

University of Southampton Research Repository

Copyright © and Moral Rights for this thesis and, where applicable, any accompanying data are retained by the author and/or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This thesis and the accompanying data cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder/s. The content of the thesis and accompanying research data (where applicable) must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holder/s.

When referring to this thesis and any accompanying data, full bibliographic details must be given, e.g.

Thesis: Author (Year of Submission) "Full thesis title", University of Southampton, name of the University Faculty or School or Department, PhD Thesis, pagination.

Data: Author (Year) Title. URI [dataset]

University of Southampton

Faculty of Environmental and Life Sciences

School of Psychology

Childhood Trauma and Posttraumatic Growth: A Systematic Review & Cognitive and Affective Predictors of Wayfinding in a Virtual Maze

by

Karoline Greve Grouleff

ORCID ID: <https://orcid.org/0000-0001-8535-9191>

Thesis for the degree of Doctor of Clinical Psychology

May 2024

Word count: 12682

(Chapter one word count: 9027 including tables, figures and references)

(Chapter two word count: 9928 including tables, figures and references)

University of Southampton

Abstract

Faculty of Faculty of Environmental and Life Sciences

Thesis for the degree of Doctor of Clinical Psychology

Childhood Trauma and Posttraumatic Growth: A Systematic Review & Cognitive and Affective Predictors of Wayfinding in a Virtual Maze

By

Karoline Greve Grouleff

Both chapters of this doctoral thesis focus on investigating the impact of childhood adversity.

The first chapter is a systematic review which aimed to identify, summarise and critically evaluate the research investigating the relationship between childhood trauma and posttraumatic growth (PTG), including mediating and moderating factors. Following PRISMA guidelines, a systematic literature search on three electronic databases (PsychInfo, Medline and Web of Science), nine articles were identified to meet the inclusion and exclusion criteria. A quality assessment of the nine included studies was conducted and a narrative synthesis undertaken. Six of the nine studies included in the review found a nonsignificant relationship between childhood trauma and PTG. Significant mediations included avoidant coping, social support, intrusions, emotion regulation difficulties, attachment style, acceptance, trauma event centrality and resilience. Significant moderators included social and emotional resources and the presence of prosocial adults. Limitations and implications for clinical practice and future research were discussed.

The second chapter is an empirical paper, which aimed to test a central claim of the theory of latent vulnerability by using an experimental design to examine whether bias to threat poses an advantage within an adverse environment and whether this advantage is predicted by ACEs and symptoms of anxiety, paranoia and depression. Upon completion of a pilot phase which used a sample of university students (n=12) recruited via SONA, the experimental study recruited a general adult population sample (n=105) via Prolific. Participants completed one flanker task assessing bias to threat and four self-report questionnaires assessing ACEs and symptoms of depression, anxiety and paranoia. Participants completed two virtual maze tasks assessing spatial navigation in neutral and adverse environments. Multiple linear regressions revealed that bias to threat did not predict maze latency, and that neither ACEs nor current symptoms of depression, anxiety or paranoia predicted maze. Pearson's correlation evidenced significant associations between different indicators of bias to threat, ACEs and latency variance. Limitations, implications and future research were discussed.

Table of Contents

Table of Contents	3
Table of Tables	6
Table of Figures	7
Research Thesis: Declaration of Authorship	8
Acknowledgements	9
Definitions and Abbreviations	10
Chapter 1 Childhood Trauma and Posttraumatic Growth: A Systematic Review	11
1.1 Abstract	11
1.2 Introduction	12
1.3 Current Study	15
1.4 Method	15
1.4.1 Search Strategy	15
1.4.2 Eligibility Criteria.....	16
1.4.3 Study Selection	17
1.4.4 Quality Assessment.....	18
1.5 Results	19
1.5.1 Study Characteristics	19
1.5.2 Sample Characteristics.....	21
1.5.3 The Relationship between Childhood Trauma and PTG.....	22
1.5.4 The Relationship between Childhood Trauma and PTG Domains	24
1.5.5 Mediators	25
1.5.6 Moderators.....	26
1.6 Discussion	33
1.7 Conclusion	40
Chapter 2 Is a Bias Towards Threat Advantageous Within a Threatening Environment: An Experimental Study	42

Table of Contents

2.1	Abstract	42
2.2	Introduction	43
2.2.1	Rationale.....	46
2.2.2	Research Question and Hypotheses	46
2.3	Methods	47
2.3.1	Ethics	47
2.3.2	Design.....	47
2.3.3	Participants	47
2.3.4	Measures	48
2.3.4.1	Demographics Questions	48
2.3.4.2	Attentional Bias to Threat	48
2.3.4.3	Self-report Measures of Depression, Anxiety and Paranoia.....	50
2.3.4.4	Measure of ACEs.....	51
2.3.4.5	Measure of Spatial Navigation in Neutral and Adverse Environments	52
2.3.5	Procedure	55
2.3.6	Statistical Analysis.....	56
2.4	Results	57
2.4.1	Sample Characteristics.....	57
2.4.2	Correlations.....	59
2.4.3	Assessment of the Parametric Assumptions	60
2.4.4	Research Question 1: Does a bias to threat pose an advantage within an adverse environment?	61
2.4.5	Research Question 2: Is this advantage further predicted by ACEs and symptoms of anxiety, paranoia and depression?	64
2.5	Discussion	65
2.6	Conclusion	70
2.7	Acknowledgements	70
2.8	Declaration of interest statement	70
	Appendix A Author Guideline	71

Table of Contents

Appendix B Search Terms and Search Strategy	73
Appendix C ERGO-II Ethics Approval.....	75
Appendix D Demographic Questionnaire.....	76
Appendix E Participant Information Sheet.....	79
Appendix F Debriefing Statement.....	86
List of References.....	90
Chapter One.....	90
Chapter Two	95

Table of Tables

Table 1.1 Quality Assessment Ratings	20
Table 1.2 Sample Characteristics	22
Table 1.3 Results	28
Table 1.4 Summary of Implications	39
Table 2.1 Measures of Depression, Anxiety and Paranoia	58
Table 2.2 ACEs Frequency.....	59
Table 2.3 Pearson's Correlation.....	59
Table 2.4 Mean Reaction Time for The Four Emotional Flanker Task Conditions.....	62
Table 2.5 Paired Sample T-Test	62
Table 2.6 ANOVA.....	63
Table 2.7 Model Summary	63
Table 2.8 Bootstrap for Coefficients.....	63
Table 2.9 ANOVA.....	64
Table 2.10 Model Summary	64
Table 2.11 Bootstrap for Coefficients.....	65

Table of Figures

Figure 1.1 PRISMA Flow Diagram.....	17
Figure 2.1 Emotional Flanker Task Design.....	50
Figure 2.2 Route layout for the spatial navigation maze tasks	53
Figure 2.3 Maze Practice Trials and Experimental Tasks.....	54

Research Thesis: Declaration of Authorship

Print name: Karoline Greve Grouleff

Title of thesis: Childhood Trauma and Posttraumatic Growth: A Systematic Review & Cognitive and Affective Predictors of Wayfinding in a Virtual Maze

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

Signature: Karoline Greve Grouleff.....Date:16.05.2024.....

Acknowledgements

I would like to thank Dr Dennis Golm, Dr Lyn Ellett and Professor Matthew Garner for excellent supervision throughout the process of developing and writing my research thesis. Their knowledge and expertise have been invaluable. Also thank you to Antony Wood and Joshua Hyde for dedicating their time to support with the technical aspects of the empirical study and to Chloé Chainey for support with the screening and quality assessment for the systematic review. It has been an absolute pleasure working with you all.

I would like to thank the participants for taking part in my empirical study.

I would like to thank my family and friends for their endless support and understanding and for putting up with me spending way too many evening, weekends and holidays working and missing out on important events, birthdays and celebrations. A special thank you to my husband, Neil Allan, for always being my biggest cheerleader in life, unconditionally encouraging and supporting me on my many adventures in life.

Definitions and Abbreviations

WHO	.....	The World Health Organisation
PTG	.....	Posttraumatic Growth
ACEs	.....	Adverse Childhood Experiences
PRISMA	.....	Preferred Items for Systematic Reviews and Meta-Analysis guidelines
EPHPP	.....	Effective Public Health Practice Project
CTQ	.....	Childhood Trauma Questionnaire
ACE	.....	Adverse Childhood Experiences Checklist
PTGI	.....	Posttraumatic Growth Inventory
CSA	.....	Childhood Sexual Abuse
QATOCSS	.....	Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies
TF-CBT	.....	Trauma Focused Cognitive Behavioural Therapy
fMRI	.....	Functional Magnetic Resonance Imaging
PTSD	.....	Posttraumatic Stress Disorder
MDD	.....	Major Depressive Disorder
SES	.....	Socioeconomic Status
SONA	.....	An online research participant pool for university students
Prolific	.....	A global online research participant pool
PHQ-9	.....	The Patient Health Questionnaire
GAD-7	.....	The Generalised Anxiety Disorder Questionnaire
R-GPTS	.....	The Revised Paranoid Thoughts Scale
IAPS	.....	International Affective Picture System
MAC	.....	The Maltreatment and Abuse Chronology of Exposure Scale
PPI	.....	Personal and Public Involvement
Qualtrics	.....	A global experience management platform

Chapter 1 Childhood Trauma and Posttraumatic Growth: A Systematic Review

1.1 Abstract

The World Health Organisation (WHO) recognises childhood trauma as a global human rights and public health problem. The research literature has established its impact on psychopathology and life trajectory, but also suggested that childhood trauma can lead to Posttraumatic Growth (PTG) which refers to positive psychological changes and enhanced functioning. This review investigated the relationship between childhood trauma and PTG, including mediating and moderating factors. Following PRISMA guidelines, nine articles were identified by systematically searching three electronic databases (PsychInfo, Medline and Web of Science). Five studies showed a nonsignificant relationship, and three studies showed a significant relationship between childhood trauma and PTG with small effect sizes ($r = -.187-.23$). The relationship was significantly mediated by avoidant coping, social support, intrusions, emotion regulation difficulties, attachment style, acceptance, trauma event centrality and resilience. Social and emotional resources and the presence of prosocial adults were found to significantly moderate the relationship. A quality assessment revealed that the quality of the evidence was weak for all nine studies. Limitations and implications for clinical practice and future research are discussed.

1.2 Introduction

The World Health Organisation (WHO) considers childhood adversity to be a global human rights and public health problem. The WHO defines childhood trauma and adversity as any form of emotional or physical mistreatment, abuse, neglect or exploitation which lead to potential or actual harm to a child (Butchart et al., 2006). This review will use the terms ‘childhood trauma’ and ‘childhood adversity’ interchangeably and in reference to the WHO definition.

It is estimated that one in four children are exposed to adversity at some point in their lives (Lippard & Nemeroff, 2023). The research literature has long established the impact of childhood trauma on development (McCrorry & Viding, 2015), suggesting it is the strongest predictor of psychopathology (McKay et al., 2022). 41.2% of individuals with disruptive disorders have a history of adverse childhood experiences (ACEs). This figure is 32.4% for anxiety disorders, 26.2% for mood disorders and 21.0% for substance disorders. While these figures refer to disorders emerging across the lifespan, the rates of disorders emerging in childhood are higher compared to adulthood. An estimated 44.6% of 20 different DSM-IV disorders, including anxiety, mood disorders, substance misuse and disruptive behaviour, which occur in childhood, are associated with childhood adversity or trauma. This figure is 25.9% for the same mental health disorders occurring in adult life (Green et al., 2010). For individuals with ACEs, depression has been found to be more severe and less responsive to treatment when compared to individuals without ACEs (Nanni et al., 2012).

Childhood trauma and adversity can also serve as a catalyst for positive changes and enhanced functioning (Sheridan & Carr, 2020; Tedeschi & Calhoun, 2004). As a result, the study of Posttraumatic Growth (PTG) has received increasing empirical attention in recent years (Tranter et al., 2021; Woodward & Joseph, 2003). The concept of PTG was firstly

developed by Tedeschi and Calhoun (Tedeschi & Calhoun, 1995) nearly 30 years ago based on the research literature on adult trauma, including sexual assault and military combat. A more detailed version of the PTG model has been developed in recent years (Tedeschi et al., 2018), defining PTG as the positive psychological changes which an individual experiences following trauma or adversity. This include growth in one or more of the five PTG subdomains, including new possibilities, relating to others, personal strength, spiritual change and appreciation of life (Tedeschi & Calhoun, 1996). To our knowledge, a separate definition for PTG emerging from childhood trauma does not exist. As such, research investigating PTG in the context of childhood trauma tends to use the PTG definition provided by Tedeschi & Calhoun (1996), measuring growth across the same five domains (Kilmer et al., 2023).

PTG is not thought to simply result from the traumatic event itself but arises from meaning making and lessons which the individual learns through their struggle in dealing with the aftermath and new reality following trauma (Tedeschi et al., 2018). As a result, PTG leads to an enhanced level of functioning which, importantly, exceeds pre-trauma functioning. This makes it a transformational process which goes beyond resilience and recovery (Tedeschi & Calhoun, 2004). PTG has mostly been studied in adult trauma populations, which has evidenced its relationships with several environment, demographic, social and psychological factors.

Environmental factors such as trauma severity have been found to be significantly positively related to PTG ($r=0.07$) (Helgeson et al., 2006). Demographic factors includes gender ($r=-.08$) and age ($r=-.07$), with results suggesting that females report significantly higher PTG than males (Helgeson et al., 2006) and that gender differences in PTG increase with age (Vishnevsky et al., 2010). In addition, belonging to an ethnic minority group has been shown to be significantly associated with higher PTG ($r=.11$) (Helgeson et al., 2006). Social factors significantly associated with PTG include social support ($r=0.26$) and

religiosity/spirituality ($r=0.23$) (Prati & Pietrantonio, 2009). Psychological factors include processes related to distress response such as perceived stress ($r=0.14$) and intrusive cognitions ($r=0.18$) which have been found to be significantly positively associated with PTG (Helgeson et al., 2006). Psychological processes related to dealing with the aftermath of the trauma include positive reappraisal ($r=0.38$), acceptance ($r=0.20$), denial ($r=0.16$) (Helgeson et al., 2006), optimism ($r=0.23$) and religious coping ($r=0.38$) (Prati & Pietrantonio, 2009). PTG has also been found to be significantly positively associated with secure attachment style ($r = 0.21$) and negatively associated with dismissive attachment style ($r = -0.12$), which have also been found to impact on how individuals cope with childhood trauma (Gleeson et al., 2021). PTG has also been found to be significantly positively associated with well-being ($r=0.22$) and negatively associated with depression ($r=-0.09$), illustrating its positive impact on mental health (Helgeson et al., 2006).

Whilst the presented evidence is for trauma experienced during adulthood, the evidence base on PTG following trauma experienced during childhood is emerging such that a review of the literature is now warranted (Kilmer et al., 2023). Whilst a recent review investigated PTG following sexual assault in adult women (Fayaz, 2023), this novel review will consider both genders, include a broader range of trauma categories and focus on trauma occurring during childhood. The current review will investigate the relationship between PTG and the most common forms of childhood adversity, including psychological abuse, physical abuse, sexual abuse, physical neglect, emotional neglect and household dysfunction (Felitti et al., 1998; Gardner et al., 2019).

1.3 Current Study

The aim of the current review is to investigate the relationship between childhood trauma and PTG. By summarising the findings from the included studies, this review will address the following two research questions:

1. What is the association between childhood trauma and PTG?
2. What factors mediate and moderate the relationship between childhood trauma and PTG?

1.4 Method

1.4.1 Search Strategy

Initial scoping searches were conducted in April 2023. The review was then registered on PROSPERO (CRD42023488700) and a systematic search was conducted in December 2023. The review followed the Preferred Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021). Using a narrative synthesis approach, a summary of the data is presented. A meta-analysis was not performed. Whilst the included studies measured the same outcome (PTG), there was a lack of information about common time points (time since trauma exposure) across the studies and, as such, a statistical synthesis of the included studies is not recommended (Boland et al., 2017).

Three electronic databases were searched, including PsychInfo (through EBSCO), Medline (through EBSCO) and Web of Science. The two key terms, posttraumatic growth and childhood trauma, from the research question directed the search terms, which were further informed by the initial scoping search conducted in April 2023. Using the Boolean operators, the search terms, which were limited to the heading, keyword, author keyword, title or abstract section of the paper, included “adverse childhood experienc*” OR “ACES” OR "child* abuse" OR "child* neglect" OR "child* trauma*" in addition to “posttraumatic

growth" OR "post-traumatic growth" OR "post traumatic growth" OR "PTG" (Appendix B shows the systemic use of search terms across the three electronic databases). Implemented limiters, including source and language, helped focus the literature search to articles written in English and published in academic journals. The search did not include date limits in terms of publication year.

1.4.2 Eligibility Criteria

Inclusion criteria were: Original empirical quantitative studies published in English, using a cross-sectional or longitudinal study design and with participants (children, adolescents or adults) with experiences of childhood trauma specified as psychological abuse, physical abuse, sexual abuse, physical neglect, emotional neglect or household dysfunction (Felitti et al., 1998; Gardner et al., 2019). To improve the quality of the evidence included in the current review, studies were required to use valid and reliable measures of childhood trauma and PTG, which could include widely used self-report or informant (e.g. parent or teacher) questionnaires with well-known psychometric properties or less known questionnaires with reported reliability (α).

Exclusion criteria were: Qualitative studies, systematic reviews and meta-analyses, intervention studies, studies investigating childhood trauma or PTG as mediators in other relationships, grey literature, dissertations, conference abstracts and studies only measuring single subdomains of PTG, to ensure that growth was measured in more than one domain. In addition, studies where participants had not experienced trauma themselves, e.g., intergenerational trauma, were also excluded from the review. Similarly, studies investigating adversity outside of intrafamilial adversity, i.e., studies investigating posttraumatic growth in the context of physical illness, natural disasters, terror attacks and COVID-19 were also excluded.

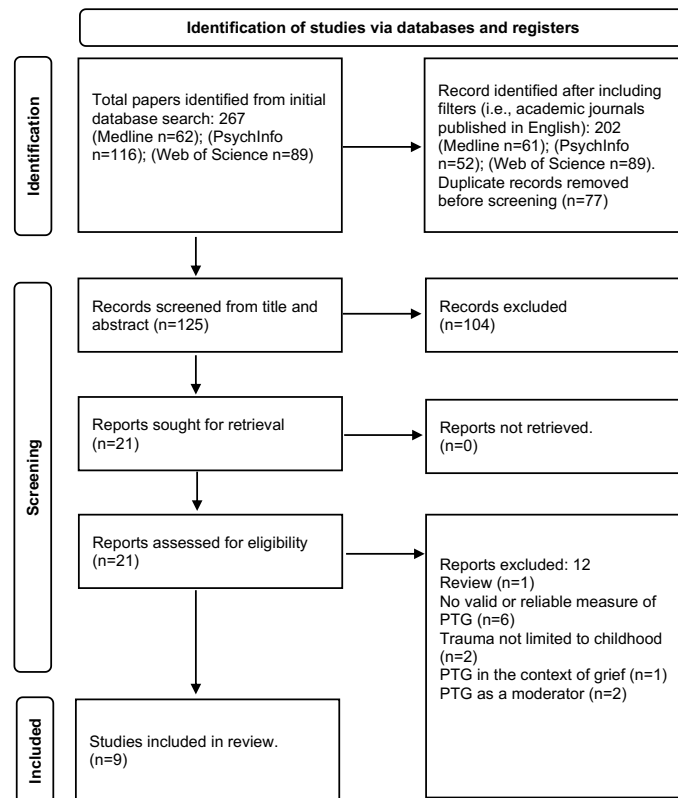
1.4.3 Study Selection

The PRISMA Flow Diagram (Figure 1.1; Page et al., 2021) illustrates the systematic approach to screening, excluding and selecting papers for this review. The systematic search resulted in 267 papers. After limiting the searches to only include papers written in English and published in academic journals, 202 papers were identified. Using the EndNote duplication removal function, 77 duplicates were automatically removed. Afterwards, the list of articles were screened manually. A total number of 125 titles and abstracts were screened via Endnote, which resulted in exclusion of a further 104 papers. As a result, 21 papers were identified as eligible for full text screening. During this process, 12 papers were excluded, leaving 9 papers to be included in this review.

