What is psychosis? Exploring the Nature and Correlates of Psychotic Symptoms in the General Population and Former Residents of Institutional Care Facilities

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Declaration

October 30th, 2020

I, David Murphy, declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work. I agree to deposit this thesis in the University's open access institutional repository or allow the library to do so on my behalf, subject to Irish Copyright Legislation and Trinity College Library conditions of use and acknowledgement.

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Executive Summary

Background: The extant literature indicates that the distinction between affective and non-affective psychotic symptoms is arbitrary. Emerging evidence indicates that psychosis may be best represented as a multidimensional construct comprising a General dimension that captures the covariance shared across all affective and non-affective symptoms, and five specific dimensions that capture the unique shared variance within positive, negative, depression, manic, and disorganized symptoms. In addition, sustained and repeated childhood trauma is a risk factor for psychosis and Complex PTSD (CPTSD). However, there is limited research on (1) the latent structure of psychosis in general population samples, (2) the reliability and replicability of these dimensions, (3) the associations between these dimensions and established risk factors of psychotic illness, (4) what psychosocial variables might mediate the association between childhood interpersonal trauma and these dimensions of psychosis, and (5) if psychosis and CPTSD are related constructs.

Objectives: (1) To determine the appropriate latent structure of psychosis in the general population; (2) To assess the reliability and replicability of each dimension of the best fitting model of the latent structure of psychosis; (3) To assess the association between each dimension of psychosis and a range of established risk factors for psychotic illness; (4) To assess if the association between childhood interpersonal trauma and each dimension of psychosis is mediated by multiple psychosocial variables; (5) To determine if CPTSD and psychosis are related constructs.

Methods: Empirical assessments were conducted in three phases. Research objectives 1-3 were assessed in phase one and were based on a nationally representative sample of the adult population of the United States (N = 36, 309). Confirmatory factor analysis and confirmatory bifactor modelling were used to test a series of alternative models of the latent structure of psychosis. Bifactor strength indices were used to assess the reliability and replicability of each dimension of the most appropriate measurement model of psychosis. Finally, structural equation modelling (SEM) was used to test the associations between environmental, developmental, demographic, social, and psychological variables and each dimension of psychosis. Research objective 4 was assessed in phase two and was based on the same sample as used in phase one. SEM was used to test if the associations between childhood interpersonal trauma and each dimension of psychosis was mediated via multiple psychosocial variables. The findings from phases one and two were used to inform the final phase of the study which was based on a sample of former residents of institutional care facilities (N = 45). The fifth objective used independent samples and chi-square tests to examine the association between psychosis and CPTSD.

Results: The latent structure of psychosis was best represented by a bifactor model which included a General dimension (e.g. affective + non-affective symptoms) and four specific dimensions reflecting positive, negative, manic, and disorganized symptoms. The General and Negative dimensions demonstrated adequate reliability and replicability. The General dimension was correlated with several established risk factors for psychotic illness including childhood trauma, diminished social support, history of attempted suicide, younger age, being male, ethnic majority status, and lower socio-economic status. Multiple mediating effects were identified in the association between childhood interpersonal trauma and the General dimension of psychosis. Posttraumatic stress disorder (PTSD), diminished social support, and history of attempted suicide mediated

the association between childhood interpersonal trauma and the General dimension of psychosis. There were also a number of mediating effects from childhood interpersonal trauma and the specific dimensions. Finally, psychosis and CPTSD were found not to be associated with one another in the sample of former residents of institutional care facilities.

Conclusion: These findings represent an important addition to the existing psychosis literature by addressing several gaps in knowledge. Results indicate that psychosis is best understood as a dimensional construct in the general population, and there exists a general vulnerability to affective and non-affective symptoms. The internal reliability, replicability, and external validity of the General dimension of psychosis was supported. In addition, the association between childhood interpersonal trauma and this General dimension of psychosis was found to be influenced by social support networks, PTSD symptomology, and a history of attempted suicide. These finding provide clinicians with evidence for how best to conceptualise psychotic symptoms, and targets for treatment in highly vulnerable groups. Finally, the independent nature of psychosis and CPTSD in former residents of institutional care facilities suggests that while both forms of psychological distress are common in this cohort, distinct clinical interventions may be required to address these problems.

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Keep fighting the good fight. Special thanks to Margaret McCuckin and Survivors and Victims of Institutional Abuse Northern Ireland. Your support and guidance throughout the research process has been invaluable.

Abbreviations

ACE = Adverse Childhood Experiences

ACTH = Adrenocorticotropic Hormone

ANOVA = Analysis of Variance

APA = American Psychiatric Association

APSS = Adolescent Psychotic-Like Symptom Screener scale

AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule

BC = Bias Corrected

BDF = Bandwidth Fidelity Dilemma

BPD = Borderline Personality Disorder

CBM = Confirmatory Bifactor Modelling

CFA = Confirmatory Factor Analysis

CFI = Comparative Fit Index

CI = Confidence Interval

CPTSD = Complex Post-traumatic Stress Disorder

CSA = Childhood Sexual Abuse

DESNOS = Disorders of Extreme Stress Not Otherwise Specified

DSM = Diagnostic and Statistical Manual

DSM-I = Diagnostic and Statistical Manual first edition

DSM-II = Diagnostic and Statistical Manual second edition

DSM-III = Diagnostic and Statistical Manual third edition

DSM-III-R = Diagnostic and Statistical Manual third revision-Revised

DSM-IV = Diagnostic and Statistical Manual fourth edition

DSM-5 = Diagnostic and Statistical Manual fifth edition

DSO = Disturbance of Self Organization

EAEIS = East Asian Ethnic Identity Scale

E-Risk = Environmental-Risk

ESCAPE = Enduring Personality Change After Catastrophic Experience

FEP = First Episode Psychosis

GDPR = General Data Protection Regulation

GxE = Gene and Environmental Interaction

HiTop = Hierarchical Taxonomy Of Psychopathology

HPA-axis = Hypothalamic-Pituitary-Adrenal-axis

ICD = International Classification of Diseases

ICD-10 = International Classification of Diseases 10th Revision

ICD-11 = International Classification of Diseases 11th Revision

IPA = Interpretative Phenomenological Analysis

IQ = Intelligent Quotient

ISEL-12 = Interpersonal Support Evaluation List-12

ITQ = International Trauma Questionnaire

MEIM = Multigroup Ethnic Identity Measure

MFF = Maladaptive Family Functioning

MZ = Monozygotic

NCS = National Comorbidity Survey

NESARC = National Epidemiological Survey on Alcohol and related Conditions

NIAAA = National Institute on Alcohol Abuse and Alcoholism

PANSS = Positive and Negative Symptom Scale

PLE's = Psychotic-Like Experiences

PTSD = Post-traumatic Stress Disorder

RMSEA = Root-Mean-Square Error of Approximation

SAVIA-NI = Survivors and Victims of Institutional Abuse-Northern Ireland

SEM = Structural Equation Modelling

SES = Socio-economic Status

SIA = Social Identity Approach

SIB = Suicidal Ideation/Behaviour

TLI = Tucker-Lewis Index

UK = United Kingdom

US = United States of America

WHO = World Health Organization

WLSMV = Weighted Least Squares Means and Variances Adjusted

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Chapter 1: Introduction

1.1 Background

The accurate classification of psychiatric disorders is essential to clinical practice as it informs diagnosis and clinical interventions (Bebbignton, 2015). More broadly, psychiatric diagnoses are also used to inform judgements in law (Banner, 2015), medical claims (Mark et al., 2018), and child custody disputes (Ostrow et al., 2020), with considerable impact on society. Traditional diagnostic manuals such as the American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders* (DSM) and the World Health Organization's (WHO) *International Classification of Diseases and Related Health Problems* (ICD) are useful clinical tools to provide a shared, coherent lexicon for describing and understanding psychiatric disorders, facilitating diagnosis, research, and interdisciplinary communication (Kotov et al., 2018). A common lexicon for psychiatric disorders also provides researchers with a platform to test the trajectory of disease, efficacy of treatments, and aetiology (Kendell & Jablensky, 2003). The diagnostic structure of the DSM and ICD has been traditionally aligned with the biomedical model of pathology in that psychiatric disorders are assumed to be categorically distinct entities. Despite this fundamental assumption however, comorbidity between psychiatric disorders is commonly observed in the research literature and in clinical practice (Wilkie et al., 2018). For example, receiving one psychiatric diagnosis increases the likelihood of receiving another, with this association following an incremental linear trend (Kessler et al., 2005).

A growing movement spearheaded by the Hierarchical Taxonomy of Psychopathology (HiTOP: Kotov et al., 2017) consortium has challenged the validity of traditional diagnostic manuals on an empirical basis. Empirical evidence indicates that

discrete classifications have been arbitrarily divided, when in actuality symptom profiles are not confined to specific disorders, but rather are indicators of a single latent dimension accounting for the covariation observed across all clinical disorders (Caspi & Moffitt, 2018; Caspi et al., 2014; Lahey et al., 2012; Martel et al., 2017). Kotov et al. (2017) proposed a dimensional and hierarchical model of psychopathology wherein the covariation between psychiatric disorders – or more precisely, the constituent symptoms of psychiatric disorders - can be explained by a small number of latent variables including (but not limited to) Internalizing (e.g., depression, generalized anxiety), Externalizing (e.g., substance dependence, antisocial personality disorder), and Thought Disorder (e.g. schizophrenia, bipolar disorder) psychopathology. These dimensions reflect psychopathology associated with negative affect, behavioural inhibition, and psychosis, respectively. Moreover, the covariation between these dimensions of psychopathology is explained in terms of a single higher-order dimension of general psychopathology referred to as '*p*' (Caspi et al., 2014). In other words, the HiTOP model proposes that vulnerability to all forms of observed psychopathology is determined ultimately by a single underlying latent vulnerability (see Kotov et al., 2017).

Global prevalence estimates indicate that schizophrenic diagnoses have increased from 13.1 per million in 1990 to 20.9 per million in 2016. Schizophrenic disorders contribute significantly to the global burden of disease with an estimated 13.4 million years of life living with a disability (Chong et al., 2016). Likewise, the global prevalence of bipolar disorders has increased from 32.7 million in 1990 to 48.8 million in 2013. Bipolar disorders accounted for 9.9 million years living with a disability, globally, during this timeframe (Charlson et al., 2018). Although schizophrenic and bipolar disorders are less prevalent than Internalizing and Externalizing based disorders, a diagnosis of a Thought Disorder increases the likelihood of experiencing a poorer quality of life

throughout the lifespan. Indeed, schizophrenic and bipolar disorders are associated with poorer relationship quality (Galuppi et al., 2010), increased likelihood of hospitalizations (Kessler et al., 2019), and suicidality (Huang et al., 2018; Novick et al., 2010; Schaffer et al., 2015).

1.2 Institutional Abuse Survivors

Child abuse perpetrated by members of the clergy and lay people in religious/state institutional care facilities is a global issue. A series of scandals and inquires beginning in the 1970s and continuing to the present day in the United States of America, Canada, Australia, and multiple European nations have revealed that children who spent time in institutional care facilities during their childhood and/or adolescence were subjected to considerable abuse and neglect (Daly, 2014). Although the cultural context varies across nations, a consistent trend of abuse meted out for perceived immorality and deviancy to young children and adolescents prevailed (Sköld, 2016). The strong grip of Catholicism on the island of Ireland has had a particular influence on the legacy of institutional abuse of children. Ireland's emancipation from Britain brought with it a desire to reform governmental institutions, and indeed wider society in a manner which was consistent with the principles of Catholicism. A fundamental aspect of this reform which impacted institutional abuse in Ireland was the ceding of control of the educational system from the State to the Catholic Church. From the formation of the Irish Free State in 1922, institutional care facilities were viewed as places where deviant and immoral children could be disciplined and reformed outside of the public view; owing to perceived breeches of Catholic orthodoxy and acts of criminality (Redmond, 2018). Consequently, children were often subjected to years of incarceration for trivial 'offences' including poor school attendance, stealing food, or parents conceiving out of wedlock (Ferguson, 2007). Moreover, children who were sent to intuitional care facilities such as industrial

schools or Magdalene Laundries were often subjected to physical, sexual, and emotional abuse, and physical and emotional neglect within their families (Ryan, 2009). As such, children in institutional care were often deemed legitimate targets of abuse due to the stigma associated with incarceration in such facilities.

The Commission to Inquire into Child Abuse (Ryan, 2009) outlined in detail that children in institutional care facilities experienced sustained and multiple types of abuse for prolonged periods of time (e.g. physical, sexual, emotional abuse, and physical and emotional neglect) in the Irish Free State. Similarly, the Historical Institutional Abuse Inquiry (Hart, 2017) documented that abuse and neglect were widespread in institutional care facilities in the North of Ireland. These experiences have had a deleterious effect on survivors' mental and physical well-being as well their ability to function in society. Research indicates, for example, that survivors of institutional abuse are at an increased likelihood of experiencing Internalizing and Externalizing psychiatric disorders (Carr et al., 2010, 2019, 2020; Lueger-Schuster et al., 2014, 2018).

The voices of institutional abuse survivors have largely been silenced in truth and reconciliation efforts. Most recently, the government of the Republic of Ireland passed a controversial piece of legislation – the Commission of Investigation (Mother and Baby Homes and certain related Matters) Records, and another Matter, Bill 2020 – that will allow the transfer of a database, and potentially lead to the sealing, of over 60,000 records, including witness testimonies of abuse suffered in institutional care facilities. Institutional abuse advocacy and support groups such as Survivors and Victims Northern Ireland, Right of Place, and the Aislinn Centre continue to fight for the right of survivors of institutional abuse to be heard and adequately compensated through various means including monetarily, physically, mentally, socially, and emotionally. Research into the

psychological effects of intuitional abuse is one avenue through which survivors can voice their lived experiences.

1.3 Research Goals

The current thesis makes use of a number of theoretical and conceptual frameworks such as Einheitspsychosis (Griesinger, 1867), Kraepelinian distinction (Kraepelin, 1892), psychodynamic approach, dopaminergic model of psychosis (Tost et al., 2010), extended phenotype of psychosis (van Os & Reininghaus, 2016), latent variables (Bollen, 2002), band-width fidelity dilemma (Cronbach & Gleser, 1957), adverse childhood experiences (Felitti et al., 1998), genes multiplied by environment framework (e.g. GxE), social deafferentation hypothesis (Hoffman, 2007), Attachment theory (Bowlby, 1965, 1973), theory of self-categorisation (Turner et al.,1987), social identity theory (Tajfel et al., 1979), and the suicidal drive hypothesis (Murphy et al., 2018) to understand the latent structure of psychosis and how general and specific symptoms (e.g. positive symptoms) of psychosis relate to environmental, developmental, demographic, social, and psychological variables, as well as other psychiatric disorders. In addition, this study adopts the Bradford-Hill criteria (Bradford-Hill, 1965) to assess the causal relationship between childhood trauma and psychosis.

The aim of the current research was to provide incremental additions to emerging and understudied areas of research within the field of psychology. Specifically, this body of work sought to address key gaps in the literature in relation to the bifactor model of psychosis and how it relates to environmental, developmental, demographic, social, and psychological factors – as well assessing theoretical paths from childhood trauma to symptoms of psychosis. In addition, this thesis sought to assess how psychosis relates to emerging diagnostic frameworks such as CPTSD.

1.4 Purpose Statement and Research Objectives

The purpose of this thesis is to identify the optimal measurement model of the nature of psychosis in the general adult population, and to identify how psychosis – when modelled in an empirically derived manner - is associated with environmental, developmental, social, psychological, and demographic factors. In addition, this thesis seeks to examine the relationship between CPTSD and symptoms of psychosis in a sample of former residents of institutional care facilities. In doing so, this work endeavours to make important and unique contributions to existing theory and practice in psychosis. To achieve this, five specific research objectives are presented.

Objective 1: To determine the optimal latent structure of psychosis symptoms the general population sample. Objective 1 is achieved by answering the following research question:

- Is the latent structure of psychosis best represented by a unitary, multidimensional, or bifactor model?

Objective 2: To assess the reliability and replicability of each dimension of the most appropriate model of the latent structure of psychosis in the general population. Objective 2 is achieved by answering the following research question:

- Do the latent dimensions of psychosis (as identified in objective 1) possess acceptable reliability and replicability?

Objective 3: To assess the external validity of each dimension of the most appropriate model of the latent structure of psychosis in the general population. Objective 3 is achieved by answering the following research question:

- To what extent are the latent dimensions of psychosis (as identified in objective 1) associated with environmental, developmental, social, psychological, and

demographic factors, including childhood trauma, perceived social support, attempted suicide, age, sex, socio-economic status, urbanicity, and ethnicity?

Objective 4: To ascertain if the associations between childhood trauma and the latent dimensions of psychosis (as indicated by objective 1) are mediated by multiple social and psychological variables. Objective 4 is achieved by answering the following question:

- Do perceived social support, social identity, history of attempted suicide, and PTSD mediate the association between childhood trauma and latent dimensions of psychosis (as identified in objective 1)?

Objective 5: To determine if CPTSD and psychosis are related psychopathological constructs in a sample of former residents of institutional care facilities. Objective 5 is achieved by answering the following research question:

- Are CPTSD and psychosis significantly associated in a sample of former residents of institutional care facilities?

1.5 Significance of the Study

The findings of this doctoral thesis add to a growing body of literature that seeks to improve our understanding of how psychosis – and more broadly psychopathology – manifests in the population. From a research perspective, this work represents the first attempt to correlate recognised risk factors for psychotic illness with psychosis, when psychosis is modelled in an empirically derived manner, in a general population sample. Additionally, this work represents the first effort to simultaneously model multiple proposed mediators of the relationship between childhood interpersonal trauma and multiple empirically derived dimensions of psychosis. Furthermore, this work represents the first effort to explore the relationship between psychosis and CPTSD among former

residents of institutional care facilities; a section of the general population who are characterised high levels of early life trauma.

At a practical level, the findings from this research may be used to inform clinical practice in conceptualising and treating psychotic illness by providing an empirical based representation of psychotic illness, and identifying risk factors associated with different facets of psychosis. Moreover, the current research will identify critical risk factors that are especially pertinent to psychosis among persons who have experienced childhood trauma. From a policy perspective, this work highlights that those who have spent time in institutional care facilities have been subjected to high levels of trauma and experience high levels of psychological distress. As such, government policy should continue to engage with institutional abuse survivor advocacy groups to ensure that survivors are given a voice and are allowed to access their history from official records - as well as to ensure that their needs for counselling, housing, and education are met.

1.6 Thesis Structure

Chapter 2 offers a comprehensive review of the historical and contemporary debates in the literature regarding the nature of psychosis. Specifically, this chapter critically reviews the validity and clinical utility of categorical, unitary, multidimensional, and bifactor models of psychosis. In addition, this chapter applies the Bradford-Hill criteria for assessing the veracity of a causal relationship between childhood trauma and psychosis. This chapter also reviews the literature investigating the association between psychosis and a number of social and psychological variables including social identity, perceived social support, suicidality, and PTSD, and in doing so, outlines and critiques established and emerging theories in the psychosis aetiology literature. Finally, this chapter provides a discussion of the historical context of institutional abuse and the levels of childhood trauma and subsequent adverse psychopathological outcomes in survivors of

institutional abuse. Together, this chapter provides a synthesis of the relevant extant theory that undergird the rationale for the thesis objectives.

Chapter 3 outlines post-positivism as the guiding philosophical paradigm of the thesis. A step-by-step protocol for a sequential study design is described, describing how the findings of each quantitative study are used to inform the methods of the subsequent research objective is outlined in this chapter. Ethical procedures and considerations are also detailed.

Chapter 4 addresses the first, second, and third research objectives. Specifically, this chapter assesses the latent structure of psychosis in the general population using confirmatory factor analysis and confirmatory bifactor modelling. Bifactor strength indices are used to assess the reliability and replicability of dimensions of the latent structure of psychosis. Structural equation modelling is also used to investigate the association between dimensions of psychosis and multiple recognised risk factors for psychosis. The measurement model of psychosis identified in this chapter is then carried over as the model of psychosis used in the analyses in Chapter 5.

Chapter 5 addresses the fourth research objective and investigates if the association between childhood trauma and the dimensions of psychosis are mediated by multiple social and psychological variables. Again using structural equation modelling, the results of this chapter offer a theoretical framework which seeks to address how trauma experienced in childhood may be associated with psychosis.

Chapter 6 addresses the fifth research objective. This chapter presents the findings of analyses that seek to ascertain if having symptoms of psychosis is associated with also having PTSD and CPTSD symptoms in former residents of institutional care facilities, whereby the selection of these psychopathological constructs was informed by the

outcomes of the analyses assessing the first four research objectives and the literature review in Chapter 2.

Chapter 7 discusses the findings of the empirical chapters in terms of their relevance to theory, clinical practice, and policy and the unique contributions of the thesis towards improving our understanding of how psychosis – and more broadly psychopathology – manifests in the population are also discussed. The strengths and limitations of the research methodology used in the current study are also discussed. In addition, this chapter offers suggestions for future research and an overall conclusion of the findings from the thesis.

Chapter 2: Literature Review

2.1 History of Psychosis

The phenomena of hearing voices or having visions, holding rigid distrust of others, displaying peculiar speech and behaviour, having difficulty controlling emotion, and becoming socially isolated have most likely always been a part of the human condition (Hornstein, 2017; Lysaker & Lysaker, 2008). How such phenomena are perceived by society however is highly dependent on the historical and cultural context. Hearing voices, for example, has been socially interpreted as divinity as well as insanity (Hornstein, 2017). Similarly, the classification of 'madness' has undergone dramatic revisions and incremental theoretical adjustments reflective of prevailing religious, social, philosophical, or scientific paradigms (Jablensky, 1997). As aptly acknowledged by Lysaker and Lysaker (2008), the labelling associated with psychotic symptomology can mean that we lose sight of the fact that people actually experience severe psychological distress. The evolution of the classification of severe psychological distress, including the concept of 'psychosis', is therefore as much a product of discovery as it is a rediscovery

of former ‘truths’ (Jablensky, 1997). A better understanding of this historical development therefore provides potential to free the individual from the narrow constraints imposed by traditional nosology, allowing for a more person-centred, and perhaps, a more compassionate approach to caring for those in distress.

The origins of the classification of psychological distress can be traced to ancient Greek philosophy. Most notable amongst Greek writings is that of Hippocrates (c. 460 – c.370 BC), acknowledged as the father of modern medicine (Grammaticos & Diamantis, 2008), who attributed the experience of psychological distress to physiological causes (Coolidge & Segal, 1998), and purported that such mechanisms could be heritable (Evans et al., 2003). Hippocrates proposed that the presence of excess black bile in the blood caused ‘melancholy’, contemporarily understood as depressive symptomology (Arikha, 2008). As such, Hippocrates’ proposals are still relevant in the contemporary literature, notably in genetic and pharmacological research. As core premises, the biomedical model of psychopathology holds that abnormalities of serotonin and dopamine regulation influence depressive and psychotic disorders. Moreover, the susceptibility to abnormal neurotransmitter functioning is thought to be strongly influenced by genetic predisposition (Kavanagh et al., 2019; Muñoz-Negro et al., 2020; Smoller et al., 2019).

Plato (c. 427 – C. 347) differentiated ‘madness’ according to divine revelation or physical abnormality. It is unsurprising that hearing voices or seeing visions were equated with divinity in ancient Greece, as Greek culture was deeply rooted in mythology and was cross-culturally influenced by exchanges with the Jewish community who also had strongly held beliefs regarding divine revelation (Kyziridis, 2005). What is interesting, and from which parallels may be drawn to contemporary classifications, is that of the stark consequences of the label assigned to an individual. Biblical references allude to individuals deemed to be demonically possessed and being banished from communities

(Mark 5: 1-20). On the other hand, divine madness or *theia mania*, as proposed by Plato, was a revered quality that influenced creativity (Cybulska, 2019). Thus, it would appear that social perceptions of the cause of outwardly behaviour influenced how the individual was treated in society. This partitioning of divine versus demonic causes of psychotic experiences continued throughout the Middle Ages, with varying consequences associated with either label (Hornstein, 2017). This parallels the stigma that often surrounds psychiatric disorders in contemporary society, in that negative connotations associated with particular labels of mental illness can have adverse consequences for the individual with regard to living a normal life and integrating into society (Morgan et al., 2018; Schnyder et al., 2017).

In more recent history, European classification systems have been strongly influenced by Aristotelian and Newtonian philosophy which emphasise cause and effect, in keeping with a positivist perspective of reality. In essence, this epistemological approach holds that reality is that which is observable and measurable (Carson, 1998; Radden, 2002). Contrary to the dichotomy of divinity vs. physiological causes of 'madness' proposed by Plato (Cybulska, 2019), German physicians in the late 19th century attributed all psychological distress to a single source. This theory was informed by the prevailing spiritual paradigm of the time, which emphasised the singularity of the soul. That is, psychopathology was considered to be distress of the soul caused by a disorder of the brain (Goekoop & Goekoop, 2014). Griesinger (1867) coined the term 'Einheitspsychosis', which translates to 'Unitary Psychosis', proposing that this single dimension of psychopathology, rooted in biological determinacy, accounted for all combinations and permutations of observed symptoms. Moreover, variation in symptomology indicated severity along a dimension rather than a reflection of a distinct disease entity (Berrios & Beer, 1994). According to Griesinger (1867), severity ranged

from affect dysregulation and psychomotor deficiencies (low intensity) through manic and delusionary symptomology (intermediate-intensity) to the peak of psychological distress ('madness') comprised of low and intermediate-intensity symptoms with the addition of disorganized symptoms (see Goekoop & Goekoop, 2014 for a full review).

Emil Kraepelin (1892) - touted as the defining influence on modern psychiatry (Bentall, 2004) - directly challenged the notion of a single cause of psychopathology, arguing that severe 'Einheitspsychosis' symptomology did not require a dimensional transition through lower-intensity symptoms but instead that severe symptoms could occur in the absence of all other psychopathological indicators (Goekoop & Goekoop, 2014). Drawing from the bio-medical paradigm of pathology, Kraepelin proposed that psychological distress could be classified by symptom groupings, and that these classifications could be further delineated by unique aetiological factors (Bentall, 2004). Moreover, and although Kraepelin would later soften his beliefs, he proposed that all psychopathology could be distinguished according to two overarching categories: dementia praecox and manic-depressive illness (Greene, 2007).

Dementia praecox is a term derived from Latin referring to the senility of the young (emphasising early onset) and consisting of auditory and tactile hallucinations, emotion dysregulation, disorganized speech and behaviour, and delusions of persecution and grandiosity, and was characterised by chronicity and severe intellectual impairment (Bentall, 2004). Importantly, Kraepelin dismissed the role of environmental factors in the aetiology of dementia praecox and instead implicated neuro-abnormalities as the root cause of this psychopathology (van Bergen, 2015). Eugene Bleuler subsequently rebranded this symptomatic grouping 'schizophrenia', emphasising a distinction between positive (e.g. hallucinations and delusions) and negative symptoms (e.g. social withdrawal and emotional blunting) (Bentall, 2004); a distinction that remains in

contemporary psychiatric lexicon and which is reflected in commonly used measures of psychosis such as the Positive and Negative Syndrome Scale (PANSS: Kay et al., 1987). It is noteworthy however, that Bleuler never intended the use of schizophrenia to describe multiple personalities, but rather to convey fragmented thought (Kyziridis, 2005), as the historical colloquialism 'split personality', borne out of such reasoning, is loaded with connotations of derangement and danger (George & Klijn, 2013; Riordan, 2005).

Manic-depressive illness, on the other hand, was characterised by mood disturbances (i.e. manic and depressive symptoms) with greater prospects of recovery (Bentall, 2004). Consistent with the paradigmatic and philosophical zeitgeist of late 19th century medicine, biology and genetic predisposition as casual factors featured heavily in Kraepelin's nosology and Kraepelin believed that manic-depressive illness was strongly based in genetic predisposition (Greene, 2007). Indeed, the human condition was considered to be strongly determined by genetic and biological factors, as evidenced by the social-Darwinism and eugenics movements (van Bergen, 2015). In keeping with social-Darwinism, and indeed the wider social perception of the late 19th century, labels such as 'schizophrenic' and 'manic-depressive' carried connotations of heredity and irreversibility which spread stigma to families and facilitated mass incarceration of the severely psychologically distressed into overcrowded asylums (Arboleda-Flórez & Stuart, 2012).

Although Kraepelin's dichotomy remained the conventional psychiatric nosological framework in European settings (Jablensky, 2010), the conceptualisation of psychopathological classification and aetiology underwent a marked revision in the United States (US), influenced by the academic and clinical adoption of psychoanalytic theory (Kawa & Giordano, 2012). Here, and whereas the individual was considered passive in the biologically determined manifestation of psychiatric symptomology within

the Kraepelinian framework, psychoanalytic theory placed the person at the core of psychological distress. Indeed, psychiatric symptoms were considered indicators of suppressed trauma in the developmental period and reactions to environmental stressors (Compton & Guze, 1995; Kawa & Giordano, 2012). Moreover, and in contrast to the Kraepelinian proposition that the individual lacked insight into symptomology, all thoughts and symptoms were acknowledged as meaningful windows into the root of psychological distress (Compton & Guze, 1995). Similar to Griesinger's (1867) 'Einheitspsychosis', psychoanalytic theory further abandoned Kraepelin's categorical classification system and replaced it with dimensional representations, whereby psychological distress ranged from normal emotional and behavioural dysregulation to severe mental illness (Sanders, 2011).

2.1.1 Psychosis and the Diagnostic and Statistical Manual of Mental Diseases (DSM)

Heavily influenced by psychodynamic theory, and in response to crude and disjointed efforts of psychiatric classification by military and medical bodies in the US, the American Psychiatric Association (APA) sought to devise a definitive nomenclature of psychopathology in 1952 (Kawa & Giordano, 2012). To accomplish this, authors of the Diagnostic and Statistical Manual of Mental Disorders (DSM-1; American Psychiatric Association, 1952) relied on consensus as a guiding principle of classification (Bentall, 2004). That is, 10% of APA members were lobbied to gather opinion on what constituted mental illness with the consensus accepted as truth (Bentall, 2004).

