	-.040	-.118	.478*	.436*	.340*	.513*	.863*	.477*
12. PTG Total	.009	.171	.336*	.135	.221	.143	.236	.210	.460*	.617*
13. PTG: appreciation of life	.028	.149	.221	.039	.277	.161	.313	.221	.366*	.470*
14. PTG: relations with others	.119	.168	.287	.190	-.030	-.037	-.034	-.006	.290	.419*
15. PTG: personal strength	.072	.247	.161	.152	.075	-.007	.105	.097	.288	.411*
16. PTG: spiritual change	-.094	.065	.471*	.115	.284	.225	.264	.272	.494*	.608*
17. PTG: new possibilities	-.046	.049	.279	.061	.280	.222	.312	.231	.389*	.574*
18. ESI Total	-.115	.130	.468*	.131	.055	-.005	.097	.052	.337*	.358*
19. ESI: cognitive orientation	-.046	.146	.455*	.177	.128	.033	.164	.136	.378*	.419*
20. ESI: phenomenological	-.071	-.075	.241	.009	.162	.075	.142	.193	.349*	.322*
21. ESI: paranormal	.000	-.010	.239	-.095	.158	.035	.157	.167	.183	.143
22. ESI: existential well-being	-.092	.120	.119	.167	-.471*	-.333*	-.402*	-.463*	-.277	-.128
23. ESI: religiosity	-.101	.181	.489*	.121	.097	.029	.118	.104	.347*	.335*

Note: PDS=Posttraumatic Distress Scale, PTGI= Posttraumatic Growth Inventory; ESI= Expressions of Spirituality Inventory

*p<.002

± Point biserial correlations

Continued from previous page...

Table 3. Correlation matrix of all variables including subscales

Variable	11	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22
12 PTG Total	.178											
13 PTG: appreciation of life	.192	.816*										
14 PTG: relations with others	.065	.791*	.532*									
15 PTG: personal strength	.084	.744*	.641*	.469*								
16 PTG: spiritual change	.221	.752*	.463*	.587*	.373*							
17 PTG: new possibilities	.110	.819*	.599*	.540*	.495*	.609*						
18 ESI Total	.200	.481*	.325*	.406*	.332*	.604*	.297					
19 ESI: cognitive orientation	.230	.501*	.411*	.370*	.349*	.624*	.304	.882*				
20 ESI: phenomenological	.290	.391*	.227	.347*	.170	.528*	.294	.789*	.670*			
21 ESI: paranormal	.166	.240	.210	.203	.144	.285	.139	.653*	.434*	.596*		
22 ESI: existential well-being	-.387*	.125	-.033	.195	.233	.076	.071	.143	-.013	-.091	-.145	
23 ESI: religiosity	.231	.390*	.251	.374*	.277	.539*	.170	.878*	.820*	.594*	.529*	-.025

Note: PDS=Posttraumatic Distress Scale, PTGI= Posttraumatic Growth Inventory; ESI= Expressions of Spirituality Inventory

*p<.002

± Point biserial correlations

Hierarchical regression

A three-stage hierarchical stepwise regression equation was conducted with PTG as the dependent variable, to detect which variables made a significant contribution to the PTG model, prior to undertaking the moderation analysis. The analysis revealed that at stage one, ethnicity did not significantly and uniquely contribute to the model, $F(1, 94) = 13.268, p = .125$, however, it explained 12.4% of the variation in PTG. Introducing DR accounted for an additional 31.7% of the variation in PTG, which was significant, $F(1, 93) = 52.690, p < .001$. Adding spirituality explained an extra 7.8% and this was also significant $F(1, 92) = 14.884, p < .001$. The strongest predictor of PTG was DR. In total, the variables explained 51.9% of the variance in PTG. A further two-stage hierarchical stepwise regression was conducted with PTSD as the dependent variable, as outlined in the method section, to again identify which variables contributed significantly to the model. The equation removed spirituality as not contributing to the model. Introducing the IR variable accounted for 24.1% of the variation in PTSD, which was significant, $F(1, 94) = 29.86, p < .001$ (see Table 4 for the results of both regression models).

Table 4. Summary of hierarchical regression models

Model	Step	Variable	R ²	R ² change	Standardized Coefficients		95% Confidence intervals for Beta		
					Beta	<i>t</i>	Sig	Lower	Upper
PTG	Step 1	Ethnicity	.124	.124	.122	1.549	.125	-.107	.866
	Step 2	DR	.441	.317	.502	6.555	.000	.579	1.083
	Step 3	Spirituality	.519	.078	.312	3.858	.000	.081	.254
PTSD	Step 1	IR	.241	.241	-.491	5.464	.000	.445	.954

Moderation Analysis

A moderation analysis was employed to test the hypothesis that spirituality would moderate the relationship between DR and PTG. A significant interaction (see Table 5) was found between the DR and spirituality ($b=0.014$, $SE_b=0.006$, $t=1.34$, $p=.02$). This finding suggests that spirituality is a moderator in the relationship between DR and PTG. However, the non-significant finding in the PTSD regression model indicates that spirituality does not moderate the relationship between IR and PTSD. Simple slopes analysis revealed that the relationship between DR and PTG changes at different levels of spirituality. At low levels of DR, PTG was lower for people with low levels of spirituality ($b = 0.526$, 95% CI [0.12, 0.93], $t = 2.60$, $p = 0.01$), compared to those with moderate ($b = 0.8522$, 95% CI [0.62, 1.08], $t = 7.22$, $p < 0.001$), or high levels of spirituality ($b = 1.178$, 95% CI [0.85, 1.49], $t = 7.34$, $p < 0.001$). Participants with high levels of both DR and spirituality experienced the most PTG and those with the lowest levels of both DR and spirituality experienced the least PTG. These results reveal that the relationship between DR and PTG becomes stronger as levels of spirituality increase, however, even when DR is low, levels of PTG are still higher in those with higher

levels of spirituality compared to those with lower levels (see Figure 2 for the simple slopes graph).