All papers were screened and reviewed by two independent raters at the title- and abstract screening stage and the full text screening stage. There was a 92.19% agreement amongst the two raters in the title and abstract screening phase due to 10 discrepancies with an interrater reliability classified as ‘moderate agreement’ ($k=0.50$). There was 95.23% agreement in the full text screening phase due to one discrepancy, which was resolved via discussion. The interrater reliability was classified as ‘almost perfect agreement’ ($k=0.90$) (Landis & Koch, 1977).

Figure 1.1 PRISMA Flow Diagram

Chapter 1



1.4.4 Quality Assessment

The quality of the included studies was assessed using the Effective Public Health Practice Project (EPHPP) assessment tool (<http://www.city.hamilton.on.ca/phcs/EPHPP/>), which was selected because of its generic application to a variety of quantitative study designs, including cross-sectional studies, investigating health-related topics, and because its content and construct validity has been established (Thomas et al., 2004).

The EPHPP assesses quality within six domains (selection bias, study design, confounders, blinding, data collection method and withdrawals/dropouts) from which it provides a global quality score (Armijo-Olivo et al., 2012). Each domain can be rated as weak, moderate or strong according to a standardised guide. The global quality score ultimately depends on the total number of weak domain scores with a strong global rating containing zero weak domain scores, a moderate global rating containing one weak domain

score, and a weak global rating containing a minimum of two weak domain scores (Thomas et al., 2004). Two independent raters conducted quality assessments for all papers. Any disagreements were resolved via discussion.

All nine studies obtained a weak global quality rating. Items which rated low for all nine studies referred to study design and confounders as all the studies used a cross-sectional design and did not consider potential confounders. Items which rated moderate for all nine studies included blinding and withdrawal.

1.5 Results

1.5.1 Study Characteristics

Studies were published between 2017 to 2023. All nine studies used a cross-sectional design with sample sizes ranging from 139 to 1,028. Studies were conducted in the USA (k=4), UK (k=3), China (k=1) and Indonesia (k=1). All nine included papers received a weak global quality score as illustrated in Table 1.1.

Participants in all nine studies had historic experiences of childhood maltreatment, which was assessed retrospectively via self-report questionnaires. Whilst two studies used a version (standard or short form) of the Childhood Trauma Questionnaire (CTQ; Pennebaker & Susman, 1988) and two studies used a version (standard or short form) of the Adverse Childhood Experiences Checklist (ACE; Felitti et al., 1998), the majority of studies (k=5) all used different measurement tools for childhood trauma. All nine studies used the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) to measure PTG.

Table 1.1 Quality Assessment Ratings

Author	Selection bias	Study design	Confounders	Blinding	Data Method Collection	Withdrawals and Dropouts	Global Score
Brooks et al. (2019)	Weak	Weak	Weak	Moderate	Strong	Moderate	Weak
Carter et al (2021)	Moderate	Weak	Weak	Moderate	Weak	Moderate	Weak
Fraus et al. (2023)	Weak	Weak	Weak	Moderate	Weak	Moderate	Weak
Mohr & Rosén (2017)	Weak	Weak	Weak	Moderate	Weak	Moderate	Weak
Nelson et al. (2019)	Moderate	Weak	Weak	Moderate	Strong	Moderate	Weak
Quan et al. (2022)	Moderate	Weak	Weak	Moderate	Weak	Moderate	Weak
Schaefer et al. (2018)	Moderate	Weak	Weak	Moderate	Strong	Moderate	Weak
Tranter et al. (2021)	Weak	Weak	Weak	Moderate	Weak	Moderate	Weak
Widyorini et al. (2022)	Weak	Weak	Weak	Moderate	Strong	Moderate	Weak

1.5.2 Sample Characteristics

Across the nine included studies, 73.57% of participants were female. Participants in the majority of studies were predominantly white and from countries of western culture (k=5). Four studies did not provide any data on race or ethnicity. The mean age ranged from 19.68 to 41.64 and was calculated to be 30.05 across the studies (k=6) reporting this. Four studies included only adults, two studies included adolescents and adults, one study included only adolescents, and two studies did not clarify this. All nine studies included non-clinical populations and used convenience sampling. Four studies recruited students from places of education, including high school (k=1), college (k=2) and university (k=1). One study recruited from the general population and reported that 60.5% of the participants were high school or university students. One study included adult survivors of childhood sexual abuse recruited from online support networks. One study recruited participants from different places, including university (37.7%), victim support services and online forums (26.5%), and professional networking websites (35.8%). The remaining studies (k=2) included participants from the general population, however, did not provide information on the study advertisement and recruitment processes. No studies considered potential confounders such as gender, SES or culture and this was a limitation to the quality of the research.

Table 1.2 provides an overview of studies (k=5) reporting the types of childhood trauma which participants were historically exposed to. Sexual abuse and physical abuse were found to be the most common types of childhood trauma. Across studies (k=5) providing data on this, 52.38% of all participants reported historic experiences sexual abuse/assault and 27.52% of all participants reported historic experiences of physical abuse/violence during childhood. From the studies (k=5) reporting the average number of

unique traumatic events, participants had on average been exposed to 3.24 traumatic events during childhood.

Table 1.2 Sample Characteristics

Study	Trauma Type	Mean Trauma Events
Brooks et al. (2019)	Sexual abuse (100%)	Not reported
Carter et al. (2021)	Bereavement, parental upheaval, sexual abuse, physical abuse, serious illness or injury, neglect, other	2.39
Fraus et al. (2023)	Death (79%), divorce/separation (36%), sexual assault (14%), violence (10%), significant injury (28%)	2.12
Mohr & Rosén (2017)	Physical abuse (48.1%), sexual abuse (26.5%), emotional abuse (74.6%), neglect (24.2%)	Not reported
Nelson et al. (2019)	Sexual abuse (100%)	Not reported
Quan et al. (2022)	Emotional abuse, emotional neglect, sexual abuse, physical abuse and physical neglect	Not reported
Schaefer et al. (2018)	Physical abuse (52%) and sexual abuse (69%)	7.88
Tranter et al. (2021)	Physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect and household dysfunction	2.37
Widyorini et al. (2022)	Physical abuse, verbal abuse, sexual harassment, physical abandonment, emotional abandonment and household dysfunction	1.46

1.5.3 The Relationship between Childhood Trauma and PTG

The majority of studies (k=6) (Brooks et al., 2019; Carter et al., 2021; Fraus et al., 2023; Nelson et al., 2019; Schaefer et al., 2018; Tranter et al., 2021) found a nonsignificant correlation between childhood trauma and PTG. Three studies (Brooks et al., 2019; Nelson et

al., 2019; Schaefer et al., 2018) found a small negative non-significant correlation ($r = -.04 - .16$) and three studies (Carter et al., 2021; Fraus et al., 2023; Tranter et al., 2021) found a small positive non-significant correlation ($r = .00 - .14$). Importantly, for studies that found a significant correlation as well as studies that did not find a significant correlation, a cross-sectional study design was used. This was a limitation to the quality of the research in all nine studies, which all obtained weak global quality ratings.

Two out of nine studies (Quan et al., 2022; Widyorini et al., 2022) found a significant negative correlation between childhood trauma and PTG ($r = -0.17, p < 0.01$ and $r = -.19, p < .01$). One study (Fraus et al., 2023) operationalised childhood trauma as event severity and total number of trauma events. Results from this study indicated a significant correlation between PTG and event severity ($r = .23, p < .01$) and a nonsignificant correlation between PTG and the number of trauma events ($r = .15, p > .05$). Using Cohen's (1992) classification guide, the effect of the significant relationships can all be classified as small (Cohen, 1992). Contrary to the studies that did not find a significant relationship between childhood trauma and PTG, the studies that did find significant relationships were conducted in countries of non-western culture but did not specify race ($k=2$). They used translated versions of the questionnaires ($k=2$) or an adapted version of the PTGI ($k=1$), investigated PTG in relation to trauma associated with death and divorce ($k=1$) or did not provide descriptive information about trauma types ($k=2$). The studies also included high school or college students ($k=3$) with age ranges lower ($k=2$) than the mean age across the included studies. The studies were conducted using pen and paper ($k=2$) and used either a very small sample size ($k=1$) or a very large sample size ($k=1$).

Whilst eight of the included studies used correlation analysis to report the relationship between childhood trauma and PTG, one study (Mohr & Rosén, 2017) only reported the descriptive statistics and found that 91% of all participants ($n=236$) reported PTG, which was

evidenced as a score of 1 or more on the PTGI ($M=39.57$, $SD=29.35$). This appear to be a low threshold as other studies using the PTGI have applied cutoff scores ranging from 3 (Holtmaat et al., 2017; Jansen et al., 2011) to 45 (Mazor et al., 2016).

1.5.4 The Relationship between Childhood Trauma and PTG Domains

Three studies (Fraus et al., 2023; Nelson et al., 2019; Widyorini et al., 2022) investigated the relationship between childhood trauma and specific PTG domains.

Across the three studies, the PTG domain ‘new possibilities’ was found to be significantly positively associated with the number of trauma events ($r=.34$, $p<.01$) ($k=1$) and significantly negatively associated with ACEs ($r=-.166$, $p<.01$) ($k=1$) and intrusions ($r=-.12$, $p<.05$) ($k=1$) with the latter being operationalised as the perceived impact of childhood sexual abuse. The strength of the relationships can be classified as medium, small and small respectively.

The PTG domain ‘personal strength’ was found to be significantly associated with ACEs ($r=-.155$, $p<.01$) ($k=1$), the number of trauma events ($r=.24$, $p<.01$) ($k=1$) and the perceived impact childhood sexual abuse (CSA) ($k=1$) measured as intrusions ($r=-.17$, $p<.01$), avoidance ($r=-.12$, $p<.05$) and hyperarousal ($r=-.18$, $p<.001$). The strength of the relationships can all be classified as small.

The PTG domain ‘relating to others’ was found to be significantly negatively associated with hyperarousal ($r=-.12$, $p<.05$) ($k=1$) and ACEs ($r=-.188$, $p<.01$) ($k=1$). Both relationships can be classified as small in strength.

The PTG domain ‘appreciation of life’ was found to be significantly positively associated with the total number of trauma events ($r=.27$, $p<.01$) ($k=1$) and significantly

negatively associated with and ACEs ($r=-.159, p<.01$) ($k=1$) and hyperarousal ($r=-.12, p<.05$) ($k=1$). The strength of the relationships can be classified as small.

No studies found a significant association between childhood trauma and the PTG domain ‘spirituality’.

Contrary to studies ($k=6$) that did not investigate the relationship between childhood trauma and PTG domains, studies ($k=3$) investigating these relationships also found significant relationship between childhood trauma and PTG ($k=2$) and differed from the majority of studies in ways already discussed. In addition, two of the three studies investigating PTG domains also differed in relation to operationalisation and measurement of childhood trauma, including the perceived impact of the trauma ($k=1$) or the total number of trauma events ($k=1$).

1.5.5 Mediators

Six studies (Brooks et al., 2019; Cater et al., 2021; Nelson et al., 2019; Quan et al., 2022; Tranter et al., 2021; Widyorini et al., 2022) investigated the role of 15 different mediators regarding the relationship between childhood trauma and PTG. Nine different factors were found to significantly mediate the relationship between childhood trauma and PTG. Importantly, most mediators were not investigated across more than one study and only resilience, as a mediator, was investigated in two studies (Tranter et al., 2021; Widyorini et al., 2022). The effect of eight of the nine mediators were classified as small (Preacher & Kelley., 2011) and one mediator (resilience) was classified as a medium effect in two studies.

One study (Tranter et al., 2021) found a significant small positive indirect effect of ACEs on PTG via event centrality (i.e., events that significantly changes an individual’s life trajectory). One study (Brooks et al., 2019) found a significant small negative indirect effect

of childhood trauma on PTG via social support. This study also found a significant small positive indirect effect of childhood trauma on PTG via avoidant coping and intrusions respectively. One study (Carter et al., 2021) found a significant small negative indirect effect of childhood trauma on PTG via emotion regulation difficulties, which accounted for 10% of variance in PTG. One study (Nelson et al., 2019) found that the association between childhood sexual abuse and PTG was significantly mediated by attachment style, which accounted for 8% of variance in PTG. This study found that higher levels of trauma were linked to insecure attachment style and that secure attachment style was linked to PTG. One study (Quan et al., 2022) found a significant small negative indirect effect of childhood trauma on PTG via acceptance, which accounted for 17.25% of variance in PTG. Finally, two studies (Tranter et al., 2021; Widyorini et al., 2022) found a significant medium negative indirect effect of ACEs on PTG via resilience. One study (Widyorini et al., 2022) investigated the role of resilience factors as mediators regarding the relationship between childhood trauma and PTG. The study found that the association between ACEs and PTG was significantly mediated by trust in one's instinct, tolerance to negative effect, strengthening effects of stress, positive acceptance of changes and secure relationships, control and spiritual changes. Personal competence, high standards and tenacity ($k=1$), spirituality, emotional coping and active coping ($k=1$) were not found to significantly mediate the relationship between childhood trauma and PTG.

1.5.6 Moderators

Amongst the nine studies included in this review, only one study (Mohr & Rosén, 2017) investigated moderators of the association between maltreatment and PTG. Results suggested that the involvement of prosocial adults (i.e., adults who care about and look out for the individual exposed to childhood maltreatment) significantly moderated the

Chapter 1

relationship between childhood maltreatment and PTG, accounting for 7.3% of variance in PTG ($R^2=0.073, p<0.01$). The results suggest that greater involvement of prosocial adults led to higher levels of PTG. In addition, the number of social and emotional resources were also found to significantly moderate this relationship, accounting for 7.9% of variance in PTG ($R^2=0.079, p<0.01$). The results suggested that having more social and emotional resources available led to greater PTG. Acceptance, emotional support, optimism, positive reframing and self-esteem were not found to significantly moderate the relationship between childhood maltreatment and PTG (Mohr & Rosén, 2017).

Chapter 1

Table 1.3 Results

Author	Population	Sample Size (N)	Childhood Trauma Measurement Tools	PTG Measurement Tools	Main Findings (Relationship between Childhood Trauma and PTG)	Significant Mediators	Significant Moderators
Brooks et al. (2019)	General population recruited from university (37.7%), victim support services or online forums (26.5%), and professional networking websites (35.8%).	268 (of which 93 experienced childhood trauma)	PDS	PTGI-SF	Nonsignificant correlation between childhood trauma and PTG ($r = -.16, p > .05$).	The association between childhood trauma and PTG was significantly mediated via avoidant coping ($ab_{cs} = -.04$; 95% BCa CI [-.09, -.02], $p < .05$), social support ($ab_{cs} = -.02$; 95% BCa CI [-.05, -.01], $p < .05$) and intrusions ($ab_{cs} = .04$; 95% BCa CI [.01, .08], $p < .05$)	
Carter et al. (2021)	General population	223	CTQ	PTGI	Nonsignificant correlation between childhood trauma severity and PTG ($r = 0.14, p > .05$)	The association between childhood trauma and PTG was significantly mediated via emotion regulation difficulties ($ab = -.14$, 95% BCa CI [-.26, -.04], $p < .001$, $ab_{cs} = -.05$)	
Fraus et al. (2023)	High school students	139	TES	PTGI (modified version)	Nonsignificant correlation between PTG and number of trauma events ($r = .15, p > .05$). Significant correlation between PTG domains changed priorities ($r = .27, p < .01$), self-		

					reliance ($r = .24, p < .01$) and new path ($r = .34, p < .01$) and number of trauma events. Significant correlation between PTG and event severity ($r = .23, p < .01$). Nonsignificant correlations between event severity and PTG subdomains.	
Mohr & Rosén (2017)	University students	501 (of which 260 was childhood maltreatment)	MHS	PTGI	91% of participants ($n=236$) reported PTG, evidenced as a score of at least 1 on PTGI ($M = 39.57, SD = 29.35$)	Social and emotional resources ($b = -0.22, 95\% \text{ CI } [-0.37, -0.07], t = -2.92, p < 0.01, 95\% \text{ bootstrapped CI } [-0.36, -0.09]$) and the presence of prosocial adults ($b = -1.75, 95\% \text{ CI } [-2.96, -0.54], t = -4.09, p < 0.01, 95\% \text{ bootstrapped CI } [-2.90, -0.48]$) significantly moderated the relationship between childhood maltreatment and PTG.
Nelson et al. (2019)	Adult child sexual abuse (CSA) survivors recruited from online support networks.	292	IES-R	PTGI	Non-significant correlation between the overall perceived impact of CSA and PTG ($r = -.11, p > .05$). Significant correlation between PTG and	The effect of trauma on attachment style was statistically significant ($CR [.314/.069] = 4.55, p < .000$). The effect of attachment style on PTG was significant

Chapter 1

					<p>perceived impact of CSA aspect Hyperarousal ($r = -.13, p < .05$). Significant correlation between PTG subdomain Personal Strength and perceived impact of CSA including intrusions ($r = -.17, p < .01$), avoidance ($r = -.12, p < .05$) and hyperarousal ($r = -.18, p < .001$). Significant correlation between PTG subdomain New Possibilities and CSA aspect Intrusions ($r = -.12, p < .05$). Significant correlation between PTG subdomain Appreciation of Life and CSA aspect hyperarousal ($r = -.12, p < .05$). Significant correlation between PTG subdomain Relating to Others and CSA aspect hyperarousal ($r = -.12, p < .05$).</p>	<p>(CR [-.701/.345] = -2.03, $p < .05$). The effect of trauma on PTG was nonsignificant (CR [.038/.124] = 0.31, $p > .05$). Based on these findings, authors concluded that personal attachment style significantly mediated the relationship between CSA and PTG. This accounted for 8% of the variance in PTG (standardised coefficient = -.31, $p < .05$).</p>
<p>Quan et al. (2022)</p>	<p>College Students</p>	<p>1,028</p>	<p>CTQ-SF (Chinese version)</p>	<p>PTGI</p>	<p>Significant, negative correlation between childhood trauma and PTG ($r = -.17, p < 0.01$)</p>	<p>The association between childhood trauma and PTG was significantly mediated via acceptance ($\beta = -.04, SE = .03, 95\% CI [-.10, -.004], p < 0.05, ab_{es} = -.04$). This</p>

Chapter 1

Schaefer et al. (2018)	College Students	161	CTES	PTGI	Nonsignificant correlation between the total number of childhood trauma and PTG ($r = -.04, p > .05$), age and PTG ($r = .06, p > .05$) and perceived childhood trauma severity and PTG ($r = .15, p > .05$).	accounted for 17.25% of variance in PTG.
Tranter et al. (2021)	General population	167	ACE-Q	PTGI-SF	Nonsignificant correlation between ACE and PTG ($r = .00, p > 0.05$).	The association between ACE and PTG was significantly mediated via resilience ($ab_{cs} = -.10, SE = .04, 95\% CI [-.17, -.04], p < 0.05$) and event centrality ($ab_{cs} = .06, SE = .03, 95\% CI (.01, .12), p < 0.05$), which accounted for 38.4% of the variance in PTG ($F [3, 163] = 33.90, p < .001$).
Widyorini et al. (2022)	General population recruited from social networking sites. Included High School and University students (60.5%)	349	ACE	PTGI	Significant correlation between ACE and PTG ($r = -.19, p < .01$) Significant negative correlation between ACE and PTG domains, including relating to others ($r = -.188, p < .01$), new possibilities ($r = -.166, p < .01$), personal strength ($r = -.155, p < .01$) and	The association between ACE and PTG was significantly mediated via resilience ACE and PTG ($\beta_c = -.12, p < .05, ab_{cs} = -.12$).