In contrast to the Kraepelinian model in the previous century, the environment featured as a predominant aetiological agent in the development of psychosis within the DSM-I (American Psychiatric Association, 1952). Specifically, the psychoses, which ranged on a spectrum from affective dysregulation such as anxiety and depressive

symptomology to manic-depression and schizophrenia, were considered direct consequences of the individual's inability to cope with environmental stressors. Indeed, leading psychodynamic theorists considered all psychological distress to be a result of a single factor: an inability to adapt to adversity (Mayes & Horowitz, 2005). To this end, all individuals were deemed vulnerable to 'mental illness', and thus the notion of specific disease entities determined by neural and genetic abnormalities, as previously heralded by Kraepelin, was in direct contrast to the theoretical underpinnings of DSM-I (Mayes & Horowitz, 2005).

Criticisms of ambiguity and vagueness regarding the definitions of the psychoses however, precluded the widespread adoption of the APA's original psychiatric nomenclature (Kawa & Giordano, 2012). For instance, although bearing the lexicon of the Kraepelinian school of thought, descriptions of schizophrenia were broad and exhaustive to the point of yielding little clinical utility, markedly departing from the specificity of disorders observed in Kraepelin's original conceptualisation (Compton & Guze, 1995). In an effort to address concerns in the field of psychiatric treatment, the APA subsequently initiated the first of several revisions to the DSM. With these revisions came a subtle re-emergence of the notion of discrete disease entities within the psychoses and the manic-depressive/schizophrenic dichotomy (Compton & Guze, 1995).

2.1.2 The DSM-III and Neo-Kraepelinianism

The most significant influence on the current nosological conception of psychosis can be attributed to the re-emergence of the Kraepelinian classification system within the DSM-III (American Psychiatric Association, 1980), largely as a response to growing concerns in the field of psychiatry regarding the limited validity and reliability of psychodynamic-informed diagnoses, and indeed as a clinically useful theory (Shorter, 2015; Surís et al., 2016). Although such a dramatic paradigm shift wrought myriad

changes to the APA nomenclature, two specific adjustments to the clinical conception of psychosis bear particular significance to the current thesis. In the decades preceding the Kraepelinian revolution, emphasis was placed on the environmental and psychological determinants of psychosis, with leading psychiatrists suggesting that schizophrenia and manic-depression represented a reaction to environmental stressors (American Psychiatric Association, 1952, 1968; Kawa & Giordano, 2012; Sanders, 2011). The discovery of lithium as an effective method of treatment for manic-depression however, challenged the notion that the individual's social environment was the proximal aetiological agent in the onset of psychosis. As such, greater credence was attributed to the specific biological determinants of specific psychotic disorders (Goodwin & Ghaemi, 1999). In addition to the re-emergence of biological explanations to psychiatric disorders, the concurrent refinement and enhancement of psychometric assessments sought to challenge the 'vague' diagnostic criteria outlined in previous APA nomenclature, positing a more quantitative and systematic approach to psychiatric diagnosis (Kawa & Giordano, 2012).

Consequently, the DSM-III abandoned the broad continuums of psychological distress adopted by psychoanalysts in favour of the Kraepelinian dichotomy of manic-depressive/schizophrenic disorders (Surís et al., 2016). The psychoses were now defined as multiple individually distinct disorders, which were assumed, theoretically, to be determined by a specific causal factors (Bentall, 2004; Kawa & Giordano, 2012). What is more, and in stark contrast to the continuum representation of psychosis where schizophrenia represented the extreme end of the continuum (Goekoop & Goekoop, 2014), each psychotic disorder was assigned specific diagnostic cut-offs, representing the presence or absence of disease depending on symptom endorsement as well as social and functional impairment (Compton & Guze, 1995). As a consequence of discrete diagnostic classification, a greater emphasis was placed on a clear divide between normality and

abnormality and, to a greater extent, a lack of critical engagement with environmental causes of psychiatric disorders (Mayes & Horowitz, 2005).

Since the publication of the DSM-III categorical classifications and biological determinacy has dominated subsequent revisions of the psychiatric nomenclature (e.g. DSM-III-R, DSM-IV, DSM-5; American Psychiatric Association, 1980, 1987, 1994, 2000, 2013). Consequently, definitions of psychotic disorders have undergone a number of revisions, including the addition of catchall and intermediate diagnoses to accommodate heterogeneous symptom manifestation. For example, schizoaffective disorder is now a diagnostic category used to account for the overlap of affective (i.e. depressive/manic symptomology) and non-affective symptoms traditionally restricted to schizophrenic disorders (Beckmann et al., 2020).

2.1.3 Critiques of Psychiatric Classification Systems

A key motive for the adoption of the Kraepelinian classification system was firstly, to increase clinical utility, with a primary focus on consistent and reliable psychiatric diagnosis. In addition, the enhancement of reliability was supposed to herald increased validity of measurement (Ghaemi, 2016; Jablensky, 2016). And while the classification of discrete disease entities brought an element of reliability to a fragmented discipline, criticisms remain that the improvement of reliability of psychiatric constructs does not necessarily equate to the accurate measurement (or validity) of the underlying psychopathology (Kotov et al., 2017). To put it simply, it is possible for a measurement to be reliably wrong, in that it provides consistent inaccuracy due to the fact that the original calibration was invalid.

As argued by Jabelinsky (2016), the notion that psychiatric classifications represent specific disease entities presupposes ‘zones of rarity’. That is, each disease

entity should possess adequate construct validity in that they are uncorrelated or weakly correlated with each other and uniquely correlated with specific biological or environmental determinants (Jablensky, 2016). Empirical research, however, has failed to support a number of key components of the Kraepelinian distinction. For example, Kraepelin asserted that each specific disease entity amongst the psychoses could be delineated by specific biological causal factors (Shorter, 2015). There should therefore be distinct zones of rarity between bipolar and schizophrenic disorders with regards to genetic pre-disposition to the respective disorders. Large genome-wide association studies in which biological samples are collected from broad cross-sections of the general population and clinical samples have allowed for the investigation of specific genetic risk to psychiatric disorders. The International Schizophrenia Consortium (ISC) indicate, subsequent to an analysis of 3,322 persons diagnosed with schizophrenic disorders and 3,587 healthy controls in Europe, that thousands of common alleles present risk for schizophrenia. More interestingly, the same alleles also increase the risk for bipolar disorders (International Schizophrenia Consortium, 2009).

Similar findings are echoed across varying methodological designs. Analyses of polygenic risk scores derived from the International Schizophrenia Consortium (2009) for schizophrenic disorders sampled from longitudinal cohort studies in New Zealand and the United Kingdom for example, have identified common genetic vulnerability to a range of schizophrenic and other psychiatric disorders. Findings indicate that common alleles increased the risk of multiple anxiety disorders as well as manic and hypo-manic symptomology (Amare et al., 2019). Unsurprisingly then, an assessment of 9,009,202 individuals across 2 million families failed to delineate schizophrenic and bipolar disorders according to genetic predisposition. A minimal difference in likelihood estimations was observed between the disorders with 64% of the variance in

schizophrenia and 59% of the variance in bipolar diagnosis explained by hereditary risk (Lichtenstein et al., 2009).

The discovery of lithium as an effective treatment for bipolar symptomology (Goodwin & Ghaemi, 1999) spurred a wealth of research seeking to elucidate the specific effects of neurobiological dysregulation on schizophrenic and bipolar disorders. Among the theorised pathways, the dopamine hypothesis of schizophrenia purports that misfiring dopamine neurotransmitters – with their role in facilitating neural communication during learning, reward processing, and goal directed activities (Wickens et al., 2007) - are the primary cause of schizophrenia (Howes & Kapur, 2009). Although the role of dopamine varies across specific disorders, dopamine dysregulation has demonstrated a transdiagnostic influence across depression, bipolar, and schizophrenia (Jauhar et al., 2017; Lambert et al., 2018; Whitton et al., 2015).

A core characteristic of depression is the reduced capacity to experience pleasure as acknowledged in DSM-5 (e.g. '*Did you find or did others notice that you didn't care about things that you usually cared about or you didn't enjoy the things you usually enjoyed?*'; American Psychiatric Association, 2013). Given dopamine's role in reward processing, abnormalities in dopaminergic production is demonstrated to influence the development and chronicity of depression (Grace, 2016). Similarly, both hypo and hyper-dopaminergic activity increases the risk for bipolar and schizophrenic disorders (Cousins et al., 2009; McCutcheon et al., 2019). Taken together, the extant literature on the psychological effects of dopamine dysregulation supports a continuum of psychopathology ranging from affective dysregulation to schizophrenia, rather than specific aetiological pathways to discrete disease entities.

2.1.4 Dimensionality and Subclinical Psychotic Experiences

Although the most recent revisions of the DSM and International Classification of Diseases (ICD) acknowledge the dimensionality of psychotic symptomology (American Psychiatric Association, 2013; World Health Organization, 2020), it is worth outlining the necessity for a dimensional approach to the psychiatric classification of psychosis symptoms. The presence/absence logic utilised in traditional categorical classifications of psychosis employed sharp cut-off criteria which purported to discriminate between 'ill' and 'non-ill' persons, usually according to cross-sectional symptom screening by practitioners (Freeman & Fowler, 2009; Heckers et al., 2013; Kim & Park, 2019). Such theoretical assumptions regarding the onset of psychotic symptomology, however, neglect the possibility of a transitional nature of symptom manifestation and that individuals in the general population may experience psychotic phenomena without the functional or social impairment required for psychiatric diagnosis (Healy & Cannon, 2020; Kelleher et al., 2012). An apt real-world example provided by Richard Bentall (2017) is the fine line between genuine distrust of others or groups and clinical paranoid symptomology. Quoting Karl Jasper's definition of delusions (e.g. 'bizarre, resistant to counter argument, and held with great conviction'), Bentall argues that such schemas are common and therefore drawing exact diagnostic cut-off points is difficult. To put this into context, the polarization seen in contemporary American politics has rendered a significant proportion of America's population on both sides of the political spectrum 'paranoid', according to Jasper's definition.

A recent global prevalence estimate study across 18 countries (N = 31,261) indicated that although psychotic experiences (hallucinations or delusions) were common (5.8%), three-quarters of the sample reported experiencing one of a possible six psychotic experience type. The remaining proportion of the sample reported between two and five

incidences and were significantly more likely to report higher frequency of psychotic episodes (McGrath et al., 2015). This finding is further echoed in a meta-analysis of transitional rates from psychotic experiences in the general population to psychotic disorders. Individuals displaying psychotic experiences were 3.5 times more likely to be diagnosed with a psychotic disorder, than those who report no psychotic experiences (Kaymaz et al., 2012). A dose-response relationship was also observed across studies which suggests that there was a casual linear trend between increased severity of experiences and likelihood of clinical diagnosis (Kaymaz et al., 2012). This phenomenon is not confined to positive symptoms with similar rates of subclinical negative symptoms observed in the general population (Linscott & van Os, 2013). A ten-year longitudinal investigation of the predictive effect of psychotic experiences revealed that the greatest likelihood of functional impairment occurred when positive, negative, and disorganized experiences were experienced together (Dominguez et al., 2010).

Such figures directly question the validity, and the clinical utility, of diagnostic cut-offs which attempt to delineate ‘presence’ or ‘absence’ of psychotic psychopathology and suggest that psychotic symptomology may be better conceived as ranging in severity, with few individuals actually transitioning to debilitating levels of symptom manifestation, as previously proposed in earlier editions of the DSM and ICD. To contextualise this, sub-clinical psychotic-like experiences are transitory in nature. A meta-analysis investigating the transition rates from psychotic-like experiences in the general population revealed that 80 percent of all psychotic-like experiences subside over time and that those with persistent psychotic-like experiences are most likely to be diagnosed with a psychotic disorder (Linscott & van Os, 2013). Taken together, available data suggests that diagnostic cut-off criteria for psychotic symptomology are not ecologically valid, with the aetiology of psychosis most likely occurring over a prolonged period, and

with severity ranging from psychotic experiences to debilitating functionally and socially impairing symptomology.

In addition, psychotic experiences in the general population also share the same environmental risk factors as clinical symptomology. Childhood trauma, ethnicity, and lower socio-economic status have all been robustly demonstrated to influence the development of psychotic experiences in the general population (Das-Munshi et al., 2012; Freeman & Fowler, 2009; McGrath et al. 2015; Morgan et al., 2009). This has led researchers to propose the existence of an extended phenotype of psychosis. That is, psychotic expression is temporally continuous (i.e. ranging from psychotic experiences to clinical symptomology); this temporal continuity is also phenomenologically consistent (i.e. the nature of psychotic symptomology is consistent across the continuum); and all psychotic symptom manifestation share biological, demographic and environmental aetiological risk-factors (see Linscott & van Os, 2013; van Os & Reininghaus, 2016).

2.1.5 Psychosis as a Uni- or Multi-dimensional Structure?

Given the phenomenological, genetic, and biological overlap between, and indeed the heterogeneity of symptom profiles of psychosis (International Schizophrenia Consortium, 2009; Lichtenstein et al., 2009; van Os & Reininghaus, 2016), there remains considerable debate within the literature as to how to accurately represent the *latent structure* of psychosis. The *latent structure* of psychosis refers to the concept that observed indicators of psychosis, such as hallucinatory and delusionary experiences, are caused by an underlying and unobserved construct or constructs (Bollen, 2002). As psychosis is a disease of the mind, and therefore not directly observable, clinicians and researchers must determine the structure of the pathology through observable indicators.

Factor analysis is a powerful statistical approach which allows researchers to test the validity of models which seek to explain the latent structure of psychosis. Specifically, factor analysis allows for the falsification of theoretical models on an empirical basis by testing how well a model explains patterns of associations among observed variables (Bollen, 2002). Returning to earlier examples of competing explanations of psychopathology across the centuries, factor analysis provides the researcher with the capability of testing - and possibly rejecting - a one-factor vs. a multiple-factor explanation of mental illness (e.g. Einheitspsychosis) (Sellbom & Tellegen, 2019). More simply, factor analysis may determine if observable indicators of psychosis are caused by a single or multiple latent constructs.

Initially, factor analytic findings suggested that a three-factor solution comprised of positive, negative, and disorganized symptoms best explained the latent structure of psychosis (Bilder et al., 1985; Grube et al., 1998; Stefanis et al., 2002). However, these models remained strongly influenced by Kraepelinian perspectives of psychotic symptomatology, focusing primarily on schizophrenic symptoms. A three-factor model of positive, negative, and depressive symptoms observed in a Greek sample of military personnel demonstrated the advantage of incorporating affective symptoms within factor analytic models of psychosis (Stefanis et al., 2002).

More recently, a five-factor model of psychosis which assumes a transdiagnostic (i.e. a combination of affective and non-affective symptoms of psychosis) latent structure of psychosis has gained support (Wallwork et al., 2012). This model includes correlated dimensions reflecting positive, negative, depressive, manic, and disorganized symptoms. An assessment of the latent structure of symptom groupings across a spectrum of non-affective disorders in a sample of 535 individuals presenting to clinical settings with first-episode psychosis, for example, found a five-factor model of positive, negative,

depressive, manic, and disorganized symptoms provided the best representation of the latent structure of psychosis (Emsley et al., 2003). This is consistent with an analysis of 25 published studies, which indicated that a five-factor model provided the best fit of DSM-IV (American Psychiatric Association, 2000) and PANSS (Kay et al., 1987) diagnostic criteria across 5,769 schizophrenic patients. Here, the five dimensions remained consistent across age, sex, and duration of illness (van der Gaag et al., 2006).

Although a five-factor model provided the best representation of symptom profiles across categorical diagnoses of schizophrenia, bipolar, and psychotic depression, key differences were observed between disorders on specific symptom dimension endorsement. Specifically, patients assigned psychotic depression and schizophrenic diagnoses scored higher on negative symptomology in comparison to bipolar patients; those with bipolar and schizophrenia demonstrated higher endorsement of positive symptoms in comparison to those with psychotic depression; and cognitive disorganization was most strongly endorsed by patients with schizophrenia (Rosen et al., 2012).

In a similar study of chronic patients with treatment-resistant affective and non-affective psychosis conducted by Woodward et al. (2014), a five-factor model was utilised to ascertain dimensional responses to inter-disciplinary treatment (e.g. pharmaceutical, psychological, and social interventions) across disorders. Again, categorical diagnoses indicated differential dimensional responses to treatment. Across the disorders, bipolar and schizoaffective patients demonstrated greater reductions in the positive symptom dimension compared to patients diagnosed with schizophrenia and psychotic depression. The greatest symptom reductions in the negative and emotional distress (e.g. depressive symptomology) dimensions were observed in those with psychotic depression, whereas disorganization responded best to treatment in the bipolar

group. The schizophrenic group were the most resistant to treatment across all symptom dimensions (Woodward et al., 2014). Taken together, these findings suggest that although dimensional models of psychosis are empirically supported to a greater degree than categorical models, the categorical distinction between certain forms of psychotic illness offers clinical utility.

2.1.6 The Utility of Categorical vs. Dimensional Representations of Psychosis

In keeping with the neo-Kraepelinian mandate for greater construct validity (Shorter, 2015; Surís et al., 2016), determining the correct measurement model of psychotic symptoms has implications for accurate assessments, diagnosis, and clinically relevant outcomes. In a sample of 706 individuals with chronic psychotic disorders, as classified by DSM-III-R (American Psychiatric Association, 1987) and ICD-10 (World Health Organization, 1992) criteria, across cross-sectional and lifetime measurement, dimensional representations of psychotic symptomology more accurately predicted the endorsement of clinically relevant criteria (van Os et al., 1999). More specifically, dimensional representations outperformed categorical classification in the prediction of 18 clinically relevant outcome variables including quality of life, suicidal ideation, functionality, and anti-psychotic and anti-depressant use, with categorical representations only outperforming dimensional scoring on three of the 18 outcomes (number of months living independently, number of months on antipsychotic medication, and whether the patient had received lithium) (van Os et al., 1999).

Furthermore, a dose-response relationship was observed between dimensional scoring and clinical indicators, further increasing the potential clinical utility of the dimensional approach. For example, higher scores on the Positive and Negative symptom dimensions predicted longer stays in psychiatric care (van Os et al., 1999). Although schizoaffective disorder acknowledges the comorbidity of affective dysregulation in non-

affective psychosis (e.g. schizophrenia), the categorical nature of this diagnosis raises questions regarding its validity. If bipolar and schizophrenic disorders fall under discrete disease entities, as categorical classification models assume, there should be clear points of distinction in the symptom content between the two constructs. However, in practice, individuals present to clinical settings with a wide range of heterogeneous symptom profiles that cut across diagnostic entities (Picardi et al., 2012).

In light of this, researchers have specifically sought to test the validity of categorical boundaries between non-affective and affective psychosis. To accurately capture the heterogeneity of psychotic symptomology, for example, Peralta and Cuesta (2008) divided their research sample into those presenting with non-affective, non-affective with mood syndromes, schizoaffective disorder with predominant schizophrenic features, schizoaffective disorder with predominant affective features, or a mood disorder with psychotic features. Their results indicated that disorder characteristics could only be distinguished at the extreme ends of the disorder distribution (e.g. non-affective vs mood disorder with psychotic features), demonstrating that a considerable proportion of the sample were vulnerable to misspecification. Such misspecification could have detrimental consequences for treatment, as treatment strategies vary between affective and non-affective symptomology (Amodeo et al., 2017; Bowie et al., 2018). Conversely, when considered dimensionally, a clear pattern of disorder distribution emerged whereby schizoaffective disorder represented the mid-point on a scale of psychotic symptomology ranging from affective dysregulation with psychotic features to non-affective psychosis. Importantly, this model outperformed categorical distinctions by more accurately distinguishing symptom profiles and demonstrating associations with clinically relevant correlates, thereby offering greater clinical utility (Peralta & Cuesta, 2008).

That said, more recent research has challenged purely dimensional classification models, proposing that the greatest clinical utility may be garnered from a hybrid dimensional-categorical model of psychosis. The heterogeneity of treatment response across specific psychotic dimensions seen in Woodward et al. (2014), is indicative of a diverse combination of symptom profiles which correlate under the diagnostic umbrella of psychosis. Thus, the prediction of remission rates of psychotic symptomology is a significant litmus test for the clinical utility of a psychometric model (Ajnakina et al., 2018; Keshavan et al., 2013). Ajnakina et al. (2018) demonstrated the superiority of remission prediction of a hybrid dimensional-categorical model over both individual categorical and dimensional models with first-episode patients over a four-year period. Specifically, a hybrid model of five dimensions (Positive, Negative, Depression, Mania, Disorganization) with a concurrent schizophrenic categorical diagnosis provided the best fit when compared to multidimensional and categorical prediction models. Therefore, hybrid classification models have the advantage of offering both clinical utility, and providing practitioners with the flexibility to account for the continuous distribution of severity in psychotic symptomology, while simultaneously acknowledging specific symptom profiles.

2.1.7 Introducing the Bifactor Model of Psychosis

The evidence presented so far has sought to challenge the theoretical assumptions of psychiatric nosologies regarding what constitutes the most accurate representation of the latent structure of psychosis. The extant literature consistently demonstrates that the Kraepelinian distinction between manic-depression and schizophrenia is arbitrary and not supported by a robust body of empirical evidence. To the contrary, a lack of specificity in aetiological and biological determinants as well as studies seeking to differentiate affective, schizoaffective, and non-affective psychotic disorders suggests that psychotic

illness may be best conceptualised as a single dimensional construct (Berrios & Beer, 1994; International Schizophrenia Consortium, 2009; Lichtenstein et al., 2009; Matheson et al., 2013; Peralta & Cuesta, 2008). At the same time, robust evidence for a five-factor dimensional model of psychosis has been demonstrated in the literature. Concerns regarding the utility of categorical versus fully dimensional models must therefore be recognised (Ajnakina et al. 2017; van der Gaag et al., 2006).

Chen et al. (2012) argue that a trade-off exists between the two psychometric approaches in relation to diagnostic validity. On the one hand, adopting a unitary model of psychosis acknowledges the high prevalence of symptom overlap between bipolar and schizophrenic symptomology (Østergaard et al., 2017), allowing clinicians to calculate a total score of psychosis by adding scores on each symptom dimension. This approach benefits diagnostic accuracy for psychotic symptoms, in general, by harnessing the shared variance of bipolar and schizophrenic symptoms. However, the benefit gained from shared variance is offset by a lack of specificity in diagnostic prediction, in that it is difficult to disentangle which symptoms are directly influencing specific outcomes, or indeed, are being influenced by specific aetiological agents (van Os & Reininghaus, 2016). On the other hand, by summing related items into individual symptom dimensions (e.g. Positive, Negative, Depression, Mania, and Disorganization) researchers and clinicians can identify specific relationships between symptom groupings and clinical outcomes. For example, returning to van Os et al's. (1999) findings, Positive and Negative symptom dimensions were individually related to longer stays in psychiatric care. Had clinicians adopted a total score of all the psychosis items within a scale, these relationships would have been difficult to detect. The challenge, however, is that it is impossible to fully delineate specific effects of symptom profiles from the shared

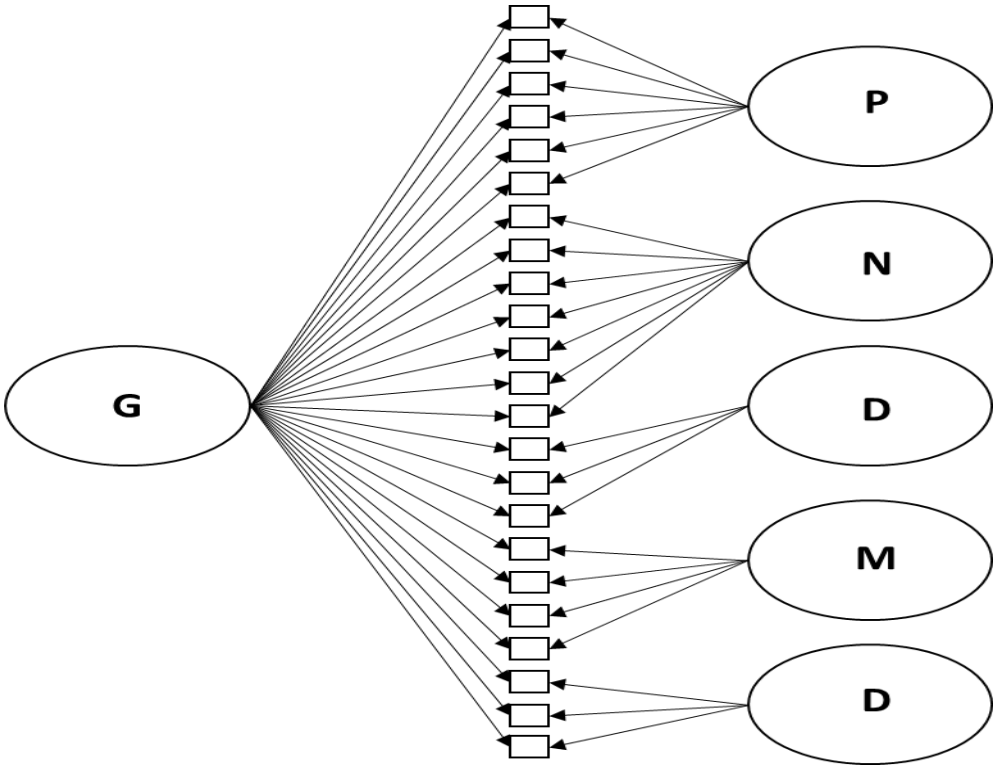
variance of the total score - a phenomenon referred to as the Bandwidth–Fidelity Dilemma (BFD) (see Chen et al., 2012 for further details).

BFD refers to a state of equilibrium between the total number of items in a scale (shared variance) and the potential for accuracy contained within the total number of items, for example the subdomains of the PANSS (Kay et al., 1987; e.g. Positive, Negative, Depression, Mania, Disorganization symptom profiles) (Cronbach, 1990; Salgado, 2017). Here, 'Bandwidth' signifies the broad potential for variability between symptom endorsements across all items contained within a scale. In practical terms, the possibility for a diverse range of scores between psychotic depression and schizophrenic patients on the PANSS scale is quite high. Fidelity within this framework denotes the potential for specific symptom profiles within the individual subdomains of a given scale. For example, high scores on the Mania and Depression dimensions would most likely signify the presence of a bipolar disorder (See Salgado, 2017 for further information).

Bifactor modelling within factor analysis is a technique that permits unidimensionality and multidimensionality to be simultaneously modelled (Chen et al., 2012). It therefore offers a potential solution to the BFD. Within a bifactor framework, psychosis can be represented by a single General dimension which accounts for the shared variance and covariance between all indicators of psychotic illness (Bandwidth), while simultaneously acknowledging that symptoms can cluster within specific dimensional constellations (e.g., positive and depressive symptoms equalling psychotic depression). Figure 2.1 displays a bifactor pentagonal model of psychosis. Assuming that psychosis follows a continuous distribution from affective psychosis to non-affective psychosis (Kaymaz et al., 2012; Linscott & van Os, 2013; McGrath et al., 2015; van Nierop et al., 2012), clinicians and researchers can maximise the benefit of shared variance between all indicators by constructing total scores to predict disease trajectory

(van OS & Reininghaus, 2016). Total scores can, therefore, be used to predict disorders at the affective or non-affective end of the psychosis continuum. Moreover, scores on specific symptom dimensions can be used to inform categorical diagnoses (e.g. such that higher scores on Positive, Negative, and Disorganization symptom dimensions suggest a categorical diagnosis of schizophrenia), if the clinical need is there.

Figure 2.1 A bifactor model of psychosis



Note: G = General dimension, P = Positive dimension, N = Negative dimension, D = Depression dimension, M = Mania dimension, D = Disorganization dimension. In the bifactor model of psychosis, all symptoms are indicators of a general vulnerability to psychosis (i.e., a General dimension), and that subsets of symptoms reflect a specific form of psychosis (i.e., specific dimensions such as positive symptoms). Importantly, in a bifactor model the General and specific dimensions are orthogonal, and the specific dimensions may be correlated or uncorrelated to one another.

A general criticism of the bifactor model is that a number of traditional fit indices, or fit statistics used to identify how well a model fits the sample data, tend to favour bifactor models over alternative models due to their inherent complexity, and not necessarily because bifactor models provide superior representations of reality (Greene et al., 2019). As such, it is recommended that researchers not to rely solely on fit indices when choosing measurement models, but also consider alternative metrics such as the clinical utility and the statistical interpretability of a model, as well the reliability and replicability of the General and specific dimensions. In addition, a key requirement proposed by Greene et al. (2019) is that General and specific dimensions should be significantly associated with theoretically informed exogenous variables before they can be deemed to be valid constructs.

An initial assessment of the applicability of the bifactor model of psychosis in clinical settings was conducted in a sample of acute first and second episode (N = 309) and chronic schizophrenic patients (N = 507) (Reininghaus et al., 2013). To determine the suitability of a bifactor framework, three models were tested including a unitary model where each item loaded onto a General dimension; a pentagonal model where specific items were constrained to load onto one of five specific dimensions (e.g. Positive, Negative, Depression, Mania, and Disorganization); and a bifactor model where items loaded onto a General psychosis dimension, and onto their respective specific dimensions (e.g. hallucinations loaded onto the Positive dimension) (see figure 2.1). Results indicated that a bifactor model containing a General dimension and five specific dimensions of positive, negative, depressive, manic, and disorganized symptoms was superior to unitary and multi-dimensional (e.g. a pentagonal model of psychosis) models in explaining the latent structure of psychosis in both early and chronic samples (Reininghaus et al., 2013).

The bifactor model offers a number of useful clinical insights. Although Reininghaus et al. (2013) did not assess the reliability and replicability of the General and specific dimensions, as per Greene et al.'s (2019) recommendations, the findings do offer support for the clinical utility of the bifactor model of psychosis. For instance, stage of illness (e.g. first onset vs chronic) demonstrated differential scoring on the General and specific dimensions whereby first - and second-episode patients had higher scores on the General dimension of psychosis compared to patients with chronic psychotic disorders. Thus, higher scores on the General dimension may be used to assess early stage psychosis vulnerability. Moreover, higher scores on the Positive symptom dimension successfully discriminated between patients with delusional disorder compared to those with schizoaffective and schizophrenic diagnoses; and higher scores on the Disorganization dimension discriminated schizophrenia patients from schizophreniform and delusional diagnoses (Reininghaus et al., 2013).