Table 5. Linear model of predictors of Posttraumatic Growth

	<i>B</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
Constant	19.73 [17.18, 22.29]	1.286	15.34	<i>p</i> < .001
Spirituality (centred)	0.15 [0.07, 0.24]	0.043	3.67	<i>p</i> < .001
Deliberate Rumination (centred)	0.85 [0.62, 1.09]	0.118	7.22	<i>p</i> < .001
Spirituality X Deliberate Rumination	0.014 [-.39, .026]	0.006	2.34	<i>p</i> = .02

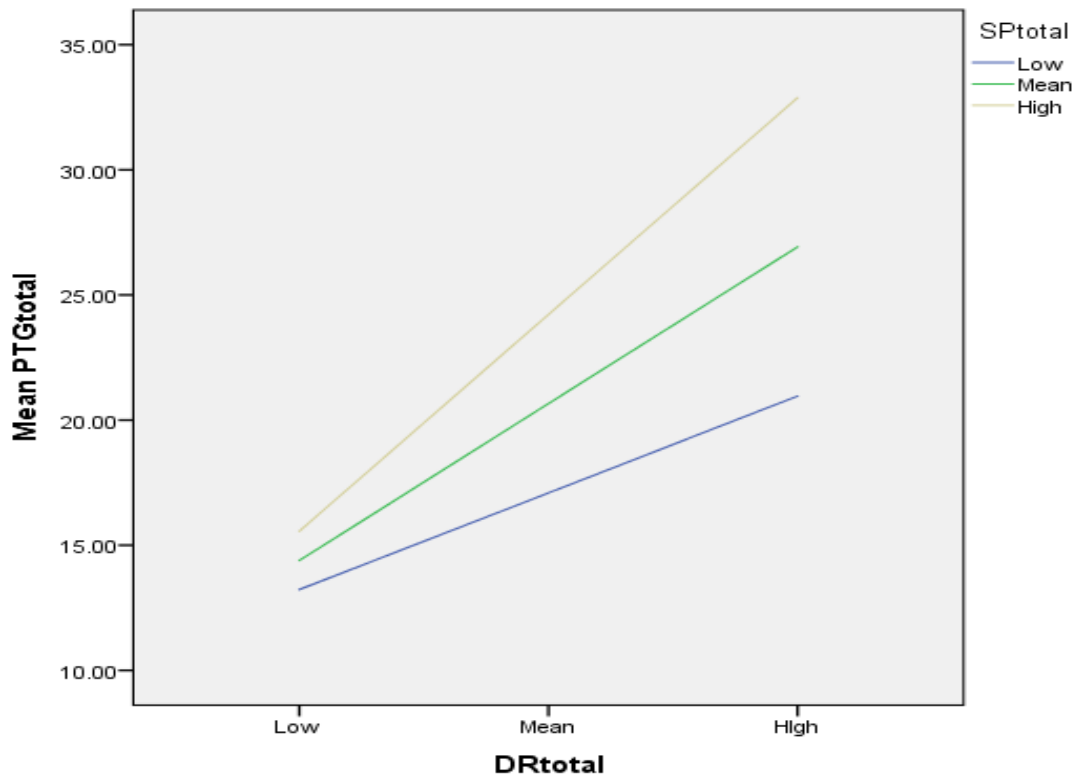


Figure 2. Simple slopes line graph of levels of spirituality

DISCUSSION

This study aimed to supplement the existing trauma literature by identifying a mechanism that moderates the relationship between cognitive processing and trauma outcomes. It intended to explore if spirituality is positively associated with PTG and also to investigate whether spirituality moderates the relationship between DR and PTG. Tentative predictions were also made that negative associations would be found between spirituality and symptoms of PTSD, and that spirituality would moderate the relationship between IR and PTSD.

Findings

As hypothesised, a significant relationship was found between spirituality, PTG and four of the five growth subscales. A significant relationship was also found between PTG and all domains of spirituality, except for existential well-being and paranormal beliefs. Also in line with predictions, spirituality was found to significantly moderate the relationship between DR and PTG, with the relationship between DR and PTG found to be stronger in people with higher levels of spirituality. However, both of the PTSD-related hypotheses were not supported; no significant relationship was found between spirituality and PTSD, and spirituality did not account for any variance in the PTSD regression model. This suggests that although spirituality is not associated with negative trauma outcomes, it is related to positive trauma outcomes and may play a role in facilitating growth following a traumatic experience. These findings contradict Shapiro et al.'s (2001) findings that higher levels of spirituality are associated with lower levels of distress and lower levels of spirituality are associated with higher levels of distress. However, the moderating relationship found supports the theory that having a belief system of some kind can provide individuals with a framework that facilitates

DR and attempts at understanding and meaning-making in the aftermath of distressing life events (Overcash et al., 1996).

The results also indicate that the subscale of ‘existential well-being’ appears to be an anomaly amongst the spirituality subsections. It is the only domain of spirituality that is significantly and negatively associated with all PTSD subscales and IR, and is also one of two domains not related to PTG. MacDonald (2000) describes ‘existential well-being’ as pertaining to “a sense of meaning and purpose for existence, and a perception of self as being competent and able to cope with the difficulties of life” (p.187). This description suggests that existential well-being may be akin to resilience, which enables coping when faced with distress, but does not help an individual to grow following a trauma. This supports the literature that suggests that resilience is inversely related to both PTSD and PTG (Levine, Laufer, Stein, Hamama-Raz & Solomon, 2009). Resilience has been defined as an individual’s ability to “maintain stable equilibrium...when exposed to... aversive life circumstances” (Bonanno, 2004, p.20); whereas PTG is an individual’s capacity to use the process of distress to enable them to make improvements in their life following a trauma (Tedeschi & Calhoun, 1996). Bonanno, Wortman and Nesse (2004) propose that resilience provides a stability that results in less struggle with the aftermath of trauma, resulting in less of a need to make sense of events; therefore it may be possible that ‘existential well-being’ provides a similar function.

Consistent with existing literature, a strong positive relationship was found between DR and PTG. DR explained a significant amount of the PTG regression model and was also found to be the strongest predictor of PTG amongst the variables tested. This provides further evidence for Calhoun and Tedeschi’s (2006) theoretical model in which DR is an important

cognitive process in the development of PTG. In relation to PTSD, the study predicted that intrusive rumination would be positively associated with symptoms of PTSD and the results support the hypothesis, with IR accounting for almost a quarter of the variance in PTSD. These results supplement the existing evidence for these particular processes being involved in the processing of a traumatic experience. Furthermore, spirituality was found to positively and significantly relate to DR, but was not associated with IR. Overcash and colleagues (1996) suggest that metaphysical beliefs are particularly resilient to disconfirmation by empirical evidence; therefore, the association found with DR may be an indication of the cognitive effort required in order to assimilate new evidence into existing belief frameworks.

No significant relationship was found between PTG and time since trauma, this result supports the findings of Bellizzi and Blank (2006), and may be a reflection of our limited understanding of the trajectory of PTG over time. No association was found between PTG and gender; contradicting the existing literature (e.g. Vishnevsky et al., 2010) that suggests females are more likely to experience PTG. Furthermore, no relationship was found between PTG and age, supporting the findings of Lelorain et al. (2010). Ethnicity was the only covariate found to correlate with PTG and contribute to the PTG model, but this was not a significant finding. Ethnicity predicting PTG provides some support for Bellizzi et al.'s (2010) findings that ethnic minorities are more likely to develop PTG, however the sample used in this study may not have been ethnically diverse enough to be significant.