Chapter 1

appreciation of life ($r = -.159, p < .01$).
Nonsignificant
correlation between
ACE and spiritual
changes ($r = -.085, p > .05$)

Note: PDS = Posttraumatic Diagnostic Scale, PTGI-SF = Post Traumatic Growth Inventory Short Form, CTQ = Childhood Trauma Questionnaire, PTGI = Post Traumatic Growth Inventor, TES = Trauma Event Survey, MHS = Maltreatment History Survey, IES-R = Impact of Events Scale – Revised, CTQ-SF = Childhood Trauma Questionnaire Short Form, CTES = Childhood Trauma Events Scale, ACE-Q = Adapted Adverse Childhood Experiences Questionnaire, ACE = Adverse Childhood Experiences Checklist.

1.6 Discussion

This systematic review investigated relationships between childhood trauma and PTG, including mediating and moderating factors. Overall, evidence from the majority of studies (k=6; Books et al., 2019; Carter et al., 2021; Fraus et al., 2023; Nelson et al., 2019; Schaefer et al., 2018; Tranter et al., 2021) suggest either a small negative non-significant (k=3; Brooks et al., 2019; Nelson et al., 2019; Schaefer et al., 2018) or small positive non-significant (k=3; Carter et al., 2021; Fraus et al., 2023; Tranter et al., 2021) relationship between childhood trauma and PTG. Only two studies (Quan et al., 2022; Widyorini et al., 2022) found a small, negative significant relationship between childhood trauma and PTG and one study (Fraus et al., 2023), operationalising childhood trauma as event severity, found a small, positive significant relationship with PTG. In addition, small negative significant relationships were found between childhood trauma and four of the five PTG subdomains (new possibilities, personal strength, relating to others and appreciation of life) in two studies (Nelson et al., 2019; Widyorini et al., 2022). One study (Fraus et al., 2023) found the number of childhood trauma events to be significantly associated with three PTG subdomains (new possibilities, personal strength and appreciation for life) with a small effect for the personal strength and appreciation of life subdomains and a medium effect for the new possibilities subdomain.

The results are supported by the broader literature, including Tedeschi and Calhoun's (1996) PTG theory stating that exposure to traumatic events does not automatically lead to PTG. To better understand the discrepant findings, considering the differences between studies that found a significant effect and studies that did not find an effect can be helpful. One study (Quan et al., 2022) which found an effect used the CTQ-SF and was the only study with a sample size larger than 1000, and therefore non-significant findings in other studies may be related to power issues due to smaller sample sizes. Interestingly, another study (Widyorini et al., 2022) which had a sample size of 349 and used the ACE questionnaire found a significant effect, which may suggest that the type of adversity measure makes a

difference to the results. Importantly, based on their respective accuracy, specificity and sensitivity, both the ACE and CTQ have been found to have moderate to strong questionnaire correspondence across adversity types such as emotional, physical and sexual abuse and emotional neglect, but not for psychical neglect (Cheng et al., 2022). Interestingly, two other studies (Carter et al., 2021; Tranter et al., 2021) also used the ACE and CTQ respectively but did not find a significant relationship between childhood trauma and PTG, which may be due to a mismatch between the samples' reported adversity types and the ones measured in ACE and CTQ, which does not include bereavement and serious illness. Interestingly, a recent meta-analysis found that memory biases and subjective interpretations of childhood trauma events can lead to both underreporting and overreporting on retrospective measures of childhood trauma (Baldwin et al., 2024). In the current review, one study (Fraus et al., 2023) found a positive association between the perceived trauma severity and PTG, and another study (Nelson et al., 2019) found a negative significant association between the perceived impact of trauma (measured with IES-R as hyperarousal, intrusions and avoidance) and four of the five PTG subdomains, confirming that the subjective interpretation of childhood trauma and its aftermath have a small effect on reported PTG.

Surprisingly, none of the studies found religion or spirituality to be linked with PTG. Other research (Tedeschi et al., 2018) including a recent systematic review (Fayaz, 2023) found religion and religious coping to be significantly associated with PTG, which is also consistent with older meta-analytic results (Prati & Pietrantonio, 2009). The five studies included in the most recent systematic review (Fayaz, 2023) were, similarly to the majority of studies included in the current review, cross-sectional studies conducted in USA and UK and included adult survivors of sexual assault. One explanation for the discrepant findings might be the difference in quality rating of studies as studies in Fayaz (2023) rated either good (n=3) or fair (n=2) on the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (QATOCSS) whereas all nine studies included in the current review received a weak quality rating score on another quality assessment tool, namely the EPHPP. Unlike studies in

the current review, which all used the PTGI to measure growth in the religion/spirituality subdomain, the review by Fayaz (2023) does not clarify how religion was assessed in the studies, which could also be a factor explaining the discrepant findings.

In addressing mediators/moderators, findings from six studies (Brooks et al., 2019; Cater et al., 2021; Nelson et al., 2019; Quan et al., 2022; Tranter et al., 2021; Widyorini et al., 2022) suggest that external factors such as social support and trauma event centrality and psychological factors such as avoidant coping, intrusions, emotion regulation difficulties, attachment style, acceptance and resilience significantly mediate the relationship between childhood trauma and PTG. In addition, one study (Mohr & Rosén, 2017) found the presence of prosocial adults and the number of social and emotional resources to have a significantly moderating effect on the relationship between childhood trauma and PTG. The effect of the mediators were classified as small apart from resilience which, in two studies, was found to have a medium effect on the relationship. Both studies used the Connor-Davidson Resilience Scale, which operationalises resilience as; 1) personal competence, tenacity and high standards; 2) positive acceptance of change and secure relationships; 3) belief in one's instinct, tolerance of negative effect, and empowerment from the effect of stress; 4) control; and 5) spiritual influences (Connor & Davidson, 2003). Interestingly, two other studies (Brooks et al., 2019; Widyorini et al., 2022) found that personal competence, high standards and tenacity ($k=1$; Widyorini et al., 2022), spirituality, emotional coping and active coping ($k=1$; Brooks et al., 2019) were not found to significantly mediate the relationship between childhood trauma and PTG. As such, these results indicate that whilst single aspects of resilience do not mediate the relationship between childhood trauma and PTG, altogether these aspects have been found to significantly mediate this relationships and with medium effect.

The current review's findings support the PTG theory's notion that certain cognitive processes such as rumination and intrusions influence the PTG process (Tedeschi et al., 2018). The findings on mediating and moderating factors are supported by the broader

research literature which has also found intrusions (Ferris & O'Brien, 2022; Helgeson et al., 2006), positive reappraisal (Ferris & O'Brien, 2022; Helgeson et al., 2006; Prati & Pietrantonio, 2009), rumination (Ferris & O'Brien, 2022; Schubert et al., 2016), social support (Ning et al., 2023; Prati & Pietrantonio, 2009) and attachment (Gleeson et al., 2021) being factors that significantly impact on PTG. The findings on mediating and moderating factors have important clinical implications as they can guide clinical practice in how to best promote PTG and reduce the risk of mental health problems. In light of the existing research literature and the current review's findings, clinical assessment and formulation should be mindful of the significant relationships between PTG domains and Post Traumatic Stress (PTS) symptoms such as hyperarousal, intrusions and avoidance, and consider how PTG and PTS symptoms can co-exist, and furthermore that rumination can promote PTG. Therapeutic interventions should therefore address avoidant coping, intrusions, emotion regulation difficulties and resilience. Whilst it remains unknown which factors promote the effectiveness of trauma therapy in facilitating PTG (Roepke, 2015), Trauma Focused Cognitive Behavioural Therapy (TF-CBT) has been found to be the most effective trauma intervention (Roberts et al., 2009), suggesting that its focus on learning, resources and functional coping foster growth as individuals better their knowledge about their strengths and new goals (Schubert et al., 2019). In line with the current review's results, TF-CBT also addresses some of the psychological factors which were found to mediate the relationship between childhood trauma and PTG, including avoidant coping, intrusions, emotion regulation difficulties and resilience (Little et al., 2011) thereby emphasising the importance of considering these factors within clinical practice. Clinicians should also consider how subjective interpretations of the trauma severity can result in over- and underreporting of childhood trauma (Baldwin et al., 2024) and use appropriate cognitive strategies to address this. Based on the review's findings indicating that the relationship between childhood trauma and PTG is mediated by secure attachment and social support and also moderated by social support and the presence of prosocial adults, interventions such as buddy programmes, self-help groups or support groups

could help promote PTG. Unlike findings from the current review, research has also highlighted the impact of individuals' religion/spirituality, suggesting any intervention must be adapted to these to be effective (Little et al., 2009) which is in line with the broader research literature (Fayaz, 2023; Prati & Pietrantonio, 2009; Tedeschi et al., 2018).

It is important to consider the limitations of the studies included in the review. There are validity issues in the measurement of PTG using self-report measures. This is because retrospective report of PTG may limit an objective understanding of PTG due to the subjective nature of self-report questionnaires (Ning et al., 2023) and furthermore, because cognitive bias such as social desirability bias (Jackson et al., 2005), growth beliefs, downward comparison and positive attention bias have been found to impact on perceived PTG (Gower et al., 2022). Recent metanalytic findings indicate that using interviews to support retrospective recall of childhood trauma is effective in accommodating some of these limitations, including subjective interpretation of trauma severity (Baldwin et al., 2024). In using the PTGI, which was originally standardised on an American student population, another limitation to the included studies is measuring domains of growth which have been criticised for being more applicable to individuals from countries of western culture (Kashyap & Hussain, 2018). A limitation to studies with adolescents included the use of PTGI instead of the revised version for children PTGI-C-F (Kilmer et al., 2009), which measures the same domains of PTG, however, has modified instructions, language and metrics, making it more accessible (Kilmer et al., 2009). Another limitation to the included studies, as reflected in the studies' weak quality assessment ratings, is the cross-sectional study design from which causal relationships between the variables, that are only measured at one time, cannot be derived (Kraemer et al., 2000).

Limitations of the review itself include the exclusion of grey literature, which could have provided access to more diverse research sources, however, due to the lack of rigorous peer-review processes for grey literature, the quality of the research may have been somewhat compromised. Another limitation of the current review include the lack of investigation of the

relationship between PTS symptoms and PTG. Because PTS symptoms and PTG have been found to co-exist as the latter emerges from individuals' struggle in dealing with the traumatic experience (Tedeschi & Calhoun, 1996), investigating this relationship in more detail could help advance the understanding of the effect of PTS symptoms on PTG.

The novelty of the current review include the investigation of the relationships between the most common forms of childhood trauma and PTG across the lifespan. This is because research in PTG has mostly been conducted with adult populations (Gleeson et al., 2021) and in relation to war, terrorism, cancer (Helgeson et al., 2006), serious disease, being a caregiver, accidents and bereavement (Ning et al., 2023), sexual assault (Fayaz, 2023) or in clinical populations with a confirmed Posttraumatic Stress Disorder (PTSD) diagnosis (Schubert et al., 2016). Moreover, for childhood trauma, reviews of PTG tend to include environmental disasters, war/terror and medical trauma (Ferris & O'Brien, 2022). A strength of the current review include the identification of gaps in the current research literature, highlighting how research investigating PTG is less developed for children and adolescents compared to adults. In addition, as studies with adult population mostly consist of students, findings may not be representative of the general population. Another identified gap include a lack of studies investigating mediators and moderators affecting the relationship between childhood trauma and PTG as the current review found that most mediators were only examined in individual studies, and that only one study examined moderators.

As such, future research should examine PTG in children and include investigations of moderators and mediators. Future research should also aim to develop a cross-cultural measure of PTG which does not solely rely on self-reporting to overcome the validity, cognitive and cultural bias problems previously discussed. In the current review, all nine studies used the PTGI and whilst it is the most widely used measure of PTG, it is important to consider how its subdomains appear to be more aligned with individualistic cultural values as compared to collectivistic cultural values. As trauma survivors from individualistic cultures tend to focus more on their unique and personal experiences, development and identity,

studies might be more likely to report PTG in studies where the PTGI is used with participants of western culture (Jobson & O’Kearney, 2008). Within the research literature, it has been highlighted that because PTG is considered a socially desirable form of coping, investigating other possible responses to trauma is limited and not prioritised. Therefore, conducting cross-cultural studies in PTG is an important priority area for future research (Kashyap & Hussain, 2018). Given the limitations in the existing evidence in relation to the use of cross-sectional designs, future research should include longitudinal studies evidencing the trajectories of the PTG process. This would also help improve the quality of the research within this field as the study design was found to be a central limitation to the quality of the research reviewed. A more advanced understanding of the PTG process would enable clinicians to tailor therapeutic input accordingly. Similarly, future research should also consider individual differences in the subjective perception and processing of childhood trauma. As an example, because individuals low in self-efficacy tend to rely more on emotion-focused coping as compared to action-focused coping and problem solving, they may benefit less from PTG (Hobfoll et al., 2007). Future studies should also include larger, representative general population samples to improve the quality of the evidence and its generalisability to the general population. In addition, future research should also consider the impact of potential confounders such as gender, SES and culture which were also found to be a limitation to the quality of the studies. An overview of the current review’s implications for practice, policy and research is provided in Table 1.4.

Table 1.4 Summary of Implications

Implications	
Practice	<p>Clinicians should be aware of cultural bias within the PTG evidence base, ensuring that individuals’ responses to trauma are formulated in its cultural context, considering individuals’ heritage and cultural norms.</p> <p>Within assessment and formulation, clinicians may wish to consider the relationship that can exist between PTS symptoms (hyperarousal, intrusions and avoidance) and PTG domains, and be mindful that rumination may promote PTG.</p>

Therapeutic interventions such as TF-CBT may wish to address avoidant coping, intrusions, emotion regulation difficulties and resilience.

Policy Services that routinely administer the PTGI, should be mindful of individuals' cultural contexts and heritages when interpreting findings from the PTGI, considering its norms are based on an American student population. Services may wish to include interviews in the assessment and formulation phase to overcome potential issues with over- and underreporting on childhood trauma measures.

Services may consider using the PTGI-C-R when assessing PTG in children and adolescents.

Research Future research should include prospective longitudinal studies investigating the trajectories of the PTG process to better inform the therapeutic process and the development of preventative approaches to mitigate the risk of psychopathology, re-victimisation and exposure to adversity in the future.

Research could investigate the relationship between PTS symptoms and PTG to achieve a more nuanced understanding of the PTG process, and the potential impact of different mediators and moderators at various stages in the process.

An important area for improvement appears to be the validity of cross-cultural research.

Future research should include larger, representative general population samples to improve the generalisability of findings.

Future research could also investigate PTG in children to further advance the limited literature that exist for PTG in children.

1.7 Conclusion

In conclusion, six (Books et al., 2019; Carter et al., 2021; Fraus et al., 2023; Nelson et al., 2019; Schaefer et al., 2018; Tranter et al., 2021) of the nine studies included in this review found a nonsignificant relationship between childhood trauma and PTG. Significant relationships between childhood trauma and four of the five PTG subdomains (new possibilities, personal strength, relating to others and appreciation of life) were found (Fraus et al., 2023; Nelson et al., 2019; Widyorini et al., 2022). The review investigated the mediating role of social support, trauma event centrality, avoidant coping, intrusions, emotion regulation difficulties, attachment style and acceptance, which all had a significant but small indirect effect on the relationship between childhood trauma and PTG (Brooks et al., 2019; Cater et al., 2021; Nelson et al., 2019; Quan et al., 2022). Only resilience was found to have a

significant medium indirect effect on the relationship (Tranter et al., 2021; Widyorini et al., 2022). The presence of prosocial adults and the number of social and emotional resources were found to have significant moderating effects (Mohr & Rosén, 2017). Overall, the quality of the evidence is weak, and future research should further investigate PTG in children and include longitudinal designs, and larger representative general population samples.

Chapter 2 Is a Bias Towards Threat Advantageous Within a Threatening Environment: An Experimental Study

2.1 Abstract

The theory of latent vulnerability suggests that adverse childhood experiences (ACEs) can lead to attentional bias to threat which emerges as recalibrations to dangerous environments. The current study tests a core claim of the theory using an experimental design to examine whether bias to threat poses an advantage within an adverse environment and whether this advantage is predicted by ACEs and symptoms of anxiety, paranoia and depression.

This experimental study recruited a general adult population sample (n=105). Participants completed one flanker task assessing bias to threat and four self-report questionnaires assessing ACEs and symptoms of depression, anxiety and paranoia. Participants completed two virtual maze tasks assessing spatial navigation in neutral and adverse environments. Multiple linear regressions showed that bias to threat did not predict maze latency ($F(2,102)=2.86, p=.062$ with $R^2=.053$) and that neither ACEs nor current symptoms of depression, anxiety or paranoia predicted maze latency ($F(4,100) =.77, p=.55$) with and $R^2=.030$). Results from Pearson's correlation revealed significant associations between different indicators of bias to threat, ACEs and latency variance. Limitations, implications and future research are discussed.

Keywords: ACEs, threat, spatial navigation, psychopathology.

2.2 Introduction

Adverse Childhood experiences (ACEs) refer to any form of emotional or physical mistreatment, abuse, neglect or exploitation that occur before the age of 18 and that lead to potential or actual harm to the child (Butchart et al., 2006). An estimated 25% of all children will be exposed to ACEs during their childhood (Lippard & Nemeroff, 2020). This is considered a global public health problem by the World Health Organisation (WHO; Butchart et al., 2006) as ACEs have been found to be the biggest predictor mental and physical and health conditions across the lifespan (Green et al., 2010; Kessler et al., 2010). Anxiety and depression are the most common forms of mental health disorders amongst individuals with ACEs (Felitti et al., 1998). Meta-analytic findings from prospective longitudinal studies showed that ACEs predicted anxiety and depression in adulthood, and that individuals with ACEs are more than two times likely to develop depression (OR=2.03 [95% CI 1.37–3.01]) and anxiety (OR=2.70 [95% CI 2.10–3.47]; Li et al., 2016). Similarly, individuals with a history of ACEs have also been found to be nearly three times more likely to develop psychosis (OR=2.78 [95%CI=2.34-3.31]; Varese et al., 2012). Especially paranoia, a symptom of psychosis which manifest as distressing experiences such as delusions, ideas of reference, feelings of persecution, mistrust and suspiciousness (Freeman, 2016), has been found to be associated with childhood physical abuse, sexual abuse, emotional abuse and neglect (Grindey & Bradshaw, 2022). Investigating the long-term impact, the research literature has found ACEs to be associated with further adversity. This include increased risk of addiction (Sinha, 2008), lower levels of educations, higher unemployment (Berens et al., 2017), future exposure to stressful life events (Sperry & Widom, 2013), and further adversity and re-victimisation (Westfall & Nemeroff, 2018). These factors are all associated with increased risk of psychopathology (Taylor, 2010).