A limitation of this study was the lack of inclusion of patients with bipolar disorders, undermining the ecological validity of this model given that a significant proportion of shared variance was absent from the affective psychosis component of the General dimension. Reininghaus et al. (2016) later sought to address this limitation by determining the diagnostic utility of a bifactor pentagonal model on categorical classifications in the DSM-5 and ICD-10 diagnostic systems among a sample of 1,168 patients with schizophrenic and bipolar disorders. Two findings are worth noting. First, the General dimension was successfully utilised to categorically distinguish patients at the affective (bipolar disorders) and non-affective (schizophrenic disorders) ends of the psychosis spectrum. Secondly, symptom profiles on the Positive, Negative, Depression, Mania, and Disorganization dimensions for individual diagnoses mirrored the symptom criteria required for traditional categorical classification (Reininghaus et al., 2016). For

example, higher scores on the Positive, Negative, and Disorganization symptom dimensions were significantly associated with schizoaffective disorder and schizophrenia, but not hypomania. The specificity of dimensional scores – in line with categorical classification – offers support for the clinical utility of the bifactor pentagonal model of psychosis.

The practical utility of the bifactor model of psychosis, however, is not only confined to clinical patients. Assuming that the General dimension within this model represents a general vulnerability to all forms of psychotic symptoms - affective and non-affective - and that empirical evidence indicates that psychotic expression runs from psychotic-like experiences (PLE's) through to full blown psychosis (van Os & Reininghaus, 2016), the bifactor model offers considerable utility to preventative and early intervention efforts. Indeed, following the logic of an extended phenotype of psychosis (Kaymaz et al., 2012; Linscott & van Os, 2013; McGrath et al., 2015; van Nierop et al., 2012), a bifactor model of psychosis should also provide an accurate representation of psychotic symptomology within sub-clinical samples. Providing that the latent structure of psychosis is accurately represented by a bifactor model in sub-clinical psychotic expression, practitioners could use scores on the General dimension to determine an individual's vulnerability to future affective or non-affective symptom manifestation. Such practice would provide the potential to tailor early-intervention programmes to specifically target core characteristics of affective vs. non-affective psychosis, utilising the power of the shared variance amongst symptom indicators of schizophrenic and bipolar disorders (Reininghaus et al., 2013).

Indeed, limited but promising research supports the application of a bifactor model in the measurement of sub-clinical psychotic experiences and symptomology, and by extension, the existence of an extended phenotype of psychosis. The first application

of this framework was conducted by Preti et al. (2015) with a sample (N = 649) of college students. Results suggested that a bifactor model consisting of a General dimension uncorrelated with three distinct dimensions of positive, negative, and affective symptoms was superior to unidimensional, two-, three-, and second-order representations of psychosis (Preti et al., 2015). These findings provide evidence that psychotic-like experiences among healthy functioning individuals might be best represented by a General dimension of psychosis, which encapsulates shared risk for both affective and non-affective psychotic expression, with the addition of specific symptom groupings. However, the use of a college student sample limits the applicability of these findings to the wider population.

The generalisability of a bifactor representation of psychotic symptomology was specifically addressed by Shevlin et al. (2016) who tested the validity of a bifactor model of psychosis in a nationally representative adult sample of the US population. This study extended Preti et al.'s (2015) findings by merging a General dimension (e.g. affective + non-affective symptomology) with a number of alternative models of specific dimensions such as three-, four-, and five-factor models including dimensions of positive, negative, depressive, manic, and disorganized symptoms. An important finding of this research indicated that regardless of the number of specific dimensions within the bifactor framework (e.g. three vs four factors, etc.) the addition of a General dimension of psychosis yielded superior fit to unidimensional, multi-dimensional, and higher-order models (Shevlin et al., 2016). Indeed, this was consistent with model fit indices reported by Reininghaus et al. (2013, 2016). However, Reininghaus et al. (2013, 2016) and Shevlin et al. (2016) did not assess the reliability, replicability, and external validity of the General dimension of psychosis. Therefore, it is difficult to determine if the addition of a General dimension in these studies is representative of reality, or whether model

complexity within the bifactor model of psychosis was favoured by traditional fit indices (Greene et al., 2019).

More recently, research has endeavoured to test if the General and specific dimensions of psychosis are meaningfully associated with environmental, biological, and demographic risk-factors. Quattrone et al. (2019) demonstrated in a sample of first-episode patients that the General dimension of psychosis was most strongly associated with living in an urban environment. In addition, the Positive dimension was most strongly associated with ethnic minority status; males scored higher on the Negative and Depression dimensions; and age-at-first contact with mental health services was most strongly associated with the Mania, Disorganization, and Negative dimensions. Similarly, in a US sample Reininghaus et al. (2019) showed that the General dimension as well as the Positive, Negative, and Disorganization dimensions were most strongly associated with African American (i.e., ethnic minority) status. These findings indicate that a bifactor model comprised of a General dimension and five specific dimensions of positive, negative, depressive, manic, and disorganized symptoms may be the best representation of the latent structure of psychosis across the continuum of psychotic expression. In addition, both Quattrone et al. (2019) and Reininghaus et al. (2019) demonstrated, in line with Greene et al.'s (2019) recommendations, that the General and specific dimensions of psychosis are reliable and replicable constructs, using bifactor strength indices set forth by Rodriguez et al. (2016). Bifactor strength indices assess whether a model is uni- or multi-dimensional in nature, as well as providing estimates of how reliable the General and specific dimensions are, and if these constructs are likely to be replicable in future research. These studies are certainly encouraging, however, further research is required to determine if the General and specific dimensions of psychosis are consistently identifiable in the general and clinical populations, and if they are

meaningfully associated with other established risk factors for psychotic illness including living environment, minority status, cannabis use, early life trauma, social support, and suicidality.

2.2. The Role of the Environment in the Development and Onset of Psychosis

The aetiology of psychotic symptomology has been robustly debated, often mirroring historical paradigmatic shifts (see 2.1-2.1.3). Today, it is increasingly accepted that environmental factors can contribute towards the development and onset of psychosis (American Psychiatric Association, 2013; World Health Organization, 2020). Living in an urban environment for example, has been continually and robustly associated with schizophrenic disorders (Krabbendam & van Os, 2005; McGrath et al., 2004; Schofield et al., 2017). In addition, research highlights the increased risk of developing psychotic experiences and disorders for ethnic minorities living in a non-indigenous country (Jongsma et al., 2018; Leaune et al., 2019; Veling et al., 2008), and for individuals who abuse certain controlled substances, such as cannabis (Colizz & Murrary, 2018; Gage, 2019). Research has also consistently highlighted the deleterious effect of childhood traumatic experiences such as sexual, physical, and emotional abuse, emotional and physical neglect, and a dysfunctional home environment (e.g. domestic violence and parental substance abuse, incarceration, and mental illness) on mental health in adulthood (Debowska et al., 2018; Haahr-Pedersen et al., 2020; Shevlin et al., 2018). In particular, childhood adverse experiences are robustly associated with psychotic symptomology (Varese et al., 2012a).

2.2.1 Defining Childhood Adversity

What defines childhood adverse experiences varies considerably within the literature, with different facets of a person's developmental environment considered as

likely contributors to adversity. Take, for example, the types of experiences reflected in the Adverse Childhood Experiences questionnaire (ACE; Felitti et al., 1998). Developed as part of the ACE study (CDC & Kaiser Permanente Adverse Childhood Experiences Study), as one of the first studies to investigate the cumulative effects of a range of childhood adversities, the ACE framework remains one of the most commonly used in the study of child maltreatment today (Grasso et al., 2013). Within this framework, adversity in childhood is conceptualised as interpersonal trauma, or trauma inflicted by persons older than the victim (e.g. physical, sexual, emotional abuse; and physical and emotional neglect), and/or dysfunctional home environment (e.g. domestic violence, parental substance abuse, and mental illness). Omitted from this model, however, are other forms of childhood adversity such as peer bullying, rejection, and poverty. So while these latter factors can also constitute adversity in childhood (El Bouhaddani et al., 2018; Kelleher et al., 2013; Luo et al., 2019), the conceptualisation inherent to the ACE framework of childhood adversity is adopted in this thesis on the basis that the majority of studies in the childhood adversity and psychosis literature utilise a similar approach (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Trotta et al., 2015; Varese et al., 2012a). Moreover, and given the interpersonal nature of childhood adversity, the term 'childhood trauma' is used to throughout this thesis.

Empirical models testing the association between childhood trauma and psychotic symptomology generally model childhood trauma as a casual variable. Whether childhood adversity is sufficient to cause the onset of psychotic symptomology, however, is a complex and multifaceted issue resting on philosophical, theoretical, and empirical perspectives. Nonetheless, in the interest of advancing extant theory and knowledge, particularly given how childhood trauma is deployed in empirical models, it is important to assess this assumption of a 'casual' relationship.

2.2.2 Childhood Trauma and Psychosis

One method of determining the purported causal effect of adverse childhood experiences on psychosis is to follow the Bradford-Hill criteria (Bradford-Hill, 1965). Austin Bradford-Hill, in his 1965 address to the Section of Occupational Medicine of the Royal Society of Medicine (Bradford-Hill, 1965), outlined a methodological framework consisting of nine systematic approaches to aid in the determination of a causal association. Bradford-Hill adopted this approach to ascertain the association between lung-cancer and smoking (Doll & Hill, 1964), which is now widely considered causal (e.g. smoking causes lung cancer; Hecht, 2012). Despite Bradford-Hill never referring to them as such, these methodological approaches would later be coined 'criteria'. Although this method is not without its detractors and limitations, it nonetheless serves as a useful framework to assess the veracity of well-documented empirical associations (see Phillips & Goodman, 2004). These nine 'criteria' (Bradford-Hill, 1965) are therefore adopted as a useful framework to critically assess the extant literature in terms of a causal association between adverse childhood experiences and psychosis in the following sections (2.2.3 – 2.2.11).

2.2.3 Criterion One: Strength of Association

The first methodological approach outlined by Bradford-Hill was strength of association. He indicated, through illustrations of risk of scrotal (i.e. testicular) cancer in chimney sweeps (OR = 200), and lung cancer in smokers (OR = 9), that the strength with which two phenomena are associated is an initial requirement to support causation. It is important to note however, that context was crucially important when assessing associations, according to Bradford-Hill (1965). That is to say, other possible explanatory factors must be controlled for when assessing the association.

Aligned to this first criterion, meta-analyses robustly demonstrate the association between childhood adverse experiences and psychotic experiences and symptomology. In the now frequently cited meta-analysis of prospective (*n* = 41,803), case-control (*n* = 2048 clinical; *n* = 1856 non-clinical), and general population cohorts (*n* = 35,546), Varese et al. (2012a) demonstrated that individuals exposed to childhood adversity are (OR = 2.78) significantly more likely to report psychotic symptoms or experiences in adulthood, compared to non-exposed persons. A subsequent meta-analytic investigation of the persistence of psychotic symptoms over time, indicates that childhood adverse experiences are a risk-factor for the persistence of psychotic experiences in the general population (OR = 1.76), and symptoms of psychosis in clinical samples (OR = 1.55; Trotta et al., 2015). Moreover, the severity of hallucinations and delusions are both independently associated with childhood trauma in individuals clinically diagnosed with psychotic disorders (Bailey et al., 2018). Childhood trauma is similarly demonstrated to increase the likelihood of being diagnosed with schizophrenia (OR = 3.60; Matheson et al., 2013), and bipolar disorders (OR = 2.63; Palmier-Claus et al., 2016).

2.2.4 Criterion Two: Consistency

Bradford-Hill warned against the possibility of false-positive results in limited sample sizes, particularly in a scientific era dominated by an over-reliance on statistical significance testing as an indicator of cause and effect (Phillips & Goodman, 2004). Through varied population samples, research methodologies, and analyses however, Bradford-Hill surmised that researchers could provide greater support for cause and effect (Bradford-Hill, 1965).

The aforementioned meta-analyses demonstrate consistent support for the association between childhood adverse experiences and psychosis. For example, Varese et al. (2012a) incorporated diverse research samples from Finland, Australia, Japan,

United States of America, Germany, Netherlands, Republic of Korea, Ireland, and the United Kingdom, across a range of research methodologies. Likewise, the volume of research participants and the varying statistical analyses adopted in similar meta-analyses provides strong empirical evidence for the consistency of findings regarding the relationship between adverse childhood experiences and psychosis (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Trotta et al., 2015).

A further diversification of research methodologies and data analytic techniques bolsters such empirical findings. In a novel experimental design, Veling et al. (2016) used virtual reality simulation of social events designed to trigger stress in individuals who had previously demonstrated a vulnerability to psychosis (e.g. recent onset; ultra-high risk) and control subjects. The researchers additionally assessed childhood adverse experiences (e.g. physical/sexual/emotional abuse and physical/emotional neglect) and paranoid ideation. Findings indicated that individuals exposed to childhood trauma were significantly more likely to suffer distress in response to stressful events. Moreover, the number of socially stressful events participants were exposed to influenced the association between childhood adversity and paranoid ideation (Veling et al., 2016). That is to say, for individuals with a history of childhood trauma, the probability of more strongly endorsing paranoid ideation increased with each stressful event an individual was exposed to. However, it must be noted that this study was conducted with a small sample size which limits its generalisability.

Additionally, qualitative data analyses add a rich narrative to the subjective experience of psychotic symptomology in individuals who have endured childhood trauma. Adopting interpretative phenomenological analysis (IPA), Rhodes and Healy (2017) revealed that survivors of childhood physical abuse endured a constant mistrust of others, to the point of perceiving physical attack in social situations, and more generally,

perceiving feelings of hate and contempt emanating from others. Interestingly, the most common theme in visual and auditory hallucinations expressed by participants was that of violence, suggesting that previous traumatic events may be informing the content of the hallucinations (Rhodes & Healy, 2017). This is echoed in Griffiths et al. (2019) meta-synthesis of 33 qualitative analyses of perceived environmental and psychological stressors in first-episode psychosis patients (FEP). Among a number of sources highlighted as eliciting distress, abuse in childhood and interpersonal violence were consistently identified as risk factors for psychotic symptomology, with some individuals suggesting that certain traumatic events directly influenced the onset of symptoms (Griffiths et al., 2019).

2.2.5 Criterion Three: Specificity

Strong support for a causal association may also be garnered from identifying specific agents of cause and effect. However, it is emphasised that pathology may have multiple causal factors and may not require the presence of a particular agent to manifest (Bradford-Hill, 1965). This is particularly important when assessing psychosis aetiology, as outlined by Bentall and Varese (2012), given that the causes of psychosis are most likely multi-faceted.

A leading hypothesis which has informed multiple empirical investigations on the specificity of childhood traumatic experiences and psychotic symptomology, and in particular, positive symptoms of psychosis, proposes that the type of trauma influences the trajectory of symptomology (Bentall et al., 2014). Indeed, Bentall et al. (2014) suggest that intense traumatic events such as sexual abuse, where refuge is not attainable, elicit dissociative responses (e.g. hallucinations) in the victim, as a way of psychological escape. Similarly, sustained victimisation in childhood alters the individual's perceptions of interpersonal relationships and is thus associated with paranoid ideation (Bentall et al.,

2014). However, the authors concede that such associations are not absolute, but are 'probabilistic', particularly considering that childhood traumatic experiences tend to co-occur alongside other forms of childhood adversity (Sacks & Murphey, 2018). That said, when symptom comorbidity were statistically controlled for in a nationally representative sample of the English population, specific relationships were observed between childhood sexual abuse (CSA) and auditory hallucinations, and between being raised in institutional care and paranoia (Bentall et al., 2012).

These findings were subsequently corroborated in a nationally representative US sample, whereby a delineation between CSA and hallucinations and childhood neglect and paranoia were also demonstrated (Sitko et al., 2014). An analysis of adult prisoners in England and Wales also found that being raised in institutional care specifically increased the likelihood of paranoia (OR = 1.49); whereas CSA was most strongly associated with hallucinations (OR = 2.37). The combination of CSA and bullying was also found to increase the strength of the co-occurrence of hallucinatory and paranoid experiences (Shevlin et al., 2015). A pertinent critique of Shevlin et al. (2015) however challenges the generalisability of findings drawn from prison populations to the general population.

Indeed, findings from more recent meta-analysis, offer contrasting outcomes. Bailey et al. (2018) found that both CSA and childhood neglect were most strongly associated with hallucination severity. Moreover, CSA was most strongly associated with delusions (Bailey et al., 2018). Interestingly, no specificity of associations were observed between childhood trauma type and hallucinatory or delusional experiences in 251 randomly selected medical records of New Zealand community mental health centre patients (Longden et al., 2016). Bailey et al.'s (2018) meta-analysis additionally included dimensional measurements of psychotic symptoms. Here, associations between CSA and childhood neglect were related to positive symptoms. Contrarily, childhood neglect but

not CSA was associated with negative symptoms of psychosis (Bailey et al., 2018). Ajnakina et al. (2016), utilising the Wallwork/Fortgang five-factor model of psychosis (e.g. Positive, Negative, Disorganised, Excited, Depressed; Wallwork et al., 2012) demonstrated specific associations between CSA, childhood physical abuse, and parental separation and the positive dimension of psychosis in a sample of first-episode psychosis patients. Interestingly, and contrary to Bentall et al. (2012), they found that being taken into care in childhood was specifically associated with the manic dimension of psychosis (Ajnakina et al., 2016).

The above therefore demonstrates the inconsistency in the literature regarding the specificity of trauma types and associated psychotic symptomology. However, as argued by Bentall and Varese (2012), Bentall et al. (2014), and indeed Bradford-Hill (1965), it is likely that there are multiple aetiological associations between childhood traumas and psychotic symptoms. Moreover, childhood traumas frequently co-occur (i.e. physical, sexual, emotional abuse; Sacks & Murphey, 2018), all of which negatively affect the victim's ability to function in society, and thus confound researchers' ability to isolate specific pathways.

2.2.6 Criterion Four: Temporality

The temporal ordering of the variables within an association is also important. Within the childhood adverse experiences predicting psychosis framework, it is therefore important to demonstrate that trauma precedes symptomology/experiences, rather than symptomology preceding traumatic events. This is considered particularly important given that individuals with mental health difficulties are likely targets of interpersonal trauma (Khalifeh et al., 2015), thus giving rise to criticisms of reverse-causality (i.e. mental illness causes interpersonal trauma vulnerability).

The World Health Organization mental health surveys provide a robust estimation of the temporal ordering of childhood adverse experiences and psychotic experiences. In a comprehensive multi-cultural longitudinal analysis tracking (N = 23,998) individuals across the lifespan in 17 countries, adversity in childhood was demonstrated to precede the onset of psychotic experiences (McGrath et al., 2017). Of note, familial child abuse, neglect, and dysfunctional home-life, or 'maladaptive family functioning' (MFF), were the strongest antecedents of psychotic experiences across the lifespan. Sexual abuse in childhood was also found to be the strongest predictor of childhood psychotic experiences (McGrath et al., 2017). In addition, an analysis of a longitudinal cohort of the Danish population (N = 54,458) indicated that being taken into care in childhood (a proxy for childhood adversity) preceded and conferred risk (OR = 1.96) for the development of a psychotic disorder later in life (Shevlin et al., 2016).

2.2.7 Criterion Five: Dose-response Association

Also referred to as a 'biological gradient', a dose-response association is a critical component in supporting causality. Bradford-Hill (1965) utilised the linear trajectory between the number of cigarettes smoked and increased risk of mortality to illustrate that an increase in 'X' should be mirrored in 'Y', prior to a researcher discussing cause and effect. Increased childhood adverse experiences (X) should therefore influence an incremental increase in the likelihood of psychotic experiences/symptoms (Y).

Individuals diagnosed with psychotic disorders, or indeed reporting psychotic experiences, often report complex trauma histories consisting of multiple interpersonal traumas as well other childhood adversities (Conus et al., 2009; Schäfer & Fisher, 2011). Analyses of large nationally representative samples of the US (National Comorbidity Survey [NCS], 1990-1992; N = 5782) and the United Kingdom (UK) (British Psychiatric Morbidity Survey [BPMS], 2000; N = 8580) populations found support for a dose-

response association between childhood adverse experiences and psychosis (Shevlin et al., 2008). In both samples, reporting one childhood adverse experience did not significantly increase the likelihood of psychosis. However, and with the exception of the BPMS indicating that three traumas conferred greater risk for psychosis than four traumas, a linear trend was observed between an increase in childhood traumas and psychosis, with individuals in the US population 196 times more likely to be diagnosed with psychosis if they had experienced five interpersonal traumas (Shevlin et al., 2008).

A similar association between psychotic-like experiences and childhood bullying and unwanted sexual experiences was also observed in Dutch adolescents (N = 1209) (Lataster et al., 2006). Indeed, findings indicated that the number of both childhood bullying and CSA reports independently and incrementally increased the likelihood of reporting sub-clinical hallucinatory and delusionary experiences (Lataster et al., 2006). In an analysis of Danish clinical and non-clinical participants, the likelihood of individuals who have suffered childhood trauma reporting to psychiatric services with first-episode psychosis (FEP) was 17 times greater than healthy controls (Trauelsen et al., 2015). Moreover, each additional trauma experienced by the FEP cohort conferred an increased risk (OR = 2.5) of psychosis diagnosis. Of interest, the findings further suggest that cumulative trauma was a greater indicator of psychosis, as the researchers observed a systematic decrease in the strength of the association between specific traumas and psychosis when controlling for independent trauma type (Trauelsen et al., 2015). Taken together, the above highlights the importance of considering cumulative childhood adversities when assessing the relationship between childhood trauma and psychosis.

2.2.8 Criterion Six: Plausibility

Put simply, plausibility refers to the face validity of the cause and effect relationship, whereby the proposed mechanism of cause and effect exists within the

realms of possibility. The argument for the plausibility of a causal association between childhood adverse experiences and psychosis centres on the theoretical debate as to 'what is psychosis?'. Contrary to the bio-medical model, social scientists have, for some time now, insisted that greater clinical utility may be garnered from viewing psychotic symptoms and experiences as trauma responses, in and of themselves, rather than a disease entity separate from the individual's experience (Johnstone, 2009). As discussed, a leading theory on psychosis aetiology purports that chronic victimisation and a sense of powerlessness are powerful antecedents for psychotic symptomology, and in particular paranoid ideation (Bentall et al., 2014). It follows, that a person who has been subjected to repeated and sustained physical and emotional attack is plausibly more likely to develop a distorted worldview, in which others are considered a danger to the individual (Larkin & Read, 2008; Morrison et al., 2005). Indeed, the defining characteristic of paranoid ideation is the constant perception of interpersonal threat (Read et al., 2009). Such reasoning is further supported by qualitative investigations of the content of paranoid beliefs, which demonstrate a robust association with previous traumatic experiences (Griffiths et al., 2019; Rhodes & Healy, 2017). Thus, it is possible that paranoid ideation is causally influenced by a constant perception of threat in one's childhood resulting from continued maltreatment.

Further to this, and as Gail Hornstein eloquently proposes in her narrative on the subjective experience of psychotic symptoms (Hornstein, 2017), 'delusions of grandeur' are natural reactions to a chronic sense of powerless. That is to say, a perception of special meaning provides a sense of importance to an individual otherwise confronted with overwhelming feelings of inadequacy (Hornstein, 2017). Auditory and visual hallucinations may also be viewed through this prism. Indeed, dissociative experiences

are considered a psychological mechanism to protect the individual from the distress associated with traumatic experiences (Schäfer et al., 2012; Varese et al., 2012b).

Research indicates that children who are traumatised in early development adopt dissociative coping mechanisms in response to trauma (Choi et al., 2015). It follows that a child may incorporate dissociative techniques as a learned coping mechanism to perceived threat. In turn, chronic dissociative responses to perceived threat in the person's environment may become internalised and manifest as hallucinations (Read et al., 2005). Indeed, empirical findings demonstrate that dissociative coping strategies following childhood traumatic experiences significantly increase an individual's vulnerability to, and subsequent development of, auditory hallucinations (Pilton et al., 2015; Varese et al., 2012b). Finally, in a review of the literature assessing the association between previous trauma and the content of hallucinations, Steel (2015) identified multiple studies indicating that the content of both auditory and visual hallucinations is directly related to previous childhood traumatic experiences. Thus, it is plausible that the individual begins to externalise internal psychological turmoil in auditory and visual hallucinations as a result of chronic dissociative coping strategies.

2.2.9 Criterion Seven: Coherence

Coherence is the proposition that the causal relationship between 'X' and 'Y' is coherent with the extant literature and previously identified 'facts' (Bradford-Hill, 1965), or, in this case, that the causal relationship between childhood trauma and psychosis is consistent with the broader psychopathological literature. A recent comprehensive analysis of the Environmental-Risk (E-Risk) longitudinal twin birth cohort (N = 2,232) study, specifically sought to test the causal association between childhood traumatic experiences (e.g. physical, sexual, and emotional abuse, physical and emotional neglect, and witnessing domestic violence; Schaefer et al., 2018) and psychopathology. The

findings indicate that trauma suffered in childhood and adolescence precedes the onset of psychopathology. In addition, poly-victimization (i.e. a combination of multiple trauma exposure; Finkelhor et al., 2007, 2009) compared to specific traumas, is a greater predictor of both a general vulnerability to psychopathology ('*P*') as well as Internalising, Externalising, and Thought disorders (Schaefer et al., 2018). Child and adolescent trauma also predicted psychopathology independently of shared genetic associations, as well as underlying psychopathology influencing victimization in adolescence (revere causality), thus providing robust evidence that childhood trauma is robustly associated with psychopathology in general (see Schaefer et al., 2018). This study corroborates multiple meta-analyses highlighting the association between childhood trauma and all forms of psychopathology (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Trotta et al., 2015; Varese et al. 2012a).

2.2.10 Criterion Eight: Reversibility

Experimentation, where possible, also provides significant support for a causal model (Bradford-Hill, 1965). In this case, if childhood trauma does indeed cause psychosis, then the removal of such experiences from an individual's environment should lead to the alleviation of psychotic experiences/symptoms. The nature of 'X' and 'Y' in this particular association generally precludes the assessment of reversibility given the deleterious consequences to the individual. However, a nationally representative prospective-cohort study of Irish school-going adolescents (N = 1112) sought to address this issue. Adolescents, free from psychotic symptoms at baseline, were longitudinally assessed over a three-month period on measures of physical assault, bullying, and psychotic-like experiences (Khelleher et al., 2013). Trauma robustly predicted psychotic-like experiences over the three-month period, and interestingly, particularly in relation Bradford Hill's reversibility criterion (Bentall, 2017; Bradford-Hill, 1965), a cessation of

bullying and physical assault predicted a reversal of psychotic symptoms (Khelleher, 2013).

2.2.11 Criterion Nine: Alternative Explanations

Alternative explanations refer to the question of whether an increase in 'Y' could be more reasonably be explained by alternative factors. For instance, whether the aetiology of psychosis can be more plausibly explained by genetic and biological vulnerability and malfunction such as misfiring neurotransmitters, such as dopamine.

Despite the strength of the belief that genetic predisposition is a proximal aetiological agent in the development of psychosis within the psychiatric community, rather modest associations between genotype and schizophrenia are observed in the literature. Section 2.1.5 previously discussed the lack of specificity between affective and non-affective psychotic disorders. However, it is worth returning to this data in light of the current criterion. Indeed, the identification of more than 1000 genes which correlate with schizophrenia, resulting in less than .02% increased likelihood of diagnosis of a psychotic disorder. Further, polygenic effects accounted for only 30% of variance in a sample of 3,322 participants (International Schizophrenia Consortium, 2009). Overall however, the vast quantity of genetic associations observed in the literature suggests poor predictive utility and therefore poor evidence for genetic vulnerability as an alternative explanation (Kendler, 2015).

That said, the validity and reliability of genome-wide studies have been criticised, with detractors suggesting that hypothesis-driven investigations would yield more accurate results. However, and consistent with similar analyses (Collins et al., 2012), a recent historical analysis of published data revealed no significant relationship between hypothesis-driven genes and schizophrenia (Johnson et al., 2017). More specifically, a

considerable literature has identified mitochondrial genes as specific aetiological agents in the development of schizophrenia (Andreazza & Nierenberg, 2018; Ben-Shachar et al., 2017; Rajasekaran et al., 2015). Specifically, abnormalities in mitochondrial genes are implicated in the dysregulation of neuronal energy metabolisation, particularly negatively impacting on glucose metabolism (Dean et al., 2016). A comprehensive analysis of mitochondrial genes in 35,476 schizophrenic patients and 46,839 healthy controls sought to analyse gene specific associations and their specific pathways through which abnormalities in mitochondrial genes affect the onset of schizophrenia (Gonçalves et al., 2018). Concerning the former, modest associations were observed between gene specificity and schizophrenia, with no evidence for any specific pathways observed with regards to the latter (Gonçalves et al., 2018).

A more promising avenue of exploring the effects of genetic vulnerability to psychotic symptomology seeks to address the possible interaction effect between genetics (G) and environmental factors (E). A GxE framework presupposes that genetic vulnerability to psychotic disorders is activated by environmental stressors. In a Swedish national cohort of 13,163 childhood adoptees, the risk of non-affective psychosis diagnosis increased in both biologically predisposed and non-predisposed children who were raised in socio-economically deprived environments (Wicks et al., 2010). However, the effect was exaggerated within those exposed to both socio-economic disadvantage and biological vulnerability, suggesting an environment-gene interaction effect (Wicks et al., 2010). A number of subsequent GxE analyses have demonstrated an interaction effect between childhood trauma and biological vulnerability in general population (Alemany et al., 2016; Cristóbal-Narváez et al., 2016; de Castro-Catala et al., 2016), and clinical samples (Husted et al., 2012; McCarthy-Jones et al., 2014).

However, the notion that environmental stressors activate genetic vulnerabilities resulting in psychopathological outcomes is also challenged in the literature, with some suggesting that genetic vulnerability affects both the exposure to adverse experiences and one's ability to cope with these experiences (Thapar et al., 2007). That said, clear empirical evidence demonstrates that adverse experiences, particularly in childhood, may influence the development of psychotic disorders, independently of genetic vulnerability. Using twin data (N = 2,232) from the Environmental Risk Twin Study, which prospectively measured the experience of childhood trauma, Arseneault et al. (2011) revealed that abuse suffered at the hands of an adult increased the likelihood of psychotic symptoms by almost four times, with bullying increasing the odds of the same outcome by 2.5 times. No interaction effect was observed between childhood trauma and lower IQ, social deprivation, and genetic vulnerability, supporting a direct association between childhood trauma and psychosis (Arseneault et al., 2011). Likewise, in a cohort of Spanish monozygotic (MZ) twins, individual differences were observed in the relationship between childhood trauma and psychotic experiences. More specifically, differences in the severity of psychotic experiences reported by (MZ) twins was directly related to increased severity of childhood traumatic experiences, indicating that this association was independent of biological predisposition (Alemany et al., 2013).