Limitations

The study contains several limitations which suggest caution in the interpretation of the results. First, the use of cross-sectional, correlational data limits inference of causality and

direction of effect. Also, the study relied on self-report data, which may be unreliable, particularly in regard to recall when asking participants to retrospectively report on their thinking processes in the weeks following a past event. Although student populations are often used in PTG research, and have been found to be akin to the general population in terms of prevalence of trauma (Purves & Erwin, 2002), limitations regarding the use of a student sample are acknowledged in terms of age and level of education, that may caution against interpreting the findings as being representative of the general population. A sample of mixed trauma types was used in this study, and although the systematic review section of this report indicates that mixing categories of trauma does not explain the variance in results, clarity regarding categorisation of trauma may be necessary for a more robust understanding of empirical trauma research. Furthermore, service user involvement was lacking at the investigative stage of the study. Although attempts were made to seek input through psychotherapy services that specialise in trauma, the population proved to be difficult to locate, access and involve in the early stages of the proposal. Furthermore, due to experimental error made by the author, item 39 (“How long have you experienced the problems that you reported above?”) and part 4 (“Indicate if the problems have interfered with any of the following areas of your life”) of the PDS were not included in the online questionnaire, therefore it was not possible to assess the duration of symptoms or the impact on functioning.

Spirituality is a notoriously problematic concept to define and operationalise. The ESI-R (MacDonald, 2000) was chosen in an attempt to provide a framework with which to capture the multi-dimensional nature of spirituality. It was developed with the intention of creating a universal scientific measure transcending culture and language and rectifying many of the difficulties found in other tools in terms of definition and measurement. However, despite the ESI-R being deemed the most suitable measure available at the time of the study, it is

acknowledged that any measure attempting to capture and operationalise a concept as elusive and individualistic as 'spirituality' is bound to be flawed. The author acknowledges the inherent difficulties of working empirically with a concept lacking in clarity and the implications this has for subsequent findings. However it is important that such concepts are not neglected, as Taylor (2001) argues that psychology needs to find a scientific method of measuring value systems or it risks losing the human element from which it stemmed, especially in regards to the subject of trauma, when values and beliefs of this kind are often relied on for comfort and strength.

Implications

The findings of this study may contribute to theoretical understandings that spiritual beliefs may be one of a number of mechanisms that can encourage engagement in DR in order to grow and adapt in the aftermath of trauma. Although the focus of clinical psychology is more on recovery from distress rather than on promotion of growth, the emerging field of positive psychology argues that encouraging growth would make clinical psychology a more integrative discipline (Wood & Tarrier, 2010). Theoretically, the findings may contribute to our understanding of the nature of both emotional and ruminative processes. Arguments exist over whether the subtypes within these processes (i.e. positive and negative emotions, and deliberate and intrusive rumination) exist at opposite ends of a spectrum or are distinct constructs. Vazquez, (2017) argues that positive and negative emotions are independent constructs which can co-exist, and Taku, Cann, Tedeschi & Calhoun (2009) recommend viewing the subtypes of rumination as multi-dimensional, separate constructs, which may overlap but are essentially distinct. The findings of the current study lend support to the distinct constructs theories of both rumination and emotion, as different cognitive variables

were found to contribute to both the PTG model (with its associated positive emotions) and PTSD model (with its associated negative emotions). However, Salsman, Segerstrom, Brechting, Carlson and Andrykowski (2009, p. 39) state that "much work remains to further delineate the nature of cognitive processing" as the available empirical literature is inconclusive.

Clinically the results can assist in the assessment and formulation of individuals with spiritual beliefs who have experienced trauma, and an understanding of PTG may provide clients with a sense of hope in the aftermath of tragedy. Belief systems can be used as a framework and context in which to promote DR in order to derive some benefit from distress (Bosson, Kelley & Jones, 2012). Even if clients do not possess spiritual beliefs, therapy could be tailored to encourage particular thinking styles that are associated with spirituality, such as acceptance (Kabat-Zinn, 2003) to aid reflective rumination and foster psychological growth.

Future research

The literature on rumination has become more nuanced and has progressed from categorising rumination into IR and DR, for example reflective rumination and brooding rumination are now recognised as subtypes of DR (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). However the current study was limited by the available questionnaires, as most measure reflective and brooding rumination in relation to depression rather than in relation to traumatic events.

Furthermore, the definition of trauma has changed since the publication of the DSM-V (APA, 2013), however as no measure was found to suitably correlate with the changed definition, the PDS was chosen as it was developed in line with the trauma criteria outlined in DSM-IV (APA, 2000). Therefore it is recommended that, should updated measures of trauma and the subtypes of DR be developed in future, it may be useful to repeat the analysis with the new

measures to see if the results are replicable. Also, in the PTG model, the three variables of ethnicity, DR and spirituality explained just over half of the variance and in the PTSD model, less than a quarter of the variance was identified. Future research is recommended to identify the variables that comprise the rest of these models. Quantitative research in general is limited in terms of understanding peoples lived experience in the aftermath of trauma, therefore qualitative research in the field is also recommended in order to obtain a more meaningful understanding of the development of PTG.

Conclusion

Spirituality was correlated with both DR and PTG in the current study and was found to moderate the relationship between the two constructs. However, it was not correlated with PTSD symptoms and did not moderate the relationship between IR and PTSD. This suggests that spirituality is not associated with adverse outcomes of trauma, but having spiritual beliefs may help individuals to derive some benefit in the aftermath of distressing events. Clinically, the findings may provide hope to trauma survivors who possess spiritual beliefs and for those who do not, it may encourage practitioners to encourage thinking processes linked with spirituality in order to facilitate engagement in DR and foster psychological growth.

References

- Aldwin, C. M., Levenson, M. R., & Spiro, A. (1994). Vulnerability and resilience to combat exposure: Can stress have lifelong effects? *Psychology and Aging, 9*, 34–44.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders DSM-IV-TR (Fourth ed.)*. Washington D.C.: American Psychiatric Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders DSM-V-TR (Fifth ed.)*. Washington D.C.: American Psychiatric Association.
- Bellizzi, K., & Blank, T. (2006). Predicting posttraumatic growth in breast cancer survivors. *Health Psychology, 25*(1), 47-56.
- Bellizzi, K., Smith, A., Reeve, B., Alfano, C., Baumgartner, K., Ballard-Barbash, R, ...Meeske, K. (2010). Posttraumatic Growth and Health-related Quality of Life in a Racially Diverse Cohort of Breast Cancer Survivors. *Journal Of Health Psychology, 15*(4), 615-626.
- Bonanno, G. A. (2004). Loss, Trauma, and Human Resilience: Have We Underestimated the Human Capacity to Thrive After Extremely Aversive Events?. *American Psychologist, 59*(1), 20-28.