The association between ACEs and psychopathology has been conceptualised by the theory of latent vulnerability (McCrory & Viding, 2015). According to this theory, changes in

neurobiology and cognition, including altered threat processing, reward processing, emotion regulation and executive control, emerge as adaptations/recalibrations to adverse environments characterised by a lack of safety, love and care, infrequent rewards and unpredictable punishments (McCrory et al., 2017). Whilst these neurocognitive alterations confer short-term advantages as they help ensure survival in neglectful and/or threatening environments, they also increase the risk of future psychopathology as they are not optimised when individuals enter safe environments and continue to influence how individuals interact with their internal and external world. Importantly, the theory considers the neurocognitive alterations to be latent as they do not inevitably result in psychopathology, but significantly increase this risk across the lifespan (McCrory et al., 2017; McCrory & Viding, 2015). The neurocognitive alterations can, later in life, interact with risk environments and altered health risk behaviours such as substance use which individuals may use to cope with distress (Danese & McEwen, 2012; Felitti, 2009; Reuben et al., 2016) due to stress susceptibility and poorly optimised altered neurocognitive systems and functions, which ultimately increase the risk of negative life trajectories (Berens et al., 2017).

Evidence supporting the theory of latent vulnerability has mainly been found within functional neuroimaging studies, particularly task-based Functional Magnetic Resonance Imaging (fMRI) studies have helped advance the theory (Gerin et al., 2019). Addressing a significant gap in the research literature, this research study aimed to test the central claim of the theory of latent vulnerability that a bias towards threat is advantageous within an adverse environment (McCrory et al., 2017; McCrory & Viding, 2015) using an experimental design.

The current study focused to investigate the threat system as one of the core neurocognitive domains assumed to be altered following adversity. Reviewing the child maltreatment neuroimaging literature, a meta-analysis found significantly increased bilateral amygdala activation for individuals with ACEs when presented with affective stimuli (faces showing anger, fear or sadness) both in studies with youth (k=11) and adult populations (k=9)

when compared with controls (Hein & Monk, 2017). This is consistent with previous meta-analytic findings confirming that the fronto-limbic networks, which include the amygdala, is the most altered neural pathways for individuals with ACEs (Hart & Rubia, 2012). The association between ACEs and neural reactivity of the threat system appear to be directly related to the severity of abuse and/or neglect (Maheu et al., 2010). Studies have also confirmed the role of the amygdala in the acquisition, storage and expression of fear-related memories, suggesting that stimuli perceived as threatening are prioritised for processing in individuals with ACEs (LeDoux, 2000). As such, due to amygdala hyperactivity and reduced activity in the prefrontal cortex, which is involved in applying strategies to diminish or regulate threat responses, individuals with ACEs can develop a bias to threat meaning they have heightened reactivity to perceived internal and external threat cues (McCrory, 2018; McCrory & Viding, 2015). ACEs have also been found to be linked with impaired socioemotional functioning due to the amygdala's involvement in emotion regulation (Hein & Monk, 2017). ACEs have been found to be a significant longitudinal predictor for psychopathology in adulthood (Kim-Spoon et al., 2024) and because individuals with a history of ACEs tend to experience reduced ability to elicit, cultivate and sustain close and meaningful relationships, their supportive social networks, which are typically considered a protective factor for mental health, may be limited (McCrory et al., 2017).

Alterations in key neurocognitive domains have also been identified in patients with diagnosed psychiatric disorders. Studies have found elevated amygdala activity in adults with PTSD, anxiety (Etkin & Wager, 2007), Major Depressive Disorder (MDD; Matthews et al., 2008) and Unipolar Depression (Siegle et al., 2007) in response to emotional information processing compared to healthy controls. It has been suggested that the tendency to elaborate on negative emotions and events, which is a key feature in depression, may be linked to increased limbic activity due to its involvement in the generation and recognition of emotion (Siegle et al., 2007). Studies have also found increased connectivity between amygdala and hippocampus in patients with paranoia (Walther et al., 2021).

2.2.1 Rationale

Whilst the research literature has evidenced altered neurocognitive functioning and established links between ACEs and various negative outcomes across the lifespan (Sperry & Widom, 2013; Westfall & Nemeroff, 2018), there is a paucity of research investigating the mechanisms conferring this psychological vulnerability (e.g., altered threat processing) in adulthood without using functional neuroimaging methods (Gerin et al., 2017). To our knowledge, no studies have investigated the potential advantage of bias to threat in adult life, particularly using experimental methodology. As such, the current study will use virtual spatial navigation maze tasks exposing individuals to threatening and neutral environments respectively to examine the potential advantage of bias to threat in spatial navigation. Study findings could provide further evidence for the theory of latent vulnerability, thereby advancing the understanding of the processes from which ACEs can result in mental health difficulties or potentially benefit individuals when navigating adverse environments at later points in life. Furthermore, by considering the high prevalence between ACEs, depression, anxiety and paranoia, it is also important to investigate the potential impact, which these symptoms may have on individuals' ability to navigate adverse environments.

2.2.2 Research Question and Hypotheses

The current study aims to answer the following research questions:

1. Does a bias to threat pose an advantage within an adverse environment?
2. Is this advantage further predicted by ACEs and symptoms of anxiety, paranoia and depression?

Firstly, it was hypothesised that bias to threat would predict shorter latency on the virtual maze task with threatening stimuli compared to the maze with neutral stimuli.

Secondly, it was hypothesised that ACEs and current symptoms of depression, anxiety and paranoia would predict significant variances in maze latency.

2.3 Methods

2.3.1 Ethics

The study obtained ethics approval (ERGO number: 79657) through the University of Southampton Ethics Committee (Appendix C).

2.3.2 Design

An experimental repeated-measures design was employed. The order of experimental conditions was counterbalanced.

2.3.3 Participants

A general population sample was recruited from SONA ($n = 12$) for piloting before recruiting via Prolific ($n = 105$) for this study. The study was advertised to students at University of Southampton via SONA systems, an online research participant pool for university students, in January 2024 and on Prolific, a global online research participant pool, in February 2024. Recruitment took place in February, March and May 2024. SONA participants were given research participation credits (1 credit for every 5 minutes) and Prolific participants were paid £5 for their participation, which was estimated to take 30 minutes. 131 participants recruited via Prolific took part in the study, however, as 26 participants did not complete the study, their data was removed prior to the data analysis, resulting in a total sample of $N=105$. As this was due to technical errors, participants were reimbursed for their time.

The estimated sample size was based on an a priori power analysis. Using G*power software (Faul et al., 2009) to calculate the sample size for an experimental design (using linear multiple regression: Fixed model, R^2 deviation from zero statistical test) with a total number of six predictors (MACE, PHQ-9, GAD-7, RGPTS, negative target bias score and

negative distractor bias) detecting a medium effect size ($f^2=0.15$) with power 0.80 and a significance criterion of $\alpha=.05$, it was estimated that a sample of 98 participants was adequate to test the study hypotheses.

Participants were eligible for participation if they were 18 years or older. Using a pre-screening criteria function on Prolific to filter participants according to identified gender, an equal number of males and females were recruited. This was done to reduce gender bias, enhance representativeness of the general population and improve the generalisability of study findings due to reported gender differences in attentional bias to threat (Cowden Hindash et al., 2019). In addition, the sample was also equally distributed across 10 socioeconomic status (SES) groups to ensure it included participants with and without ACEs as rates of ACEs have been found to be significantly higher in low SES populations (Garbarino & Kostelny, 1992). SES status was determined through a filter question on Prolific asking where participants would position themselves on the socio-economic ladder. This also helped ensure the study included participants with and without psychopathology, which is relevant in the investigation of the second research question, as recent longitudinal research suggest that only childhood maltreatment and not exposure to socioeconomic disadvantage significantly predict later psychopathology (Kim-Spoon et al., 2024).

2.3.4 Measures

2.3.4.1 Demographics Questions

Participants were asked a range of demographic questions, including age, gender, ethnicity and income to determine SES (Appendix D).

2.3.4.2 Attentional Bias to Threat

Based on Eriksen's Flanker test (Eriksen & Eriksen, 1974), an online behavioural measure of threat processing, an emotional flanker task, was developed for the purpose of this

study to assess attentional bias to threat. This emotional flanker task presented participants with affective or neutral pictures from the International Affective Picture System (IAPS) which can help ensure a more naturalistic approach to assessing attentional bias to threat (Bradley & Lang, 2017).

Participants were simultaneously presented with three images for 500ms which included a mix of neutral and affective images. The target image was positioned in the centre and flanked by nontarget stimuli. The individual was requested to press the left arrow key if the target was affective and the right arrow key if the target was neutral. Importantly, prior to the experimental task, participants completed a training round with non-affective stimuli, which included blue (left arrow) and orange (right arrow) shapes to become familiar with task instructions. In line with the flanker paradigm, this task aimed to test how effectively individuals can focus on the target image and ignore the flankers on the sides. Responses can either be congruent (both the target and the flankers have same affective value) or incongruent (the target and the flankers have different affective values) (Eriksen & Eriksen, 1974). As illustrated in Figure 2.1, the emotional flanker task included four different conditions, namely a negative congruent (affective target and flankers), negative incongruent (affective target and neutral flankers), neutral congruent (neutral target and flankers) and neutral incongruent (neutral target and affective flankers).

The emotional flanker test provided two bias scores. Firstly, a negative distractor bias score, which was calculated by subtracting reaction time in the neutral congruent conditions from the reaction time in the neutral incongruent condition. A positive score on the negative distractor bias reflected slower reaction times on trials where negative flankers interfered with neutral target classification, suggesting a bias towards threat. The second threat bias score was the negative target bias score, which was calculated by subtracting the reaction time in the negative congruent condition from reaction time in the neutral congruent. Similarly, a positive

score on the negative target bias reflected faster classification of negative versus neutral congruent stimuli, suggesting a bias to threat.

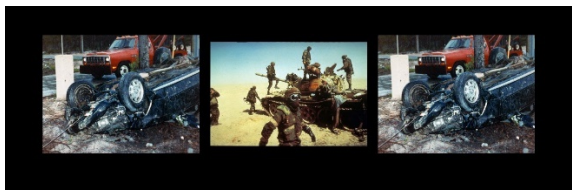
Figure 2.1 Emotional Flanker Task Design



Negative Incongruent Condition



Neutral Incongruent Condition



Negative Congruent Condition



Neutral Congruent Condition

2.3.4.3 Self-report Measures of Depression, Anxiety and Paranoia

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was used to assess symptoms of depression. The self-report questionnaire includes nine items assessing the major symptoms of depression as outlined by the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-V; Diagnostic and Statistical Manual of Mental Disorders, 2013). Each question has four response options which are “not at all”, “several days”, “more than half of the days” and “nearly every day” which score 0, 1, 2, and 3 respectively. The item scores are added up to obtain a total score ranging from 0-27 with cutoffs for mild (5-9), moderate (10-14) and severe (20-27) depression. The PHQ-9 has been found to be the most reliable tool for assessing depression with evidence suggesting that 10 is considered the most reliable cut-off score for adults (El-Den et al., 2018; Levis et al., 2019). Cronbach’s alpha in the current sample was 0.93, indicating excellent reliability.

The Generalised Anxiety Disorder Questionnaire (GAD-7; Spitzer et al., 2006) was administered to assess symptoms of anxiety. The self-report questionnaire include seven items screening for Generalised Anxiety Disorder (GAD) and assessing symptom severity in line with the DSM-V diagnostic criteria (Diagnostic and Statistical Manual of Mental Disorders, 2013). The response categories and scoring is similar to PHQ-9, but with different cut-off scores for mild (5), moderate (10) and severe (15) symptoms of anxiety (Kroenke et al., 2007; Spitzer et al., 2006). However, results from a systematic review and diagnostic meta-analysis suggest using a lower cuff score of 8 to optimise sensitivity (Plummer et al., 2016). GAD-7 was chosen due to its strong psychometric properties, making it a valid and reliable measure of anxiety (Kroenke et al., 2007; Spitzer et al., 2006). Cronbach's alpha in the current sample was .93, indicating excellent reliability.

The Revised Paranoid Thoughts Scale (R-GPTS; Freeman et al, 2019) was administered to assess participants' symptoms of paranoia. The 18-item self-report questionnaire include eight items assessing ideas of reference (e.g., 'It was hard to stop thinking about people talking about me behind my back') and 10 items assessing ideas of persecution (e.g., 'I was convinced there was a conspiracy against me') with the latter referring to individuals' thoughts that other people deliberately intend to harm them. Reliable cutoff scores are 11 for the ideas of persecution subscale and 18 for the persecutory delusion subscale (Freeman et al., 2019). The measure has excellent psychometric properties, demonstrating high reliability across clinical and non-clinical levels of paranoia (Freeman et al., 2019). Cronbach's alpha in the current sample was .92 for the R-GPTS reference subscale and .95 for the R-GPTS persecution subscale, indicating excellent reliability for both subscales.

2.3.4.4 Measure of ACEs

The Maltreatment and Abuse Chronology of Exposure Scale (MACE) (Teicher & Parigger, 2015) was administered to assess ACEs. The 52-item questionnaire retrospectively assesses exposure to ten different types of maltreatment during each year of childhood. These

include emotional neglect, physical neglect, non-verbal emotional abuse, sexual abuse, parental verbal abuse, parental physical maltreatment, peer emotional abuse, peer physical bullying, witnessing interparental violence and witnessing violence to siblings. Individuals are presented with statements/scenarios associated with these types of childhood maltreatment (e.g., ‘acted in a way that made you afraid that you might be physically hurt’) to which they provide a yes/no answer. For yes answers, individuals can indicate the ages(s) at which the maltreatment occurred (Teicher & Parigger, 2015).

The MACE has demonstrated the strongest psychometric evidence when compared to other commonly used tools measuring ACE (Georgieva et al., 2023). The MACE provides a multiplicity score (0-10) which indicate the total number of different types of childhood adversities that meet clinical thresholds. Reverse scoring was applied to six items. The MACE multiplicity scores were generated by using recommended cut-off scores defined by Teicher and Parigger (2015) for the 10 childhood adversity subscales. The questionnaire has demonstrated excellent test-retest reliability and the multiplicity score have shown good reliability (Teicher & Parigger, 2015). The MACE has also shown strong evidence for structural validity, hypothesis testing for construct validity, cross-cultural validity, criterion validity and responsiveness (Georgieva et al., 2023).

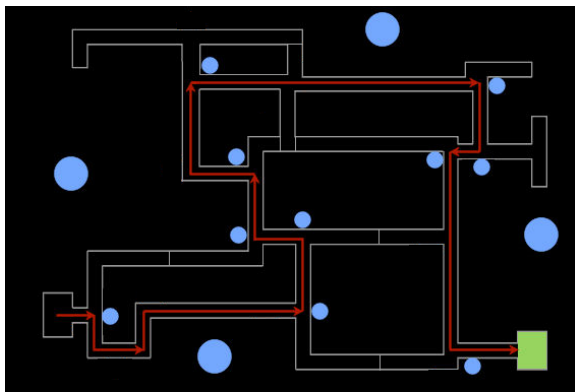
2.3.4.5 Measure of Spatial Navigation in Neutral and Adverse Environments

A spatial navigation maze task was developed to assess spatial navigation in adverse environments. The current study used the same maze design as the one used in a study by Redhead et al. (2022), however, with different stimuli as the previous study investigated the impact of nostalgia on navigation (Redhead et al., 2023) and with additional maze walls to reduce shortcuts and time spend on the maze tasks. Using interactive and life-like virtual environments similar to Redhead et al. (2023), the study was able to increase the ecological validity. The rationale for using this task was to imitate a real-life situation of having to escape a threatening environment. For the maze stimuli, the study used neutral and angry

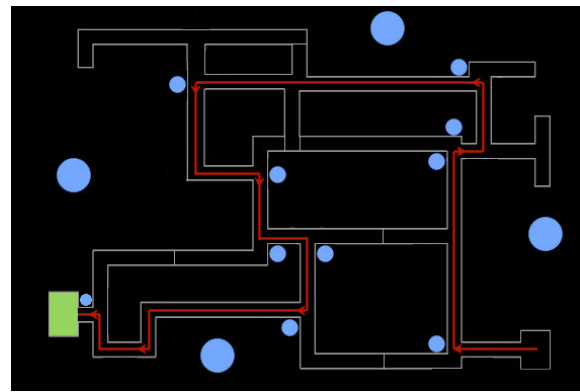
faces from IAPS with the rationale that previous neuroimaging and behavioural studies have evidenced increased neural response in the amygdala and altered threat response to stimuli such as angry faces (Maheu et al., 2010; Tottenham et al., 2011).

As illustrated in Figure 2.2, two mazes (Maze 1 and Maze 2) and two conditions (threat and neutral) were developed. Maze 1 and Maze 2 used the same design, however, in Maze 2 the route was the other way around compared to Maze 1. The purpose of using the same route and thereby including an equal number of decision-making points was to ensure the same level of maze complexity.

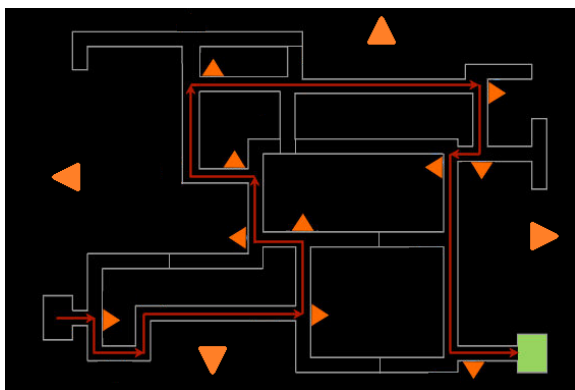
Figure 2.2 Route layout for the spatial navigation maze tasks



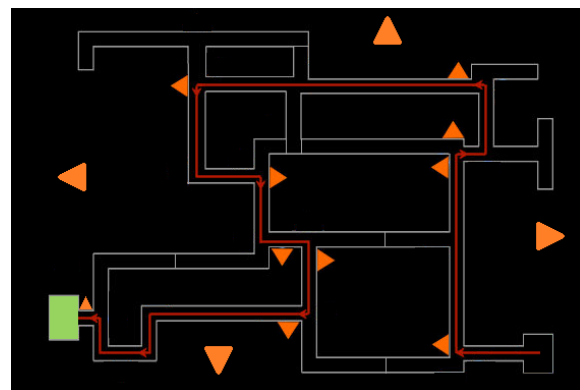
Maze 1 Neutral Condition



Maze 2 Neutral Condition



Maze 1 Threat Condition



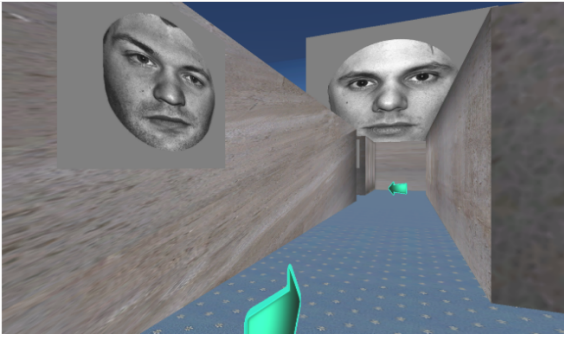
Maze 2 Threat Condition

Note: The red arrows show the route leading to the end destination which is marked with a green square. The small blue circles show the position of the local neutral stimuli. The large blue circles show the position of the distal neutral stimuli. The small orange triangles show the position of the local threatening stimuli. The large orange triangles show the position of the distal threatening stimuli.