As previously alluded to in section 2.1.5., the core premise of the dopaminergic model of schizophrenia is that psychotic symptomology is caused by insufficient or dysregulated dopamine production, inhibiting inter-neuron communication (Howes & Kapur, 2009; Jauhar et al., 2017; Lambert et al., 2018; Whitton et al., 2015). In keeping with the bio-medical model of pathology, this is akin to the role of insulin in the development of diabetes. That is, the introduction of insulin treatment aids in the regulation of glucose in the blood, controlling the pathology of diabetes (Lienhard et al.,

1992). Similarly, the use of antipsychotic medication, the majority of which are designed to block a specific subtype of the dopamine receptor (i.e. D2) in acute, short-term cases is empirically demonstrated to aid in the alleviation of psychotic symptoms. A meta-regression analysis of 167 double-blind randomized controlled trials (N = 28,102) spanning 60 years revealed that antipsychotics decreased symptom severity in double the amount participants receiving antipsychotics in comparison to placebo interventions (Leucht et al., 2017).

Following the logic of the dopaminergic model, the long-term use of antipsychotic medication should therefore consistently demonstrate reductions and control of psychotic symptomology, as is observed with insulin treatment for diabetes (Singh et al., 2009). Longitudinal analyses of the efficacy of antipsychotic medication in the treatment of affective and non-affective psychosis, however, have failed to support this hypothesis. Harrow et al. (2012) sought to investigate the long-term efficacy of antipsychotics on schizophrenic and mood disorders by prospectively assessing first-episode patients (N = 139) over a 20-year period. Across six follow-up periods from initial assessment, patients who had discontinued anti-psychotic medication for long periods of time were significantly less likely to be either currently experiencing psychotic symptomology or to have relapsed into previous clinical diagnosis (Harrow et al., 2012). Moreover, long-term use of anti-psychotics is robustly associated with adverse side effects such as suicide (Jin et al., 2013). Taken together, the research suggests that although dopamine and genetics play a role in the development and onset of psychosis, it would appear that childhood trauma has a larger effect on the aetiology of psychotic symptomology than biological factors. However, the small sample sizes in Harrow et al. (2012) and Jin et al. (2013) must be interpreted with a degree of caution.

2.3 Exploring Potential Pathways from Childhood Trauma to Psychosis

2.3.1 Introduction

Childhood trauma does not occur in a vacuum, and developmental pathways from childhood adversity to psychosis are often complex and multifaceted. Experiencing adversity in early life has the potential to fundamentally alter the person's psychological, social, and biological developmental trajectory throughout the lifespan (Nelson III, 2017; Taylor, 2010). In light of this, research has endeavoured to elucidate the mechanisms through which psychosis develops in the aftermath of childhood adversity. One promising avenue of such research identifies a host of psychological variables as potential risk factors in the aetiology of psychotic symptoms and disorders.

In their systematic review of psychological mediators between childhood trauma and psychosis, Williams et al. (2018) identify a number of psychosocial mediators through which psychosis develops and conclude by calling for more research into the psychological processes that influence the onset of psychosis following childhood trauma. As such, the following sections evaluate established and novel areas for investigation within the domain of the childhood trauma and psychosis. Specifically, this section outlines extant theory and empirical evidence surrounding the potential mediating properties of social support, social identity, self-injurious behaviour (i.e. suicidality), PTSD and CPTSD to explain the relationship between adverse childhood experiences and psychosis.

2.3.2 Social Support

The nature of many psychotic symptoms is rooted in social perceptions. Key indicators of negative symptomology are social and emotional withdrawal from social

activities and social interactions (Kay et al., 1987). Additionally, the perception of threat, and in particular interpersonal threat, is a robust predictor of positive symptoms of psychosis (Fanning et al., 2011; Read et al., 2009). In light of this, a lack of social connection has traditionally been considered as an adverse outcome of psychotic disorders with research demonstrating that persons diagnosed with schizophrenia are more likely to report less social connections (Buchanan, 1995).

However, perceptions of social support are also suggested to precede the onset of psychotic symptoms and disorders. In a systematic review on the relationship between social networks and psychosis symptomology, diminished social support networks were observed in general population samples reporting psychotic-like experiences and in first-episode samples (Gayer-Anderson & Morgan, 2013). A strong social support network is also a key factor in the alleviation of psychotic symptoms. Patients followed over a three-year period who reported higher levels of perceived social support (i.e. how strong they felt their social connections to friends and family was) reported lower severity in positive symptoms and fewer hospitalisations (Norman et al., 2005).

2.3.3 Social Deafferentation Hypothesis

The social deafferentation hypothesis proposes that a lack of neural stimulation via social stimuli increases the risk of non-affective psychotic symptoms as the brain seeks to adapt to reduced social interaction (Hoffman, 2007). The root of this hypothesis is based in the notion of a 'social brain', or the idea that the brain has evolved more neural matter than is necessary for human survival (Hoffman, 2014). Indeed, managing conflict, theory of mind, language comprehension, and maintaining social cohesion places a considerable tax on neural functioning (Dunbar & Shultz, 2007; Insel & Fernald, 2004). Thus, what happens to the brain when it is deprived of social interaction has been of considerable interest to psychological researchers.

Hoffman (2007, 2014) proposes that in the absence of stimulating social interaction the brain will conjure meaningful and complex hallucinatory and delusional experiences to stimulate the mind. There is empirical evidence to support this hypothesis. In a sample of 2,512 individuals from the general population, a lack of social diversity in friendship groups, smaller friendship groups, and less embedded social networks was related to more frequent and stronger psychotic-like experiences (Dodell-Feder et al., 2020). These findings build on previous research with clinical samples which provide evidence for the same relationship with psychotic symptoms. Social isolation has also been demonstrated to exacerbate disturbances of bodily self (i.e. an ability to discern body boundaries across space and time) in individuals with schizophrenia; a phenomenon linked to hallucinatory experiences (Michael & Park, 2016). Social deafferentation was also tested in a sample of individuals who had experienced sexual abuse in the general population of the UK. Here, avoidant personality traits (a proxy for social avoidance) were found to mediate the association between sexual abuse and manic and positive symptoms of psychosis (Murphy et al., 2013).

2.3.4 Attachment and Social Support

Insecure attachment styles are also a robust predictor of psychotic symptomology (Carr et al., 2018; Gumley et al., 2014). Attachment theory (Bowlby, 1965, 1973), which is grounded in evolutionary theory, proposes that infants seek comfort from significant caregivers to alleviate feelings of vulnerability and threat which have developed via natural selection to enhance the prospect of survival and reproduction (Fearon & Roisman, 2017). As a result, caregiver-infant interactions are internalised by the individual and are manifested in adulthood through cognitive appraisals of the self and others in relation to interpersonal relationships (Schneider, 1991). Adult attachment has been conceptualised as consisting of secure, insecure-avoidant, and insecure-anxious

dimensions (Hesse, 2008), with higher scores on the latter two categories indicative of an insecure attachment style, and low scores indicating secure attachment (Bucci et al., 2017).

Attachment avoidance is characterised by a reduction in emotional reactivity, negative perceptions of others, and avoidance of close relationships, with research indicating that avoidant attachment in particular is overrepresented among those with psychotic disorders (Bucci et al., 2017). Anxious attachment is associated with fear of abandonment and rejection, embodied in extreme emotional reactions to perceived loss of proximity or closeness with another, and a negative sense of self (Bucci et al., 2017). Empirical investigations of the latent structure of insecure attachment styles have also supported a fourth dimension of disorganized attachment, characterised by a combination of both anxious and avoidant attachment styles and a disorganization in attachment behaviours (See Bucci et al., 2017). Empirical evidence further demonstrates that both anxious and avoidant attachment styles are negatively related to perceptions of social support (Kafetsios & Sideridis, 2006; Moreira et al., 2003).

Taken together, attachment theory serves as a useful framework to understand why individuals, particularly those traumatised in childhood, become distrustful and socially distant from others, potentially compounding psychotic symptoms.

2.3.5 Mechanisms for Reducing Stress

Social support has been theorised to facilitate an individual's capacity to cope with stressful events and stimuli in their environment. At the root of this assumption is that the individual places confidence in the ability of others to help them cope with their stressful experiences (Folkman & Lazarus, 1987). Folkman and Lazarus (1987) tested this assumption and demonstrated that an individual's perceptions of social support, and

particularly emotional support, are strongly correlated with positive stress appraisals. A meta-analysis of 46 studies revealed that stronger social support networks helped to alleviate stress associated with caregivers' daily duties. Interestingly, a finding that emerged from this research indicated that the *perception* of social support was a greater predictor of stress reduction than received social support (del-Pino-Casado et al., 2018). Increased perceptions of social support have also been demonstrated to enhance adolescents' ability to appraise traumatic experiences, which additionally facilitated an alleviation of depressive symptoms (Ellis et al., 2009).

Similarly, it is proposed that having the capacity to rely on strong social bonds increases an individual's ability to process stressful stimuli emotionally and cognitively (Joseph et al., 2012). Stressful or traumatic events can prompt an individual to discuss their experiences with others, as a method of coping in the form of social sharing (Freitag et al., 2011). In a sample of Portuguese trauma survivors, emotional and cognitive discourse with trusted others enhanced post-traumatic growth (Santos et al., 2019). However, in the event where emotional and cognitive processing is blocked, perhaps due to stigma or shame associated with a particular traumatic experience, or a lack of strong social connections in one's environment, long-term deleterious effects for the individual's mental health may be more likely to occur (Morey & Brown, 2012).

2.3.6 Social Support Mediating Trauma and Psychopathology

Perceived social support is a well-established mediator of childhood trauma and psychiatric disorders. A prospective cohort study followed (N = 388) children who had suffered child abuse and neglect between the ages of 0-11 to determine their levels of psychopathology and perceived social support in later life (Sperry & Widom, 2013). At follow-up (39.5 years), respondents reported lower levels of perceived social support and belonging than matched controls (n = 308). Moreover, perceptions of social support were

demonstrated to mediate the association between childhood abuse and clinical levels of depression, anxiety, and substance abuse. Likewise, in a representative sample of Dutch adolescents (N = 390), perceived social support mediated the association between poly-victimization and posttraumatic stress symptoms (Zerach & Elklit, 2020). Gender has also been shown to moderate this relationship, with males reporting lower levels of perceived social support (Sperry & Widom, 2013). However, although the methodological rigour of the aforementioned studies bolsters the findings, the small sample sizes limits their generalisability.

Conversely, higher levels of perceived social support have also been observed to act in a protective capacity. In a sample of Northern Irish students (N = 640), social support mediated the association between childhood trauma and depression, anxiety, and PTSD, and individuals who reported higher levels of perceived social support were significantly less likely to endorse psychiatric symptoms (Lagdon et al., 2018). It follows therefore that social support networks are likely to play a key role in the development of mental health problems in the aftermath of childhood trauma. Again, however, there is an issue of generalisability when interpreting Langdon et al.'s (2018) outcome.

Despite the empirical evidence for the relationship between social support and internalising and externalising disorders, very little research has assessed this relationship with psychosis. Participants gathered from the E-Risk study – a nationally representative cohort of twins in the British population - were assessed to examine the relationship between childhood poly-victimization, perceptions of social support, and psychotic experiences. Longitudinal analyses revealed that stronger perceptions of social support had mediating and buffering effects on the association between poly-victimization and psychotic experiences in both the general population, as well as in a cohort of twins at high risk of developing psychotic symptoms (Crush et al., 2020). Given the strength of

the E-Risk methodology and sample size, this research, in particular, enhances the notion that social support plays a key role in the association between childhood trauma and psychotic experiences.

Gayer-Anderson et al. (2015) also provided support for the potential protective effects of strong perceptions of social support. In a sample of FEP patients (n = 202) and a cohort from the general population (n = 266), an interaction effect was observed between childhood adversity and perceived social support when assessing the likelihood of psychotic symptoms. However, when the sample was dichotomised into males and females, high levels of childhood trauma, accompanied by lower levels of social support, increased the likelihood of psychosis in females only. It follows that a mediation effect of social support on the association between childhood trauma and psychosis may be particularly important for women (Gayer-Anderson et al., 2015).

2.3.7 Social Identity and Psychosis

As previously discussed, interpersonal trauma that involves a violation of trust, and provokes perceptions of threat from others has a particularly deleterious effect on survivors' psychosocial well-being. In addition to perceptions of social support, the strength with which a person identifies with social groups (e.g. friends, family, ethnicity) has also been proposed as a protective factor against stress responses in the aftermath of traumatic events (Charuvastra & Cloitre, 2008).

2.3.8 Groups and Trauma

Traumatic events are not evenly distributed in the general population, with some groups more at risk of experiencing trauma than others (Muldoon, 2013). For example, firefighters (Fraess-Phillips et al., 2017) and military personnel (Reger et al., 2019) are at a disproportionately greater risk of experiencing traumatic events than individuals in the

general population. Additionally, empirical evidence demonstrates that individuals who have been raised in institutional care facilities during childhood and adolescence have experienced considerably higher levels of childhood trauma than the general population (Carr et al., 2020; Gallagher, 1999; Lueger-Schuster et al., 2014; Sherr et al., 2017; Sköld, 2013; Uliando & Mellor, 2012). Belonging to a high-risk group, however, does not guarantee that all group members will develop clinical levels of psychopathology, with researchers proposing social identity theory as a viable framework for understanding why some individuals cope with, and even thrive, following considerable trauma (Muldoon et al., 2019).

Perceptions of the individual's group membership can have a potential impact on how traumatic events are framed and processed. The theory of self-categorisation (Turner et al., 1987) proposes that individuals will internalise and accept violence and oppression if such actions fit with predefined stereotypical expectations of how members of this group are usually treated. A contemporary example of such cognitions may be observed in asylum seekers in direct provision centres in the Republic of Ireland. It is conceivable to believe some asylum seekers – many of whom have experienced discrimination within their country of origin – may become accustomed to, and even expect, discrimination from 'out group' members in the wider society.

A number of studies conducted with Northern Irish children during The Troubles demonstrate how being a member of a minority group during conflict can frame events as more traumatising than the majority group. Events such as being stopped by armed soldiers on the streets, experiencing rioting on the streets, and being stopped at army checkpoints were all framed as being more stressful by Catholic children in comparison to their Protestant contemporaries (Muldoon et al., 1998). These findings indicate that the

perception of religious and social affiliation as the 'out group', and the target of animosity and violence, increased the severity of similar events (Muldoon et al., 2019).

2.3.9 Social Identity and Posttraumatic Stress Response

While perceptions of group membership – and indeed how members of this group are treated in society - can frame adverse events as more stressful or traumatic, it is important to acknowledge that an inverse relationship also exists. Indeed, a sense of belongingness to a social or familial group can provide the individual with a sense of safety following a traumatic event (Charuvastra & Cloitre, 2008). The processing of traumatic events relies heavily on the emotional interpretation of the event and its implications for the individual in the present and future (Cusack et al., 2016). For example, soldiers who defined their reason for being in line with conflict (i.e. military battles) have been observed to display no signs of PTSD following war, and even a strengthening of their mental health. It is also suggested that the bond between soldiers, and the ability to discuss traumatic events with likeminded people, facilitates functional emotional processing (Stein et al., 2007).

Social identity additionally promotes healthy processing of traumatic experiences as it provides greater access to group resources (Jetten et al., 2014). Research indicates that people are more likely to help and provide support to individuals who have experienced trauma if they perceive them to be members of the same group (Levine et al., 2002). Moreover, help provided within this context is also shown to be most effective when it is received in manner of shared experienced (Haslam et al., 2004, 2009). Likewise, the strength of familial bonds and the capacity to disclose information related to stressful events has been shown to buffer against posttraumatic stress responses (Naughton et al., 2015; Schmid & Muldoon, 2015).

2.3.10 Social Identity and Psychosis

Despite the inherently social nature of some psychotic symptoms, as often observed in the content of hallucinations and delusions related to previous interpersonal trauma (Griffiths et al., 2019; Rhodes & Healy, 2017), relatively little research has employed a social framework to gather a more comprehensive understanding of the development of psychosis. Studies examining the increased risk of psychotic symptomology amongst ethnic minorities living in non-indigenous countries, highlights the role of social identity in the aetiology of psychosis. Migration of ethnic groups from non-English speaking to English speaking countries has been established as a risk factor for schizophrenic disorders. More specifically, Afro-Caribbean and Black minorities in Britain are at an increased likelihood of developing psychotic symptoms (Boydell et al. 2001; Halpern & Nazroo, 2000). A meta-analysis on this topic revealed that first generation migrants are 2.7 times more likely to develop schizophrenia than the general population of their adopted country. Similarly, their off-spring (second generation migrants) are 4.5 times more likely to develop schizophrenia than their compatriots (Cantor-Graae & Selten, 2005).

Although genetic predisposition cannot fully be dismissed in the aetiology of psychotic symptoms within this cohort, social factors appear to wield a significant influence on their onset. A nationally representative survey of the British population specifically sought to investigate the social influence of ethnic minority status on the development of psychotic symptomology (Das-Munshi et al., 2012). This research found that specific ethnicity (i.e. a genetic effect) did not influence the onset of psychosis, but rather that the density of the individual's ethnic group within a predominantly white indigenous neighbourhood influenced symptom onset. More specifically, the data demonstrated that for every 10 percent reduction in the number of fellow ethnic

minorities living in the same neighbourhood there was a 1.07 increased likelihood that an individual within this group would develop psychotic experiences (Das-Munshi et al., 2012). Moreover, ethnic density was negatively associated with perceptions of social support and perceived racism within the individual's community.

Similarly, Schofield et al. (2011) analysed black Afro-Caribbean and white-English people who were admitted to psychiatric care facilities for a psychotic disorder over a 10-year period in South-East London. Where black ethnicity comprised 25% or more of a neighbourhood demographic makeup, there was no increased risk of schizophrenia observed in the Afro-Caribbean population. However, when the demographics of a neighbourhood dropped below 25% of black inhabitants, the likelihood of developing schizophrenia increased between 3 and 5-fold (Schofield et al., 2011).

McIntyre et al. (2016) proposed merging two prominent theoretical frameworks in social psychology research: self-categorisation theory and social identity theory, which they refer to as a social identity approach (SIA) to better understand group dynamics and psychotic symptoms. Essentially, self-categorisation theory is concerned with how individuals develop a sense of self as it relates to membership of a group (e.g. fire-fighter; asylum seeker; Turner et al., 1987). Social identity theory proposes that group identification influences positive attitudes towards members of one's own social group ('Us') and negative evaluations of individuals who comprise groups outside of our own ('Them') (Hogg, 2016). A lack of belongingness - in essence feeling like an outsider – devoid of a social anchor from which your identity is rooted and that allows you to explore your environment, is considered a contributory factor of psychotic symptomology.

Identifying with a marginalised group has the potential for a person to internalise negative conceptions of the self (often seen in negative and depressive symptoms) and a rigid distrust of 'out-group' members. According to McIntyre et al. (2016), social identity furnishes the individual with self-esteem which acts as a protective factor against psychotic symptoms. McIntyre et al. (2018) empirically tested this theoretical model in a sample of the general British population and found that social identity (e.g. friendship groups and neighbourhood association) acted as a protective factor against paranoid ideation and depressive symptoms. Moreover, this association was demonstrated to be mediated by an increase in self-esteem. The protective effect of social identification has also been observed in prison populations, whereby the strength with which Pakistani prisoners identified with other gang members significantly decreased suicidal ideation (Shagufta et al., 2015).

2.3.11 Suicide and Psychosis

The association between psychosis and suicidal ideation/behaviour (SIB) is a thoroughly researched phenomenon in the literature. A recent meta-analysis of 50 studies assessing the longitudinal effects of psychosis on suicidal behaviour indicates that psychosis increases the risk of death by suicide (OR = 1.40), suicide attempts (OR = 1.36), and suicide ideation (OR = 1.70). On a symptom level, positive symptoms increase the risk for all SIB (see Huang et al., 2018). Indeed, SIB is associated with a broad range of psychotic disorders and experiences across the psychosis continuum, with psychotic-like experiences in the general population also increasing the likelihood of suicide attempt (OR = 3.15), death by suicide (OR = 4.39), and suicidal ideation (OR = 2.39), as observed across 23 countries (N = 84, 285) (Yates et al., 2019).

The prevalence rates for attempting suicide (18%), self-harming (49%), and suicidal ideation (66%) in individuals at ultra-high risk of psychosis are high (Taylor et

al., 2015). As is suicidal ideation (42%) amongst those at clinical-high risk of psychosis (Gill et al., 2015). First-episode psychotic patients (*N* = 3002), displaying comorbid depressive symptoms are additionally at risk of SIB (OR = 1.59) (McGinty et al., 2018), as are those (*N* = 33,873) exhibiting an admixture of depressive and positive symptoms of psychosis (Gournellis et al., 2018). A clinical diagnosis of bipolar disorder is, likewise, empirically demonstrated to increase the likelihood of SIB (Novick et al.,2010; Schaffer et al., 2015). Unsurprisingly given that schizophrenia is purported to represent the extreme endpoint of the psychosis continuum (Linscott & van Os, 2013), schizophrenia is robustly associated with all forms of self-harm (Cassidy et al., 2017).

The prevalence rates of SIB in individuals diagnosed with psychotic disorders or displaying psychotic experiences begs the question as to the psychological mechanisms involved in the association between self-harm and psychosis. Psychosis can be a debilitating experience that affects the autonomy of the person, characterised by intrusive psychological experiences such as auditory hallucinations and persecutory delusions that are often informed by past trauma (Gajwani et al., 2018; Reiff et al., 2012; Rosen et al., 2018). As such, the person's identity, ability to function within society, and perceived efficacy to obtain remission from symptoms are all significantly impaired. Thus, suicide might be deemed for some as a way to escape from extreme psychological distress and an unrelenting sense of defeat and worthlessness (see Gajwani et al., 2018 for full review). Moreover, the content of hallucinations and delusions often encourage or command the individual to engage in self-harm (Barrowcliff & Haddock, 2006). It follows, and with strong theoretical and empirical support, that psychosis is a driving force of SIB.

However, an emerging hypothesis proposes that the suicide-psychosis association may be bidirectional, with SIB acting as a precursor for positive symptoms of psychosis (Murphy et al., 2018). The fulcrum of this hypothesis rests on the well-documented

association between perceived threat and positive symptoms of psychosis (Bentall et al., 2014; Freeman et al., 2013). Individuals with persecutory delusions have been demonstrated to adopt high levels of self-serving bias in comparison to depressed and healthy controls. That is, those exhibiting persecutory delusions are significantly more likely to attribute negative events to external sources, and internal causes for positive events (Bentall et al., 1995; Moutoussis et al., 2007). This is well illustrated in Synder's (2006) discussion on paranoid content, seen in Freeman (2007, p. 440) '*I blamed THEM. When I got a parking ticket, it was THEIR influence with the police that got me into trouble. Every thought that I had was somehow associated with THEM*'. It follows that perceived threat in the individual's environment has been consistently identified as a meaningful aetiological agent in the development of persecutory delusions (Premkumar et al., 2008; Underwood et al., 2016).

According to the literature, the misattribution of negative events to external stimuli serves as a cognitive defence mechanism to protect the self-concept (Bentall et al., 1995; Moutoussis et al., 2007). Similarly, source-monitoring (cognitive processes used to discern the source of an experience; Garrett & Silva, 2003) is implicated in the aetiology of auditory hallucinations (Cho & Wu, 2013; Garrett & Silva, 2003). That is to say, the attribution to external sources of internally generated cognitive processes underlies auditory hallucinations. Source monitoring is robustly associated with auditory hallucinations in the empirical literature (Brookwell et al., 2013; Waters et al., 2012).

According to Murphy et al. (2018), these cognitive processes may be adopted to protect the individual from severe psychological distress associated with SIB. More specifically, when threat to the self is internally generated the individual may begin to attribute such experiences to external sources (e.g. 'the voice told me to jump out in front of the bus' or 'my family are trying to kill me'). Such attributions serve to protect the

individual's self-concept by attributing the threat imposed on themselves to an external source (Murphy et al., 2018). Theoretically, the notion that an individual engaging in self-injurious behaviour may externalise threat into psychotic experiences such as hallucinations and delusions as a defence to the self-concept is wholly consistent with the mainstream literature (Bentall et al., 1995; Freeman, 2007; Moutoussis et al., 2007; Premkumar et al., 2008; Underwood et al., 2016).

Building on this theoretical foundation, Murphy et al. (2018) sought to empirically test this hypothesis. Using a combination of epidemiological cross-sectional and prospective longitudinal data, Murphy et al. (2018) demonstrated a temporal association where suicide preceded psychosis. Analyses of nationally representative samples of the British population revealed a marked increase in the likelihood of endorsing psychotic experiences from suicidal ideation to suicide attempt. That is, the more a person became a threat to themselves, the more likely they were to develop positive symptoms of psychosis (Murphy et al., 2018). Moreover, SIB was statistically more likely to predict psychosis than visa-versa in a longitudinal sample of the Danish population (Murphy et al., 2018).

In a follow-up study, Butter et al. (2019) sought to specifically examine the propensity for individuals to externalise internal threat to external sources (e.g. hallucinations and delusions). This work indicated that clinical psychotic disorders (i.e. extreme expression of psychotic symptomology) was most strongly related to internal threat via SIB. Moreover, psychotic like-experiences were associated with varying levels of SIB across a spectrum ranging from low severity to high.

2.3.12 Psychosis and PTSD: A Theoretical Perspective

There is a marked disparity in prevalence rates of psychotic symptomology between individuals with PTSD and the general population. Although findings vary depending on sample selection and methodology, individuals diagnosed with PTSD are significantly more likely to experience symptoms of psychosis than those in the general population (Anketell et al., 2010; Brewin & Patel, 2010). This association is of particular interest to researchers seeking to elucidate how environmental stressors manifest in psychosis. Indeed, childhood trauma is a well-established risk factor for both psychosis and PTSD (Ehring et al., 2014; Varese et al., 2012a). Thus, PTSD offers potential utility in determining how trauma response following childhood traumatic experiences may manifest in symptoms of psychosis.

2.3.13 Misdiagnosis of Psychosis Symptoms as PTSD

A number of items used in the measurement of psychosis and PTSD can be said to overlap with regards to their conceptual similarity (Brunet et al., 2012). For instance, 'active social avoidance' ('Diminished social involvement associated with unwarranted fear, hostility, or distrust'; Positive and Negative Syndrome Scale [PANSS]; Kay et al., 1987) overlap with 'avoidance' symptoms in PTSD ('Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)'; International Trauma Questionnaire [ITQ]; Cloitre et al., 2018). Likewise, both 'hallucinations' ('perceptions that are not generated by external stimuli'; PANSS; Kay et al., 1987) and 're-experiencing' ('Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now?'; ITQ; Cloitre et al., 2018) are core characteristics of psychosis and PTSD, respectively. Moreover, both symptoms may influence similar behavioural manifestations such as verbal and physical interactions with these experiences.

Similarly, ‘excitement’ (‘Hyperactivity as reflected in accelerated motor behaviour, heightened responsivity to stimuli, hypervigilance or excessive mood lability’; PANSS; Kay et al., 1987), and ‘sense of threat’ (‘Being “super-alert”, watchful, or on guard?’ or ‘Feeling jumpy or easily startled?’; ITQ; Cloitre et al., 2018) overlap with regards to conceptuality and therefore may not be readily distinguishable (see Brunet et al., 2012). However, a latent class analysis of the US population revealed distinct groups of individuals exhibiting symptoms of psychosis, PTSD, or comorbid PTSD and psychosis, thereby indicating that PTSD and psychosis may exist independently and together (Shevlin et al., 2011).

2.3.14 Shared Aetiological Risk Factors between Psychosis and PTSD

In addition to an increased risk of psychosis, childhood traumatic events also increase an individual’s vulnerability to PTSD in adulthood (Erhing et al., 2014; Varese et al., 2012a). Although a number of theoretical arguments have been purported, and indeed have merit in explaining this association, disruption of, and maladaptive adaptations in the hypothalamic-pituitary-adrenal HPA-axis provides a particularly useful lens to understand the comorbid relationship between psychosis and PTSD. The HPA axis refers to a complex biological interaction between hormone secretion and neurological functioning in response to stress and perceived threat in one’s environment (Juruena et al., 2018). Chronic activation of the HPA axis in childhood as a result of chronic victimisation negatively alters the individual’s ability to cope with stressors in their environment, thus increasing susceptibility to psychological distress (Raymond et al., 2018).

A significant body of literature now denotes a robust association between HPA axis dysregulation and psychotic disorders, and although the literature is heterogeneous there appears to be a meaningful association between HPA axis malfunction and PTSD.

Indeed, in a systematic review and meta-analysis investigating the association between HPA axis maladaptation and bipolar disorder, Murri et al. (2016) found that bipolar disorder was related to increases in hormones indicative of stress response within the HPA axis, such as cortisol and adrenocorticotropic hormone (ACTH). Further, bipolar disorder was significantly related to dysregulation in stress response pathways in neural regions. Murri et al. (2016) found additional evidence through studies of relatives who did not display bipolar symptoms that maladaptive HPA axis activations were not indicative of a bipolar endophenotype but were more strongly associated with childhood traumatic experiences (Murri et al., 2016).

In a further meta-analysis, HPA axis malfunctioning was demonstrated to robustly predict transition from ultra-high risk of psychosis to actual psychotic disorders (Saunders et al., 2019). Similarly, PTSD is associated with lower cortisol production, suggested to be a result of over-activation of the HPA axis in initial responses to environmental threats (Miller et al., 2007; Schumacher et al., 2019). Meta-analytical findings are inconclusive in this regard with both support for (Meewisse et al., 2007; Morris et al., 2012) and against (Klaassens et al., 2012) such a process (see Schumacher et al., 2019 for a review). Nonetheless, viewed through a theoretical prism, maladaptation in the internal stress response system, disrupted by early and sustained environmental threat, may well provide an explanation for the comorbidity between PTSD and psychosis, as both are highly responsive to traumatic events.