- Bonanno, G., Wortman, C., & Nesse, R. (2004). Prospective patterns of resilience and maladjustment during widowhood. *Psychology And Aging, 19*(2), 260-271.
- Bosson, J. V., Kelley, M. L., & Jones, G. N. (2012). Deliberate cognitive processing mediates the relation between positive religious coping and posttraumatic growth. *Journal Of Loss And Trauma, 17*(5), 439-451.
- Bryan, C. J., Graham, E., & Roberge, E. (2015). Living a life worth living: Spirituality and suicide risk in military personnel. *Spirituality in Clinical Practice, 2*, 74– 78.
- Butler, L. D., Blasey, C.M., Garlan, R.W., McCaslin, S. E., Azarow, J., Chen, X. H., ... Spiegel, D. (2005). Posttraumatic growth following the terrorist attacks of September 11, 2001: Cognitive, coping, and trauma symptom predictors in an Internet convenience sample. *Traumatology, 11*, 247–267.
- Calhoun, L. G., & Tedeschi, R. G. (2006). The foundations of posttraumatic growth: An expanded framework. In L. G. Calhoun & R. G. Tedeschi (Eds.), *The handbook of posttraumatic growth: Research and practice* (pp. 1-23). Mahwah, NJ: Lawrence Erlbaum.
- Cann, A, Calhoun, L.G., Tedeschi, R.G., Taku, K., Vishnevsky, T., Triplett, K.N., & Danhauer, S.C. (2010). A short form of the Posttraumatic Growth Inventory. *Anxiety Stress Coping, 23*(2), 127-37.

- Cann, A., Calhoun, L. G., Tedeschi, R. G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C. M. (2011). Assessing posttraumatic cognitive processes: the Event Related Rumination Inventory. *Anxiety, Stress & Coping, 24*(2), 137-156.
- Courtois, C. A. (2015). First, do no more harm: Ethics of attending to spiritual issues in trauma treatment. In D. F. Walker, C. A. Courtois, J. D. Aten, D. F. Walker, C. A. Courtois, & J. D. Aten (Eds.), *Spiritually oriented psychotherapy for trauma* (pp. 55-75). Washington, DC, US: American Psychological Association.
- Dong, C., Gong, S., Liu, X., Jiang, L., & Deng, G. (2015). Posttraumatic growth within the first three months after accidental injury in China: The role of self-disclosure, cognitive processing, and psychosocial resources. *Psychology, Health And Medicine, 20*(2), 154-164.
- Ehring, T., Szeimies, A.K., & Schaffrick, C. (2009). An experimental analogue study into the role of abstract thinking in trauma-related rumination. *Behaviour Research and Therapy, 47*, 285–293.
- Elderton, A., Berry, A., & Chan, C. (2017). A Systematic Review of Posttraumatic Growth in Survivors of Interpersonal Violence in Adulthood. *Trauma, Violence & Abuse, 18*(2), 223-236.
- Field, A. P. (2009). *Discovering statistics using SPSS*. London, England: SAGE.
- Foa, E. B. (1995). *Posttraumatic Stress Diagnostic Scale Manual*. United States of America:

National Computer Systems, Inc.

Galpin, J. (2013). *Posttraumatic stress and growth symptoms in parents of premature infants: the role of rumination type and social support* (Unpublished doctoral dissertation). University of East Anglia, U.K.

Gul, E. (2014). *Prevalence rates of traumatic events, probable PTSD and predictors of posttraumatic stress and growth in a community sample from Izmir* (Unpublished doctoral dissertation). Middle East Technical University, Turkey.

Horowitz, M.J., Wilner, N., and Alvarez, W. (1979). Impact of event scale: A measure of subjective distress. *Psychosomatic Medicine*, *41*, 207-218.

Janoff-Bulman, R. (1992). *Shattered assumptions: Towards a new psychology of trauma*. New York: Free Press.

Janoff-Bulman, R., & Frantz, C. M. (1997). The impact of trauma on meaning: From meaningless world to meaningful life. In M. Power & C. R. Brewin (Eds.), *The transformation of meaning in psychological therapies: Integrating theory and practice* (pp. 91–106). Sussex, England: Wiley.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology-Science And Practice*, *10*(2), 144-156.

- Kaijun, W., Yuqing, Z., Zhengkui, L., Peiling, Z., & Chuguang, W. (2015). Coexistence and different determinants of Post-traumatic stress disorder and Post-traumatic growth among Chinese survivors after earthquake: Role of resilience and rumination. *Frontiers In Psychology, 6*, 39189.
- Kaler, M. E., Erbes, C. R., Tedeschi, R. G., Arbisi, P. A., & Polusny, M. A. (2011). Factor structure and concurrent validity of the Posttraumatic Growth Inventory-Short Form among veterans from the Iraq War. *Journal Of Traumatic Stress, 24*(2), 200-207.
- Kira, I., Aboumediene, S., Ashby, J., Odenat, L., Mohanesh, J., & Alamia, H. (2013). The Dynamics of Posttraumatic Growth Across Different Trauma Types in a Palestinian Sample. *Journal Of Loss & Trauma, 18*(2), 120-139.
- Kolokotroni, P., Anagnostopoulos, F., & Tsikkinis, A. (2014). Psychosocial Factors Related to Posttraumatic Growth in Breast Cancer Survivors: A Review. *Women And Health, 54*(6), 569-592.
- Lancaster, S. L., Klein, K. R., Nadia, C., Szabo, L., & Mogerman, B. (2015). An integrated model of posttraumatic stress and growth. *Journal Of Trauma & Dissociation, 16*(4), 399-418.
- Leal-Soto, F., Carmona-Halty, M., & Ferrer-Urbina, R. (2016). Rumination in posttraumatic stress and growth after a natural disaster: a model from northern Chile 2014 earthquakes. *European Journal of Psychotraumatology, 7*, 316-38.

- Lelorain, S., Bonnaud-Antignac, A., & Florin, A. (2010). Long Term Posttraumatic Growth After Breast Cancer: Prevalence, Predictors and Relationships with Psychological Health. *Journal Of Clinical Psychology In Medical Settings*, 17(1), 14-22.
- Levine, S. Z., Laufer, A., Stein, E., Hamama-Raz, Y., & Solomon, Z. (2009). Examining the relationship between resilience and posttraumatic growth. *Journal Of Traumatic Stress*, 22(4), 282-286.
- MacDonald, D. A. (2000). Spirituality: Description, Measurement, and Relation to the Five Factor Model of Personality. *Journal Of Personality*, 68(1), 153-197.
- MacDonald, D. A., Friedman, H. L., Brewczynski, J., Holland, D., Salagame, K. K., Mohan, K. K., ... Cheong, H. W. (2015). Spirituality as a Scientific Construct: Testing Its Universality across Cultures and Languages. *Plos ONE*, 10(3), 1-38.
- Manne, S., Ostroff, J., Winkel, G., Goldstein, L., Fox, K., & Grana, G. (2004). Posttraumatic growth after breast cancer: Patient, partner, and couple perspectives. *Psychosomatic Medicine*, 66, 442– 454.
- Osborne, J. W. (2013). *Best Practices in Data Cleaning: A Complete Guide to Everything You Need to Do Before and After Collecting Your Data*. Thousand Oaks, CA: Sage Publications.
- Overcash, W. S., Calhoun, L. G., Cann, A., & Tedeschi, R. G. (1996). Coping with crises:

An examination of the impact of traumatic events on religious beliefs. *Journal of Genetic Psychology*, 157, 455–464.