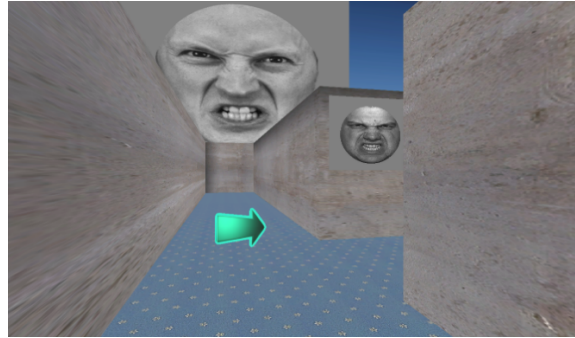
Figure 2.2 illustrates the mazes' layout, route and landmark position. The mazes included either neutral or threatening faces from IAPS. As illustrated in Figure 2.3, the face stimuli were both shown as small wall-mounted images and as larger distal images located beyond the maze walls, which could be seen from most points within the maze. By placing the images in the exact same position in the different maze conditions, we were able to control for structural salience. To ensure consistency across the maze conditions, all images included faces of white men.

Using counterbalancing to reduce the risk of order effects, participants were randomly assigned to different maze order conditions with the independent variable being the experimental condition (threatening versus neutral environment), and the dependent variable being the completion latency. Before the experimental phase, participants completed a training phase, which included three maze trials with directive arrows, consistent with the original maze task procedure in the study by Redhead et al. (2023). Afterwards, the experimental phase took place, meaning the arrows were removed, and participants were asked to find the maze exit using the same route. This is illustrated in Figure 2.3. After completing one maze task four times, participants completed a 5-minute washout task (a game of Tetris) to reduce any potential after-effects before completing the other experimental condition (threat vs neutral) four times. Only maze latency in the two experimental conditions (threat and neutral mazes without arrows) were recorded and used in the analysis. The maze latency difference was calculated by subtracting the threat maze latency from the neutral maze latency. Positive maze latency difference values indicate that participants completed the threat maze faster than the neutral maze. Negative maze latency difference values indicate that participants completed the neutral maze faster than the threat maze.

Figure 2.3 Maze Practice Trials and Experimental Tasks



Practice trial with neutral stimuli and directive arrows



Practice trial with threat stimuli and directive arrows



Experimental task trial with neutral stimuli



Experimental task trial with threat stimuli

2.3.5 Procedure

Prior to the current study, a pilot study was conducted to include personal and public involvement (PPI) by using University students who met the study's inclusion criteria to best test the experimental design and collect anonymous feedback. As a result, minor modifications were made to improve the study, including clearer task instructions, information about potential technical issues and how to avoid these, and increased turning speed for maze navigation tasks. The pilot data was reviewed and did not suggest any other modifications to the study design.

The current study was advertised on Prolific, and the survey was hosted on Qualtrics. All participation was online. When directed to Qualtrics, participants were shown the participant information sheet (Appendix E) and asked to provide online consent before proceeding to the study. The order of the tasks were as follows: Participants were asked to

answer demographic questions (Appendix D), complete the emotional flanker task and four questionnaires (MACE, R-GPTS, PHQ-9 and GAD-7) before completing the maze task.

To ensure full methodological rigor, participants completed attention checks at three points throughout the study. Upon completion of the maze tasks and before exiting the study, participants were asked to indicate (with yes / no answer) if they paid attention to the study and if they had taken their participation seriously. All participants (n=105) met the inclusion criteria, provided informed consent and successfully completed the three attention checks and confirmed they had taken their participation seriously. Participants had normal or corrected-to-normal-vision.

Finally, the participants were presented with a debriefing statement (Appendix F), which included contact information for mental health support organisations in case some participants experienced discomfort or distress when completing the study.

2.3.6 Statistical Analysis

Analysis were performed using IBM SPSS Statistics 28.0. An assessment of the parametric assumptions was conducted to affirm the integrity of using multiple linear regression to answer the research questions. Multiple linear regressions were conducted to examine whether a bias to threat posed an advantage for adults navigating adverse environments (Research Question 1). To test the hypothesis that bias to threat would predict shorter latency on the threat maze as compared to the neutral maze, the outcome variable included the maze latency difference, and the predictor variables included the negative distractor bias and negative target bias variables derived from performance on the emotional flanker task. Multiple linear regression was also used to investigate whether a history of ACE or current symptoms of depression, anxiety and paranoia predicted differences in maze latency between the maze with threatening stimuli and the maze with neutral stimuli (Research Question 2). To test the hypothesis that ACEs and current symptoms of depression,

anxiety and paranoia would predict significant variances in maze latency, two models were assessed. MACE was included as the predictor variable in Model 1 as it should precede as a distal predictor. In Model 2, MACE, GAD-7, PHQ-9 and RGPTS were included as predictor variables and the outcome variable were the maze latency difference variable in both models.

Prior to the multiple linear regression analyses, descriptive statistics were applied to report sample characteristics, using data from the demographic questionnaire, and frequency of the 10 ACEs subtypes using the MACE multiplicity data. Descriptive statistics were also used to summarise current symptoms of depression, anxiety and paranoia, using data from PHQ-9, GAD-7 and R-GPTS. Descriptive statistics were used to report average maze latency in the two experimental conditions, and furthermore, to report threat bias (operationalised as positive values in the threat distractor bias and threat target bias scores) frequencies. Paired sample t-tests were used to test if the differences in mean reaction time in the congruent and incongruent flanker conditions and also in the maze tasks were statistically significant. Pearson's correlations were conducted to investigate associations between the predictor variables and differences in maze latency.

2.4 Results

2.4.1 Sample Characteristics

From the 131 participants taking part in the survey, 105 passed the three attention checks and completed the emotional flanker task (with an error rate below 30%), the four questionnaires and the two maze tasks and were included in the final sample. Demographic information was collected for all participants (n=105) with no missing data. The sample was gender balanced (50.50% male). The majority of participants were white (74.29%) with a mean age of 37.63 (SD=12.96). Participants' educational background included undergraduate degree (30.50%), college (28.60%), master's degree (19.00%), secondary school (18.10%)

and doctorate/PhD (3.80%). The majority of participants reported an income of £25,000-£49,999 (27.60%) or £1-£9,999 (25.70%).

Results from the difference in maze latency showed that, on average, participants completed the neutral maze 13.85 seconds faster than the threatening maze ($M=-13.85$, $SD=213.69$). A paired sample t-test revealed that the difference in latency was not statistically significant $t(104)=-1.18$, $p=.241$ and that the effect was trivial ($d=-.12$; Cohen, 1992).

The average score on self-report questionnaires were 11.48 ($SD=5.55$) for PHQ-9, 10.81 ($SD=5.23$) for GAD-7, 21.78 ($SD=13.21$) for the R-GPTS. These results suggest that, on average, participants reported moderate symptoms of depression (Kroenke et al., 2001) and anxiety (Spitzer et al., 2006) and clinical levels paranoia (Freeman et al., 2019). Table 2.1 illustrates the percentage of participants meeting the clinical threshold for depression, anxiety and paranoia.

Table 2.1 Measures of Depression, Anxiety and Paranoia

		Below Clinical Threshold	Above Clinical Threshold
Depression (PHQ-9)	N	41	63
	%	39.04	60.96
	PHQ-9 Range	0-9	10-22
Anxiety (GAD-7)	N	34	71
	%	32.38	67.62
	GAD-7 Range	0-7	8-21
Paranoia (R-GPTS)	N	80	25
	%	76.19	23.81
	R-GPTS Range	0-28	30-56

Scores on the MACE multiplicity score ranged from 0 to 9 with a mean score of 2.66 ($SD=1.83$), suggesting that, on average, participants had been exposed to more than two different types of ACEs severe enough to meet clinical threshold. Only 8.57% of participants ($n=9$) did not report any ACEs. Table 2.2 illustrates the frequencies of the different types of ACEs. Based on global general population surveys, the estimated prevalence is 22.9% for physical abuse, 29.1% for emotional/psychological abuse, 18.4% for emotional neglect and 16.3% for physical neglect with no significant gender differences. In comparison, whilst the

overall prevalence is 9.6% for sexual abuse, there are significant gender differences in this type of childhood maltreatment where the prevalence is 5.7% in males and 13.4% for females (Sethi & World Health Organization, 2013).

Table 2.2 ACEs Frequency

<i>Childhood Adversity Type</i>	N	%
Familial and non-familial sexual abuse	13	12.38
Parental physical abuse	19	18.10
Parental verbal abuse	29	27.62
Parental non-verbal emotional abuse	17	16.19
Witnessed physical violence towards parents	19	18.10
Witnessed violence towards siblings	18	17.14
Peer emotional and verbal abuse	0	0.00
Peer physical violence and bullying	22	21.00
Emotional neglect	78	74.28
Physical neglect	68	64.76

2.4.2 Correlations

Table 2.3 includes results from the Pearson's correlation analysis. Findings suggest a significant negative association between negative distractor bias and negative target bias ($r = -.36, p < .001$). The MACE multiplicity score was found to significantly correlate with negative target bias ($r = -.24, p < .05$) and GAD-7 ($r = .20, p < .05$), suggesting significant positive associations between ACEs and anxiety and significant negative association between ACEs and bias to threat (in one of the two measured domains). PHQ-9 was found to significantly correlate with GAD-7 ($r = .85, p < .001$) and R-GPTS ($r = .62, p < .001$) suggesting that depression is positively associated with both anxiety and paranoia. A significant correlations between R-GPTS and GAD-7 ($r = .61, p < .001$) was also found. Difference in maze latency was found to be significantly positively associated with negative distractor bias ($r = .211, p < .05$).

Table 2.3 Pearson's Correlation

	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

Chapter 2

1.	Negative Distractor Bias	Pearson Correlation N	-- 105						
2.	Negative Target Bias	Pearson Correlation Sig. (2-tailed) N	-.362** <.001 105	-- 105					
3.	MACE	Pearson Correlation Sig. (2-tailed) N	-.016 .870 105	-.241* .013 105	-- 105				
4.	PHQ-9	Pearson Correlation Sig. (2-tailed) N	-.077 .436 105	-.039 .696 105	.173 .078 105	-- 105			
5.	GAD-7	Pearson Correlation Sig. (2-tailed) N	-.060 .542 105	-.088 .371 105	.200* .041 105	.853** <.001 105	-- 105		
6.	R-GPTS	Pearson Correlation Sig. (2-tailed) N	.166 .090 105	-.217* .026 105	.191 .051 105	.618** <.001 105	.610** <.001 105	-- 105	
7.	Maze latency Difference	Pearson Correlation Sig. (2-tailed) N	.211* .031 105	.009 .927 105	-.058 .557 105	.034 .731 105	.013 .897 105	.131 .184 105	-- 105

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

2.4.3 Assessment of the Parametric Assumptions

Before examining the predictive power of the model, an assessment of the parametric assumptions was conducted to affirm the integrity of the analysis. Scatterplots were examined to confirm linear relationships between each predictor variable and the outcome variable. With a the sample size above 50, the Kolmogorov-Smirnov test was used to assess the normality of the data (Mishra et al., 2019). Significant results for the MACE, R-GPTS, negative target bias, and maze latency difference data revealed significant deviations from a normal distribution. This was supported by findings from the normal probability plots, which

also showed deviations from normality for these variables. The data was checked for skew and kurtosis. Skew values fell within the recommended -2.0 to 2.0 range (George & Mallery, 2010) and the kurtosis values fell within the recommended -7.0 to 7.0 range for normally distributed data (George & Mallery, 2010) for most of the data. However, the negative target bias data (skewness=-3.43, kurtosis=24.41) indicated problems with skewness and kurtosis and the maze latency difference data (skewness=.28, kurtosis=8.43) indicated problems with kurtosis. The assumption of homoscedasticity was assessed by examining the *ZRESID and *ZPRED graph, which indicated heteroscedasticity as the graph funnelled out. The Durban-Watson tests confirmed that residuals were not related and that the assumption of independent errors was met with a value of 2.0 (Durbin & Watson, 1951). The Variance Inflation Factor (VIF) was below 10 for each predictor, thereby dispelling multicollinearity concerns (Myers, 1990). Overall, many of the diagnostic tests validated the parametric assumptions underpinning the multiple linear regression, however, to accommodate for non-normally distributed data and heteroscedasticity, wild bootstrapping was used in the multiple linear regression analyses. The analyses used wild bootstrapping with 2000 samples which, unlike normal bootstrapping, also deals with heteroscedasticity (Davidson & MacKinnon, 2010; Wu, 1986). Results from the wild bootstrapped data confirmed that the final parametric assumption of multicollinearity was met with no significant correlations above 0.9 (Field, 2009).

2.4.4 Research Question 1: Does a bias to threat pose an advantage within an adverse environment?

The emotional flanker task provided data on the mean reaction time in the four different conditions (negative congruent, negative incongruent, neutral congruent and neutral incongruent) and on bias to threat. Results showed that 58.90% of participants (n=61) displayed a negative distractor bias with positive values ranging between .13ms and 165.36ms. In addition, 47.62% of participants (n=50) displayed a negative target bias with

scores ranging between 3.07ms and 230.72ms. Table 2.4 illustrates the mean reaction time (in milliseconds) across the four emotional flanker task conditions, suggesting faster response time in the congruent conditions compared to the incongruent conditions. A paired sample t-test showed that there was only a significant difference in mean scores for the neutral congruent ($M=677.92$, $SD=148.22$) and the neutral incongruent ($M=691.64$, $SD=158.91$) conditions; $t(104)=2.59$, $p=.011$), confirming that difference in mean reaction time for flanker conditions with threat targets was not statistically significant as shown in Table 2.5.

Table 2.4 Mean Reaction Time for The Four Emotional Flanker Task Conditions

		Bootstrap ^a				
		Statistic	Bias	Std. Error	BCa 95% Confidence Interval	
					Lower	Upper
Negative Incongruent Condition	N	105	0	0	.	.
	Minimum	331.41				
	Maximum	1246.11				
	Mean	690.4928	-.4075	16.0162	659.5327	722.0206
	Std. Deviation	167.20685	-1.61145	13.32298	143.41280	188.44961
Negative Congruent Condition	N	105	0	0	.	.
	Minimum	349.28				
	Maximum	1253.15				
	Mean	687.9366	-.3473	15.6703	657.3383	717.4626
	Std. Deviation	165.18232	-1.44029	14.11775	138.55739	187.51874
Neutral Incongruent Condition	N	105	0	0	.	.
	Minimum	451.39				
	Maximum	1198.94				
	Mean	691.6411	-.1040	15.4474	662.3559	722.0357
	Std. Deviation	158.91202	-1.02322	12.04310	135.84120	179.96103
Neutral Congruent Condition	N	105	0	0	.	.
	Minimum	408.00				
	Maximum	1154.00				
	Mean	677.9170	-.2641	14.2398	650.2509	705.3714
	Std. Deviation	148.21565	-1.06193	11.70333	126.15148	168.27411
Valid N (listwise)	N	105	0	0	.	.

a. Bootstrap results are based on 2000 bootstrap samples

Table 2.5 Paired Sample T-Test

Paired Differences						Significance	
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	t	df	One-Sided p	Two-Sided p

					Lower	Upper				
Pair 1	Negative Incongruent Condition - Negative Congruent Condition	2.55624	61.57711	6.00931	-9.36045	14.47293	.425	104	.336	.671
Pair 2	Neutral Incongruent Condition - Neutral Congruent Condition	13.72404	54.26328	5.29555	3.22276	24.22532	2.592	104	.005	.011

As illustrated in Table 2.6 and Table 2.7, results from the multiple linear regression analysis revealed a non-significant Model 1 ($F(2,102)=2.86$, $p=.062$) with R^2 value of .053, suggesting that a bias to threat explained only 5.3% of variance in maze latency. Results from Table 2.8 confirmed that none of the threat bias indicators significantly predict maze latency differences.

Table 2.6 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	270487.149	2	135243.574	2.856	.062 ^b
	Residual	4829944.368	102	47352.396		
	Total	5100431.516	104			

a. Dependent Variable: Maze latency Difference

b. Predictors: (Constant); Negative Target Bias, Negative Distractor Bias

Table 2.7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.230 ^a	.053	.034	217.60606	.053	2.856	2	102	.062	2.009

a. Predictors: (Constant); Negative Target Bias, Negative Distractor Bias

b. Dependent Variable: Maze latency Difference

Table 2.8 Bootstrap for Coefficients

B	Bootstrap ^a
---	------------------------

Model			Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
						Lower	Upper
1	(Constant)	-37.185	-.193	22.537	.103	-80.982	5.244
	Negative Distractor Bias	1.007	.026	.524	.065	-.022	2.086
	Negative Target Bias	.210	.049	.170	.358	-.132	.652

a. Bootstrap results are based on 2000 wild bootstrap samples

2.4.5 Research Question 2: Is this advantage further predicted by ACEs and symptoms of anxiety, paranoia and depression?

As illustrated in Table 2.9 and Table 2.10, results from the multiple linear regression analysis revealed a non-significant Model 1 ($F(1,103)=.35$, $p=.56$) with R^2 value of .003, suggesting that a history of ACEs explained 0.3% of variance in maze latency. Results also revealed a non-significant Model 2 ($F(4,100)=.77$, $p=.55$) with an R^2 value of .030, suggesting that altogether, ACEs and symptoms of anxiety, depression and paranoia explained 3.0% of variance in maze latency. Results from Table 2.11 confirmed that none of the predictors significantly predicted maze latency differences.

Table 2.9 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17105.631	1	17105.631	.347	.557 ^b
	Residual	5083325.885	103	49352.678		
	Total	5100431.516	104			
2	Regression	152878.229	4	38219.557	.772	.546 ^c
	Residual	4947553.287	100	49475.533		
	Total	5100431.516	104			

a. Dependent Variable: Maze latency Difference

b. Predictors: (Constant), MACE

c. Predictors: (Constant), MACE, PHQ9, RGPTS, GAD7

Table 2.10 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.058 ^a	.003	-.006	222.15463	.003	.347	1	103	.557	
2	.173 ^b	.030	-.009	222.43096	.027	.915	3	100	.437	2.017

a. Predictors: (Constant), MACE

b. Predictors: (Constant), MACE, PHQ9, RGPTS, GAD7

c. Dependent Variable: Maze latency Difference

Table 2.11 Bootstrap for Coefficients

Model		B	Bias	Std. Error	Sig. (2-tailed)	Bootstrap ^a BCa 95% Confidence Interval	
						Lower	Upper
1	(Constant)	-6.878	-.937	47.984	.892	-101.876	80.754
	MACE	-6.994	.269	11.356	.579	-28.123	15.802
2	(Constant)	-31.722	.736	70.177	.681	-164.420	103.402
	MACE	-9.369	-.266	12.479	.502	-32.442	14.101
	PHQ9	.499	.179	7.707	.969	-14.550	14.378
	GAD7	-4.476	-.248	6.149	.506	-15.721	6.258
	R-GPTS	3.389	.003	2.298	.154	-.654	7.327

a. Bootstrap results are based on 2000 wild bootstrap samples

2.5 Discussion

The current study aimed to, firstly, investigate whether bias to threat poses an advantage for adults navigating adverse environments and, secondly, whether a history of ACEs, or current symptoms of anxiety, paranoia and depression predicted latency of maze navigation. Multiple linear regression results showed that bias to threat did not significantly predict maze latency and only explained 5.3% of variance in maze latency difference. Importantly, as the significance value was .062 and thereby approaching significance at $p < .05$, the non-

significant result may have been due to sample size. Results from Pearson's Correlation showed significant positive relationships between bias to threat (measured with the negative distractor bias) and maze latency differences, suggesting that the higher bias to threat, the bigger difference in maze latency, with participants completing the threat maze faster than the neutral maze. Furthermore, significant negative associations were found between ACEs and bias to threat (measured with the negative target bias) suggesting that the higher number of childhood adversities, the lower bias to threat.