2.3.15 PTSD Resultant from Psychotic Symptoms

Although research demonstrates that a significant proportion of the general population are exposed to traumatic events (Benjet et al., 2016; Kessler et al., 2017), only a small number of individuals exposed to trauma ultimately meet the diagnostic criteria for PTSD. In light of this, threat perception has been purported to be a key link between

traumatic events and the manifestation of PTSD (Lancaster et al., 2016). That is, the more an individual perceives an event to be threatening, the more likely they are to develop symptoms of PTSD. This theoretical framework has potential applications in the quest to understand the relationship between psychosis and PTSD. Indeed, psychotic symptoms such as auditory hallucinations have the potential to be extremely distressing, as the content of these experiences may be belligerent, abusive, and threatening (Woods, 2017). Moreover, persecutory delusions, by their nature, involve the perception of threat to the individual, and threatening intent on the behalf of the persecutor (Freeman & Garety, 2000; Schulze et al., 2013). Unsurprisingly, the malevolent content experienced in auditory hallucinations and persecutory delusions are often related to childhood trauma (Reiff et al., 2012; Rosen et al., 2018).

In a review of the quantitative literature examining the association between childhood sexual trauma and auditory hallucinations, 56% of psychiatric patients and 23% of general population samples exhibiting auditory hallucinations reported childhood sexual abuse, with evidence of this association influencing the malevolency of voices (McCarthy-Jones, 2011). Given that psychotic symptoms may be traumatic to the individual, it has been proposed that psychotic symptoms such as malevolent auditory hallucinations and persecutory delusions, can, in and of themselves, be sufficient to elicit PTSD symptoms (Berry et al., 2013). Moreover, if the content of delusions and hallucinations elicit intrusive memories of past abuse, the individual may seek to avoid external reminders of such experiences, and experiencing hyper-arousal (Brunet et al., 2012).

A meta-analysis investigating the potential PTSD sequelae following distressing psychotic experiences revealed that one-in-three individuals reported PTSD diagnosis following first-episode psychosis (Rodrigues & Anderson, 2017). Additional evidence

was offered to suggest that there was a particular association between affective psychosis symptoms and PTSD, and likewise, that depressive and anxiety symptoms increased the risk of PTSD (Rodrigues & Anderson, 2017). However, a significant limitation of these findings is that this association was tested using a cross-sectional methodology, which compromises the researchers' ability to identify cause and effect (Rodrigues & Anderson, 2017). What is more, Fornells-Ambrojo et al. (2016) argued, subsequent to their review of 21 studies investigating PTSD following psychotic episodes, that the literature in this regard is significantly limited in that over half of the studies failed to adhere to the required time-scale following a trauma for the onset of PTSD.

Thus, conclusions of temporal ordering of symptoms is difficult (Fornells-Ambrojo et al., 2016). A prospective cohort study of 39 first-episode psychosis patients sought to rectify the limitations of cross-sectional methodologies by ascertaining the longitudinal predictive effect of distressing psychotic experiences on the manifestation of PTSD. At an 18-month follow-up of acute first-episode psychosis, malevolent psychotic symptoms were predictive of distress at time 1, however, there was no predictive effect of hallucinations or persecutory delusions on PTSD (Brunet et al., 2012).

2.3.16 PTSD a Gateway to Psychosis?

Dissociative experiences are common amongst trauma-exposed individuals (Rafiq et al., 2018) and often serve as a cognitive protective mechanism to alleviate psychological distress that may occur from processing traumatic events (Hardy et al., 2016). Dissociation refers to 'discontinuities in sense of self, cognition, behavior, affect, perceptions, and/or memories' (Spiegel, 2010, p. 263), which causes functional and social impairment and is not consistent with cultural or religious practices (see Spiegel, 2010). PTSD and dissociative experiences are highly comorbid, to the extent that the DSM-5 listed a specific subtype of 'dissociative PTSD' (American Psychiatric Association,

2013). An obvious explanation for the observed comorbidity of symptoms is that both are psychological responses to perceived threat and traumatic exposure. However, dissociative coping strategies may also be employed by an individual to avoid intrusive memories of traumatic experience as well as perceived threat in the person's environment (Read et al., 2005).

As discussed in section 2.2.8., dissociative coping strategies play a key role in the development of psychosis. Indeed, empirical evidence demonstrates that children employ dissociation in response to traumatic experiences (Choi et al., 2017). Dissociative coping strategies may become internalised as chronic coping mechanism to perceived threat in a person's environment (Read et al., 2005). The frequency with which individuals access dissociative coping strategies increases the risk of developing psychotic symptoms (Pilton et al., 2015; Varese et al., 2012b).

Interestingly, heightened stress was observed to augment the association between dissociation and auditory hallucinations in a sample of patients diagnosed with schizophrenia (Varese et al., 2011). Given the theoretical and empirical evidence indicating that PTSD symptomology may elicit positive symptoms following childhood traumatic experiences, researchers have sought to test this hypothesis in clinical and general population samples. Indeed, in a recent systematic review of the psychological mediators linking childhood trauma to psychosis, PTSD was identified as a meaningful aetiological agent (Williams et al., 2018). More specifically, in a sample of Korean psychiatric patients diagnosed with a broad range of affective and non-affective psychotic disorders, childhood physical, sexual, and emotional abuse were demonstrated to indirectly affect positive symptoms of psychosis via PTSD (Choi et al., 2015).

Similarly, in a sample of individuals with reoccurring psychosis (i.e. reoccurrence of positive symptoms), 21.5% displayed PTSD, which was demonstrated to increase the likelihood of auditory hallucinations following childhood sexual abuse (Hardy et al., 2016). Emotional abuse was the only childhood trauma (e.g. sexual, physical, emotional) found to indirectly affect schizotypal personality disorder through PTSD symptomology in a primary care non-clinical sample from the US (Powers et al., 2011). Finally, PTSD was additionally observed as an indirect agent in the association between childhood neglect and schizotypal personality disorder in a study by Berenbaum et al. (2008).

2.4 CPTSD and its Potential Association with Psychosis

The most recent version of the ICD brought considerable changes to the classification of traumatic stress disorders. In ICD-11 (World Health Organization, 2018), two related but distinct disorders are presented: PTSD and CPTSD (Karatzias & Levendosky, 2019). PTSD is defined in terms of a small set of fear-based and trauma-specific symptoms reflective of three clusters; re-experiencing in the here and now, avoidance, and a sense of current threat. CPTSD includes these core trauma symptoms but also includes three symptom clusters that collectively encapsulate disturbance of self-organisation (DSO). These additional DSO symptoms include affect dysregulation, negative self-concept, and disturbances in relationships (Brewin, 2020).

CPTSD was first proposed by Judith Herman (1992) as a diagnosis likely to follow sustained and repeated interpersonal trauma. According to Herman (1992), CPTSD could result from 'complex' patterns of trauma, usually experienced in childhood (e.g. interpersonal abuse) but also possibly in adulthood (e.g. captivity as a prisoner of war, or genocide). Essentially, Herman proposed that the psychological responses to such trauma differed from PTSD in that it affected the individual's ability to orientate themselves within society by disturbing emotion regulation, ability to build and maintain

social and romantic relationships, and a chronic lack of self-worth (Herman, 1992). While Herman's original description is quite different from the now codified model of CPTSD presented in the ICD-11, its contribution remains fundamental to recognising that trauma exposure can often lead to psychological responses not directly related to the specific traumatic event.

In an early diagnostic description termed 'Disorders of Extreme Stress Not Otherwise Specified' [DESNOS] (Pelcovitz et al., 1997), PTSD was unrelated to symptoms contained within the DESNOS diagnosis which included alterations in affect regulation, consciousness, self-perception, perception of the abuse perpetrator, relations with others, somatization, and systems of meaning (Pelcovitz et al., 1997). A similar diagnosis included in the ICD-10 (World Health Organization, 1992), 'Enduring Personality Change After Catastrophic Experience' (ESCAPE), added to the concept of complex psychological responses to repeated and varied traumatic experiences by proposing enduring personality change in persons exposed to catastrophic stressors (Tanaka et al., 2018). However, a lack of use in clinical settings and empirical support undermined the validity and clinical utility of ESCAPE as a diagnostic tool (Tanaka et al., 2018).

The current diagnostic framework of CPTSD (World Health Organization, 2018) is informed by, and builds upon the ESCAPE and DESNOS diagnoses by acknowledging the fundamental change in the person's capacity to sufficiently orientate themselves in society by disturbing their ability to regulate emotion, develop and maintain relationships, and experiencing a chronic negative sense of self. However, and contrary to the diagnosis proposed by ESCAPE, these disturbances in self-regulation are distinct from the person's personality (Brewin, 2020).

While intended to capture the complexity of traumatic response, these previous diagnoses have been criticised for lacking sufficient discriminant validity from other stress and trauma related disorders (Resick et al., 2012). A significant concern was the potential overlap of symptoms (e.g. affect dysregulation, difficulty in relationships, and negative sense of self) with borderline personality disorder (BPD), as both disorders share aetiological risk-factors, including childhood trauma (Ford & Courtois, 2014). Thus, some critics have suggested that CPTSD is simply measuring comorbid PTSD and BPD (see Ford & Courtois, 2014 for a review). However, the phenomenology of CPTSD and BPD symptoms differ significantly (Hyland et al., 2019). Specifically, affect dysregulation, as is relates to CPTSD, denotes a continued inability to achieve a balance in emotional responses. In comparison, affect dysregulation within the BPD diagnostic framework specifically relates to self-injurious behaviour and fear of abandonment in relationships (Cloitre et al., 2014). Likewise, difficulties in relationships, as they relate to CPTSD, denote an avoidance of romantic and social relationships, whereas in BPD relationships are defined by extreme fluctuations in positive and negative evaluations. Finally, self-concept is defined by a chronic lack of self-worth in CPTSD, whereas abrupt changes in the sense of self are characteristic of BPD (see Hyland et al., 2019).

Further, empirical evidence supports the theoretical and phenomenological distinction between CPTSD and BPD. A latent class analysis of individuals who endorsed sexual assault as their most severe childhood trauma within National Epidemiological National Epidemiologic Survey on Alcohol and Related Conditions Wave II (NESARC-II), for example, showed clear delineation between PTSD, CPTSD, and BPD (Frost et al., 2020). Cumulative childhood trauma and neglect were also specifically associated with CPTSD, adding to the construct's psychometric and theoretical merit (Frost et al., 2020). Hyland et al. (2019), employing exploratory structural equation modelling, also

demonstrated adequate discriminant validity between PTSD, DSO, and BPD in a trauma exposed sample of the UK population. Other studies provide additional support for the discriminant validity of PTSD, DSO, and BPD (Cloitre et al., 2014; Knefel et al., 2015).

More recent criticisms have suggested that the empirical analyses used to provide support for the validity of ICD-11 CPTSD are not sufficiently varied (Achterhof et al., 2019). In addition, Ford (2020) suggests that the current measure of CPTSD is not adequately distinct from CPTSD and PTSD diagnoses seen in DSM-IV, DSM-5, and the ICD-11. However, the reservations expressed in Ford (2020) are mostly related to previous measurements associated with CPTSD and not the ICD-11 diagnostic tool, and therefore cannot speak to its validity (Cloitre et al., 2020). Multiple studies employing latent class and latent profile analyses, across multiple countries, and in samples with varying degrees of trauma exposure, indicate that PTSD and CPTSD are distinct constructs (Folke et al., 2019; Haselgruber et al., 2019; Kazlauskas et al., 2018; Kazlauskas et al., 2020; Liddell et al., 2019; Murphy et al., 2016a; Palic et al., 2016; Zerach et al., 2019). In addition, numerous factor analytic studies conducted across diverse samples have confirmed the factor structure of CPTSD, in further support of the validity and reliability of the construct (Ben- Ezra et al., 2018; Hyland et al., 2017; Karatzias et al., 2017; Palic et al., 2016). In sum, and while statistical analyses alone are not sufficient to confirm or reject the validity of a psychometric construct, there is sound theoretical, phenomenological, and empirical evidence to support the validity of CPTSD as a discrete diagnostic entity (Cloitre et al., 2020).

Given the robust association between PTSD and psychosis (2.3.12-16), the emergence of CPTSD in the diagnostic literature offers novel opportunities to advance extant theory and knowledge. From a theoretical perspective, the shared aetiological risk of prolonged, repeated, and interpersonal trauma history increasing the likelihood of

developing psychosis (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Shevlin et al., 2008; Trotta et al., 2015; Varese et al., 2012a) and CPTSD (Brewin, 2020) suggests that these constructs may be correlated. Although the literature is sparse with regards to assessing the relationship between CPTSD and psychosis, available data supports the notion that these psychopathological constructs may be related responses to trauma. Indeed, in a random sample of the UK trauma-exposed adult population (N = 1051), latent class analyses failed to delineate CPTSD and psychosis as independent constructs (Frost et al., 2019).

2.5 Institutional Abuse Survivors

One cohort within society that is at an increased risk of having suffered childhood trauma is those who resided in institutional care facilities during childhood and adolescence.

2.5.1 Historical Context

In their initial conceptualisation, institutional care facilities were a well-intentioned response to the abandonment of destitute children and new-born babies, offering nutritional and medical assistance, while also providing children with meaningful employment and a prospect of acquiring trade skills (Barnes, 1990; Molino, 2001). Although such institutional facilities were proposed as places of care for abandoned children, or offering reformation for wayward or misbehaving youths, from their inception they were wrought with religious, social, and political stigma (Garrett, 2010). Despite the considerable Catholic influence on institutional care facilities in Ireland, the first ‘asylums’ were established in 1765 for Protestant women who fell pregnant out of wedlock (Redmond, 2018). Known as Magdalene asylums or Magdalene Laundries, women housed within were widely considered second-class citizens worthy of starvation, forced labour, and social isolation. During the 1800s, an increased demand in response to

the abandonment and perceived immorality of children from predominantly working-class communities saw a boom in industrial schools, reformatory schools, and Magdalene Laundries across Ireland.

With the transference of power from London to Rome following Ireland's independence from Britain in 1922, the Catholic Church assumed control over such facilities (Redmond, 2018). And whereas Britain abolished institutional reformatories for 'deviant' or neglected children in 1933, in favour of a child-centric approach, Ireland continued their draconian practices up until the 1970s (Pembroke, 2013). Conveying the popularity of such methods of reformation amongst religious and state-run bodies, approximately 170,000 children were incarcerated in institutional care facilities between 1936 and 1970, representing 1.2 percent of the juvenile population at the time (Ryan, 2009).

The deep stigma associated with incarceration in institutional facilities is observable from official state records denoting the reasons why children were consigned by the Department of Education. Overwhelmingly, children were incarcerated for 'lack of guardianship', a term used to describe any lack of perceived orthodoxy within the familial unit, such as having children out of wedlock, or emotional or physical neglect by parents. To a lesser extent, children were also incarcerated for missing school and other criminal behaviour (Ferguson, 2007). Women were usually sent into institutional care for the former, whereas men were incarcerated for the latter (McLoone & Richards, 2012). Upon arrival to state-run institutions, children were often stripped of their identity and instead were allocated numbers to differentiate them from other children (McLoone & Richards, 2012).

Contrary to receiving care following initial traumatic experiences occurring within the familial context, children within institutional care facilities were deemed acceptable targets by abusers because of their perceived lower status in wider society. In essence, a stigma followed children incarcerated in such facilities owing to histories of destitution, immorality, or criminality, which relegated them to the status second-class citizens in the eyes of state/religious-run institutions (Ferguson, 2007; Redmond, 2018). Institutional facilities provided a system where children deemed socially deviant and immoral, and who did not conform to societal norms of Catholic Ireland, could be disciplined, and controlled out of public view (Pembroke, 2013). With reports emerging of varied and sustained childhood traumatic experiences from victims and independent media investigations came a societal call to assess the extent to which survivors experienced childhood trauma while in institutional care. Published in 2009, the Report of the Commission to Inquire into Child Abuse, commonly referred to as the Ryan report, detailed the abuse and neglect suffered by those who had resided in institutional care facilities (Ryan, 2009). The report documented that physical, sexual, and emotional abuse, as well as physical and emotional neglect, were rife in Irish institutional care facilities. Excerpts of testimony from institutional abuse survivors contained within the Ryan report vividly detail the nature of the abuse suffered. For example, on experiencing physical abuse one survivor reported:

> '*he jumped straight at me, picked me up, threw me like a dog around the place. I hit desks, hit the floor. I landed after some time on the floor. The commotion of boys screaming had brought Br Quintrell,10 who was in 11 school, which was the next school, he flew in and pulled him off. I know I was unconscious, and I know to God that if it hadn't been for him coming in, I do not think I would be here today, in all honesty. The attack was vicious. Moments later, he was apologising, crying.*' (Ryan, 2009, p. 116).

2.5.2 Institutional Abuse

While institutional abuse has been defined in various ways throughout the literature, two definitions are particularly relevant in the context of this thesis, given its focus on childhood trauma and psychosis. Firstly, institutional abuse has been defined in relation to power imbalances, whereby every aspect of a person's life is controlled by authoritative figures who misappropriate power entrusted to them to perpetrate abuse (Lueger-Schuster et al., 2014; Wolfe 2003). Additionally, and in relation to the nature of the trauma suffered, institutional abuse has also been defined as repeated and sustained in nature and varying across multiple types including physical, sexual, and emotional abuse, as well as physical and emotional neglect (Wolfe et al., 2006). The nature of institutional abuse most likely encompasses the aspects proposed in both definitions.

Extant data demonstrates that individuals who resided in institutional care facilities experienced high rates of childhood trauma. Within an Irish context, Carr et al. (2010) investigated the levels of abuse experienced by a sample of (N = 247) former residents of industrial schools and reformatories, including the Magdalene Laundries, who had engaged with the aforementioned Commission to Inquire into Child Abuse. Over 90% of former residents reported experiencing physical and emotional abuse as well as emotional neglect while in care. In addition, 47% reported having experienced sexual abuse. The abuse suffered by those in institutional care was also frequent and varied, with 45 to 95% of survivors having experienced between two and five types of abuse. More specifically, 14% of respondents reported having experienced sexual abuse between 11 and 100 times and nine percent were sexual victimised over 100 times (Carr et al., 2010).

These figures are consistent with a general trend in childhood traumatic experiences suffered in institutional settings by European and international cohorts (Biehal, 2014; Gallagher, 1999; Sen et al., 2008; Sherr et al., 2017; Sköld, 2013; Uliando

& Mellor, 2012). Research assessing levels of childhood trauma in individuals who accessed the Scottish Child Abuse Inquiry revealed that 95% experienced physical abuse, and between 37 and 85% experienced emotional and sexual abuse, as well as physical and emotional neglect. This abuse was perpetrated on average over an eight-year period (Carr et al., 2019). Emotional abuse was the most highly endorsed childhood trauma by Austrian institutional abuse survivors, with 83% reporting this experience. Additionally, 68% of the sample reported physical and sexual abuse (Lueger-Schuster et al., 2014).

2.5.3 Institutional Abuse and Psychopathology

The literature assessing the psychological effects of institutional abuse has primarily employed a broad focus to determine prevalence estimates of internalising and externalising psychiatric disorders amongst survivors. A recent analysis of Scottish institutional abuse survivors demonstrated the stark contrast in adverse psychopathological outcomes with those who resided in institutional settings, compared with individuals in the general public that had suffered child abuse. Carr et al. (2019) compared the rates of psychopathology in Scottish institutional abuse survivors to 26 community samples in World Mental Health Surveys (Koenen et al., 2017) and 85 international surveys (Steele et al., 2014). Here the result indicated that 84% of institutional abuse survivors suffered from a psychiatric disorder in comparison to 29% in the general public. Similarly, 48% of institutional abuse survivors reported a diagnosis of PTSD compared to 4% in the general population. In addition, 41% of institutional abuse survivors had received a diagnosis of depression in contrast to 10% of the general population (see Carr et al., 2019 for further details). An investigation of the psychological wellbeing of Irish survivors of institutional abuse following the Ryan report in 2009 revealed a similar trend. Of the 247 individuals who had suffered institutional abuse in an

Irish context, 80% met the criteria for a lifetime diagnosis of a psychiatric disorder (Carr et al., 2010).

A comprehensive review of the available literature which included participants from the US, Canada, Australia, Switzerland, Finland, Tanzania, Romania, Ireland, Germany, and Austria provides a broad context to the negative impact of institutional abuse on survivors psychological well-being (Carr et al., 2020). Of the 3865 survivors of institutional abuse surveyed, 71% had experienced some form of physical, emotional, or sexual abuse, which was strongly related with negative psychopathological outcomes. Indeed, 84% of this sample received a lifetime psychiatric disorder diagnosis, with 19% to 58% of the sample reporting an internalising, externalising, or personality disorder diagnosis (Carr et al., 2020).

2.5.4 Institutional Abuse and Post-traumatic Stress Response

Institutional abuse differs from intra-familial abuse in that it is more likely to occur over a longer period of time, it is difficult to escape from, and the greater likelihood that abuse will be repeated by multiple different offenders (Wolfe, 2003). As previously discussed, CPTSD is thought to develop following trauma that is repeated, sustained, and interpersonal in nature (Brewin, 2020), bearing considerable similarity to the trauma experienced by those who have resided in institutional settings (Wolfe et al., 2006). Moreover, this type of trauma is theorised to impact the person's sense of self, ability to develop and maintain relationships, and exert control over emotional reactions to stressful stimuli (Gilbar et al., 2018). These outcomes have been indirectly measured in multiple studies examining the quality of life survivors of institutional abuse experience. Findings indicate that institutional abuse survivors have high levels of insecure attachment styles, low self-esteem, and display difficulty in coping with stressful stimuli in their environment (Carr et al., 2010, 2019; Ferguson, 2007; Lueger-Schuster et al., 2018). In

light of this, it is reasonable to assume that survivors of institutional abuse survivors are at risk of endorsing symptoms consistent with CPTSD. Moreover, given the types of trauma that institutional abuse survivors have generally been exposed to, and that the ICD-11 diagnostic guidelines preclude the diagnosis of both PTSD and CPTSD (Cloitre et al., 2018; World Health Organization, 2020), it is highly probable that this cohort are more likely to meet the diagnostic criteria for CPTSD rather than PTSD (Carr et al., 2010, 2019, 2020; Lueger-Schuster et al., 2014).

To date, however, only two studies have examined CPTSD amongst institutional abuse survivors. In a sample of Austrian institutional abuse survivors (N = 229), more participants displayed symptoms consistent with a diagnosis of CPTSD (24.1%) than PTSD (17%). When further analysed by individual symptoms, participants displayed high levels of both PTSD and DSO symptoms with endorsement rates ranging from 31.1% ('*Feelings of guilt*') to 62.9% ('*Affective dysregulation*') (Knefel & Lueger-Schuster, 2013). A latent profile analysis investigated whether CPTSD and PSTD could be adequately distinguished within the same sample (Knefel et al., 2015). Four distinct profiles emerged, including a PTSD with high DSO symptoms class (i.e., CPTSD), a PTSD and low DSO symptoms class (i.e., PTSD), a high DSO and some elevation in PTSD class, and a low symptom class. Thus, initial evidence supports the distinction between CPTSD and PTSD amongst survivors of institutional abuse (Knefel et al., 2015).

2.4.5 Institutional Abuse and Psychosis

This chapter presents a considerable body of evidence relevant to the relationship between childhood adversity and psychotic symptomology. However, and despite the wealth of available evidence of the relationship between childhood trauma and psychosis, the literature examining the adverse psychosocial effects of institutional abuse has largely neglected psychotic symptoms. The nature of institutional child abuse makes this form of

childhood trauma a potent risk factor for psychotic symptomology. As the literature clearly outlines, multiple forms of child abuse are the rule rather than the exception within institutional settings (Carr et al., 2020; Daly, 2018; Lueger-Schuster et al., 2018). Therefore, and given the robust relationship between the number of traumas experienced in childhood and the risk of developing symptoms of psychosis (e.g. dose-response; Latater et al., 2006; Shevlin et al., 2008; Trauelsen et al., 2015), the risk for psychotic symptomology amongst individuals who have resided in institutional settings during childhood is likely to be high. Indeed, a study of the general English population revealed those who had resided in institutional settings prior to their 18th birthday were 11 times more likely to develop paranoid symptoms (Bentall et al., 2012). By comparison, individuals in the general English population who had been raped, physically abused, or bullied were twice, 8.5, and 1.4 times more likely to develop paranoid symptoms, respectively (Bentall et al., 2012).

Therefore, and although the literature provides some indication as to the risk of developing psychotic symptoms following child abuse experienced in institutional settings, little is known regarding the prevalence of psychotic symptomology among survivors of institutional abuse. The global prevalence rates of psychotic symptomology vary in the general population, with three quarters of the global population experiencing at least one psychotic experience at some point in their life (McGrath et al., 2015). Given what is known about the rates of trauma among institutional abuse survivors, a greater exploration/understanding of psychotic symptomology among this sub-population group is warranted.

2.6 Research Gaps

The current chapter identified a number of gaps in the literature. Firstly, although the bifactor model of psychosis has been supported in clinical samples – comparatively

less is known regarding whether this model accurately represents the latent structure of psychosis in the general population. Specifically, no study has yet tested whether the General and specific dimensions possess adequate reliability and replicability – and indeed if these dimensions are significantly associated with established risk factors for psychosis – in a general population sample. Secondly, while studies have investigated various biological, social, and psychological mediators of the relationship between childhood trauma and psychosis, very few have tested multiple mediators simultaneously within a single model. Moreover, no study to date, has investigated whether the relationship between childhood trauma and the General and specific dimensions of psychosis are mediated by social and psychological variables. Finally, although the diagnostic measure of CPTSD has undergone rigorous assessment in the extant literature, relatively less is known regarding how it relates to other psychopathologies, in particular psychosis. The nature of institutional abuse poses as a significant risk factor for both psychosis and CPTSD. Thus, there is an opportunity to advance extant theory and knowledge by investigating the association between psychosis and CPTSD in a sample of former residents of institutional care facilities.

2.6.1 Research Goals

The aim of the current research was to provide incremental additions to emerging and understudied areas of research within the field of psychology. Specifically, this body of work sought to address key gaps in the literature in relation to the bifactor model of psychosis and how it relates to environmental, demographic, social, and psychological factors – as well assessing theoretical paths from adverse childhood experiences to symptoms of psychosis. In addition, this thesis sought to assess how psychosis relates to emerging diagnostic frameworks such as CPTSD.

2.6.2 Research Objectives

Objective 1: To determine the optimal latent structure of psychosis symptoms the general population sample. Objective 1 is achieved by answering the following research question:

- Is the latent structure of psychosis best represented by a unitary, multidimensional, or bifactor model?

Objective 2: To assess the reliability and replicability of each dimension of the most appropriate model of the latent structure of psychosis in the general population. Objective 2 is achieved by answering the following research question:

- Do the latent dimensions of psychosis (as identified in objective 1) possess acceptable reliability and replicability?

Objective 3: To assess the external validity of each dimension of the most appropriate model of the latent structure of psychosis in the general population. Objective 3 is achieved by answering the following research question:

- To what extent are the latent dimensions of psychosis (as identified in objective 1) associated with environmental, developmental, social, psychological, and demographic factors, including childhood trauma, perceived social support, attempted suicide, age, sex, socio-economic status, urbanicity, and ethnicity?

Objective 4: To ascertain if the associations between childhood trauma and the latent dimensions of psychosis (as indicated by objective 1) are mediated by multiple social and psychological variables. Objective 4 is achieved by answering the following question:

- Do perceived social support, social identity, history of attempted suicide, and PTSD mediate the association between childhood trauma and latent dimensions of psychosis (as identified in objective 1)?

Objective 5: To determine if CPTSD and psychosis are related psychopathological constructs in a sample of former residents of institutional care facilities. Objective 5 is achieved by answering the following research question:

- Are CPTSD and psychosis significantly associated in a sample of former residents of institutional care facilities?

Chapter 3: Methodology

3.1 Chapter Overview

The current chapter outlines the general design of the study and introduces post-positivism as the undergirding philosophical approach applied to achieve the objectives of the current study. Aligned to this epistemology, a description of the quantitative methods used to answer the five research questions posed in this study is provided. The empirical studies within the current thesis followed a phased approach, with each phase building on findings from the previous phase. The first and second phases make use of the third wave of the National Epidemiological Survey on Alcohol and related Conditions (NESARC-III) - a large nationally representative survey of the US population - to achieve the first four research objectives. Firstly, the NESARC-III is used to ascertain the optimal measurement model of psychosis within the general US population (objective 1). More specifically, this first empirical study seeks to replicate findings observed in Shevlin et al. (2016) (Chapter 2.1.7). The current study advances Shevlin et al.'s (2016) research by assessing the reliability and replicability of dimensions (objective 2) and correlating well-established risk factors for psychosis with the optimal measurement model identified in objective 1 (objective 3). The findings from these first, second, and third research objectives subsequently inform the selection of independent and dependent variables in phase two. Specifically, the optimal measurement model chosen in the first empirical study is used as the dependent variable(s) to test a multiple mediation model investigating the mediation effect of multiple social and psychological variables on the association between childhood trauma and psychosis. Phase two therefore addresses the fourth research objective. The findings from phase one and two are then used to inform the research objectives and the selection of measurement instruments used in phase three, which tests the association between psychosis and CPTSD in a sample of former residents

of institutional care facilities during childhood and adolescence. This third phase thus addresses the fifth and final research objective in the current thesis.

The structure of the current chapter, as such, follows the phases of the present thesis. Details for participants and procedures used in each phase, as well as the measures, statistical analyses and ethical concerns, are outlined as they relate to each phase. In addition, in the third phase, a description of engagement with institutional abuse survivor advocacy groups, as well as an online cross-sectional survey design are outlined in detail.

3.2 General Design of the Study

A sequential dynamic research design (Leech & Onwuegbuzie, 2009) was selected for this thesis, allowing for research objectives and methodologies to be continually informed by previous findings. Specifically, the research took place over three distinct phases. The first phase was used to address the study's first three objectives. Specifically, (1) To determine the optimal latent structure of psychosis symptoms, (2) To assess the reliability and replicability of dimensions of psychosis within the optimal measurement model, and (3) To examine the associations between well-established risk factors for psychosis and the optimal measurement model selected. Presented in Chapter 4, these results were then used to inform the selection of predictor and criterion variables to address the fourth research objective in phase two to (4) explore which social and psychological variables mediate the relationship between childhood trauma and psychosis, as per the best fitting model presented in Chapter 4. These results are presented in Chapter 5. The third phase of the research, the results of which are presented in Chapter 6, then carries forward findings from the first and second phases of the research to further (5) understand the relationship between psychosis and CPTSD among individuals who resided in institutional care facilities during some period of their childhood and adolescence.