Pargament, K. I. (1999). The psychology of religion *and* spirituality? Yes and no. *International Journal for the Psychology of Religion*, 9, 3–16.

Pargament, K. I., Smith, B. W., Koenig, H. G., & Perez, L. (1998). Patterns of positive and negative religious coping with major life stressors. *Journal for the Scientific Study of Religion*, 37, 710–724.

Purves, D.G., & Erwin, P.G. (2002). A Study of Posttraumatic Stress in a Student Population. *The Journal of Genetic Psychology*, 163(1), 89-96.

Redwood, K. (2015). *An exploration of gender differences in post-traumatic growth in survivors of colorectal cancer* (Unpublished doctoral dissertation). School of Psychology, University of Southampton, U.K.

Salsman, J. M., Segerstrom, S. C., Brechting, E. H., Carlson, C. R., & Andrykowski, M. A. (2009). Posttraumatic growth and posttraumatic stress disorder symptomatology among colorectal cancer survivors: A 3 month longitudinal examination of cognitive processing. *Psycho-Oncology*, 8, 30-41.

Shapiro, S.L., Lopez, A.M., Schwartz, G.E., Bootzin, R., & Figueredo, A.J. (2001). Quality of life and breast cancer: Relationship to psychosocial variables. *Journal of Clinical Psychology*, 57, 501-519.

Solomon, Z., & Dekel, R. (2007). Posttraumatic stress disorder and posttraumatic growth among Israeli ex-POWs. *Journal of Traumatic Stress, 20*, 303–312.

Stockton, H., Hunt, N., & Joseph, S. (2011). Cognitive processing, rumination, and posttraumatic growth. *Journal of Traumatic Stress, 24*, 85–92.

Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2009). Intrusive versus deliberate rumination in posttraumatic growth across US and Japanese samples. *Anxiety, Stress, & Coping, 22*, 129-136.

Tallman, B., Shaw, K., Schultz, J., & Altmaier, E. (2010). Well-being and posttraumatic growth in unrelated donor marrow transplant survivors: a nine-year longitudinal study. *Rehabilitation Psychology, 55*(2), 204-210.

Taylor, A. W. (2001). Spirituality and personal values: Neglected components of trauma treatment. *Traumatology, 7*(3), 111-119.

Tedeschi, R. G., & Calhoun, L.G. (1995). *Trauma and transformation, growing in the aftermath of suffering*. Thousand Oaks, CA: Sage Publications.

Tedeschi, R. G., & Calhoun, L. G. (1996). The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress, 9*, 455– 471.

- Tedeschi, R.G., & Calhoun, L.G. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. *Psychological Inquiry*, *15*, 1-18.
- Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: psychometric analysis. *Cognitive Therapy and Research*, *27*, 247–259.
- Triplett, K. N., Tedeschi, R. G., Cann, A., Calhoun, L. G., & Reeve, C. L. (2012). Posttraumatic growth, meaning in life, and life satisfaction in response to trauma. *Psychological Trauma: Theory, Research, Practice, And Policy*, *4*(4), 400-410.
- Vazquez, C. (2017). What does Positivity Add to Psychopathology? An Introduction to the Special Issue on ‘Positive Emotions and Cognitions in Clinical Psychology’ . *Cognitive Therapy And Research*, 1-10.
- Vishnevsky, T., Cann, A., Calhoun, L. G., Tedeschi, R. G., & Demakis, G. J. (2010). Gender differences in self-reported posttraumatic growth: a meta-analysis. *Psychology of Women Quarterly*, *34*(1), 110–120.
- Widows, M., Jacobsen, P., Booth-Jones, M., & Fields, K. (2005). Predictors of posttraumatic growth following bone marrow transplantation for cancer. *Health Psychology*, *24*(3), 266-273.
- Woo, C., & Brown, E. (2013). Role of meaning in the prediction of depressive symptoms among trauma-exposed and nontrauma-exposed emerging adults. *Journal Of Clinical Psychology*, *69*(12), 1269-1283.

Wood, A. M., & Tarrrier, N. (2010). Positive clinical psychology: A new vision and strategy for integrated research and practice. *Clinical Psychology Review*, 30(7), 819-829.

Wu, K. K., Leung, P. L., Cho, V. W., & Law, L. C. (2016). Posttraumatic growth after motor vehicle crashes. *Journal Of Clinical Psychology In Medical Settings*, 23(2), 181-191.

Wuensch, K. L. (2016). *Reporting the results from a simple moderation analysis*. Retrieved from <http://core.ecu.edu/psyc/wuenschk/StatsLessons.htm>

Zoellner, T., Rabe, S., Karl, A., & Maercker, A. (2008). Posttraumatic growth in accident survivors: Openness and optimism as predictors of its constructive or illusory sides. *Journal Of Clinical Psychology*, 64(3), 245-263.

Appendix A: PRISMA Protocol

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support:		
Sources	5a	Indicate sources of financial or other support for the review
Sponsor	5b	Provide name for the review funder and/or sponsor
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review

Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2 , Kendall's τ)
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)

* It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Appendix B: QATOCC quality assessment tool

Taken from <https://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/cohort>

Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

Criteria	Yes	No	Other (CD, NR, NA)*
1. Was the research question or objective in this paper clearly stated?			
2. Was the study population clearly specified and defined?			
3. Was the participation rate of eligible persons at least 50%?			
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?			
5. Was a sample size justification, power description, or variance and effect estimates provided?			
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?			
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?			
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?			
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?			
10. Was the exposure(s) assessed more than once over time?			
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and			

implemented consistently across all study participants?			
12. Were the outcome assessors blinded to the exposure status of participants?			
13. Was loss to follow-up after baseline 20% or less?			
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?			
Quality Rating (Good, Fair, or Poor) (see guidance)			
Rater #1 initials:			
Rater #2 initials:			
Additional Comments (If POOR, please state why):			

*CD, cannot determine; NA, not applicable; NR, not reported

Appendix C: Journal Guidelines

The Journal of Positive Psychology guidelines taken from:

<http://www.tandfonline.com/action/authorSubmission?show=instructions&journalCode=rpos>

20

- A non-structured abstract of no more than 150 words.
- 4-10 keywords.
- No more than 7500 words; this limit includes tables, references, figure captions, endnotes
- References in APA (American Psychological Association) format.

Appendix D: Ethical approval

Pierce

I am pleased to inform you that IPHS Research Ethics Committee has approved your application for ethical approval. Details and conditions of the approval can be found below.