Interestingly, this indicate that there are relationships between ACEs and bias to threat and between bias to threat and maze latency differences, however, the indicators of bias to threat are different for these significant relationships. To better understand the absence of expected associations, other factors possibly influencing the relationships may be considered. This include the proximal (i.e., recent ACEs) and distal (i.e., historic ACEs) risk experiences, as younger participants might show stronger associations due to more proximal risk exposure. As the amygdala has been found to be involved in both detecting threat and regulating the emotional response (Hein & Monk, 2017), another potential factor impacting the association may be emotion regulation. Because social support is considered a buffer against the adverse effects of ACEs (McCrorry et al., 2017), this may also be a factor impacting the associations. Importantly, within the research literature, a call has been made for longitudinal neurocognitive research to investigating how risk trajectories unfold, suggesting that the functional plasticity in the brain is examined over time to better understand the extent to which behavioural outcomes are associated with recalibration of the neurocognitive systems and the development of compensatory strategies (McCrorry et al., 2022).

Surprisingly, findings showed a significant negative association between ACEs and negative target bias scores, which would indicate that the higher the adversity, the lower the bias towards threat. Whilst these findings are inconsistent with research showing positive relationship between ACEs and bias to threat (Hart & Rubia, 2012; Hein & Monk, 2017;

Maheu et al., 2010), the findings appear to be consistent with other research showing a varied association between ACEs and bias to threat across development. Whilst children with ACEs have been found to exhibit bias towards threat, results indicate that older adolescents with ACEs tend to exhibit bias away from threat (Weissman et al., 2019). As such, findings from the current study could suggest that bias away from threat may also be present in adults. Alternatively, the negative correlation between ACEs and negative target bias could also reflect the utilisation of attentional avoidance to threat stimuli (i.e., a strategy used to direct attention away from emotional stimuli), which has been evidenced in individuals with ACEs (Kelly et al.; Pine et al., 2005) and which is also consistent with findings showing a relative slower mean reaction time in the congruent threat flanker task compared to the congruent neutral flanker task. Finally, the negative correlation may also be explained by the types of ACEs measured (the majority of the sample reported emotional and physical neglect). Research has found that children with a history of physical neglect have more difficulties discriminating emotional expressions compared to healthy controls and physically abused children and, furthermore, that only physically abused children show a response bias for angry faces (Pollak et al., 2000). Based on the theory that neurocognitive alterations emerge as adaptive recalibration to environments characterised by inconsistent care from primary caregivers, as seen in neglect, or environments with dangerous and unpredictable threat from others, as seen in physical and sexual abuse (McCrorry et al., 2017), the recalibrations may be different depending on the adversity type (McLaughlin et al., 2014). Therefore, the ability to recognise threat and hostile social cues, as evidenced in research (Pollak & Sinha, 2002), may be more enhanced in individuals with a history of abuse compared to neglect due to the different environments they emerge from and adapt to.

In addressing the second research question, the study found that neither a history of ACEs nor current symptoms of depression, anxiety or paranoia significantly predicted maze latency, and only explained 3.0% of variance in maze latency. However, the study found that ACEs were significantly associated with depression and anxiety, consistent with other research (Li

et al., 2016). In addition, a borderline significant association between ACEs and paranoia with a significance value of .051 was also in line with previous research findings confirming significant relationship between childhood adversity and paranoia (Grindey & Bradshaw, 2022). The direction was, as expected, positive for these significant correlations, confirming that the higher level of childhood adversity, the higher level of current symptoms of depression, anxiety and paranoia. Interestingly, the significant negative association between one of the indicators of bias to threat (negative target bias) and R-GPTS may contribute to research showing that bias away from threat is associated with decreased psychopathology over time (Weissman et al., 2019), consisting with findings indicating that the prevalence of mental health disorders emerging in adulthood is lower than in childhood for individuals with ACEs (Green et al., 2010).

The study had a number of strengths. Using an experimental design with high ecologically valid tasks/paradigms to investigate bias to threat, including use of maze stimuli from IAPS, which is considered a robust and reliable instrument for eliciting emotion (Branco et al., 2023). The study was able to use virtual environments which may resemble threatening environments that individuals with ACEs are more likely to encounter compared to individuals without ACE. Another strength included the pilot phase, which allowed minor modifications to be made to improve the quality of the study. In addition, the study used non-facial stimuli to examine bias to threat in the emotional flanker task which were different from the face images used in the experimental task to reduce spillover. A final strength include the sample size ($n=105$), which was above the estimated 98, resulting in a study with a power of 0.84. Having a sample equally distributed across SES and gender helped ensure the sample was more representative of the UK population in terms of educational background, income and race, thereby increasing generalisability of the study findings. 74.29% of participants identified as white and 25.71% identified as black, Asian or mixed race, which is similar to the UK population where 82% are white and 18% are black, Asian or mixed race (GOV.UK, 2021).

The study also has a number of limitations. Unlike other research simultaneously using behavioural tasks and fMRI when investigating the modulating effect of affective stimuli on spatial attention (Armony & Dolan, 2002), the current study did not include neuroimaging or biomarkers to measure threat responses during the maze navigation tasks. This is because neural activation measures have been found to show differences in the absence of behavioural findings (Golm et al., 2016). As such, concluding whether differences in maze latency, although not significant, were in fact linked to differences in physiological threat responses was not possible in this study design nor was it intended. Further limitations to the study include technical issues associated with the maze tasks, not recruiting a clinical population or a high-risk population such as care experienced people, and not recruiting a wider range of ACEs.

In the light of the above-mentioned limitations, future research should aim to resolve the technical issues associated with the maze task and furthermore, validate the current maze task against new, improved maze tasks. Studies should also recruit a sample with a wider range of ACEs to examine the effect of different types of ACEs. Future research could also include biomarkers or neuroimaging to measure participants' physiological threat response and amygdala reactivity to better confirm the impact of bias to threat on spatial navigation in adverse environments. This could help further advance the understanding of the interaction between emotions, cognitions and behaviour in individuals with ACEs, ultimately to support clinical practice in the development of preventative approaches that reduce the risk of further adversity and re-victimisation for individuals with ACE. Future research should also aim to conduct the task with children and adolescents to further examine potential age-specific shift in the direction of bias to threat as found in other research. Future epidemiological studies should investigate the trajectory of the neurocognitive alterations, testing the theory's claim that alterations are poorly optimised, to better understand how fixed these recalibrations are later in life, and moreover if they are different for abuse and neglect.

2.6 Conclusion

The current study used an experimental design to test a central claim of the theory of latent vulnerability, namely whether bias to threat poses an advantage when navigating adverse environments. Furthermore, the study also investigated whether this advantage is predicted by ACEs and symptoms of depression, anxiety and paranoia. Multiple linear regression revealed that bias to threat did not predict maze latency, which contradicted the prediction of the theory of latent vulnerability. Furthermore, ACEs, depression, anxiety and paranoia did not predict maze latency variances. However, the correlational analysis evidenced significant associations between different indicators of bias to threat, ACEs and latency variance, which is in line with the theory. Possible explanations was explored, including a bias away from threat and attentional avoidance to threat stimuli, which have been evidenced in other studies. Future research should aim to conduct the study with children and adolescents, examine a wider range of ACEs and include neurocognitive longitudinal studies investigating the trajectory of the neurocognitive alterations. This will help further advance the understanding of the link between ACEs and bias to threat, and the interaction between emotions, cognitions and behaviour in individuals with ACEs to support the development of preventative approaches that reduce the risk of further adversity and re-victimisation for individuals with ACE.

2.7 Acknowledgements

We would like to thank Antony Wood and Joshua Hyde for their technical support in developing the emotional flanker task and the maze tasks.

2.8 Declaration of interest statement

No potential conflict of interest was reported by the author(s)

Appendix A Author Guideline

Chapter one follow the publishing guidelines for the Trauma, Violence & Abuse journal ([Submission Guidelines: Trauma, Violence, & Abuse: Sage Journals \(sagepub.com\)](https://www.sagepub.com/journalsPermissions.nav?lang=en&path=/journals/trauma-violence-abuse/journal)) which include the following (below is taken directly from the website):

- Using APA style, and be no longer than 40 double-spaced pages, including references, tables, and figures.
- Include an abstract of up to 250 words describing the topic of review, method of review, number of research studies meeting the criteria for review, criteria for inclusion, how research studies were identified, and major findings.
- Begin with a clear description of the knowledge area that is being researched or reviewed and its relevance to understanding or dealing with trauma, violence, or abuse.
- Provide a clear discussion of the limits of the knowledge that has been reviewed.
- Include two summary tables: one of critical findings and the other listing implications of the review for practice, policy, and research.
- Include a discussion of diversity as it applies to the reviewed research.*

Chapter two follow the publishing guidelines for the Emotion and Cognition Journal ([https://www.tandfonline-com.soton.idm.oclc.org/action/authorSubmission?show=instructions&journalCode=pcem20](https://www.tandfonline.com/soton.idm.oclc.org/action/authorSubmission?show=instructions&journalCode=pcem20)) which include the following criteria for a full article (below is taken directly from the website):

- Should be written with the following elements in the following order: title page; abstract; keywords; main text introduction, materials and methods, results, discussion; acknowledgments; declaration of interest statement; references;

Appendix A

appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list)

- Should be between 8000 and 10000 words, inclusive of the abstract, references, footnotes.
- Should contain an unstructured abstract of 200 words.
- Should contain between 1 and 5 keywords.

Appendix B Search Terms and Search Strategy

Operator	Area of search	Search Terms	Number of papers identified
S1	Heading OR Keyword (PsychInfo and Medline) Author Keyword OR Keyword Plus (Web of Science)	"childhood adversity"	5,269 (PsychInfo), 553 (Medline), 1,442 (Web of Science)
S2	Title OR Abstract OR Keyword	"adverse childhood experienc*" OR ACES OR "child* abuse" OR "child* neglect" OR "child* trauma*"	31,788 (PsychInfo), 92,449 (Medline), 97,236 (Web of Science)
S3	S1 OR S2		33,351 (PsychInfo), 92,641 (Medline), 98,254 (Web of Science)
S4	Heading OR Keyword (PsychInfo and Medline) Author Keyword OR Keyword Plus (Web of Science)	"posttraumatic growth"	2,475 (PsychInfo), 654 (Medline), 4,215 (Web of Science)
S5	Title OR Abstract OR Keyword	"posttraumatic growth" OR "post- traumatic growth" OR "post traumatic growth" OR PTG	3,841 (PsychInfo), 4,079 (Medline), 1,316 (Web of Science)
S6	S4 OR S5		3,994 (PsychInfo), 4,079 (Medline), 100 (Web of Science)
S7	S3 AND S6		116 (PsychInfo), 62 (Medline), 89 (Web of Science)
Limiters		Source: Academic Journals	54 (PsychInfo) 62 (Medline) 89 (Web of Science)
		English	52 (PsychInfo) 61 (Medline)

Appendix B

	89 (Web of Science)
Imported to Endnote and duplicates removed	202

Appendix C ERGO-II Ethics Approval

The screenshot shows a web interface for an ethics approval submission. At the top, there is a navigation bar with 'Home' and 'Submissions'. The main heading is '79657 - Cognitive and affective predictors of wayfinding in a virtual maze'. Below this are four tabs: 'Submission Overview' (selected), 'Submission Questionnaire', 'Attachments', and 'History'. The 'Details' section shows the submission status as 'Approved', the category as 'Category B', and the submitter's faculty as 'Faculty of Environmental and Life Sciences (FELS)'. A notice states that the end date for the study is currently 31 August 2024, with a 'Request extension' button. A note advises that any other changes require an amendment. The 'Latest Review Comments' section contains two entries, both dated 13/09/2023 and marked as 'Approved'. The first entry includes specific comments regarding data withdrawal and clinical advice. The second entry has no comments.

Home Submissions

79657 - Cognitive and affective predictors of wayfinding in a virtual maze

Submission Overview | Submission Questionnaire | Attachments | History

Details

Status Approved
Category Category B
Submitter's Faculty Faculty of Environmental and Life Sciences (FELS)

The end date for this study is currently 31 August 2024

[Request extension](#)

If you are making any other changes to your study please create an amendment using the button below.

Latest Review Comments

13/09/2023 17:51:24 - Committee: Approved
Comments:
Approved subject to two issues:
1 - you are clear that participants can ask to have their data withdrawn without breaching anonymity (can SONA manage this, for example, though code numbers?);
2 - you get clear clinical advice on the suitability of asking questions of this nature during the first few weeks of students having left home when they may be feeling very vulnerable.
Apologies for the delay in reviewing.

13/09/2023 19:03:44 - Committee: Approved
No comments

Appendix D Demographic Questionnaire

What best describes your gender?

- Female
- Male
- Non-Binary
- A gender not listed here (please specify)

How old are you in years?

What is the highest level of education you have completed

- Primary School
- Secondary School
- College
- Undergraduate degree
- Master's degree
- Doctorate / PhD.

Which of the following best describes your personal income last year?

- £0
- £1 to £9, 999
- £10, 000 to £24, 999
- £25, 000 to £49, 999
- £50, 000 to £74, 999
- £75, 000 to £99, 999
- £100, 000 or more
- Prefer not to answer

Appendix D

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

- White
- English / Welsh / Scottish / Northern Irish / British
- Irish
- Gypsy or Irish Traveller
- Any other White background, please describe.

Mixed / Multiple ethnic groups

- White and Black Caribbean
- White and Black African
- White and Asian
- Any other Mixed / Multiple ethnic background, please describe

Asian / Asian British

- Indian
- Pakistani
- Bangladeshi
- Chinese
- Any other Asian background, please describe

Black / African / Caribbean / Black British

- African
- Caribbean
- Any other Black / African / Caribbean background, please describe

Other ethnic group

- Arab

Appendix D

- Any other ethnic group, please describe _____

Appendix E Participant Information Sheet

Study Title: Cognitive and affective predictors of wayfinding in a virtual maze

Researcher: Karoline Greve Grouleff (Trainee Clinical Psychologist)

Research Supervisors: Dr Dennis Golm (PhD, Lecturer in Psychology, University of Southampton), Dr Lyn Ellett (Associate Professor of Clinical Psychology, University of Southampton), Professor Matthew Garner (BSc, PhD, Professor of Psychology & Affective Neuroscience, Head of Psychology, University of Southampton)

ERGO number: 79657

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully and ask questions if anything is not clear or you would like more information before you decide to take part in this research. You may like to discuss it with others, but it is up to you to decide whether or not to take part. If you are happy to participate you will be asked to sign a consent form.

What is the research about?

My name is Karoline Greve Grouleff, and I am a Trainee Clinical Psychologist conducting research as part of my doctorate training in Clinical Psychology at University of Southampton.

This study examines individual differences and their association with maze navigation, and how maze characteristics modulate maze navigation. The study will be written up as my doctorate thesis.

Why have I been asked to participate?

We aim to recruit adults aged 18 or over. Exclusion criteria include individuals under the age of 18.

What will happen to me if I take part?

If you would like to take part in this study, you will be asked to give consent to take part. You will then be invited to complete an online survey which will ask you some demographic questions (i.e., your gender, age and ethnicity), questions about your life history when growing up and your current mental health. Afterwards, you will be asked to complete two different online tasks. In the first task, we will test your reaction time and attention. In the second task, we will test your spatial navigation skills in different virtual mazes. All participation will be online, and you will not have to attend any part of this study in person. The total estimated time for participation is approximately 30 minutes. Upon completion of the maze tasks, a written debrief form will be provided.

The research project is estimated to last until May 2024 when the doctorate thesis is submitted.

Are there any benefits in my taking part?

Your participation will help improve our current understanding of how different life experiences impact on spatial navigation and information processing. We hope that our research can inform future research in this field.

Participants recruited from Prolific will be paid £5 for their participation upon completion of the maze tasks.

Are there any risks involved?

Completing questionnaires asking about past life experiences, and current mental health may cause some level of psychological discomfort or distress for some participants. Distressed participants will be able to use any of the signposting services listed at the bottom of the

information sheet and on the written debrief form, which include an extensive list of organisations offering mental health support.

What data will be collected?

We will collect information about your demographics (i.e., ethnicity), your experiences when growing up, your mental health and behavioural data from the online tasks such as reaction times.

Data is anonymised to protect participant confidentiality. Data will be collected and stored digitally in a password protected folder and backed up on a secure server.

Will my participation be confidential?

Your participation and the information we collect about you during the course of the research will be kept strictly confidential.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential. Following submission of the thesis, anonymised data will be uploaded onto data repository. This will enable other researchers to use the data for future projects. The deposited data will not include your prolific id or your ethnicity. Instead of your real age in years, age bands will be used.

Do I have to take part?

No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, you will need to give online consent to show that you have agreed to take part.

What happens if I change my mind?

You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights being affected. If you wish to withdraw from the study, please contact Karoline Greve Grouleff on k.g.grouleff@soton.ac.uk

You can withdraw from the study up until four weeks after data collection as the data will be processed then. You will be reimbursed upon completion of the study.

If you wish to withdraw from this study after four weeks, we will keep the information about you that we have already obtained for the purposes of achieving the objectives of the study only. Withdrawn data will not be uploaded to a data repository.

What will happen to the results of the research?

Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent.

The project will be written up as part of a doctorate thesis and published in a scientific journal. Following submission of the doctoral thesis, the data will be uploaded onto data repository. The University of Southampton is responsible for holding the data. The data might be used for future studies to help develop the research field further. Use and access restrictions will apply to the data in the future and will exclude commercial use. If you remain unhappy or have a complaint about this, please contact the University of Southampton Research Integrity and Governance Manager on Tel: 023 8059 5058 or email: rgoinfo@soton.ac.uk

Where can I get more information?

Potential participants can contact Karoline Greve Grouleff (k.g.grouleff@soton.ac.uk) in the research team with any questions they may have after reading this information sheet.

What happens if there is a problem?

If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.

Researcher: Karoline Greve Grouleff (k.g.grouleff@soton.ac.uk)

Research Supervisors: Dr Dennis Golm (d.golm@soton.ac.uk), Dr Lyn Ellett (l.a.ellett@soton.ac.uk), Professor Matthew Garner (m.j.garner@soton.ac.uk)

If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Research Integrity and Governance Manager (023 8059 5058, rgoinfo@soton.ac.uk).

If you experience any discomfort or distress during this study, you can contact any of the following organisations for support:

- Your General Practitioner (GP)
- Samaritans: To talk about anything that is upsetting you, you can contact Samaritans 24 hours a day, 365 days a year on tel:116 123 or email jo@samaritans.org
- SANEline: If you are experiencing a mental health problem or supporting someone else, you can contact SANEline on Tel: 0300 304 7000 from 4.30pm–10.30pm every day.
- Campaign Against Living Miserably (CALM): If you are struggling and need to talk, you can contact CALM on Tel: 0800 58 58 58 (5pm–midnight every day) or use the CALM webchat service if you prefer not to speak on the phone.
- Shout: If you would prefer not to talk but want some mental health support, you can text SHOUT to 85258. Shout offers a confidential 24/7 text service providing support if you are in crisis and need immediate help.
- Papyrus HOPELINEUK. If you're under 35 and struggling with suicidal feelings or concerned about a young person who might be struggling, you can call Papyrus HOPELINEUK on Tel: 0800 068 4141 (weekdays 10am-10pm, weekends 2pm-10pm and bank holidays 2pm–10pm), or email pat@papyrus-uk.org or text 07786 209 697.