All phases of the study used a cross-sectional survey design approach. A cross-sectional design was adopted for a number of reasons. Firstly, a cross-sectional design provides a useful framework to assess the latent structure of psychosis, at a given moment in time, in a large nationally representative sample of the general population, as seen in Shevlin et al. (2016). Secondly, a cross-sectional design allows for the testing of multiple external correlates that may influence the development of psychosis. Finally, a cross-sectional design is commonly used to access difficult to reach populations, such as institutional abuse survivors, with who relatively little research has been conducted in comparison to other populations. In sum, within the parameters of a thesis, a cross-sectional approach allows for the convenient access to large nationally representative data sets and potentially easier access to difficult to reach populations.

3.3 Philosophical and Theoretical Foundations

The guiding philosophical approach of this study is post-positivism. Post-positivism adheres to a number of tenets of positivism, particularly in the use of, but not limited to, quantitative methods. However, unlike positivism, post-positivism regards the attainment of 'truth' as a probabilistic rather than deterministic. From a post-positivist perspective, cause *likely* determines observed outcomes (Creswell, 2017). For example, within a post-positivist framework, outwardly expressions of psychosis are likely driven by an underlying causal factor or factors. As such, post-positivism is not concerned with definitely proving or disproving, but rather seeks to provide utility by advancing extant theory and knowledge by supporting or falsifying claims about reality (Creswell, 2017; Dedeurwaerdere, 2018).

Empirical outcomes of research methodology are thus considered indicators of 'truth' within this paradigm, as post-positivism acknowledges that although objective reality may exist, how the researcher accesses such 'truth' is influenced by social and

language heuristics, particularly in the study of human thought and behaviour (Bhattacherjee, 2012; Bracken & Oughton, 2006; Gales, 2003). Thus, if 'truth' can never be fully divorced from the researcher or the individual, the research process becomes an endeavour concerned with utility and the application of knowledge rather than a quest to discover objective reality (Park et al., 2020; Popper, 2005). Post-positivism therefore applies a broader definition of truth, to incorporate 'unobservable' phenomena (e.g. psychosis) as viable candidates for scientific scrutiny (Bhattacherjee, 2012; Durepos et al., 2018). A post-positivistic approach thus holds that unobservable phenomena may be studied via the scientific method by examining their effect on observable phenomena (Bisel & Adame, 2017). For example, the observable behaviour consistent with hallucinations and paranoia serve as indicators of the unobservable psychopathology (e.g. psychosis) driving such outwardly behaviour.

The application of measurement within psychological research provides greater utility to the researcher when viewed through a post-positivist lens. A post-positivist approach advocates that objective measures of phenomena do not exist and are likely laden with systematic error and researcher bias, via cultural norms and language (Adam, 2014; Panhwar et al., 2017; Viswesvaran et al., 2014). What is more, empirical measures are guided by theory in their construction and application, further questioning the existence of truly objective measures within scientific research (Gefen, 2019). This therefore renders the notion of the researcher's ability to definitively prove or disprove a scientific theory unrealistic (Gefen, 2019). This acknowledgement of measurement error within research methodology allows for the correction of inaccuracies in statistical applications of individual measurement scales, refining the accuracy and potential utility of empirical outcomes (Fuller, 2009). Further, the acceptance that development and application of measurement within the scientific method are influenced by the researcher

through theory and bias allows for the refinement of measurement, usually through statistical methods (Adam, 2014; Fuller, 2009; Gefen, 2019; Panhwar et al., 2017; Viswesvaran et al., 2014).

It follows that numerical measures of observations are common within a post-positivist paradigm, in an attempt to, in as much as possible, detach the researcher's bias from the interpretation of empirical outcomes (Cohen et al., 2013). Such beliefs coincide with the notion that empirical findings generated from one research study do not necessarily generalise to a global population and that findings must be interpreted within the context from which they are generated (Gefan, 2019). Moreover, the probabilistic nature of post-positivism concedes that results are not necessarily generalisable to all cases, in all situations (Clark, 1998). Therefore, hypotheses must be tested across diverse cultural and language settings prior to the consideration of a universal empirical outcome.

As discussed in the literature review, the individual factors that constitute psychotic symptomology - whether psychosis is most accurately conceived as a dimensional phenomenon or as a categorical phenomenon divided across multiple individually distinct categories - and the primary aetiological antecedents of psychosis are highly debated. Comprehending the myriad interactions and permutations of antecedents involved in the aetiology of psychosis is beyond the scope of this study. Instead, this study endeavours to contribute to extant knowledge and theory regarding the psychometric properties of psychosis, and how clearly identified aetiological factors interact in a theoretical 'causal' chain to influence the development of psychosis.

Unobservable phenomena, as understood through a post-positivist lens, are most commonly described as 'latent variables' within the scientific literature (Bollen, 2002). Although widely used across most scientific disciplines, a clear universal definition of a

'latent variable' does not exist (Bollen, 2002). Instead, definitions are generally tied to the method of enquiry employed by the researcher (Borsboom et al., 2003). Despite the lack of a clear universal definition, the core assumption undergirding the application of latent variables is that variation in observed variables, and covariation between observed variables, is *caused* by an unobserved or 'hidden' variable(s). The use of 'latent variable' throughout this study therefore refers to the unobservable within the post-positivist perspective, according to the aforementioned assumptions.

3.4 Phase One

3.4.1 Participants and Procedures

The NESARC surveys are representative of the civilian, noninstitutionalized adult population of the United States (US), including residents of the District of Columbia, Alaska, and Hawaii. The first version of the NESARC survey (N = 43 093) took place between 2001 and 2002, and the second wave of the NESARC took place between 2004 and 2005 (N = 34 653). All data in the NESARC-I and NESARC-II surveys was collected using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV; Grant et al., 2000).The AUDADIS-IV captured a multitude of psychiatric diagnoses in accordance with the DSM-IV diagnostic guidelines and was shown to possess good-to-excellent psychometric properties (see Grant et al., 2003; Ruan et al., 2008). For NESARC-III (Grant et al., 2014), a new sample was gathered (N = 36 309) and the AUDADIS was updated so that all psychiatric diagnoses were captured in relation to the DSM-5 diagnostic criteria. The NESARC-III also differed from previous NESARC studies as DNA samples were collected via saliva sampling. The NESARC-III, like previous versions, recruited a nationally representative sample of the civilian, non-institutionalised adult population of the entire US, above the age of 18 years old, including military veterans. Those who were excluded from the NESARC-III data

collection process were individuals on active military service, homeless, cognitively impaired, under the influence of alcohol or drugs, currently incarcerated, or living in remote locations.

Multistage probability sampling methods were used to randomly select one participant from households and designated group dwellings (Grant et al., 2014). Higher probability rankings were allocated to minority homes (i.e., Black, Hispanic, Asian, Native American) to ensure their inclusion within the survey. As such, two prospective respondents were randomly selected from minority households with more than four adults (n = 1661). The initial screener response rate was 72.0%, with an overall response rate of 60.1% (Grant et al., 2014). To ensure representativeness, the data were adjusted and weighted to counterbalance oversampling and non-responses, in accordance with the American Community Survey (US Census Bureau, 2010) – a previous US population survey (Saha et al. 2016).

Data were collected electronically via face-to-face structured interviews delivered by trained laypersons. Participants provided informed consent prior to engaging in this study. As part of this consent, participants acknowledged the use of their data for secondary data analyses, publication, and dissemination. Respondents were payed a fee of $90.00 for their participation in the NESARC-III study. The institutional review boards of the National Institutes of Health and Westat, Inc. provided approval for the research protocol in the NESARC-III and funding was provided by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). A more comprehensive account of the sampling procedures for NESARC-III is provided by Grant et al. (2014).

The demographic details of the NESARC-III sample are presented in Table 3.1. The NESARC-III was selected to achieve the first three research objectives in the current

study, for a number of reasons. Firstly, following Shevlin et al.'s (2016) findings, it was necessary to assess the latent structure of psychosis in a general population sample, which the NESARC-III offers. Secondly, the NESARC-III contains a sufficient number of cases to allow for bifactor modelling and multiple mediation analysis - as both statistical analyses require considerable case numbers within a given sample to be adequately powered. Finally, the NESARC-III is a readily available data set, for which the data controllers (National Institute on Alcohol and Abuse and Alcoholism) encourage widespread use. As such, the NESARC-III can be obtained with relative ease, once necessary criteria are met.

Table 3.1 Weighted sociodemographic characteristics of the sample (N = 36, 309)

	% (n)
Sex	
Male	43.7 (15862)
Female	56.3(20447)
Age in Years	
18-29	22.4% (8126)
30-44	27.9% (10135)
45-59	26.7% (9681)
60+	23.0% (8367)
Education	
Less than high school	15.2% (5490)
High school	22.6% (8217)
Equivalency degree	4.4% (1582)
Some college	22.0% (7982)
Bachelor's or higher	35.9% (13038)

Race/Ethnicity	
White, Non-Hispanic	52.9% (19194)
Black, Non-Hispanic	21.4% (7766)
American Indian/Alaska Native, Non-Hispanic	1.4% (511)
Asian/Native Hawian/Pacific Islander, Hispanic	5.0% (1801)
Hispanic, any race	19.4% (7037)
Marital Status	
Married	39.9% (14482)
Widowed	7.1% (2595)
Divorced	14.5 %(5251)
Separated	4.3% (1577)
Never Married	27.8% (10092)
Living with a partner	6.4% (2312)
Region	
Northeast	14.3% (5180)
Midwest	20.8% (7566)
South	40.0% (14532)
West	24.9% (9031)
Income, US$	
Median and above ($30,000 – 34,000 to $100,000+)	37.9% (13765)
Below the median ($0.00 to 25,000 – $29,000)	62.1% (22544)

Use of NESARC-III data is contingent on a user agreement filed with the National Institute on Alcohol Abuse and Alcoholism. Within this agreement, the researcher must provide the title of the proposed study, the key aims and the background of the research,

and clearly state the research objective(s) that the NESARC-III data will be used to achieve. Additionally, proof of ethical approval from the researcher's university and data protection procedures must be provided. Having fulfilled these requirements, the NESARC-III data set was transferred into my possession and stored on an encrypted device in June of 2018.

Given the considerable size of the NESARC-III data set, it was not viable to use the original data file for statistical analyses. Therefore, a new data file was created and the necessary data points from the NEASRC-III were transferred to smaller and more manageable data set. The National Institute on Alcohol and Abuse and Alcoholism provide a full list of the questions administered in the study(https://www.niaaa.nih.gov/research/nesarc-iii/questionnaire); as well as a general codebook (https://www.niaaa.nih.gov/research/nesarc-iii/general-codebook); and a diagnostic codebook(https://www.niaaa.nih.gov/research/nesarc-iii/diagnostic-codebook). These codebooks provide endorsement rates of each variable in the NESACR-III data set. As such, these were invaluable resources that were continually referenced during the management of this data to ensure the accuracy of the data transferred from the NESARC-III to a smaller subset of measures used in this study.

3.4.2 Measures

A review of the recent literature on the bifactor pentagonal model of psychosis and the wider psychosis literature informed the selection of risk variables associated with psychotic symptomology used in this study, which included a number of demographic, social, and psychological variables. Additionally, the literature presented opportunities to advance existing studies by including predictors of psychosis that had yet to be tested within a bifactor framework, such as adverse childhood experiences.

All of the data used in the current study was derived from the AUDADIS-5 (Grant et al., 2011). The AUDADIS-5 is an operationalised face-to-face interview version of the DSM-5 that employs a broad range of psychiatric measures to capture a multitude of Internalising disorders (e.g. Depression, Anxiety, PTSD, Phobias); Externalising disorders (e.g. substance abuse, anti-social personality disorder); Thought/affective disorders (e.g. schizotypal personality, bipolar I & II), and Eating disorders (Grant et al., 2011). In addition, this measure captures broad demographic and lifestyle and developmental data. Multiple studies have demonstrated the AUDADIS-5 to be a reliable measurement of substance abuse and psychiatric disorders in the general population (Grant et al., 2015; Hasin et al., 2015). As the first objective of the current study was to attempt to replicate the findings of Shevlin et al. (2016), the procedures used by these authors to select indicators of psychotic symptomatology were followed as closely as possible. This meant that items, where possible, were selected from the same section of the AUDADIS and the same criteria for item endorsement were utilised.

3.4.3 Psychosis symptoms

Shevlin et al. (2016) selected 22 items from various sections of the AUDADIS-IV to represent psychosis. They selected items that possessed conceptual similarity to the items within the PANSS (Kay et al., 1987) and to, as closely as possible, reflect the items used by Reninghaus et al. (2013). The 22 items covered the dimensions of positive, negative, mania, disorganized, and depressive symptoms. In the current study, 23 items were selected to measure the same dimensions of psychosis from the AUDADIS-5 (see Table 3.2). Of these, 14 items were identical to those used to by Shevlin et al. (2016). Variation in the remaining 9 items was due to changes made from the AUDADIS-IV to the AUDADIS-5. In the current study, 13 of the 23 items used were drawn from Section 10 of the AUDADIS-5 (“Usual Feelings and Actions”) which measured schizotypal

personality disorder and borderline personality disorder. Of the remaining items, 6 were drawn from section 4A ('Low Mood I') which measured hypomania, 2 were drawn from section 5 ('High Mood') which measured hypermania, and 1 item was drawn from section 9 ('General Anxiety') which measured general anxiety symptoms.

Table 3.2 Items selected based on conceptual similarity to PANSS items used by Reininghaus et al. (2013)

	Item	Symptom	AUDADIS-5
	Positive		
1.	Have you ever felt that you could make things happen just by making a wish or thinking?	Delusions	Section10, Item39
2.	Have you often thought that objects or shadows are really people or animals, or that noises are actually people's voices	Hallucinations	Section 10, Item 44
3.	Have you believed that you have a 'sixth' sense that allows you to know and predict things that others can't	Grandiosity	Section 10, Item 41
4.	Have felt suspicious of people, even if you have known them for a while	Suspiciousness	Section 10, Item 37
5.	Have people thought you have strange ideas	Unusual thought content (1)	Section 10, Item 51
6.	Have you often had the feeling that things that have no special meaning to most people are really meant to give you a message	Unusual thought content (2)	Section 10, Item 36
	Negative		
7.	Have you had trouble expressing your emotions and feelings	Blunted affect	Section 10, Item 50
8.	Have you often felt empty inside	Emotional withdrawal	Section 10, Item 19
9.	Have people said you were a cold person who didn't seem to care about other's	Poor rapport	Section 10, Item 56-4
10.	Have you preferred to be alone rather than being with other people	Passive social withdrawal	Section 10, Item 53

11.	Moved/talked much more slowly than usual most days for 2+ weeks?	Motor retardation	Section 4A, Item 3L1
12.	Often found it harder to make decisions	Disturbance of volition	Section 4A, Item 3V
13.	Had fear/avoidance of social situation due to fear of becoming speechless, having nothing to say or saying something foolish	Active social avoidance	Section 9, Item 3C
	Mania		
14.	Feel extremely excited or elated?	Excitement	Section 5, Item 6A
15.	Have you often had temper outbursts or gotten so angry that you lose control?	Hostility	Section 10, Item 11
16.	Have you often done things impulsively	Impulsivity	Section 10, Item 29
	Depression		
17.	Did you feel or did others notice you were sad, hopeless, depressed or down?	Depression	Section 4A, Item 3A
18.	Did you feel guilty about things you normally wouldn t feel guilty about nearly every day for at least 2 weeks?	Guilt	Section 4A, Item 3R
19.	Did you feel keyed up or tense?	Tension	Section 4A, Item 4A
20.	Did you find it difficult to stop or control your worrying?	Anxiety	Section 4A, Item 4G
	Disorganization		
21.	Have you frequently been surprised about how other people react to things you do or say?	Concept disorganisation	Section 10, Item 56-4
22.	Have people often commented that you said things that seemed strange or out of place?	Concept disorganisation 2	Section 10, Item 56-1
23.	Have people told you that your expressions didn't fit the situation you were in, or how you said you were feeling?	Mannerisms and posturing	Section 10, Item 56-3

Section 10 contains a specific symptom (e.g. '*Have you felt suspicious of people, even if you have known them for a while*?'), which if endorsed, prompts a follow-up question enquiring whether that symptom caused any distress or impairment in functioning (e.g. '*Did this ever trouble you or cause problems at work, school, or with your family or other people?*'). An indicator of psychosis was deemed to be present (scored '1') if both the symptom and the distress/impairment questions were endorsed. The other sections of the AUDADIS-5 did not include a distress/impairment follow up question. However, a screener question was included prior to the presentation of the remaining symptoms (e.g. '*Have you ever had a time lasting at least 3 months when you felt extremely worried or anxious about many different things*?'). For these, an indicator of psychosis was deemed to be present if the screener question and the symptom (e.g. '*Avoid events or activities that could have possible negative consequences?*') items were both endorsed. The endorsement rates for all 23 indicators of psychosis are reported in Table 3.3.

Table 3.3 Items from the AUDADIS-5 used to represent the dimensions of psychosis.

	Item	Symptom %(n)	AUDADIS-5
	Positive		
1.	Have you ever felt that you could make things happen just by making a wish or thinking about them?	Delusions 0.7%	Section10, Item39
2.	Have you often thought that objects or shadows are really people or animals, or that noises are actually people's voices?	Hallucinations 0.5%	Section 10, Item 44

3.	Have you believed that you have a 'sixth sense' that allows you to know and predict things that others can't?	Grandiosity 0.7%	Section 10, Item 41
4.	Have you felt suspicious of people, even if you have known them for a while?	Suspiciousness 4.5%	Section 10, Item 37
5.	Have people thought you have strange ideas?	Unusual thought content (1) 1.5%	Section 10, Item 51
6.	Have you often had the feeling that things that have no special meaning to most people are really meant to give you a message?	Unusual thought content (2) 1.3%	Section 10, Item 36
	Negative		
7.	Have you had trouble expressing your emotions and feelings?	Blunted affect 5.4%	Section 10, Item 50
8.	Have you often felt empty inside?	Emotional withdrawal 5.0%	Section 10, Item 19
9.	Have people said you were a cold person who didn't seem to care about other's?	Poor rapport 2.3%	Section 10, Item 56-4

10.	Have you preferred to be alone rather than being with other people?	Passive social withdrawal 3.5%	Section 10, Item 53
11.	Did you move or talk MUCH more slowly than usual most days for at least 2 weeks?	Motor retardation 11.2%	Section 4A, Item 3L1
12.	Did you find it harder than usual to make decisions most of the time for at least 2 weeks?	Disturbance of volition 20.1%	Section 4A, Item 3V
13.	Avoid events or activities that could have possible negative consequences?	Active social avoidance 8.7%	Section 9, Item 3C
	Mania		
14.	Feel extremely excited or elated?	Excitement 3.9%	Section 5, Item 6A
15.	Have you often had temper outbursts or gotten so angry that you lose control?	Hostility 5.93%	Section 10, Item 11

16.	Have you often done things impulsively, not caring about the consequences?	Impulsivity 5.4%	Section 10, Item 29
	Depression		
17.	Did you feel worthless nearly every day for at least 2 weeks?	Depression 16.9%	Section 4A, Item 3Q
18.	Did you feel guilty about things you normally wouldn't feel guilty about nearly every day for at least 2 weeks?	Guilt 16.4%	Section 4A, Item 3R
19.	Did you feel keyed up or tense?	Tension 15.9%	Section 4A, Item 4A
20.	Did you find it difficult to stop or control your worrying?	Anxiety 19.1%	Section 4A, Item 4G
	Disorganization		
21.	Have you frequently been surprised about how other people react to things you do or say?	Concept disorganisation 2.3%	Section 10, Item 54
22.	Have people often commented that you said things that seemed strange or out of place?	Concept disorganisation 2 1.7%	Section 10, Item 56-3

23.	Have people told you that your expressions didn't fit the situation you were in, or how you said you were feeling?	Mannerisms and posturing 2.3%	Section 10, Item 56

3.4.4 Risk variables

3.4.5 Childhood Interpersonal Trauma

Items reflecting childhood (i.e. prior to respondent's 18th birthday) interpersonal traumatic experiences were also selected from section 13. Section 13 includes a range of childhood traumatic experiences including a dysfunctional home environment (e.g. parental/sibling alcohol/drug abuse), witnessing domestic violence (e.g. mother domestically assaulted), and interpersonal traumas (e.g. physical, sexual, and emotional abuse, and physical and emotional neglect). Childhood interpersonal traumas were selected as the literature identifies these as the most robust predictors of psychotic symptomology from the variables available for selection (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Varese et al., 2012a). Questions in section 13 were based on the Adverse Childhood Experiences (ACE) study (Dong et al., 2003; Dube et al., 2003) with additional questions drawn from the Childhood Trauma Questionnaire (Bernstein et al., 1994) and the Conflict Tactics Scales (Straus, 1979; Straus et al., 1996). The current study selected a subset of 19 questions to reflect childhood interpersonal trauma (e.g., emotional neglect, physical neglect, emotional abuse, physical abuse, and sexual abuse). Respondents indicated the frequency with which they had experienced each trauma on a five-point Likert scale (1 = 'Never', 5 = 'Very often'). Emotional neglect items were reversed scored to reflect the scoring logic of the other childhood traumas. Each trauma type was summed to create a total score of childhood interpersonal trauma, with higher scores indicating higher frequency of childhood interpersonal trauma.

3.4.6 Social support

Section 2E of the NESARC-III includes 12 questions measuring perceived social support. In this section, perceived social support was measured using the Interpersonal Support Evaluation List (ISEL-12; Cohen et al., 1985), a well-established measure of perceived social support and has been demonstrated to be a highly reliable measure (Merz et al., 2014). Questions were phrased as either positive (e.g., '*When I need suggestions on how to deal with a personal problem, I know someone I can turn to*') or negative (e.g., '*I feel that there is no one I can share my most private worries and fears with*') statements about perceptions of social relationships. Respondents were asked to indicate how true or false each statement is in relation to themselves on a 4-point Likert scale, ranging from definitely false (1) to definitely true (4). All items were dichotomised to reflect true (1) or false (0) statements. Five of the items were recoded, as answering false indicated perceived social support for these items (e.g., *'I don't often get invited to do things with others'*). Higher scores on the ISEL-12 indicate higher levels of perceived social support. The internal reliability (Cronbach's alpha) of the ISEL-12 in the current study was satisfactory ($\alpha = .77$).

3.4.7 Suicide

Attempted suicide was measured by one question which asked respondents: '*In your entire life did you ever attempt suicide*?' Respondents were asked to answer on a 'Yes' (1) or 'No' (0) basis.

3.4.8 Demographic variables

Several demographic risk variables were selected in line with recent research investigating the bifactor pentagonal model of psychosis in clinical samples (Quattrone et al., 2019; Reininghuas et al., 2019) and the wider literature (Das-Munshi et al., 2012; Freeman & Fowler, 2009; McGrath et al. 2015; Morgan et al., 2009). Demographic

variables included in the current study were sex (Female = 0, Male = 1), socio-economic status ('below the median wage' = 0 and 'on or above the median wage' = 1), ethnicity ('white' = 0, 'non-white' = 1), and urbanicity ('non-urban dwelling' = 0, 'urban dwelling' = 1).

3.4.9 Structural Equation Modelling

Aligned to post-positivism, structural equation modelling (SEM) is an amalgamation of statistical techniques concerned with the testing of theory-driven hypotheses regarding the structural nature of, and casual relationship between, variables (Mueller & Hancock, 2008; Weston & Gore, 2006). There are a number of criteria which make SEM particularly useful and applicable to the current research objectives, consistent with a post-positive perspective. Firstly, SEM acknowledges that all measurement is compromised by error and seeks to identify and remove measurement inaccuracies from psychometric instruments (Grewal et al., 2004; Hu & Bentler 1999; Kline, 2015). Second, a core premise of SEM is that unobservable phenomena (latent variables) are measurable and empirically testable via observable phenomena (Bollen, 2005; Fornell & Larcker, 1981; Tarka, 2018). The general application of SEM in social science research is thus to test well-defined *a priori* theories and hypotheses established by the researcher (Hair et al., 2010). In this regard, and although exploratory SEM has become increasingly popular within the research literature, SEM is typically considered confirmatory in nature and seeks to limit the researcher's influence on the interpretation of statistical outcomes by primarily testing the validity of theoretical models (Abu-Alhaija, 2019; Schreiber et al., 2006). SEM analyses thus seek to determine the extent to which hypothesised models 'fit' observed data, or how well *a priori* hypothesised models explain the variation and covariation in scores on individual measures provided by a sample from a given population (Hoe, 2008, Iacobucci, 2010; Singh, 2009). It follows, and again aligned to

post-positivism, that SEM does not seek to definitively prove the existence of latent variables and their relationships with other observed or latent variables. Rather, SEM is primarily concerned with the extent to which hypothesised models explain proposed relationships between variables (Barrett, 2007; Fan & Sivo, 2007).

3.4.10 SEM Measurement

SEM consists of two principal modelling approaches. The first, a *measurement* component, relies on confirmatory factor analysis (CFA) techniques. CFA assumes that the variance in individual item scores, as well as the covariation between item scores, are determined by a single, or multiple latent constructs (Brown & Moore, 2012; Iacobucci, 2009). CFA therefore seeks to provide a parsimonious explanation of shared variance between observed indicators within measurement instruments (Bollen & Hoyle, 2012; Preacher, 2006). However, and as discussed in Chapter 2.1.6, criticisms of multi-dimensional models of psychopathological constructs have paved the way for the use of confirmatory bifactor modelling (CBM; Chen et al., 2012; Woodward et al., 2014; Rosental et al., 2012).

CBM offers a flexible statistical platform to test specific hypotheses related to the uni - or multidimensionality of a construct (Chen et al., 2012; Reise, 2012; Salgado, 2017). Whereas CFA assumes that covariation of observed indicators is explained by a single or multiple dimensions, CBM operates on the assumption that General dimensions and specific grouping dimensions can explain item variation (Hyland et al., 2014; Rodriguez et al., 2016). Essentially, CBM tests whether specific symptom groupings may explain a meaningful additional amount of variance in the covariation of observed indicators not otherwise captured by the General dimension (Reininghaus et al., 2013; Reise et al., 2010; Shevlin et al., 2016). An emerging suite of analyses known as *bifactor strength indices* further allow the researcher to determine whether a psychometric tool is

unidimensional or multidimensional in nature and the reliability and replicability of general and specific dimensions within a CBM framework (Reise et al., 2010). Additionally, such analyses provide information related to the strength of bifactor indices which seek to determine the potential usefulness of subscale scores beyond the shared variance in scores accounted for by a General dimension (Rodriguez et al., 2016). In the case of psychosis research, bifactor strength indices indicate how much additional variation in scores on individual items are due to specific clusters of symptoms beyond the shared variance of all the symptoms contained within a scale, as well as how reliable these specific dimensions may be in future research and practice (Reise et al., 2013).

3.4.11 Structural Component

The second modelling approach used in SEM is the *structural* component, rooted in traditional general linear modelling analyses such as multiple regression, analysis of variance (ANOVA), and path analysis (Hoyle, 2012; Weston & Gore, 2006). SEM thus broadens the complexity of hypothesis testing beyond standard general linear modelling as multiple causal variables, often termed *exogenous* variables in the literature are entered into theoretical models and simultaneously tested for unique effects on multiple dependent or *endogenous* variables (Heck & Thomas, 2015; Schreiber et al., 2006; Singh, 2009). For example, whereas traditional univariate analyses provides a framework for the testing of multiple independent variables (e.g. childhood traumatic experiences) on a single dependent variable (e.g. hallucinations), SEM allows for the simultaneous testing of multiple forms of childhood trauma (e.g. physical, sexual, emotional abuse, and emotional and physical neglect) on multiple psychotic symptoms (e.g. hallucinations, delusions, disturbance of volition, mood elevation, fragmented thought etc.). Moreover, SEM facilitates the testing of relation between observed phenomena (e.g. physical abuse)

and multiple latent constructs (e.g. positive symptoms, negative symptoms, depressive symptoms).

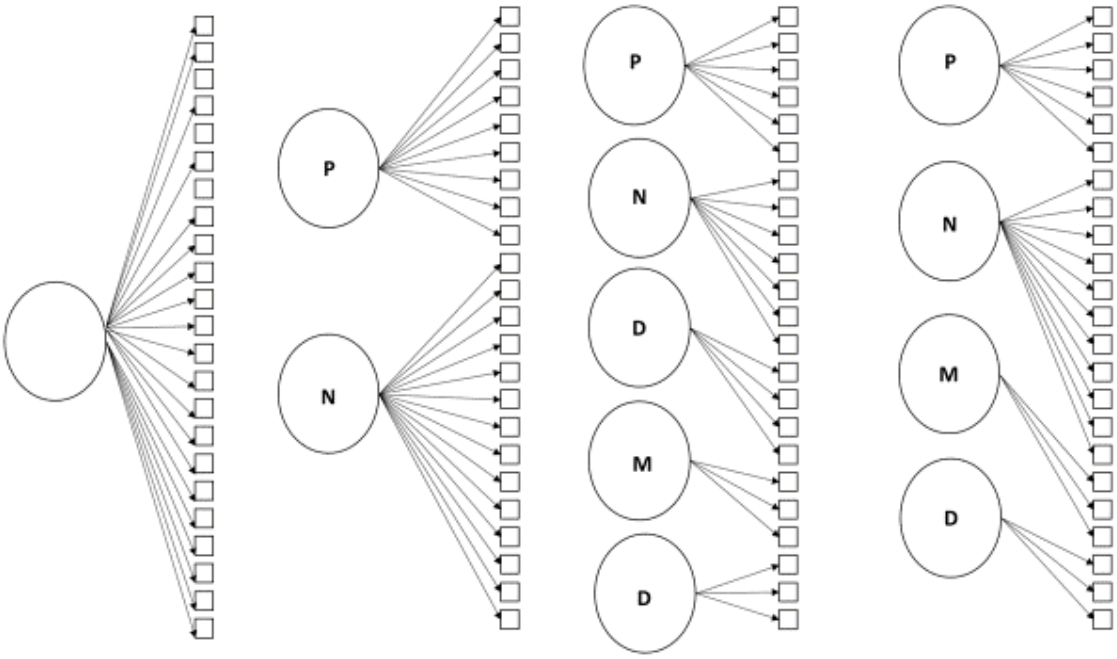
SEM additionally departs from a static view within the confirmatory factor analytic paradigm, which views observed phenomena as being solely caused or influenced by unobserved phenomena, towards a more flexible framework which allows the researcher to examine the influence of external observed variables on latent variables. (Bollen & Ting, 2000; Diamantopoulous & Winklhofer 2001; Edwards, 2001; Fayers & Hand, 2002; Grace & Bollen, 2008). For example, SEM allows the researcher to examine if adverse childhood experiences influence the development of the latent construct of psychosis. In the current thesis, SEM thus provides a robust statistical framework to test the latent structure of psychosis (research objective one), assess multiple correlations between external predictor variables and multiple dependent variables (research objective three), as well as simultaneously test multiple mediation models (research objective four). In light of the above, SEM was deemed best suited to achieve the research objectives of the current study given its precision of measurement and flexibility.