Ref: IPHS-1516-LB-145
PI / Supervisor: Pierce O'Carroll
Title: The role of repetitive thinking and spirituality in the development of posttraumatic growth and symptoms of posttraumatic stress disorder.
First Reviewer: Rumona Dickson
Second Reviewer: Dimitris Tsvilis
Date of Approval: 21st January 2016

The application was APPROVED subject to the following conditions:

Conditions

- 1 All serious adverse events must be reported to the Sub-Committee within 24 hours of their occurrence, via the Research Governance Officer (ethics@liv.ac.uk).
- 2 This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, IPHS REC should be notified as follows. If it is proposed to make an amendment to the research, you should notify IPHS REC by following the Notice of Amendment procedure outlined at <http://www.liv.ac.uk/researchethics/amendment%20procedure%209-08.doc>.
- 3 If the named PI / Supervisor leaves the employment of the University during the course of this approval, the approval will lapse. Therefore please contact the Institute's Research Ethics Office at iphsrec@liverpool.ac.uk in order to notify them of a change in PI / Supervisor.

Best Wishes

Liz Brignal
Secretary, IPHS Research Ethics Committee

Email: iphsrec@liv.ac.uk

Appendix E: The Posttraumatic stress Diagnostic Scale (PDS; Foa, 1995)

Posttraumatic Stress Diagnostic Scale (PDS)

Part 1

Many people have lived through or witnessed a very stressful and traumatic event at some point in their lives. Below is a list of traumatic events. Put a checkmark in the box to ALL of the events that have happened to you or that you have witnessed.

(1) serious accident, fire, or explosion (for example, an industrial, farm, car, plane, or boating accident)

(2) natural disaster (for example, tornado, hurricane, flood, or major earthquake)

(3) non-sexual assault by a family member or someone you know (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint)

(4) non-sexual assault by a stranger (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint)

(5) sexual assault by a family member or someone you know (for example, rape or attempted rape)

(6) sexual assault by a stranger (for example, rape or attempted rape)

(7) military combat or a war zone

(8) sexual contact when you were younger than 18 with someone who was 5 or more years older than you (for example, contact with genitals, breasts)

(9) imprisonment (for example, prison inmate, prisoner of war, hostage)

(10) torture

(11) life-threatening illness

(12) other traumatic event

(13) If you marked item 12, specify the traumatic event below:

Part 2

(14) If you marked more than one traumatic event in Part 1, put a checkmark in the box below next to the event that bothers you the most. If you marked only one traumatic event in Part 1, mark the same one below:

- Accident
- Disaster
- Non-sexual assault/someone known
- Non-sexual assault/stranger
- Sexual assault/someone know
- Sexual assault/stranger
- Combat
- Sexual contact under 18
- Imprisonment
- Torture
- Life-threatening
- Other

Below, briefly describe the traumatic event you marked above:

Below are several questions about the traumatic event you just described above:

(15) How long ago did the traumatic event happen?

- 1: less than 1 month
- 2: 1 to 3 months
- 3: 3 to 6 months
- 4: 6 months to 3 years
- 5: 3 to 5 years
- 6: more than 5 years

For the following questions, circle Y or N
During the traumatic event:

- (16) Y N Were you physically injured?
- (17) Y N Was someone else physically injured?
- (18) Y N Did you think that your life was in danger?
- (19) Y N Did you think that someone else's life was in danger?
- (20) Y N Did you feel helpless?
- (21) Y N Did you feel terrified?

Part 3

Below is a list of problems that people sometimes have after experiencing a traumatic event. Read each one carefully and circle the number (0-3) that best describes how often that problem has bothered you IN THE PAST MONTH. Rate each problem with respect to the traumatic event you described in item 14.

0: Not at all or only one time

1: Once a week or less/once in a while

2: 2 to 4 times a week/half the time

3: 5 or more times a week/almost always

(22) 0 1 2 3 Having upsetting thoughts or images about trauma event that came into your head when you didn't want them to

(23) 0 1 2 3 Having bad dreams or nightmares about the traumatic event

(24) 0 1 2 3 Reliving the traumatic event, acting or feeling as if it was happening again

(25) 0 1 2 3 Feeling emotionally upset when you were reminded of the trauma event (e.g. feeling scared, angry, sad, guilty, etc.)

(26) 0 1 2 3 Experiencing physical reactions when you were reminded of the traumatic event (for example, breaking out in a sweat, heart beating fast)

(27) 0 1 2 3 Trying not to think about, talk about, or have feelings about the trauma

(28) 0 1 2 3 Trying to avoid activities, people, or places that remind you of the trauma

(29) 0 1 2 3 Not being able to remember an important part of the traumatic memory

(30) 0 1 2 3 Having much less interest or participating less often in important activities

(31) 0 1 2 3 Feeling distant or cut off from people around you

(32) 0 1 2 3 Feeling emotionally numb (e.g. being unable to cry or have loving feelings)

(33) 0 1 2 3 Feeling as if your future plans or hopes will not come true (e.g. you will not have a career, marriage, children, or long life)

(34) 0 1 2 3 Having trouble falling or staying asleep

(35) 0 1 2 3 Feeling irritable or having fits of anger

(36) 0 1 2 3 Having trouble concentrating (for example, drifting in and out of conversations, losing track of a story on TV, forgetting what you read)

(37) 0 1 2 3 Being overly alert (for example, checking to see who is around you, being uncomfortable with your back to a door, etc.)

(38) 0 1 2 3 Being jumpy or easily startled (for example, when someone walks up behind you)

(39) How long have you experienced the problems that you have reported above?

1: Less than 1 month

2: 1 to 3 months

3: More than 3 months

(40) How long after the traumatic event did these problems begin?

1: Less than 6 months

2: 6 or more months

Part 4

Appendix F: The Event Related Rumination Inventory (ERRI; Cann et al., 2011)

The Event Related Rumination Inventory

After an experience like the one you reported as being most stressful or traumatic, people sometimes, but not always, find themselves having thoughts about their experience even though they don't try to think about it. Indicate for the following items how often, if at all, you had the experiences described during the weeks immediately after the event.

0	1	2	3
Not At All			Often

1. I thought about the event when I did not mean to.
2. Thoughts about the event came to mind and I could not stop thinking about them.
3. Thoughts about the event distracted me or kept me from being able to concentrate.
4. I could not keep images or thoughts about the event from entering my mind.
5. Thoughts, memories, or images of the event came to mind even when I did not want them.
6. Thoughts about the event caused me to relive my experience.
7. Reminders of the event brought back thoughts about my experience.
8. I found myself automatically thinking about what had happened.
9. Other things kept leading me to think about my experience.
10. I tried not to think about the event, but could not keep the thoughts from my mind.
11. I thought about whether I could find meaning from my experience.
12. I thought about whether changes in my life have come from dealing with my experience.
13. I forced myself to think about my feelings about my experience.
14. I thought about whether I have learned anything as a result of my experience.
15. I thought about whether the experience has changed my beliefs about the world.
16. I thought about the experience might mean for my future.
17. I thought about whether my relationships with others have changed following my experience.