- Switchboard. If you identify as gay, lesbian, bisexual or transgender, you can call Switchboard on 0300 330 0630 (10am–10pm every day), email chris@switchboard.lgbt or use their webchat service. Phone operators all identify as LGBT+.

Data Protection Privacy Notice

The University of Southampton conducts research to the highest standards of research integrity. As a publicly funded organisation, the University has to ensure that it is in the public interest when we use personally-identifiable information about people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use information about you in the ways needed, and for the purposes specified, to conduct and complete the research project. Under data protection law, ‘Personal data’ means any information that relates to and is capable of identifying a living individual. The University’s data protection policy governing the use of personal data by the University can be found on its website (<https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page>).

This Participant Information Sheet tells you what data will be collected for this project and whether this includes any personal data. Please ask the research team if you have any questions or are unclear what data is being collected about you.

Our privacy notice for research participants provides more information on how the University of Southampton collects and uses your personal data when you take part in one of our research projects and can be found at

<http://www.southampton.ac.uk/assets/sharepoint/intranet/ls/Public/Research%20and%20Integrity%20Privacy%20Notice/Privacy%20Notice%20for%20Research%20Participants.pdf>

Any personal data we collect in this study will be used only for the purposes of carrying out our research and will be handled according to the University’s policies in line with data protection law. If any personal data is used from which you can be identified directly, it will

not be disclosed to anyone else without your consent unless the University of Southampton is required by law to disclose it.

Data protection law requires us to have a valid legal reason ('lawful basis') to process and use your Personal data. The lawful basis for processing personal information in this research study is for the performance of a task carried out in the public interest. Personal data collected for research will not be used for any other purpose.

For the purposes of data protection law, the University of Southampton is the 'Data Controller' for this study, which means that we are responsible for looking after your information and using it properly. The University of Southampton will keep identifiable information about you for 10 years after the study has finished after which time any link between you and your information will be removed.

To safeguard your rights, we will use the minimum personal data necessary to achieve our research study objectives. Your data protection rights – such as to access, change, or transfer such information - may be limited, however, in order for the research output to be reliable and accurate. The University will not do anything with your personal data that you would not reasonably expect.

If you have any questions about how your personal data is used, or wish to exercise any of your rights, please consult the University's data protection webpage (<https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page>) where you can make a request using our online form. If you need further assistance, please contact the University's Data Protection Officer (data.protection@soton.ac.uk).

Thank you.

Thank you for taking the time to read the information sheet and considering taking part in the research study.

Appendix F Debriefing Statement

Study Title: Cognitive and affective predictors of wayfinding in a virtual maze

Ethics/ERGO number: 79657

Researcher(s): Karoline Greve Grouleff (Trainee Clinical Psychologist), Dr Dennis Golm (PhD, Lecturer in Psychology, University of Southampton), Dr Lyn Ellett (Associate Professor of Clinical Psychology, University of Southampton), Professor Matthew Garner (BSc, PhD, Professor of Psychology & Affective Neuroscience, Head of Psychology, University of Southampton)

University email(s): k.g.grouleff@soton.ac.uk (Karoline Grouleff) d.golm@soton.ac.uk (Dr Dennis Golm) l.a.ellett@soton.ac.uk (Dr Lyn Ellett), m.j.garner@soton.ac.uk (Professor Matthew Garner)

Version and date: Version 2, 18/08/2023

Thank you for taking part in our research project. Your contribution is very valuable and greatly appreciated.

Purpose of the study

The aim of this research study was to examine individual differences and their association with maze navigation, and how maze characteristics modulate maze navigation. We collected information about individual differences by asking participants to complete a trait measure task assessing response to threat and secondly four questionnaires assessing potential past experiences of adverse childhood experiences and current mental health. We then asked participants to navigate maze tasks with different neutral and threatening stimuli. The analysis of the data will investigate potential differences in maze navigation (neutral vs threatening) and whether individual differences impacted on maze navigation.

Confidentiality

Results of this study will not include your name or any other identifying characteristics.

Further support

We recognise that taking part in this study may have caused some discomfort or distress for some participants. Please note that you can contact any of the following organisations for support:

- Your General Practitioner (GP)
- Samaritans: To talk about anything that is upsetting you, you can contact Samaritans 24 hours a day, 365 days a year on tel:116 123 or email jo@samaritans.org
- SANEline: If you are experiencing a mental health problem or supporting someone else, you can contact SANEline on Tel: 0300 304 7000 from 4.30pm–10.30pm every day.
- Campaign Against Living Miserably (CALM): If you are struggling and need to talk, you can contact CALM on Tel: 0800 58 58 58 (5pm–midnight every day) or use the CALM webchat service if you prefer not to speak on the phone.
- Shout: If you would prefer not to talk but want some mental health support, you can text SHOUT to 85258. Shout offers a confidential 24/7 text service providing support if you are in crisis and need immediate help.
- Papyrus HOPELINEUK. If you're under 35 and struggling with suicidal feelings or concerned about a young person who might be struggling, you can call Papyrus HOPELINEUK on Tel: 0800 068 4141 (weekdays 10am-10pm, weekends 2pm-10pm and bank holidays 2pm–10pm), or email pat@papyrus-uk.org or text 07786 209 697.
- Switchboard. If you identify as gay, lesbian, bisexual or transgender, you can call Switchboard on 0300 330 0630 (10am–10pm every day), email chris@switchboard.lgbt or use their webchat service. Phone operators all identify as LGBT+.

- Students at University of Southampton can access the student hub 24/7 for wellbeing support. Students can contact the service via email (studenthub@soton.ac.uk) or telephone (02380 599 599)

Further reading

If you would like to learn more about this area of research, you can refer to the following resources:

Gerin, M. I., Hanson, E., Viding, E., & McCrory, E. J. (2019). A review of childhood maltreatment, latent vulnerability and the brain: implications for clinical practice and prevention. *Adoption & Fostering*, 43(3), 310–328.

McCrory, E. J., & Viding, E. (2015). The theory of latent vulnerability: Reconceptualizing the link between childhood maltreatment and psychiatric disorder. *Development and psychopathology*, 27(2), 493–505.

McCrory, E.J., Gerin, M.I., Viding, E. (2017). Annual Research Review: Childhood maltreatment, latent vulnerability and the shift to preventative psychiatry - the contribution of functional brain imaging. *Journal of Child Psychology and Psychiatry*, 58(4), 338-357.

Further information

If you have any concerns or questions about this study, please contact please contact Karoline Greve Grouleff at k.g.grouleff@soton.ac.uk who will do their best to help.

If you remain unhappy or would like to make a formal complaint, please contact the Head of Research Integrity and Governance, University of Southampton, by emailing: rgoinfo@soton.ac.uk, or calling: + 44 2380 595058. Please quote the Ethics/ERGO number which can be found at the top of this form. Please note that if you participated in an anonymous survey, by making a complaint, you might be no longer anonymous.

Thank you again for your participation in this research.

List of References

Chapter One

- Armijo-Olivo, S., Stiles, C. R., Hagen, N. A., Biondo, P. D., & Cummings, G. G. (2012). Assessment of study quality for systematic reviews: A comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. *Journal of Evaluation in Clinical Practice*, *18*(1), 12–18. <https://doi.org/10.1111/j.1365-2753.2010.01516.x>
- Baldwin, J. R., Coleman, O., Francis, E. R., & Danese, A. (2024). Prospective and Retrospective Measures of Child Maltreatment and Their Association With Psychopathology: A Systematic Review and Meta-Analysis. *JAMA Psychiatry*. <https://doi.org/10.1001/jamapsychiatry.2024.0818>
- Brooks, M., Graham-Kevan, N., Robinson, S., & Lowe, M. (2019). Trauma characteristics and posttraumatic growth: The mediating role of avoidance coping, intrusive thoughts, and social support. *Psychological Trauma: Theory, Research, Practice and Policy*, *11*(2), 232–238. <https://doi.org/10.1037/tra0000372>
- Boland, A., Dickson, R., Cherry, G., (2017). *Doing a Systematic Review: A Student's Guide*. London SAGE Publications. ISBN: 9781526416582.
- Butchart A., Phinney Harvey A., Mian M., Fűrnis T., Kahane T. (2006). Preventing child maltreatment: A guide to taking action and generating evidence / World Health Organization and International Society for Prevention of Child Abuse and Neglect. *Guide Sur La Prévention de La Maltraitance Des Enfants : Intervenir et Produire Des Données*. <https://iris.who.int/handle/10665/43499>
- Carter, L., Brooks, M., & Graham-Kevan, N. (2021). Emotion Regulation Mediates Posttraumatic Growth and Cluster B Personality Traits After Childhood Trauma. *Violence and Victims*, *36*(6), 706–722. <https://doi.org/10.1891/VV-D-20-00022>
- Cheng, T., Seghete, K. M., & Teicher, M. (2022). *Correspondence between the Childhood Trauma Questionnaire and Adverse Childhood Experiences questionnaire*. <https://doi.org/10.31234/osf.io/jdvye>
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. <https://doi.org/10.1037//0033-2909.112.1.155>
- Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, *18*(2), 76–82. <https://doi.org/10.1002/da.10113>
- Fayaz, I. (2023). Role of religiosity or spirituality in experiencing posttraumatic growth among sexual assault survivors: A systematic review: *Journal of Spirituality in Mental Health*. *Journal of Spirituality in Mental Health*. <https://doi.org/10.1080/19349637.2023.2264834>

List of References

- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*(4), 245–258. [https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)
- Ferris, C., & O'Brien, K. (2022). The ins and outs of posttraumatic growth in children and adolescents: A systematic review of factors that matter: *Journal of Traumatic Stress*. *Journal of Traumatic Stress*. <https://doi.org/10.1002/jts.22845>
- Fraus, K., Dominick, W., Walenski, A., & Taku, K. (2023). The impact of multiple stressful life events on posttraumatic growth in adolescence. *Psychological Trauma: Theory, Research, Practice, and Policy*, *15*(1), 10–17. <https://doi.org/10.1037/tra0001181.supp>
- Gardner, M. J., Thomas, H. J., & Erskine, H. E. (2019). The association between five forms of child maltreatment and depressive and anxiety disorders: A systematic review and meta-analysis. *Child Abuse & Neglect*, *96*, 104082. <https://doi.org/10.1016/j.chiabu.2019.104082>
- Gleeson, A., Curran, D., Reeves, R., J Dorahy, M., & Hanna, D. (2021). A meta-analytic review of the relationship between attachment styles and posttraumatic growth. *Journal of Clinical Psychology*, *77*(7), 1521–1536. <https://doi.org/10.1002/jclp.23156>
- Golm, D., Schmidt-Samoa, C., Dechent, P., & Kröner-Herwig, B. (2016). Tinnitus-related distress: evidence from fMRI of an emotional stroop task. *BMC Ear, Nose and Throat Disorders*, *16*, 1-16.
- Green, J. G., McLaughlin, K. A., Berglund, P. A., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Childhood Adversities and Adult Psychiatric Disorders in the National Comorbidity Survey Replication I: Associations With First Onset of DSM-IV Disorders. *Archives of General Psychiatry*, *67*(2), 113–123. <https://doi.org/10.1001/archgenpsychiatry.2009.186>
- 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*(5), 797–816. <https://doi.org/10.1037/0022-006X.74.5.797>
- Hobfoll, S. E., Hall, B. J., Canetti-Nisim, D., Galea, S., Johnson, R. J., & Palmieri, P. A. (2007). Refining our Understanding of Traumatic Growth in the Face of Terrorism: Moving from Meaning Cognitions to Doing what is Meaningful. *Applied Psychology*, *56*(3), 345–366. <https://doi.org/10.1111/j.1464-0597.2007.00292.x>
- Holtmaat, K., van der Spek, N., Cuijpers, P., Leemans, C. R., & Verdonck-de Leeuw, I. M. (2017). Posttraumatic growth among head and neck cancer survivors with psychological distress. *Psycho-Oncology*, *26*(1), 96–101. <https://doi.org/10.1002/pon.4106>

List of References

- Jackson, N., Waters, E., & Guidelines for Systematic Reviews in Health Promotion and Public Health Taskforce. (2005). Criteria for the systematic review of health promotion and public health interventions. *Health Promotion International*, 20(4), 367–374. <https://doi.org/10.1093/heapro/dai022>
- Jansen, L., Hoffmeister, M., Chang-Claude, J., Brenner, H., & Arndt, V. (2011). Benefit finding and post-traumatic growth in long-term colorectal cancer survivors: Prevalence, determinants, and associations with quality of life. *British Journal of Cancer*, 105(8), 1158–1165. <https://doi.org/10.1038/bjc.2011.335>
- Jobson, Laura., & O’Kearney, Richard. (2008). Cultural differences in personal identity in post-traumatic stress disorder. *British Journal of Clinical Psychology*, 47(1), 95–109. <https://doi.org/10.1348/014466507X235953>
- Kashyap, S., & Hussain, D. (2018). Cross-Cultural Challenges to the Construct “Posttraumatic Growth”. *Journal of Loss and Trauma*, 23(1), 51–69. <https://doi.org/10.1080/15325024.2017.1422234>
- Kelly, P. A., Viding, E., Puetz, V. B., Palmer, A. L., Mechelli, A., Pingault, J.-B., Samuel, S., & McCrory, E. J. (2015). Sex differences in socioemotional functioning, attentional bias, and gray matter volume in maltreated children: A multilevel investigation. *Development and Psychopathology*, 27(4pt2), 1591–1609. <https://doi.org/10.1017/S0954579415000966>
- Kilmer, R. P., Armstrong, L. M., & Billingsley, J. T. (2023). Posttraumatic Growth in Children and Youth. In *The Routledge International Handbook of Posttraumatic Growth*. Routledge.
- Kilmer, R. P., Gil-Rivas, V., Tedeschi, R. G., Cann, A., Calhoun, L. G., Buchanan, T., & Taku, K. (2009). *Posttraumatic Growth Inventory for Children—Revised*. <https://doi.org/10.1037/t22273-000>
- Kraemer, H. C., Yesavage, J. A., Taylor, J. L., & Kupfer, D. (2000). How Can We Learn About Developmental Processes From Cross-Sectional Studies, or Can We? *American Journal of Psychiatry*, 157(2), 163–171. <https://doi.org/10.1176/appi.ajp.157.2.163>
- Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. *Biometrics*, 33(1), 159–174. <https://doi.org/10.2307/2529310>
- Lippard, E. T. C., & Nemeroff, C. B. (2023). The Devastating Clinical Consequences of Child Abuse and Neglect: Increased Disease Vulnerability and Poor Treatment Response in Mood Disorders. *American Journal of Psychiatry*, 180(8), 548–564. <https://doi.org/10.1176/appi.ajp.19010020>
- Little, S. G., Akin-Little, A., & Gutierrez, G. (2009). Children and traumatic events: Therapeutic techniques for psychologists working in the schools. *Psychology in the Schools*, 46(3), 199–205. <https://doi.org/10.1002/pits.20364>

List of References

- Little, S. G., Akin-Little, A., & Somerville, M. P. (2011). Response to trauma in children: An examination of effective intervention and post-traumatic growth. *School Psychology International, 32*(5), 448–463. <https://doi.org/10.1177/0143034311402916>
- Mazor, Y., Gelkopf, M., Mueser, K. T., & Roe, D. (2016). Posttraumatic Growth in Psychosis. *Frontiers in Psychiatry, 7*. <https://doi.org/10.3389/fpsyt.2016.00202>
- McCrary, E. J., & Viding, E. (2015). The theory of latent vulnerability: Reconceptualizing the link between childhood maltreatment and psychiatric disorder. *Development and Psychopathology, 27*(2), 493–505. <https://doi.org/10.1017/S0954579415000115>
- McKay, M. T., Kilmartin, L., Meagher, A., Cannon, M., Healy, C., & Clarke, M. C. (2022). A revised and extended systematic review and meta-analysis of the relationship between childhood adversity and adult psychiatric disorder. *Journal of Psychiatric Research, 156*, 268–283. <https://doi.org/10.1016/j.jpsychires.2022.10.015>
- Mohr, D., & Rosén, L. A. (2017). The Impact of Protective Factors on Posttraumatic Growth for College Student Survivors of Childhood Maltreatment. *Journal of Aggression, Maltreatment & Trauma, 26*(7), 756–771. <https://doi.org/10.1080/10926771.2017.1304478>
- Nanni, V., Uher, R., & Danese, A. (2012). Childhood maltreatment predicts unfavorable course of illness and treatment outcome in depression: A meta-analysis. *The American Journal of Psychiatry, 169*(2), 141–151. <https://doi.org/10.1176/appi.ajp.2011.11020335>
- Nelson, K. M., Hagedorn, W. B., & Lambie, G. W. (2019). Influence of attachment style on sexual abuse survivors' posttraumatic growth. *Journal of Counseling & Development, 97*(3), 227–237. <https://doi.org/10.1002/jcad.12263>
- Pennebaker, J. W., & Susman, J. R. (1988). Disclosure of traumas and psychosomatic processes. *Social Science & Medicine (1982), 26*(3), 327–332. [https://doi.org/10.1016/0277-9536\(88\)90397-8](https://doi.org/10.1016/0277-9536(88)90397-8)
- Pine, D. S., Mogg, K., Bradley, B. P., Montgomery, L., Monk, C. S., McClure, E., Guyer, A. E., Ernst, M., Charney, D. S., & Kaufman, J. (2005). Attention Bias to Threat in Maltreated Children: Implications for Vulnerability to Stress-Related Psychopathology. *American Journal of Psychiatry, 162*(2), 291–296. <https://doi.org/10.1176/appi.ajp.162.2.291>
- 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), 364–388. <https://doi.org/10.1080/15325020902724271>
- Quan, L., Lü, B., Sun, J., Zhao, X., & Sang, Q. (2022). The relationship between childhood trauma and post-traumatic growth among college students: The role of acceptance and positive reappraisal. *Frontiers in Psychology, 13*, 921362. <https://doi.org/10.3389/fpsyg.2022.921362>