3.4.12 Analytic Strategy

To test the research objectives in phase one, the analytical strategy followed a three-step process. First, CFA and CBM were used to determine the optimal latent structure of the 23 psychosis symptom indicators by comparing seven alternative models advanced within the literature (Quattrone et al., 2019; Reininghaus et al., 2013, 2016, 2019; Shevlin et al., 2016). Model 1 was a unidimensional model of psychosis, where the 23 items loaded onto a single General dimension of psychosis. Model 2 was a correlated two-factor model of positive and negative symptoms. Model 3 was a correlated four-factor model similar to the pentagonal model but where the negative and depression items load onto a single Negative dimension and was included due to the occurrence of a high

correlation (r = .95) between these two dimensions in Shevlin et al.'s (2016) study. Model 4 was a correlated five-factor pentagonal model of positive, negative, depression, manic, and disorganized symptoms. Finally, Models 2, 3, and 4 were also assessed within a bifactor framework whereby an uncorrelated General dimension of psychosis was modelled in addition to the specific dimensions (these are Models 2b-4b). In the bifactor models, the specific dimensions were free to correlate given that these are conceptually meaningful constructs. See Figure 3.1.

Figure 3.1 alternative models of the latent structure of psychosis tested in Phase one



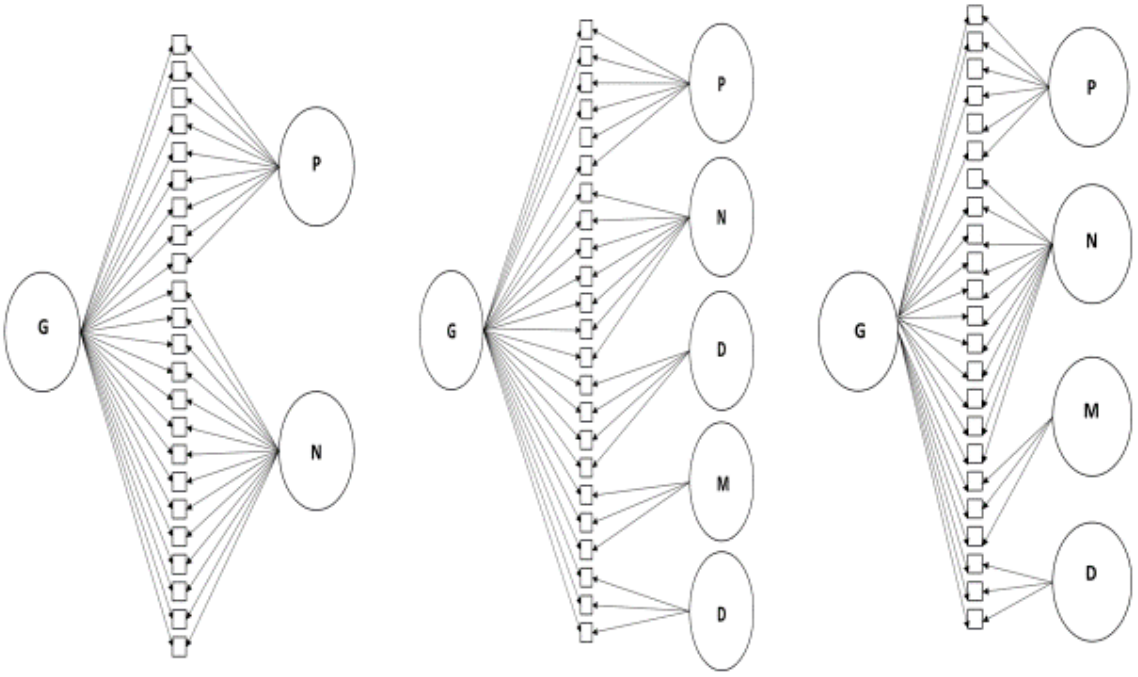


Figure 3.1 from left to right depicts a uni, two, five, and four-factor models as well as bifactor two, five, and four-factor models.

3.4.13 Bifactor Strength Indices

Second, upon selection of the best fitting model of psychosis, reliability and replicability were assessed according to a number of strength indices advocated by Rodriguez et al. (2016). These included omega reliability (ω; the proportion of common variance explained by the General and specific dimensions), omega hierarchical (ωH; the proportion of variance within the individual symptom indicators attributable to the General [or specific] dimension[s], controlling for the specific [or General] dimensions), the relative omega (ωR: calculated by dividing ωH by ω, and represents the proportion of reliable variance due to the General dimension independent of the specific dimensions, and each specific dimension independent of the General dimension), and index H (the extent to which a set of items represents a latent variable and the likelihood of that latent variable to replicate across studies). Omega coefficients and index H values range from 0-1, and in all cases values closer to 1 suggest greater reliability and replicability of the

latent variable. By convention, values greater than .80 on all indices reflect satisfactory reliability and replicability (Rodriguez et al., 2016). These indices were calculated using Deuber's (2017) calculator.

3.4.14 Structural Equation Model

Third, the multivariate associations between each dimension of the best fitting model of psychosis and each risk factor (sex, age, socio-economic status, ethnicity, urbanicity, total childhood interpersonal trauma, perceived social support, and suicide attempt) was assessed using SEM. The psychosis latent variables were therefore the endogenous variables in the model, regressed onto the exogenous variables which were all entered into the model as observed variables (i.e. not as latent variables).

3.4.15 SEM Fit Indices

The factor analytic and SEM models were conducted in Mplus version 7.4 (Muthen & Muthen, 2013) using the weighted least squares means and variances adjusted (WLSMV) estimator which is appropriate for categorical data (Flora & Curran, 2004). There was minimal missing data (3.9%), and this was handled using the default pairwise deletion method for the WLSMV estimator in Mplus. The complex survey design of the NESARC-III was accounted for in all analyses by applying the 'complex' analysis function in Mplus which adjusts for the weighting, stratification, and clustering of the survey design. Model fit was determined based on standard guidelines (Bollen, 1989; Hu & Bentler, 1999) including; a non-significant chi-square result; Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) values $\geq$ .90 and $\geq$ .95 indicating adequate and excellent fit, respectively; and Root-Mean-Square Error of Approximation (RMSEA) values $\leq$ .08 and $\leq$ .06 indicating adequate and excellent fit, respectively. To compare the fit of the different measurement models of psychosis, changes in the RMSEA (ΔRMSEA) were inspected, as this index includes penalties for increasing model complexity.

ΔRMSEA values > .015 are indicative of significant changes in the fit of the respective models (Chen et al., 2008).

3.4.16 Ethical Considerations

Ethical approval for the current study was obtained from the Health Policy & Management / Centre for Global Health Research Ethics Committee in Trinity College Dublin, Ireland (Appendix A). Participants in the NESARC-III are identified via randomly generated participant identification numbers (e.g. 'Participant 1') and therefore, participants are largely de-identifiable. However, the NESARC-III does contain data from which, although highly unlikely, participants may be identified, such as date of birth. Thus, the data was stored on password-protected devices and using encrypted software to maintain participants' anonymity. Individual demographical information was never presented or recorded in any format. Demographical information was only presented in descriptions of the overall sample, thus eliminating the possibility of individuals being identified from the data presented. Participants in the initial data collection have given consent for their data to be used in secondary data analyses, dependent on their anonymity being protected.

3.5 Phase Two

3.5.1 Measures

Informed by the literature review presented in Chapter 2, the results from Phase one identified a number of risk variables which correlate with the dimensions of psychosis. While the testing of all possible variables which may indirectly affect psychotic symptoms in the aftermath of childhood adversity is beyond the scope of the current work, a number of variables of particular theoretical and clinical relevance in the assessment and treatment of psychosis symptomology, including perceptions of social

support, social identity, attempted suicide, and PTSD, were included as mediating variables in phase two of the study.

3.5.2 Psychosis Symptoms

The optimal measurement model of psychosis identified in the first phase of research was used to represent the latent structure of psychosis in phase two.

3.5.3 Mediating Variables

Measures of social support and attempted suicide are previously presented in sections 3.4.6 and 3.4.7, respectively.

3.5.4 Social Identity

Previous research has utilised racial identity as a proxy for social identity within the psychosis literature, as theory and empirical evidence suggests that a sense of group belonging influences the protective effects of social identity on psychotic symptomology (Charuvastra & Cloitre, 2008). Section 2E of the NESARC-III includes the race-ethnic identification scale (Ruan et al., 2008) which measures respondents' perceptions of the importance of their race/ethnic heritage (e.g. '*Your race/ethnic heritage is important in your life*'), how race/ethnic heritage influences interactions with others (e.g.*'You are more comfortable in social situations where others are present from your racial/ethnic group*'), the strength with which they identify with their racial/ethnic group (e.g. *'You identify with other people from your race/ethnic group*'), pride associated with belonging to a racial/ethnic group (e.g. '*You are proud of your race/ethnic heritage*'), and shared values, attitudes, and behaviours (e.g.' *Your values, attitudes and behaviors are shared by most members of your race/ethnic group*') (Ruan et al., 2008). Building on the three-item Ethnic Identity Scale employed in the National Comorbidity Survey-Replication and the National Latino and Asian American Study, the racial-ethnic identification scale (Ruan et

al., 2008) includes eight items which are designed to measure an individual's sense of self as it relates to membership of a social group. These items were informed by established measures of ethnic/racial identity, in diverse ethnic groups including the Multigroup Ethnic Identity Measure (MEIM; Phinney, 1992) and the East Asian Ethnic Identity Scale (EAEIS; Barry, 2002). Items were recoded from an original six-point Likert scale that ranged from '*Strongly Agree*' (1) to '*Strongly Disagree*' (6), to categorical variables to reflect respondents' '*agreement*' (1) or '*disagreement*' (0) with each statement. Higher scores indicate higher levels perceptions regarding group identity. Some items were reversed scored and therefore it was necessary to recode these items before computing all 8 of the items to create a total score of social identity. Internal reliability for the scale in the current sample was found to be good ($\alpha = .88$).

3.5.5 PTSD symptoms

A DSM-5 diagnosis of PTSD was used in the current study. There are a number of criteria that must be met by respondents to receive a DSM-5 PTSD diagnosis. Initially, respondents were asked to indicate if they directly experienced, witnessed or learned about, or if they had been repeatedly exposed to one or more of a possible 34 traumatic events including sexual violence, death, and natural disasters. Respondents who reported more than one traumatic event were then asked a number of symptom related questions in terms of what they consider their most stressful event experienced. To receive a PTSD diagnosis, respondents must endorse $\geq$1 symptoms of persistent intrusion (e.g. '*After most stressful event, did you keep involuntarily remembering it?*'), $\geq$1 symptoms of avoidance of stimuli (e.g. '*Did you try to avoid conversations about it?*'), and $\geq$3 symptoms of negative alterations in cognition or mood (e.g. '*Did you often feel more angry than usual*?), and $\geq$2 symptoms of alterations in arousal (e.g. '*Did you have physical reactions when reminded of it*') (Smith et al., 2016). In addition, these symptoms must have been

associated with impairment or distress (e.g. '*Did reactions to the worst stressful event interfere with your daily life*? Or '*Did reactions to the worst stressful event distress you a lot*?), and have persisted for longer than one month, post trauma exposure (Smith et al., 2016). To create a lifetime measure of PTSD, past-year and prior-to-past-year diagnoses of PTSD were combined. The past-year and prior-to-past-year PTSD diagnoses test-retest reliability was fair ($\kappa = 0.41$ & 0.44) (Grant et al., 2015).

3.5.6 Childhood Interpersonal Trauma

Measures of childhood trauma are previously presented in section 3.4.5.

3.5.7 Demographics

Demographic variables are previously described in section 3.4.8.

3.5.8 Analytic Strategy

Structural equation modelling (SEM) was used to examine paths from childhood interpersonal trauma to psychosis via perceived social support, social identity, attempted suicide, and PTSD. The best fitting measurement model of psychosis in the NESARC-III sample – the results of which are described in Chapter 4 - was specified as the measurement component of psychosis in the SEM model in the current study.

The extant theoretical and empirical literature indicate that the association between childhood interpersonal trauma and psychosis may be both direct (i.e. childhood interpersonal directly influences the aetiology of psychosis) and indirect via multiple social, psychological, emotional, and biological variables (Bentall et al., 2014; Griffiths et al., 2019; Read et al., 2005; Rhodes & Healey, 2017). To reflect the direct and indirect association between childhood interpersonal trauma and psychosis symptoms, two models were tested. Firstly, a fully indirect model, whereby childhood interpersonal traumas' association with the best fitting measurement model of psychosis was fully mediated by

social support, social identity, attempted suicide, and PTSD was tested See Figure 3.2. A second direct and indirect model, identical to the first model with the addition of a direct path from childhood interpersonal trauma to each dimension, was also tested. See Figure 3.3.

Figure 3.2 Example of a fully indirect model, using a bifactor model as the measurement model of psychosis

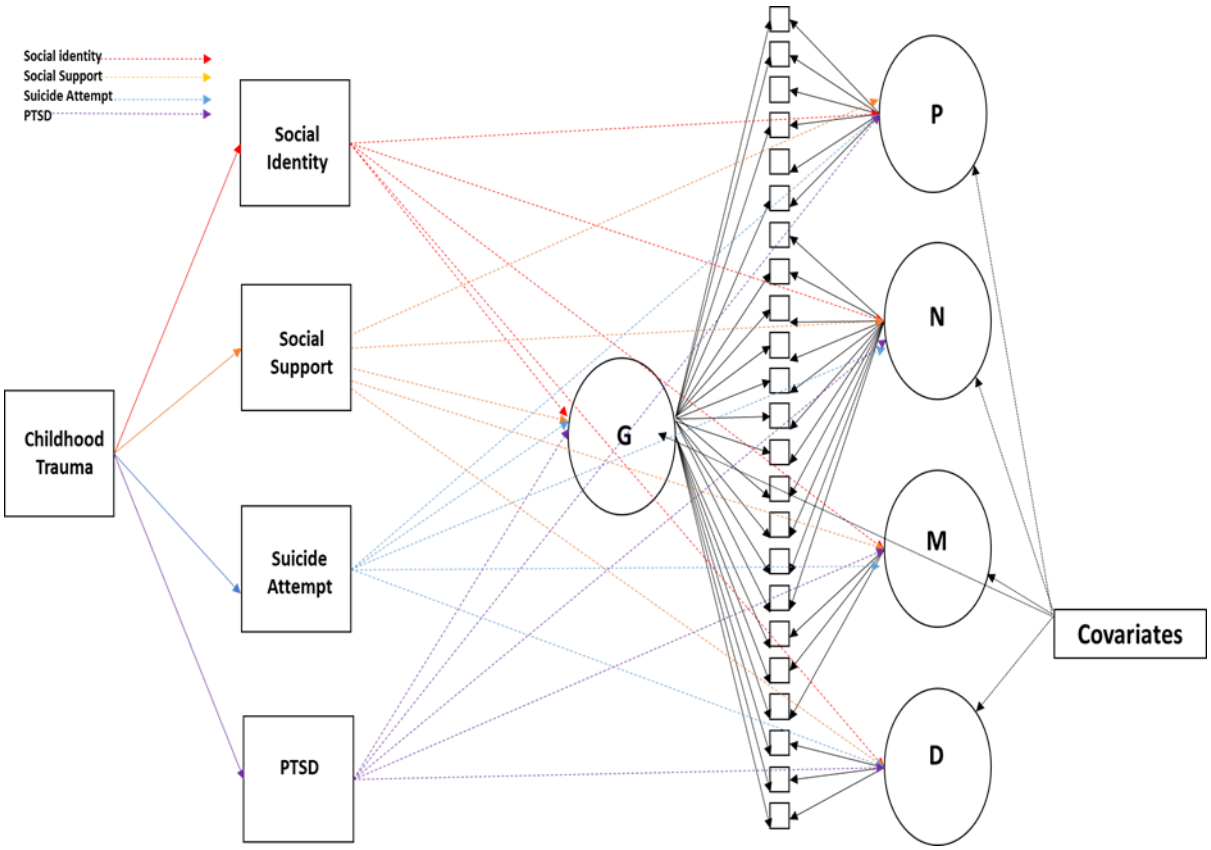
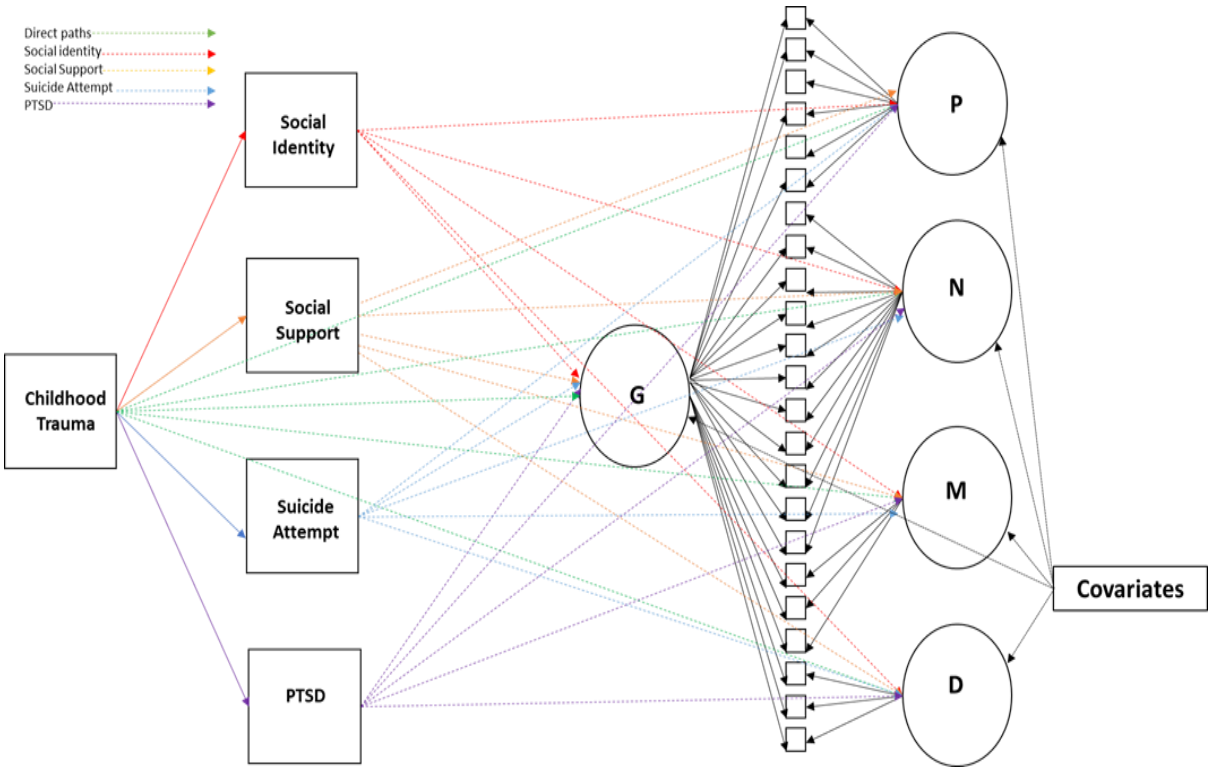


Figure 3.3 Example direct and indirect effects model using a bifactor model as the measurement model of psychosis



In addition, those demographic variables (Anglin et al., 2014; Kelly et al., 2010; McGrath et al., 2004; Oh et al., 2014; Quattrone et al., 2019; Reininghaus et al., 2019; Vassos et al., 2012; Veling, 2008) found to be associated with the best fitting measurement model of psychosis in Chapter 4 were also controlled for in this model. The best fitting structural model was identified using standard guidelines (Bollen, 1989; Hu & Bentler, 1999), as described in section 3.4.15, above.

General guidelines for testing indirect effects, as proposed by Preacher and Hayes (2008), dictate that bias-corrected (BC) bootstrapping techniques should be reported to ensure reliability. Here, non-parametric statistics which do not assume the normality of multivariate distribution provide confidence intervals for each indirect effect (Preacher & Hayes, 2008). However, as discussed (3.4.1) the NESARC-III employed multistage probability sampling methods during data collection. To adjust for weighting, stratification, and clustering of the survey design the 'complex' analysis function in Mplus was applied. However, Mplus does not allow for the use of BC bootstrapping

techniques when the 'complex' function is applied. Therefore, and given that the national representativeness of the NESARC-III is a core strength of the data set, and a sample of 36, 309 participants significantly increases the reliability of statistical outcomes, it was decided that the 'complex' function would be applied at the expense of BC bootstrapping techniques. The SEM models again were conducted in Mplus version 7.4 (Muthen & Muthen, 2013) using the weighted least squares means and variances adjusted (WLSMV) estimator, as appropriate for categorical data (Flora & Curran, 2004). As with phase one, there was minimal missing data (3.9%), and this was handled using the default pairwise deletion method for the WLSMV estimator in Mplus.

3.6 Phase Three

3.6.1 Participants and Procedures

Phase three of the current thesis involved primary data collection via an online cross-sectional survey design with individuals who has spent time in institutional care facilities prior to their 18th birthday.

3.6.2 Recruiting a Hard to Reach Population

The literature indicates that institutional abuse survivors are a highly traumatised population with a high prevalence of psychiatric disorders (Carr et al., 2010, 2019, 2020). Moreover, consultation with those who have previously worked with survivors of institutional abuse caution that members of this community can be understandably sceptical of participating in research studies. In light of this, I involved three of the largest institutional abuse survivor advocacy groups in Ireland, including 'Survivors and Victims of Institutional Abuse Northern Ireland' (SAVIA-NI), the 'Aislinn Centre', and 'Right of Place' throughout various stages of the research process. Specifically, directors of institutional abuse survivor advocacy groups were involved to ensure that study

procedures were ethical, caused the minimal amount of distress as possible, and were generally acceptable to this population group.

In February 2017, I travelled to Northern Ireland to meet with the head of SAVIA NI to discuss the viability of conducting this research with consideration for how to recruit and inform potential participants; risk of re-traumatisation; the accessibility of the study, participant information leaflets, and consent forms; and most importantly, the implications of this research for survivors of institutional abuse. These same issues were also discussed with the directors of Right of Place and the Aislinn Centre in June and September of 2017, respectively.

A number of recurring themes emerged from my discourse with survivor advocacy groups, which subsequently informed the study procedures. First, survivor advocacy groups were concerned about the length of time required to complete the research study, suggesting that a maximum of 30 minutes would be acceptable to their members. Second, the language within the psychometric measures was deemed too complex, resulting in adaptations of items in order to enhance the prospect of engagement from members of survivor advocacy groups. Finally, and given the that numerous members were living across varying locations in the Republic and Northern Ireland, some advocacy groups suggested the use of online methods to increase the prospect of greater participation. Taking this information on board, I continually engaged with these advocacy groups throughout 2018 and 2019 to ensure that the suggestions proposed were implemented. This engagement involved sending drafts of revised measures to the directors of the survivor advocacy groups to gauge the accessibility and duration of the study.

3.6.3 Participants

Data utilised in this phase of the study were ultimately gathered from two independent sources and combined to create a single cohort. The first sample, henceforth referred to as 'Sample 1', consisted of twenty-six individuals who had spent time in state care prior to their 18th birthday. These participants completed an online survey. There was substantial missing data in this cohort which resulted in only 13 cases being viable data sources. The second sample, henceforth referred to as 'Sample 2', were 32 participants who endorsed a question enquiring if they had spent time in state care prior to their 18th birthday, as part of a larger nationally representative survey of the Republic of Ireland (Hyland et al., 2020).

Data for Sample 1 were collected by circulating an online link to the directors of survivor advocacy groups mentioned above. In addition, data were also collected across social media platforms (e.g. Facebook and Twitter) via Survey Monkey. More specifically, institutional abuse survivor support groups operating on Facebook and Twitter were contacted and asked to share a link to the survey with members of their online groups. The average time for completion of this survey was 9 minutes. Following the completion of the survey, participants were reminded of the potential distressing nature of some of the questions contained in the study and were directed to a list of psychological care providers, should the need arise. All data were anonymised (e.g. participant 1) to protect respondents' identities.

Data for Sample 2 was collected as part of a large (N = 1020) nationally representative survey of the Republic of Ireland designed to estimate the prevalence of PTSD and CPTSD in the general adult population (see Hyland et al. 2020). All data for this survey were collected by an Irish based survey company, Qualtrics. Qualtrics is a global survey company who use panels of research participants in varying countries to

collect research data. Qualtrics remunerate panel members on a general rather than a study-by-study basis in an attempt to minimise biased responses from participants. For this study, panel members were selected via stratified, random probability sampling methods to ensure the national representativeness of the sample, in accordance with the 2016 census of the Republic of Ireland's population. Three demographic variables were essential to this process. They included sex, age, and geographical distribution, and were compared with 2016 census data to ensure their accuracy. Information regarding non-responses was not available. Qualtrics employed online methods of data collection, contacting panel members via email, SMS, or in-app notification. To ensure that responses were trustworthy, surveys completed in less than 7 minutes were not included, with the median time for completion of the survey being 22 minutes.

Both surveys assessed a compatible range of demographic, clinical, social, and psychological variables. They included age, sex, income, and relationship status, measures of psychosis (e.g. 'Adolescent Psychotic-Like Symptom Screener scale [APSS]; Kelleher et al., 2011); CPTSD (e.g. ITQ; Cloitre et al., 2018); and adverse childhood experiences (e.g. ACE; Felitti et al., 1998). Subsequent to ensuring that the scoring and coding of items was consistent across all measures contained in Samples 1 and 2, both data sets were merged to create an overall sample (N = 45) of adults who had spent time in state care prior to their 18th birthday. The majority of the current sample were female (62.2%), born in Ireland (75.6%), and in a committed relationship (64.4%). Table 3.4 provides full details of the descriptive statistics of the current sample. Independent descriptive statistics tables for Sample 1 and Sample 2 are displayed in Appendix B and C.

Table 3.4 Descriptive statistics for the sample participants (N = 45)

	N (%)
Sex	
Male	17 (37.8)
Female	28 (62.2)
Age in Years	
18-29	16 (35.6)
30-44	16 (35.6)
45-59	5 (11.1)
60+	8 (17.8)
Place of birth	
Republic of Ireland	34 (75.6)
Outside of Ireland	11 (24.4)
Income	
On or above median wage	22 (48.9)
Below median wage	23 (51.1)
Relationship status	
In a committed relationship	29 (64.4)
Not in a committed relationship	16 (35.6)

3.6.4 Measures

3.6.5 Psychosis

Psychotic-like symptoms were measured using a revised version of the APSS (Kelleher et al., 2011). Kelleher et al.'s original scale sought to measure multiple psychotic symptoms over a brief period of time using seven items that reflected core psychotic symptomology. Four of the items in the APSS were derived from the Diagnostic Interview Schedule for Children (Costello et al., 1982; Poulton et al., 2000) including 'mind reading' (e.g. '*Some people believe that their thoughts can be read by another person. Have other people ever read your mind?*'); 'TV/radio' (e.g. '*Have you ever had messages sent just to you through TV or radio?*'); 'spying' (e.g. '*Have you ever thought that people are following you or spying on you?*'); and 'auditory hallucinations' (e.g. '*Have you ever heard voices or sounds that no one else can hear?*'). In addition, three questions were added by Kelleher et al. (2011) to capture visual hallucinations (e.g. '*Have you ever seen things that other people could not see?*'); delusions of control (e.g. '*Have you ever felt you were under the control of some special power?*'); and delusions of grandiosity (e.g. '*Have you ever felt like you had extraspecial powers?*').

In the initial APSS conceptualisation, individual items were measured on a three-point Likert-scale: 'Yes' (1), 'Maybe' (0.5), and 'No' (0), with total scores over 2 indicating a vulnerability to clinical psychotic symptoms (Kelleher et al., 2011). The current study made use of a revised version of the APSS, which measures these seven items in terms of their frequency and whether these experiences were distressing to the individual (See Murphy et al., 2015), and which has been demonstrated to be a valid and reliable measure (Nolan et al., 2018). To reduce the cognitive load on participants – and on the recommendation of the survivor groups - an adaptation was made to the APSS in the current study. Usually, the revised version of the APSS measures the frequency of a

psychotic experience, and then enquires in a follow-up question whether this experience caused the respondent any distress. In the current study, the frequency and distress items were merged. As an example, 'auditory hallucinations' were measured 'Have you ever heard voices or sounds that no one else can hear?' and participants could respond in one of three ways (1) No; (2) Yes, but this does not upset me; and (3) Yes, and this upsets me. Responses that did not endorse distress associated with a psychotic experience (e.g. = 1 or = 2) were coded '0' and questions that associated distress with psychotic experiences (e.g. = 3) were coded '1'. An indicator of psychosis was thus deemed present if a participant endorsed experiencing and being distressed by a symptom. To match the scoring of the APSS used in sample 1, frequency and distress items in Sample 2 were combined and recoded to follow the logic used in Sample 1. All seven recoded items were then summed to create a total score of psychosis. Scores ranged from 0-7 with higher scores indicating higher levels of psychosis-like symptoms. The internal reliability (Cronbach's alpha) of the scale in the current study was excellent ($\alpha = .94$).