18. I forced myself to deal with my feelings about the event.
19. I deliberately thought about how the event had affected me.
20. I thought about the event and tried to understand what happened.

Appendix G: The Post Traumatic Growth Inventory – Short Form (PTGI-SF; Cann et al., 2010)

SA-5. Posttraumatic Growth Inventory – Short Form¹⁷

Before answering the following questions, focus on one traumatic or life altering event that has occurred in your life. Please circle the general experience you are thinking of:

- | | | |
|---------------------------------|--------------------------------|--------------------|
| Loss of a loved one | Disaster | Accident or injury |
| Chronic or acute illness | Job Loss | Divorce |
| Violent or abusive crime | Financial hardship | Retirement |
| Change in family responsibility | Career or location change/move | Combat |
| | | Other |

Circle time lapsed since event occurred

- 6 months – 1 year 1 – 2 years 2 – 5 years More than 5 years

Indicate for the statement below the degree to which the change reflected in the question is true in your life as a result of your crisis, using the following scale. Responses are made on the following six-point scale:

- 0 = I did not experience this change as a result of my crisis.
- 1 = I experienced this change to a very small degree as a result of my crisis.
- 2 = I experienced this change to a small degree as a result of my crisis.
- 3 = I experienced this change to a moderate degree as a result of my crisis.
- 4 = I experienced this change to a great degree as a result of my crisis.
- 5 = I experienced this change to a very great degree as a result of my crisis.

1. I changed my priorities about what is important in life.	0	1	2	3	4	5
2. I have a greater appreciation for the value of my own life.	0	1	2	3	4	5
3. I am able to do better things with my life.	0	1	2	3	4	5
4. I have a better understanding of spiritual matters.	0	1	2	3	4	5
5. I have a greater sense of closeness with others.	0	1	2	3	4	5
6. I established a new path for my life.	0	1	2	3	4	5
7. I know better that I can handle difficulties.	0	1	2	3	4	5
8. I have a stronger religious faith.	0	1	2	3	4	5
9. I discovered that I'm stronger than I thought I was.	0	1	2	3	4	5
10. I learned a great deal about how wonderful people are.	0	1	2	3	4	5

¹⁷ Cann, Annie, Calhoun, Lawrence G., Tedeschi, Richard G., Taku, Kanako, Vishnevsky, Tanya, Triplett, Kelli N. and Danhauer, Suzanne C. (2010) A short form of the posttraumatic growth inventory. *Anxiety, Stress & Coping*, 23: 2, 127 – 137.

Appendix H: The Expressions of Spirituality Inventory- Revised (ESI-R; MacDonald et al., 2000)

Expressions of Spirituality Inventory-Revised

This is a questionnaire which concerned your experiences, attitudes, beliefs and lifestyle practices pertaining to spirituality. Below are several statements. Read each statement carefully. Using the five point scale described below, rate the extent to which you agree with each statement as it applies to you and put your response in the space provided. There are no right or wrong answers. Please respond to every statement and respond as honestly as possible.

0-----1-----2-----3-----4
 Strongly Disagree Neutral Agree Strongly Agree
 Disagree

- ___ 1. Spirituality is an important part of who I am as a person
- ___ 2. I have had an experience in which I seemed to be deeply connected to everything.
- ___ 3. It always seems that I am doing things wrong.
- ___ 4. It is possible to communicate with the dead.
- ___ 5. I believe that going to religious services is important.
- ___ 6. Spirituality is an essential part of human existence.
- ___ 7. I have had an experience in which I seemed to transcend space and time.
- ___ 8. I am not comfortable with myself.
- ___ 9. I believe witchcraft is real.
- ___ 10. I feel a sense of closeness to a Higher Power.
- ___ 11. I am more aware of my lifestyle choices because of my spirituality.
- ___ 12. I have had a mystical experience
- ___ 13. Much of what I do in life seems strained.
- ___ 14. It is possible to predict the future.
- ___ 15. I see myself as a religiously oriented person
- ___ 16. I try to consider all elements of a problem, including it's spiritual aspects, before I made a decision.
- ___ 17. I have had an experience in which I seemed to merge with a power or force greater than myself.
- ___ 18. My life is often troublesome.
- ___ 19. I do not believe in spirits or ghosts.
- ___ 20. I see God or a Higher Power present in all the things I do.

- 21. My life has benefited from my spirituality.
- 22. I have had an experience in which all things seemed divine.
- 23. I often feel tense.
- 24. I think psychokinesis, or moving objects with one's mind, is possible.
- 25. I practice some form of prayer.
- 26. I believe that attention to one's spiritual growth is important.
- 27. I have had an experience in which I seemed to go beyond my normal everyday sense of self.
- 28. I am an unhappy person.
- 29. It is possible to leave your body.
- 30. I believe that God or a Higher Power is responsible for my existence.
- 31. This questionnaire appears to be measuring spirituality.
- 32. I responded to all statements honestly.

The positive and negative impact of traumatic experiences

Research Volunteers Wanted

Donna O'Connor (Trainee Clinical Psychologist) is currently recruiting students to take part in a study looking at the psychological consequences of trauma. Trauma is a common experience amongst student populations. We would like to explore both the positive and negative impact that trauma has on individuals .

Criteria for participation:

- (1) Over 18
- (2) The traumatic event must have occurred after the age of 16,
- (3) but not within the past 4 months

NOTE: Your participation will be ANONYMOUS.

The study will be running from **January to December 2016.**

We are asking people to volunteer to complete online questionnaires. This will take between 20-40 minutes

Participants will be provided with a £5 Amazon e-voucher as a thank you for your time and participation

More information and the link to take part in the study can be accessed via this website: <XXXXXXXXXXXXXXXXXXXXXXX>

Appendix J: Participant Information Sheet

Participant Information Sheet

Title of Study: The positive and negative impact of traumatic experiences

You are being invited to take part in an online research study. Before you decide whether you would like to take part or not, it is important for you to understand why the research is being done and what it will involve. **Please take time to read the following information carefully and discuss it with others if you wish.** If anything is not clear, or you would like some more information, you can email the researcher at Donnaoc@liverpool.ac.uk

What is the study for?

This research is about understanding individuals' experience following a traumatic event. Some individuals report negative consequences affecting their thoughts and feelings while others report positive consequences with their thoughts and feelings. We want to explore the types of thinking that individuals engage with following trauma and whether these kinds of thinking are influenced by beliefs that individuals hold about how to understand why events of these kinds happen.

Who is doing the study and who has approved it?