List of References

- Roberts, N. P., Kitchiner, N. J., Kenardy, J., & Bisson, J. I. (2009). Systematic Review and Meta-Analysis of Multiple-Session Early Interventions Following Traumatic Events. *American Journal of Psychiatry*, *166*(3), 293–301. <https://doi.org/10.1176/appi.ajp.2008.08040590>
- Roepke, A. M. (2015). Psychosocial interventions and posttraumatic growth: A meta-analysis. *Journal of Consulting and Clinical Psychology*, *83*(1), 129–142. <https://doi.org/10.1037/a0036872>
- Schaefer, L. M., Howell, K. H., Schwartz, L. E., Bottomley, J. S., & Crossnine, C. B. (2018). A concurrent examination of protective factors associated with resilience and posttraumatic growth following childhood victimization. *Child Abuse & Neglect*, *85*, 17–27. <https://doi.org/10.1016/j.chiabu.2018.08.019>
- Schubert, C. F., Schmidt, U., Comtesse, H., Gall-Kleebach, D., & Rosner, R. (2019). Posttraumatic growth during cognitive behavioural therapy for posttraumatic stress disorder: Relationship to symptom change and introduction of significant other assessment. *Stress and Health: Journal of the International Society for the Investigation of Stress*, *35*(5), 617–625. <https://doi.org/10.1002/smi.2894>
- Schubert, C. F., Schmidt, U., & Rosner, R. (2016). Posttraumatic Growth in Populations with Posttraumatic Stress Disorder—A Systematic Review on Growth-Related Psychological Constructs and Biological Variables. *Clinical Psychology & Psychotherapy*, *23*(6), 469–486. <https://doi.org/10.1002/cpp.1985>
- Sheridan, G., & Carr, A. (2020). Survivors' lived experiences of posttraumatic growth after institutional childhood abuse: An interpretative phenomenological analysis. *Child Abuse & Neglect*, *103*, 104430. <https://doi.org/10.1016/j.chiabu.2020.104430>
- Tedeschi, R. G., & Calhoun, L. G. (1995). *Trauma & transformation: Growing in the aftermath of suffering* (pp. x, 163). Sage Publications, Inc. <https://doi.org/10.4135/9781483326931>
- Tedeschi, R. G., & Calhoun, L. G. (1996). The Posttraumatic Growth Inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress*, *9*(3), 455–471. <https://doi.org/10.1007/BF02103658>
- Tedeschi, R. G., & Calhoun, L. G. (2004). TARGET ARTICLE: 'Posttraumatic Growth: Conceptual Foundations and Empirical Evidence'. *Psychological Inquiry*, *15*(1), 1–18. https://doi.org/10.1207/s15327965pli1501_01
- Tedeschi, R. G., Shakespeare-Finch, J., Taku, K., & Calhoun, L. G. (2018). *Posttraumatic Growth: Theory, Research, and Applications*. Routledge. <https://doi.org/10.4324/9781315527451>
- Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A process for systematically reviewing the literature: Providing the research evidence for public health nursing interventions. *Worldviews on Evidence-Based Nursing*, *1*(3), 176–184. <https://doi.org/10.1111/j.1524-475X.2004.04006.x>

List of References

- Tranter, H., Brooks, M., & Khan, R. (2021). Emotional resilience and event centrality mediate posttraumatic growth following adverse childhood experiences. *Psychological Trauma: Theory, Research, Practice, and Policy*, *13*(2), 165–173. <https://doi.org/10.1037/tra0000953>
- 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. *Psychology of Women Quarterly*, *34*(1), 110–120. <https://doi.org/10.1111/j.1471-6402.2009.01546.x>
- Widyorini, E., Roswita, M. Y., Primastuti, E., & Wijaya, D. A. (2022). The Role of Resilience towards the Correlation between Adverse Childhood Experiences and Post-Traumatic Growth. *The Open Psychology Journal*, *15*(1). <https://doi.org/10.2174/18743501-v15-e2203280>
- Woodward, C., & Joseph, S. (2003). Positive change processes and post-traumatic growth in people who have experienced childhood abuse: Understanding vehicles of change. *Psychology and Psychotherapy: Theory, Research and Practice*, *76*(3), 267–283. <https://doi.org/10.1348/147608303322362497>

Chapter Two

- Armony, J. L., & Dolan, R. J. (2002). Modulation of spatial attention by fear-conditioned stimuli: An event-related fMRI study. *Neuropsychologia*, *40*(7), 817–826. [https://doi.org/10.1016/s0028-3932\(01\)00178-6](https://doi.org/10.1016/s0028-3932(01)00178-6)
- Berens, A. E., Jensen, S. K. G., & Nelson, C. A. (2017). Biological embedding of childhood adversity: From physiological mechanisms to clinical implications. *BMC Medicine*, *15*(1), 135. <https://doi.org/10.1186/s12916-017-0895-4>
- Bradley, M. M., & Lang, P. J. (2017). International Affective Picture System. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences* (pp. 1–4). Springer International Publishing. https://doi.org/10.1007/978-3-319-28099-8_42-1
- Branco, D., Gonçalves, Ó. F., & Badia, S. B. i. (2023). A Systematic Review of International Affective Picture System (IAPS) around the World. *Sensors (Basel, Switzerland)*, *23*(8), 3866. <https://doi.org/10.3390/s23083866>
- Butchart A., Phinney Harvey A., Mian M., Fűrnis T., Kahane T. (2006). Preventing child maltreatment: A guide to taking action and generating evidence / World Health Organization and International Society for Prevention of Child Abuse and Neglect. *Guide Sur La Prévention de La Maltraitance Des Enfants : Intervenir et Produire Des Données*. <https://iris.who.int/handle/10665/43499>

List of References

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. <https://doi.org/10.1037//0033-2909.112.1.155>
- Cowden Hindash, A. H., Lujan, C., Howard, M., O'Donovan, A., Richards, A., Neylan, T. C., & Inslicht, S. S. (2019). Gender Differences in Threat Biases: Trauma Type Matters in Posttraumatic Stress Disorder. *Journal of Traumatic Stress*, *32*(5), 701–711. <https://doi.org/10.1002/jts.22439>
- Danese, A., & McEwen, B. S. (2012). Adverse childhood experiences, allostasis, allostatic load, and age-related disease. *Physiology & Behavior*, *106*(1), 29–39. <https://doi.org/10.1016/j.physbeh.2011.08.019>
- Davidson, R., & MacKinnon, J. G. (2010). Wild Bootstrap Tests for IV Regression. *Journal of Business & Economic Statistics*, *28*(1), 128–144. <https://doi.org/10.1198/jbes.2009.07221>
- Diagnostic and statistical manual of mental disorders: DSM-5™, 5th ed* (pp. xlv, 947). (2013). American Psychiatric Publishing, Inc. <https://doi.org/10.1176/appi.books.9780890425596>
- DURBIN, J., & WATSON, G. S. (1951). TESTING FOR SERIAL CORRELATION IN LEAST SQUARES REGRESSION. II. *Biometrika*, *38*(1–2), 159–178. <https://doi.org/10.1093/biomet/38.1-2.159>
- El-Den, S., Chen, T. F., Gan, Y.-L., Wong, E., & O'Reilly, C. L. (2018). The psychometric properties of depression screening tools in primary healthcare settings: A systematic review. *Journal of Affective Disorders*, *225*, 503–522. <https://doi.org/10.1016/j.jad.2017.08.060>
- Eriksen, B. A., & Eriksen, C. W. (1974). Effects of noise letters upon the identification of a target letter in a nonsearch task. *Perception & Psychophysics*, *16*(1), 143–149. <https://doi.org/10.3758/BF03203267>
- Ethnicity facts and figures*. (n.d.). Retrieved May 12, 2024, from <https://www.ethnicity-facts-figures.service.gov.uk/>
- Etkin, A., & Wager, T. D. (2007). Functional Neuroimaging of Anxiety: A Meta-Analysis of Emotional Processing in PTSD, Social Anxiety Disorder, and Specific Phobia. *The American Journal of Psychiatry*, *164*(10), 1476–1488. <https://doi.org/10.1176/appi.ajp.2007.07030504>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Felitti, V. J. (2009). Adverse Childhood Experiences and Adult Health. *Academic Pediatrics*, *9*(3), 131–132. <https://doi.org/10.1016/j.acap.2009.03.001>
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*(4), 245–258. [https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)

List of References

- Field, A. (2009). *Discovering Statistics Using SPSS*. SAGE Publications.
- Freeman, D. (2016). Persecutory delusions: A cognitive perspective on understanding and treatment. *The Lancet Psychiatry*, 3(7), 685–692. [https://doi.org/10.1016/S2215-0366\(16\)00066-3](https://doi.org/10.1016/S2215-0366(16)00066-3)
- Freeman, D., Loe, B. S., Kingdon, D., Startup, H., Molodynski, A., Rosebrock, L., Brown, P., Sheaves, B., Waite, F., & Bird, J. C. (n.d.). The revised Green et al., Paranoid Thoughts Scale (R-GPTS): Psychometric properties, severity ranges, and clinical cut-offs. *Psychological Medicine*, 51(2), 244–253. <https://doi.org/10.1017/S0033291719003155>
- Garbarino, J., & Kostelny, K. (1992). Child maltreatment as a community problem. *Child Abuse & Neglect*, 16(4), 455–464. [https://doi.org/10.1016/0145-2134\(92\)90062-V](https://doi.org/10.1016/0145-2134(92)90062-V)
- George, D., & Mallery, P. (2010). *SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 Update*. Allyn & Bacon.
- Georgieva, S., Tomás, J. M., Navarro-Pérez, J. J., & Samper-García, P. (2023). Systematic Review and Critical Appraisal of Five of the Most Recurrently Validated Child Maltreatment Assessment Instruments from 2010 to 2020. *Trauma, Violence, & Abuse*, 24(4), 2448–2465. <https://doi.org/10.1177/15248380221097694>
- Gerin, M. I., Hanson, E., Viding, E., & McCrory, E. J. (2019). A review of childhood maltreatment, latent vulnerability and the brain: Implications for clinical practice and prevention. *Adoption & Fostering*, 43(3), 310–328. <https://doi.org/10.1177/0308575919865356>
- Gerin, M. I., Puetz, V. B., Blair, R. J. R., White, S., Sethi, A., Hoffmann, F., Palmer, A. L., Viding, E., & McCrory, E. J. (2017). A neurocomputational investigation of reinforcement-based decision making as a candidate latent vulnerability mechanism in maltreated children. *Development and Psychopathology*, 29(5), 1689–1705. <https://doi.org/10.1017/S095457941700133X>
- Green, J. G., McLaughlin, K. A., Berglund, P. A., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Childhood Adversities and Adult Psychiatric Disorders in the National Comorbidity Survey Replication I: Associations With First Onset of DSM-IV Disorders. *Archives of General Psychiatry*, 67(2), 113–123. <https://doi.org/10.1001/archgenpsychiatry.2009.186>
- Grindey, A., & Bradshaw, T. (2022). Do different adverse childhood experiences lead to specific symptoms of psychosis in adulthood? A systematic review of the current literature. *International Journal of Mental Health Nursing*, 31(4), 868–887. <https://doi.org/10.1111/inm.12992>
- Hart, H., & Rubia, K. (2012). Neuroimaging of child abuse: A critical review. *Frontiers in Human Neuroscience*, 6. <https://doi.org/10.3389/fnhum.2012.00052>

List of References

- Hein, T. C., & Monk, C. S. (2017). Research Review: Neural response to threat in children, adolescents, and adults after child maltreatment – a quantitative meta-analysis. *Journal of Child Psychology and Psychiatry*, 58(3), 222–230. <https://doi.org/10.1111/jcpp.12651>
- Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., Aguilar-Gaxiola, S., Alhamzawi, A. O., Alonso, J., Angermeyer, M., Benjet, C., Bromet, E., Chatterji, S., de Girolamo, G., Demyttenaere, K., Fayyad, J., Florescu, S., Gal, G., Gureje, O., ... Williams, D. R. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *The British Journal of Psychiatry: The Journal of Mental Science*, 197(5), 378–385. <https://doi.org/10.1192/bjp.bp.110.080499>
- Kim-Spoon, J., Briant, A., Folker, A., Lindenmuth, M., Lee, J., Casas, B., & Deater-Deckard, K. (2024). Psychopathology as long-term sequelae of maltreatment and socioeconomic disadvantage: Neurocognitive development perspectives. *Development and Psychopathology*, 1–12. <https://doi.org/10.1017/S0954579424000531>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Kroenke, K., Spitzer, R. L., Williams, J. B. W., Monahan, P. O., & Löwe, B. (2007). Anxiety Disorders in Primary Care: Prevalence, Impairment, Comorbidity, and Detection. *Annals of Internal Medicine*, 146(5), 317–325. <https://doi.org/10.7326/0003-4819-146-5-200703060-00004>
- LeDoux, J. E. (2000). Emotion Circuits in the Brain. *Annual Review of Neuroscience*, 23(1), 155–184. <https://doi.org/10.1146/annurev.neuro.23.1.155>
- Levis, B., Benedetti, A., & Thombs, B. D. (2019). Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: Individual participant data meta-analysis. *BMJ*, 11476. <https://doi.org/10.1136/bmj.11476>
- Li, M., D’Arcy, C., & Meng, X. (2016). Maltreatment in childhood substantially increases the risk of adult depression and anxiety in prospective cohort studies: Systematic review, meta-analysis, and proportional attributable fractions. *Psychological Medicine*, 46(4), 717–730. <https://doi.org/10.1017/S0033291715002743>
- Lippard, E. T. C., & Nemeroff, C. B. (2020). The Devastating Clinical Consequences of Child Abuse and Neglect: Increased Disease Vulnerability and Poor Treatment Response in Mood Disorders. *The American Journal of Psychiatry*, 177(1), 20–36. <https://doi.org/10.1176/appi.ajp.2019.19010020>
- Maheu, F. S., Dozier, M., Guyer, A. E., Mandell, D., Peloso, E., Poeth, K., Jenness, J., Lau, J. Y. F., Ackerman, J. P., Pine, D. S., & Ernst, M. (2010). A preliminary study of medial temporal lobe

List of References

- function in youths with a history of caregiver deprivation and emotional neglect. *Cognitive, Affective & Behavioral Neuroscience*, 10(1), 34–49. <https://doi.org/10.3758/CABN.10.1.34>
- Matthews, S. C., Strigo, I. A., Simmons, A. N., Yang, T. T., & Paulus, M. P. (2008). Decreased functional coupling of the amygdala and supragenual cingulate is related to increased depression in unmedicated individuals with current major depressive disorder. *Journal of Affective Disorders*, 111(1), 13–20. <https://doi.org/10.1016/j.jad.2008.05.022>
- McCrory, E. J. (2018). Investigating the Neurocognitive Mechanisms That Influence How Mental Health Risk Can Unfold Following Maltreatment. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, 3(7), 579–580. <https://doi.org/10.1016/j.bpsc.2018.05.003>
- McCrory, E. J., Gerin, M. I., & Viding, E. (2017). Annual Research Review: Childhood maltreatment, latent vulnerability and the shift to preventative psychiatry – the contribution of functional brain imaging. *Journal of Child Psychology and Psychiatry*, 58(4), 338–357. <https://doi.org/10.1111/jcpp.12713>
- McCrory, E. J., & Viding, E. (2015). The theory of latent vulnerability: Reconceptualizing the link between childhood maltreatment and psychiatric disorder. *Development and Psychopathology*, 27(2), 493–505. <https://doi.org/10.1017/S0954579415000115>
- McCrory, E., Foulkes, L., & Viding, E. (2022). Social thinning and stress generation after childhood maltreatment: A neurocognitive social transactional model of psychiatric vulnerability. *The Lancet Psychiatry*, 9(10), 828–837. [https://doi.org/10.1016/S2215-0366\(22\)00202-4](https://doi.org/10.1016/S2215-0366(22)00202-4)
- McLaughlin, K. A., Sheridan, M. A., & Lambert, H. K. (2014). Childhood Adversity and Neural Development: Deprivation and Threat as Distinct Dimensions of Early Experience. *Neuroscience and Biobehavioral Reviews*, 47, 578–591. <https://doi.org/10.1016/j.neubiorev.2014.10.012>
- Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive Statistics and Normality Tests for Statistical Data. *Annals of Cardiac Anaesthesia*, 22(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18
- Myers, R. H. (1990). *Classical and Modern Regression with Applications*. PWS-KENT.
- Plummer, F., Manea, L., Trepel, D., & McMillan, D. (2016). Screening for anxiety disorders with the GAD-7 and GAD-2: A systematic review and diagnostic metaanalysis. *General Hospital Psychiatry*, 39, 24–31. <https://doi.org/10.1016/j.genhosppsych.2015.11.005>
- Pollak, S. D., Cicchetti, D., Hornung, K., & Reed, A. (2000). Recognizing emotion in faces: Developmental effects of child abuse and neglect. *Developmental Psychology*, 36(5), 679–688. <https://doi.org/10.1037/0012-1649.36.5.679>
- Pollak, S. D., & Sinha, P. (2002). Effects of early experience on children's recognition of facial displays of emotion. *Developmental Psychology*, 38(5), 784–791. <https://doi.org/10.1037//0012-1649.38.5.784>

List of References

- Redhead, E. S., Wildschut, T., Oliver, A., Parker, M. O., Wood, A. P., & Sedikides, C. (2023). Nostalgia enhances route learning in a virtual environment. *Cognition and Emotion*, *37*(4), 617–632. <https://doi.org/10.1080/02699931.2023.2185877>
- Reuben, A., Moffitt, T. E., Caspi, A., Belsky, D. W., Harrington, H., Schroeder, F., Hogan, S., Ramrakha, S., Poulton, R., & Danese, A. (2016). Lest we forget: Comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *Journal of Child Psychology and Psychiatry*, *57*(10), 1103–1112. <https://doi.org/10.1111/jcpp.12621>
- Sethi, D. & World Health Organization (Eds.). (2013). *European report on preventing child maltreatment*. World Health Organization, Regional Office for Europe.
- Siegle, G. J., Thompson, W., Carter, C. S., Steinhauer, S. R., & Thase, M. E. (2007). Increased Amygdala and Decreased Dorsolateral Prefrontal BOLD Responses in Unipolar Depression: Related and Independent Features. *Biological Psychiatry*, *61*(2), 198–209. <https://doi.org/10.1016/j.biopsych.2006.05.048>
- Sinha, R. (2008). Chronic Stress, Drug Use, and Vulnerability to Addiction. *Annals of the New York Academy of Sciences*, *1141*(1), 105–130. <https://doi.org/10.1196/annals.1441.030>
- Sperry, D. M., & Widom, C. S. (2013). Child abuse and neglect, social support, and psychopathology in adulthood: A prospective investigation. *Child Abuse & Neglect*, *37*(6), 415–425. <https://doi.org/10.1016/j.chiabu.2013.02.006>
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, *166*(10), 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Taylor, S. E. (2010). Mechanisms linking early life stress to adult health outcomes. *Proceedings of the National Academy of Sciences*, *107*(19), 8507–8512. <https://doi.org/10.1073/pnas.1003890107>
- Teicher, M. H., & Parigger, A. (2015). The “Maltreatment and Abuse Chronology of Exposure” (MACE) scale for the retrospective assessment of abuse and neglect during development. *PloS One*, *10*(2), e0117423. <https://doi.org/10.1371/journal.pone.0117423>
- Tottenham, N., Hare, T. A., Millner, A., Gilhooly, T., Zevin, J. D., & Casey, B. J. (2011). Elevated amygdala response to faces following early deprivation. *Developmental Science*, *14*(2), 190–204. <https://doi.org/10.1111/j.1467-7687.2010.00971.x>
- Varese, F., Smeets, F., Drukker, M., Lieveise, R., Lataster, T., Viechtbauer, W., Read, J., van Os, J., & Bentall, R. P. (2012). Childhood adversities increase the risk of psychosis: A meta-analysis of patient-control, prospective- and cross-sectional cohort studies. *Schizophrenia Bulletin*, *38*(4), 661–671. <https://doi.org/10.1093/schbul/sbs050>

List of References

- Walther, S., Lefebvre, S., Conring, F., Gangl, N., Nadesalingam, N., Alexaki, D., Wüthrich, F., Rüter, M., Viher, P., Federspiel, A., Wiest, R., & Stegmayer, K. (2021). Limbic links to paranoia: Increased resting-state functional connectivity between amygdala, hippocampus and orbitofrontal cortex in schizophrenia patients with paranoia. *European Archives of Psychiatry and Clinical Neuroscience*, 272, 1–12. <https://doi.org/10.1007/s00406-021-01337-w>
- Westfall, N. C., & Nemeroff, C. B. (2018). Child abuse and neglect as risk factors for post-traumatic stress disorder. In *Post-traumatic stress disorder* (pp. 443–470). Oxford University Press.
- Wu, C. F. J. (1986). Jackknife, Bootstrap and Other Resampling Methods in Regression Analysis. *The Annals of Statistics*, 14(4), 1261–1295. <https://doi.org/10.1214/aos/1176350142>

List of References