The study is being carried out by a team from the University of Liverpool. It has been approved by the University of Liverpool's Research Ethics Committee.

Why have I been invited to take part?

We are inviting all students currently registered at the University of Liverpool.

Am I eligible to take part?

We are inviting students over the age of 18 who have experienced a traumatic event(s) after the age of 16, but not within the past 4 months.

Do I have to take part in the study?

No. It is up to you to decide whether or not to take part. If you decide to take part then we will ask you to complete a consent form. However, you are still free to withdraw at any time without giving a reason. If you choose to withdraw from the study, you may do so at any time by simply closing the browser window. Please note that if you choose to withdraw, it will not be possible to redirect you to the debrief page, your data will be excluded from the study and you will not be eligible for the £5 Amazon voucher.

What will taking part involve?

If you agree to take part, the link will direct you to complete an online consent form. You will then proceed to complete a set of online questionnaires. We estimate that these should take between 10 and 20 minutes. Please ensure you have sufficient time to complete the questionnaires before commencing the study as it is advisable to complete them in a single sitting. At the end of the study, you will be asked to enter your email address so that we can email you your £5 Amazon gift voucher. Your email address will not be connected to your responses in any way therefore your responses will remain anonymous.

Will there be benefits to taking part?

A £5 Amazon voucher will be awarded to all participants who take part in the study. By taking part you will help us to further improve understanding and awareness of the impact of trauma on peoples' lives. The goal of the research is to help inform the way we support those who struggle with the effects of trauma (e.g., by

providing guidance to health workers and policy makers).

What are the possible disadvantages of taking part?

The questionnaires will take time to complete (a minimum of 10 minutes). They might involve answering questions about things that are upsetting to you. For example, the survey will ask you to specify the type of trauma experienced, how long ago it occurred and will enquire about your emotional reactions to the event. If you find answering questions upsetting you are free to discontinue the study at any time. We will provide information to access local student support services.

What will happen if I want to stop taking part?

You have the right to stop answering any questionnaire at any point, without needing to give any explanation. Should you wish to do this, simply close the internet browser window. Incomplete data sets will be deleted from the data base.

What if I am unhappy or there is a problem?

If you wish to complain or have any concerns about any aspect of the way you have been treated during this study, you can approach Donna O'Connor (Donnaoc@liv.ac.uk). Alternatively, you can contact the Research Governance Officer (0151 794 8290 or ethics@liv.ac.uk). When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

Will my taking part in this study be kept confidential?

Yes it will. All responses will be anonymised, which means that no one will know your identity or which responses are yours. Your data will only be viewed by the researchers involved in the study. All information collected for this research project will be kept safely and securely on a University of Liverpool password-protected computer for 10 years in a central file store in line with University of Liverpool policy for the storage of research data. Access to data by researchers not involved in the current study will be subject to further ethical review.

What will happen to the results of this study?

The results will form part of a Doctorate thesis in Clinical Psychology. They may also be written up for publication in academic journals.

Who can I contact for further information?

Donna O'Connor (Trainee Clinical Psychologist) Email: Donnaoc@liverpool.ac.uk

Thank you for taking the time to read this. You should keep this information sheet for future reference

Donna O'Connor, Trainee Clinical Psychologist, University of Liverpool
Dr Catrin Eames, Lecturer and Clinical Psychology researcher, University of Liverpool
Dr Gundi Kiemle, Clinical Psychologist & Academic Director, University of Liverpool

Appendix K: Participant Consent Form

Title of Study: Positive and negative impact of traumatic experiences

Researcher(s): Donna O'Connor

Dr Catrin Eames

Dr Gundi Kiemle

**Please
check box**

1. I confirm that I have read and have understood the information sheet dated December 2015(version 1) for the above study.

2. I understand that my participation is voluntary and that I am free to withdraw at any time

3. I agree to my anonymised questionnaire data being stored at the University of Liverpool in line with their policy for the storage of research data.

4. I understand and agree that once I submit my data it will become anonymised and I will therefore no longer be able to withdraw my data.

5. I confirm that I fulfil the inclusion criteria outlined in the participant information sheet, including that I am aged over 18 years.

6. I understand that by checking all the boxes, I agree to take part in this study.

The contact details of the researchers that will be carrying out the study are:

Donna O'Connor, Department of Clinical Psychology, 0151 7945535
Donnaoc@liverpool.ac.uk

Dr Catrin Eames, Department of Clinical Psychology, 0151 7945535
eamesce@liverpool.ac.uk

Thank you very much for your time and cooperation

Appendix L: Demographic Questionnaire

Demographic Information

The following questions will be asking you a bit about yourself.

Q.6. What is your gender?

- Male
- Female

Q.7. What is your age?

Q.8. What is your ethnic group? Choose one option that best describes your ethnic group or background:

- White British
- White Irish
- White (other)
- British Asian
- Indian
- Pakistani
- Bangladeshi
- Chinese
- Asian (other)
- Black African
- Black Caribbean
- Black British
- Black (other)
- White and Black Caribbean
- White and Black African
- White and Black Asian
- Any other mixed background
- Arab
- Any other ethnic group (please describe)

Q.9. What category of student are you?

- Home
- European Union
- International

Q.10. What year of study are you in?

- 1st year undergraduate
- 2nd year undergraduate
- 3rd year undergraduate
- 4th year undergraduate
- 5th year undergraduate
- Masters
- Doctorate

Appendix M: Debrief Form

THANK YOU!

We really appreciate the time and effort that you have put into participating in this study. Please follow the link <XXXXXXXXXXXXXXXXXXXX> to enter your email address and we will email you a £5 Amazon voucher within 24 hours.

We hope that there has been nothing upsetting about taking part. However, we would like to remind you that if any of the questions raise concerns or distress, you are advised to contact your GP for support, and/or discuss them with someone you trust.

Also support is available from the Student Mental Health service Monday to Friday between the hours of either 8.30 am - 4.30 pm, or 9.00 am - 5.00 pm. They are contactable via email at mentalhealthadviser@liverpool.ac.uk, telephone on 0151 794 2320/ 0151 794 5863 or by visiting Student Services Centre at the following address: Ground Floor, 150 Mount Pleasant, Liverpool, L69 3GD.

Student Counseling services are contactable via email on counserv@liverpool.ac.uk, telephone on 0151 794 3304 (internal 43304) and drop in sessions are available Monday to Friday: 10.00am - 11.00am (with Men's Space Drop-in sessions on Wednesday afternoon: 3.00 pm - 4.00 pm) at the following address: 14 Oxford Street, Liverpool, L69 7WX.

The contact details of the researchers that will be carrying out the study are:

Donna O'Connor, Department of Clinical Psychology, 0151 7945535 Donnaoc@liverpool.ac.uk

[Dr Catrin Eames, Department of Clinical Psychology](#), 0151 7945535 eamesce@liverpool.ac.uk