3.6.6 CPTSD

CPTSD symptoms were measured using the International Trauma Questionnaire (ITQ; Cloitre et al., 2018), a self-report measure based on the ICD-11 diagnostic manual (World Health Organization, 2020). In line with ICD-11 principles, the ITQ aims to maximise clinical utility and global applicability by focusing on core symptoms of PTSD and CPTSD (Cloitre et al., 2018). First, respondents were asked to designate a traumatic experience (e.g. verbal, physical, and sexual abuse, and emotional and physical neglect) which troubles them the most and answer questions in relation to this experience. PTSD symptoms were then assessed using six symptoms items. Three symptom clusters were measured using two items for each cluster, including: 'Re-experiencing in the here and now' (e.g. '*Having upsetting dreams that replay part of the experience or are clearly*

related to the experience?'); 'Avoidance' (e.g. '*Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)?*'); and 'Sense of current threat' (e.g. '*Being "super-alert", watchful, or on guard?*'). An additional three items assessed functional impairment related to PTSD symptoms with regards to relationships or social life, work life, and important activities such as parenting, or educational commitments. Symptom and functional impairment items were measured on a five-point Likert-scale, ranging from 'Not at all' (scored '0') to 'Extremely' (scored '1'). To assess disturbances of self-organisation (DSO) symptoms, an additional six items are used. Two items measured 'Affective dysregulation' (e.g. '*I feel numb or emotionally shut down*'); two items measured 'Negative self-concept' (e.g. '*I feel worthless*'); and two items measured 'Disturbed relationships' (e.g. '*I find it hard to stay emotionally close to people*'). As with PTSD symptoms, questions assessing DSO were followed by three related functional impairment items. DSO and functional impairment items were also measured on a five-point Likert scale ranging from 'Not at all' (scored '0') to 'Extremely' (scored '1').

To meet the diagnostic requirements for PTSD, a score of '2' (e.g. '*Moderately*') or greater on at least one item in each of the 'Re-experiencing in the here and now', 'Avoidance', and 'Sense of current threat' clusters must be endorsed, in addition to the endorsement of at least one functional impairment item. The CPTSD diagnostic criteria specifies that all PTSD criteria must be satisfied, and that at least one symptom in each of 'Affective dysregulation', 'Negative self-concept', and 'Disturbed relationships' must be endorsed by a score of 2 or greater, in addition to one functional impairment item associated with these symptom (Murphy et al., 2020). Diagnostic criteria, as per the ICD-11 guidelines, only permit a diagnosis of PTSD or CPTSD, but not both (Cloitre et al., 2018).

Items were summed to create total scores for PTSD and CPTSD according to scoring guidelines outlined by Cloitre et al. (2018). A comprehensive description of the ITQ's contents, scoring, and diagnostic criteria is freely available from https://www.traumameasuresglobal.com/itq. The ITQ has been thoroughly validated in diverse populations (Haselgruber et al., 2020; Ho et al., 2019; Karatzias et al., 2017). The reliability of the PTSD items (α = .91), the DSO items (α = .82), and the total scale score (α = .91) were excellent in the current sample.

3.6.7 Childhood Interpersonal Trauma

Childhood interpersonal trauma was measured using a contracted version of the Adverse Childhood Experiences Scale (ACE; Felitti et al., 1998). To minimise the length of the questionnaire for participants, five items were selected from a total of ten, measuring verbal/emotional abuse (i.e. being sworn at, insulted, put down, humiliated, or being otherwise made to feel afraid by an adult); physical abuse (i.e. being physically attacked by an adult); sexual abuse (i.e. being sexually assaulted by an adult); emotional neglect (i.e. developmental emotional needs not being fulfilled); and physical neglect (i.e. developmental physical needs not being fulfilled). Different prefixes were also attached to the adverse experiences in Sample 1 (e.g. '*During your time in an institution did an adult ever touch or fondle you or have you touch their body in a sexual way? or try to or actually have oral, anal, or vaginal sex with you?*') and Sample 2 (e.g. '*Did a parent or other adult in the household often push, grab, slap, or throw something at you? or ever hit you so hard that you had marks or were injured?*'). Respondents indicated if an event occurred during the first 18 years of life on a 'Yes' (scored '1') or 'No' (scored '0') basis. A total childhood interpersonal trauma variable was created by summing the five individual items, with scores ranging from 0 to 5, with higher scores indicating higher levels of childhood interpersonal trauma.

3.6.8 Demographics

Several demographic variables were comparable across the two samples including age, sex (Male = 0, Female = 1), relationship status ('in a committed relationship' = 0, 'not in a committed relationship' = 1), and socio-economic status ('below the median wage' = 0, and 'on or above the median wage' = 1).

3.6.9 Analytic Strategy

The proportion of endorsement of each psychosis and CPTSD symptom were calculated, along with endorsement levels for each childhood interpersonal trauma event. Additionally, the proportion of the sample meeting the diagnostic requirements for PTSD and CPTSD were estimated. Next, assessments of normality were conducted to the distribution of scores for psychosis, CPTSD, and childhood interpersonal trauma. This was considered necessary given that the literature indicates that individuals who have spent time in state care display high levels of childhood adversity and psychopathology related to stress response (Carr et al., 2010, 2019, 2020; Lueger-Schuster et al., 2014, 2018). Normality was assessed as per Tabachnick and Fidell's (2013) recommendations. Given the small sample size, the Kolmogorov-Smirnov test would be underpowered rendering any results untrustworthy (Ghasemi & Zahediasl, 2012).

Initially it was planned to test the association between psychosis and CPTSD symptoms using a bivariate correlational analysis. However, psychosis was non-normally distributed in the current sample, and therefore Pearson's correlation analysis was not viable. A Pearson's correlation analysis assumes that the distribution of scores on the X and Y variables are normally distributed (Casson & Farmer, 2014). On the other hand, a Spearman's Rho correlation analysis assumes that the distribution on the X variable must be monotonically related to the Y variable. A monotonic relationship is dependent on either an increase in X influencing an increase in Y, or a decrease in X influencing an

increase in Y (Ghasem & Zahediasl, 2012). Inspection of the scatterplot assessing the relationship between data points of psychosis and CPTSD revealed a non-monotonic association between psychosis and CPTSD in the current sample.

Alternatively, an independent samples t-test is a robust analysis of differences in mean scores of variables that are not normally distributed (Ugiana et al., 2018). Moreover, and importantly, an independent samples t-test only requires that the dependent variable is normally distributed. As such, PTSD and CPTSD continuous variables were treated as dependent variables and the psychosis continuous variable was dichotomised to reflect the presence (scored '1') or absence (scored '0') of psychosis symptoms. Consequently, it was possible to test the difference in mean scores of PTSD and CPTSD in those with and without psychotic symptoms. In addition, chi-square tests were employed to assess the association between psychotic symptoms (i.e., present or absent) and meeting the diagnostic criteria for PTSD (Yes or No) and CPTSD (Yes or No). All analyses were conducted using SPSS (Version 25).

3.6.10 Ethical Considerations

Some questions related to information such as child abuse and psychotic symptoms were potentially distressing. Although unlikely (Jaffe et al., 2015), there was a possibility that individuals might experience distress when recalling psychotic-like symptoms, as the symptoms in and of themselves can be distressing. It is more likely however, that some individuals may have become distressed when recalling incidences of child abuse. As stated above, information for contact information for local psychological care professionals was therefore provided following the completion of the online survey, and participants were encouraged to contact such professionals if they became distressed. Prior to commencement of the study, potential participants were clearly informed through an information leaflet within the online survey of their right to discontinue participation

without warning. Ethical approval for data collection from Sample 1 was obtained from the Health Policy & Management / Centre for Global Health Research Ethics Committee in Trinity College Dublin, Ireland. Informed consent was gathered by Qualtrics and ethical approval for the original study was obtained from the Social Research Ethics Committee at Maynooth University (see Hyalnd et al., 2020 for further details). Ethical approval for the use of this data as part of phase three of study was provided by Health Policy & Management / Centre for Global Health Research Ethics Committee in Trinity College Dublin, Ireland.

3.6.11 Consent

Prior to engaging with this research study, prospective participants were asked to read information related to the study, their rights as participants, their right to discontinue participation, and where they could access psychological care providers should they become distressed during or after participation. The participants could not proceed to the research study without acknowledging that they had read and understood the information related to the online study. Consent was provided by participants by ticking a number of boxes, which indicated that they agreed with a number of statements related to the information and their participation in the study. These statements included (i) All of my questions, as they pertain to this research, have been answered; (ii) I have read and understood the participant information leaflet; (iii) That my participation is entirely voluntary; (iv) That I can exit the survey at any time and I do not have to answer any questions that I do not feel comfortable answering; (v) That due to the anonymous nature of the survey, once I have submitted my survey, my responses cannot be withdrawn; (vi) I am aware that the results from this survey are being used for research purposes and may be published in the future; (vii) I give consent to participate in this study. Participants

could not continue to the research study with ticking each box that accompanied the statements above.

3.6.12 Data Storage

All data used in all three phases were stored on stored on password-protected devices such as my personal laptop and desktop, which remained on the grounds of Trinity College Dublin. The storage of all data adhered to article 5 of the GDPR 2018 principles for processing personal data. As such, all data were handled in a manner that ensured adequate security, and were protected from risk of destruction, unauthorised access, and illegal processing. This was ensured by securing all data on pin-protected devices which only the principal researcher had access to. Data will continue to be stored on these devices until June 2021 – in line with contractual obligations with the The National Institute on Alcohol and Abuse and Alcoholism. Data will be destroyed by permanently deleting the NESRC-III and derivatives from the hard drives of my laptop and desktop

Chapter 4: Exploring the Nature of Psychosis in the General Adult US Population

4.1 Chapter Outline

This chapter presents the results of the first phase of the study and addresses the first and second research objectives by answering the first three research questions:

1. Is the latent structure of psychosis best represented by a unitary, multidimensional, or bifactor model?
2. Do the latent dimensions of psychosis (as identified in objective 1) possess acceptable reliability and replicability?
3. To what extent are the latent dimensions of psychosis (as identified in objective 1) associated with environmental, developmental, social, psychological, and demographic factors, including childhood trauma, perceived social support, attempted suicide, age, sex, socio-economic status, urbanicity, and ethnicity?

As outlined in section 3.4.12, these questions were addressed in three steps. First, confirmatory factor analysis and confirmatory bifactor modelling are used to determine the optimal measurement model of psychosis in the general US population, testing a series of models including a single dimension, multidimensional, and multiple variations of bifactor models using data from the National Epidemiological Survey on Alcohol and Related Conditions (NESARC-III). Symptoms of psychosis were modelled from multiple measures of psychopathology derived from the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5), in line with procedures adopted in previous research (Shevlin et al., 2016). Second, reliability and replicability of individual dimensions were within the selected measurement model were assessed using bifactor

strength indices advocated by Rodriguez et al. (2016). Finally, SEM analysis was used to assess the association between age, sex, socio-economic status, urbanicity, ethnicity, childhood interpersonal trauma, social support, suicide attempt and the dimensions of the selected measurement model.

4.2 Results

4.2.1 Descriptive Statistics

The most commonly reported form of childhood interpersonal trauma was emotional neglect (53.3%), followed by emotional abuse (43.4%), physical abuse (35.4%), physical neglect (34.4%), and sexual abuse (11.5%). A quarter of the sample did not experience childhood interpersonal trauma (25.2%). A minority of the sample had attempted suicide (5.5%). Levels of perceived social support were high (*M* = 10.46; *SD* = 2.10; *Range* = 0 - 12) in the current sample. Information related to the demographics of the NESARC-III sample can be seen in section 3.4.1.

4.2.2 The Latent Structure of Psychosis

The model fit results are presented in Table 4.1. Model 1, the unidimensional model of psychosis, yielded good model fit according to the CFI, TLI, and RMSEA results. The correlated two-, four-, and five-factor models also fit the data very well. Based on the ΔRMSEA results there was no significant improvement in model fit between the unidimensional and multidimensional models of psychosis. The bifactor models (Models 2b-4b) fit the data closely and were statistically superior to the unidimensional and multidimensional models (all ΔRMSEA values were > .015).

The bifactor pentagonal model (Model 4b) fit the data well, however, as with Shevlin et al.'s (2016) findings, a high correlation was found between the 'Negative' and 'Depression' dimensions (*r* = .95). Model 3b, which combines these two dimensions, was

statistically indistinguishable from the bifactor pentagonal model. On the grounds of model parsimony and avoiding issues related to lack of discriminant validity between these dimensions in the SEM analysis, Model 3b (Figure 4.1) was selected as the best representation of the latent structure of psychosis symptoms in this sample, as it balanced theoretical and statistical interpretability.

Table 4.1 Model fit results for the alternative models of psychosis (N = 36, 309)

	χ^2	df	CFI	TLI	RMSEA 90% CI
Model 1	10192.82*	230	.955	.951	.035 (.034-.035)
Model 2	9043.98*	229	.960	.956	.033 (.032-.033)
Model 2b	1078.67*	206	.996	.995	.011 (.010-.011)
Model 3	7636.78*	224	.967	.962	.030 (.030-.031)
Model 3b	**890.36***	**201**	**.997**	**.996**	**.010 (.009-.010)**
Model 4	5968.70*	220	.974	.970	.027 (.026-.027)
Model 4b	783.84*	197	.997	.997	.009 (.008-.010)

Note: χ^2 = chi-square goodness of fit statistic; df = degrees of freedom; RMSEA = Root-Mean-Square Error of Approximation with 90% Confidence Intervals; CFI = Comparative Fit Index; TLI= Tucker Lewis Index. *Indicates χ^2 are statistically significant (p < 0.001). Best fitting model is in bold.

The factor loadings and factor correlations for Model 3b are presented in Table 4.2. The 23 psychosis symptoms loaded positively, significantly ($p < .001$), and robustly (mean factor loading = .67) on the General psychosis dimension. In relation to the specific dimensions, the six positive symptoms loaded positively and significantly ($p < .001$) onto this dimension with a mean factor loading of .40. Ten of the eleven negative

symptoms loaded onto this dimension positively and significantly ($p < .001$) with a mean factor loading of .51. The three manic symptoms loaded positively and significantly ($p < .001$) onto this dimension with a mean factor loading of .39. Finally, the three disorganized symptoms items loaded positively and significantly ($p < .001$) onto this dimension with a mean factor loading of .26. The correlations between the four specific dimensions ranged from .23 (Disorganization and Negative) to .47 (Negative and Mania). The Disorganization and Mania dimensions were not significantly correlated.

Table 4.2 Standardized factor loadings (and standard errors) and factor correlations for Model 3b

	General	**Positive**	**Negative**	**Mania**	**Disorganization**
	β (SE)	**β (SE)**	**β (SE)**	**β (SE)**	**β (SE)**
Delusions	.68(.02)	.47(.05)			
Hallucinations	.66(.03)	.44(.05)			
Grandiosity	.59(.02)	.55(.05)			
Suspiciousness	.80(.01)	.35(.03)			
Unusual thought content 1	.85(.01)	.13(.04)			
Unusual thought content 2	.70(.02)	.46(.04)			
Blunted affect	.75(.01)		.10(.02)		
Emotional withdrawal	.83(.01)		.28(.02)		
Poor rapport	.80(.01)		-.01(.03)		

Motor retardation	.45(.02)	.72(.01)		
Disturbance of volition	.46(.02)	.84(.01)		
Active social avoidance	.61(.02)	.36(.02)		
Passive social withdrawal	.82(.01)	.15(.02)		
Depression	.51(.02)	.78(.02)		
Guilt	.46(.02)	.80(.01)		
Tension	.47(.02)	.79(.01)		
Anxiety	.48(.02)	.83(.01)		
Excitement	.52(.02)		.54(.04)	
Hostility	.72(.01)		.33(.03)	
Impulsivity	.74(.01)		.29(.03)	
Concept disorganization 1	.82(.01)			.26(.06)
Concept disorganization 2	.88(.01)			.18(.04)
Mannerisms and posturing	.83(.02)			.33(.06)
Factor Correlations				
Positive		.25(.05)	.37(.07)	.23(.10)
Negative			.47(.04)	.27(.07)

Mania					-.04(.11)
Disorganization					
Reliability and					
Replicability					
Ω	.65	.06	.24	.03	.01
ωH	.84	.22	.41	.21	.08
Ωr	.85	.24	.42	.26	.09
H	.97	.58	.92	.39	.19

Note: All correlations are statistically significant (p < .001) with the exceptions of 'Poor rapport' with the negative factor and the mania factor with the disorganization factor.

4.2.3 Reliability and Replicability of the Psychosis dimensions

The reliability and replicability indices for each dimension from Model 3b are presented in Table 4.2. The General dimension explained 84% of the reliable item variance, controlling for the specific dimensions (ωR = .84). The Positive (ωR = .24), Negative (ωR = .42), Mania (ωR = .26), and Disorganization (ωR = .09) specific dimensions did not explain a satisfactory level of reliable item variance, controlling for the General dimension. High H values for the General and Negative dimensions indicated that they were well defined latent variables. However, satisfactory H values were not observed for the Positive, Mania, and Disorganization dimensions, indicating that they may lack sufficient construct replicability.

4.2.4 Psychosis Dimensions and Risk Variables

The SEM model of psychosis provided an excellent fit of the data (χ^2 (345) = 1120.67, p < .001; CFI = .994; TLI = .992; RMSEA = .008 [95% CI = .008 - .009]), and explained 19% of variance in the general psychosis dimension, 7% of the variance in the Positive dimension, 13% of variance in the Negative dimension, 7% of variance in the Mania dimension, and 10% of variance in the Disorganization dimension (all *p*s < .001). The multivariate associations between the risk variables and the General and specific dimensions of psychosis are reported in Table 4.3.

The General dimension of psychosis was most strongly associated with higher levels of childhood interpersonal trauma. It was also significantly associated with younger age, diminished social support, attempting suicide, being male, lower socio-economic status, and majority ethnic status. The Positive dimension of psychosis was most strongly associated with minority ethnic status, and was also significantly associated with lower socio-economic status, older age, and attempting suicide. The Negative dimension was most strongly associated with being female and was also significantly associated with attempting suicide, majority ethnic status, and childhood interpersonal trauma. The Mania dimension was most strongly associated with attempting suicide, and was also significantly associated with being male, childhood interpersonal trauma, younger age, lower socio-economic status, and increased social support. Finally, the Disorganization dimension was most strongly associated with older age, and was also significantly associated with minority ethnic status, lower socio-economic status, and was negatively associated with childhood interpersonal trauma.

Table 4.3 Standardized regression coefficients from structural equation modelling results

	General	Positive	Negative	Mania	Disorganization
	R^2 = 19%	R^2 = 7%	R^2 = 13%	R^2 = 7%	R^2 = 10%
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Age	-.18(.01)***	.13(.03)***	.01(.01)	-.09(.03)**	.24(.05)***
Sex	.08(.01)***	-.05(.03)	-.22(.01)***	.12(.02)***	-.09(.05)
Income	-.06(.01)***	-.13(.03)***	.00(.01)	-.08(.03)**	-.11(.05)*
Urbanicity	-.01(.02)	-.05(.03)	.01(.01)	-.02(.03)	-.03(.06)
Ethnicity	-.05(.01)***	.18(.03)***	-.13(.01)***	-.01(.02)	.15(.04)**
Childhood interpersonal trauma	.24(.01)***	.01(.03)	.11(.01)***	.12(.02)***	-.11(.04)*
Social support	-.18(.01)***	.03(.02)	-.02(.01)	.07(.02)**	.05(.04)
Suicide attempt	.13(.01)***	.07(.02)***	.17(.02)***	.14(.02)***	.02(.03)

Note: Statistical significance = *p < .05, **p < .01, ***p < .001.

4.3 Discussion

The first phase of the study was primarily concerned with determining the optimal measurement model of psychosis within a general population sample. The extant literature assessing the most appropriate latent variable model of psychosis consistently supports a bifactor pentagonal model consisting of a General dimension which accounts for the shared variance amongst affective and non-affective symptoms orthogonal to five specific dimensions of positive, negative, depressive, manic, and disorganized symptoms (Quattrone et al., 2019; Reininghaus et al., 2013, 2016, 2019). However, the existing literature is limited in that, to date, only a single study has assessed the validity of a bifactor pentagonal model of psychosis within a general population sample (Shevlin et al., 2016). Moreover, this study raised further questions as to whether the Negative and Depression dimension might be better conceptualised as a single construct at the general population level (Shevlin et al., 2016).

4.3.1 Latent Structure of Psychosis

A bifactor model containing a General dimension uncorrelated with four, rather than five, specific dimensions of positive, negative, manic, and disorganized symptoms provided the most appropriate measurement model in the current sample. As with the findings of Shevlin et al. (2016), the Negative and Depression dimensions within the bifactor pentagonal model were correlated above .9 (r = .95) in the current study. Therefore, and although the bifactor pentagonal model also provided an excellent fit of the sample data, the high correlation between the Negative and Depression dimensions undermined their discriminant validity. The symptoms of the Depression and Negative dimensions were thus combined to load onto a single latent dimension to represent ‘negative’ symptoms. This, however, does not mean to definitively suggest that these constructs should be collapsed into a single dimension in future practice, with clear and valid clinical and research reasons to uphold their distinction. Negative symptoms are a core feature of psychosis and are particularly important

for predicting clinical outcomes of psychotic disorders across the schizophrenic spectrum, from schizotypal personality disorder to schizophrenia (Strauss et al., 2010). Moreover, negative symptoms are strongly related to quality of life and recovery rates of psychotic disorders (Fervaha & Remington, 2013; Piskulic et al., 2020; Strauss et al., 2010). Similarly, depressive symptomology represents a core feature of affective psychotic disorders (Bentall, 2004). Studies have demonstrated the clinical utility of bifactor models in correctly classifying categorical diagnoses of psychotic disorders (Reininghaus et al., 2013, 2016). Maintaining the distinction between specific dimensions within the bifactor model of psychosis is important for accurate classification in clinical settings. For example, if the Depression and Negative dimensions were collapsed into a single Negative dimension in all future models, a considerable proportion of specificity would be lost in classification. The capacity to provide a diagnosis of psychotic depression (e.g. high scores on the Positive & Depression dimensions) would be considerably affected were the Depression dimension to be incorporated into the Negative dimension, as higher scores on negative symptoms may be driven by depressive symptoms, and not necessarily negative symptoms. Ultimately, a bifactor model of psychosis must be a clinically useful tool, and therefore, maximising the specificity of individual symptom dimensions is paramount to this endeavour (van Os & Reininghaus, 2016).

From a research perspective, studies in clinical samples using more precise measures of psychotic symptoms than in the current study have consistently demonstrated adequate discriminant validity between the Negative and Depression dimensions, allowing for the testing of associations between recognised risk factors for psychosis and the specific psychosis dimensions (Quattrone et al., 2019; Reininghaus et al., 2019). Examining the association between recognised risk factors for psychosis and each of the five specific dimensions (e.g. Positive, Negative, Depression, Mania, and Disorganization) provides the

capacity to further extant theory and knowledge by potentially gaining a greater understanding of the aetiology of psychosis. Understanding how each of the specific symptom constellations of psychosis relate to individual risk factors for psychosis, after statistically controlling for the shared variance across all psychosis symptomology, offers a novel approach to understanding the development and onset of psychotic symptoms.

A four-dimension bifactor model, presented in Figure 4.1, was ultimately chosen as the optimal measurement model in the current study for a number of reasons. Firstly, the correlation above .9 (r = .95) between the Negative and Depression dimensions made meaningfully interpreting the variation within each construct difficult. Recommendations proposed by Green et al. (2019) indicate that statistical interpretability is an important factor to consider when choosing measurement models of psychopathology. Secondly, and given the third research objective of correlating risk variables with the General and specific dimensions, when the bifactor pentagonal model was entered into an SEM framework, the high correlation between the Negative and Depression dimensions prevented the SEM model from converging. Therefore, there was a disparity between the performance of the bifactor pentagonal model on the measurement and structural components of the SEM framework. Third, the four-dimensional bifactor model offered a more parsimonious explanation of the sample data in comparison to the bifactor pentagonal model, as well as performing well in both the measurement and structural analyses. Taken together, these metrics indicated that a four-dimension bifactor model offered the optimal representation of the latent structure of psychosis in the current sample.

Figure 4.1 A bifactor four-factor model of psychosis

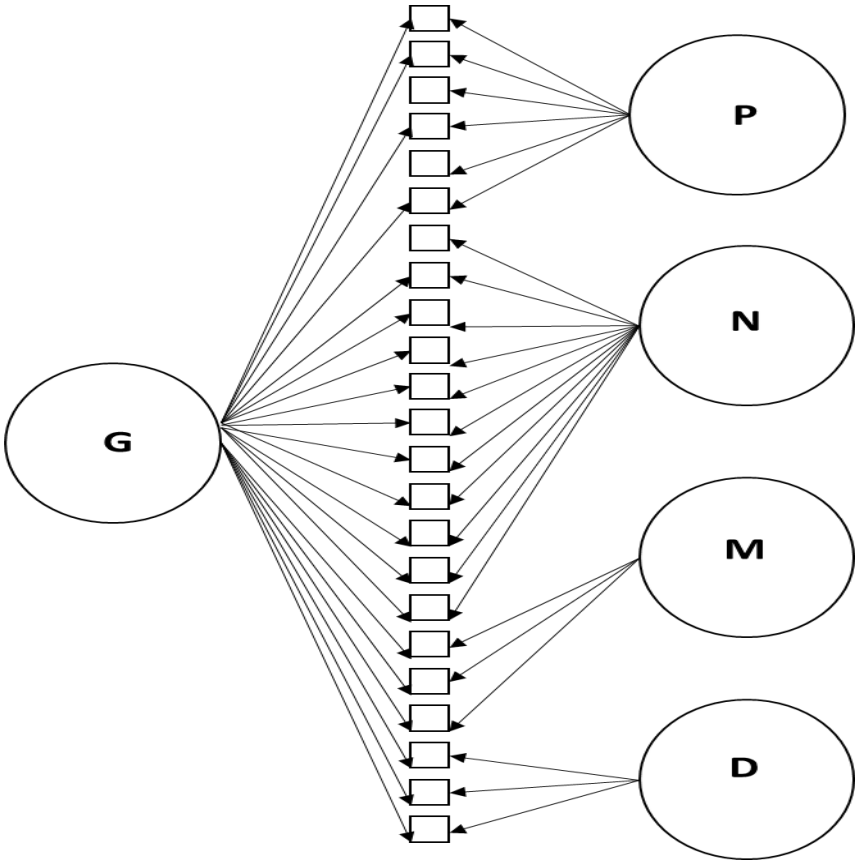


Figure 4.1 depicts a bifactor four-dimension model of psychosis. Note G = General dimension, P = Positive dimension, N = Negative dimension, M = Mania dimension, D = Disorganization dimension.

At this point, it is worth acknowledging that the selection of a four-dimension bifactor model does not invalidate the bifactor pentagonal model found in previous research. The absence of distinction between the Negative and Depression dimensions in the current study, similar to those found by Shevlin et al. (2016), are likely due to methodological limitations associated with using NESARC data sets. A number of indicators used to measure the Negative and Depression dimensions were gathered from the same section of the AUDADIS-5, with a high correlation between the two dimensions possibly an artefact of item ordering (Marshall et al., 2013). That said, the overarching outcome is consistent with Shevlin et al. (2016) and indeed the clinical literature (Quattrone et al., 2019; Reininghaus et al., 2013, 2016, 2019) in that the distinction between affective and non-affective symptoms of

psychosis is arbitrary. Moreover, the application of a General dimension systematically improved the fit of each multidimensional model when tested, indicating the necessity for a General dimension when considering the latent structure of psychosis within a general population. However, as noted by Greene et al. (2019) model fit alone is not sufficient to determine the optimal measurement model of psychosis within the general population.

4.3.2 Construct Reliability and Replicability

The General dimension performed excellently on each of the bifactor strength indices, with the exception of the omega reliability coefficient, indicating that this is a well-defined and reliable representation of psychosis symptomology in the US general population. Conversely, each of the specific dimensions did not meet the criteria to be considered reliable and replicable latent constructs, with the exception of the Negative dimension which returned a high index H value, indicating that this particular dimension was well-defined and likely to be replicated in future research studies. The lack of reliability and replicability in the specific dimensions is not consistent with recent research that has thus far applied the same statistical analyses to bifactor models of psychosis in clinical samples, which found the General and specific dimensions to display adequate reliability and replicability (Quattrone et al., 2019; Reinginghaus et al., 2019). As this is the first study to apply these analyses in a general population sample, it is difficult to make direct comparisons to previous research however the discrepancy in performance of the General and specific dimensions may have occurred for a number of reasons.

Previous research with patients with acute and enduring psychosis revealed that the General dimension was more pronounced in the early stages of psychotic disorders; patients in the early stages of psychotic illness displayed higher scores on the General dimension in comparison to those who were diagnosed with enduring psychosis (Reininghaus et al., 2013). Considering that the General dimension captures the variation in all affective and non-

affective symptoms, it is likely that this particular construct is more pronounced in earlier stages of illness, as it represents a vulnerability to all forms of psychosis, and that clinical features of psychotic illness do not become manifestly distinct from general psychosis until the illness progresses in severity. Shevlin et al. (2016) additionally noted that it is difficult to measure some clinical features of psychosis such as symptoms of cognitive disorganization without clinical observation, which may have also confounded the results in the current study. Preliminarily, the current results indicate that within the general population the nature of psychosis is predominantly represented by a vulnerability to affective and non-affective symptomology, and not necessarily specific symptoms.

4.3.3 Risk Variables

The results demonstrated quite a unique pattern of associations between the General and specific dimensions and each of the risk variables. Lower socio-economic status and a history of attempted suicide were the only two risk variables that displayed a consistent pattern of association with the General and specific dimensions. Socio-economic status was negatively associated with the General, Positive, Mania, and Disorganization dimensions, whereas attempted suicide was positively associated with the General, Positive, Negative, and Mania dimensions. These findings are interpreted as lower socio-economic (below the median wage) status and having attempted suicide as increasing an individual's vulnerability to all forms of psychotic symptomology.

There were differential patterns of association observed for other variables within the SEM model. Ethnic minority status (i.e., non-white US citizen) was associated with increased scores on the Positive and Disorganization dimensions, a finding that is consistently demonstrated in the literature (Anglin et al., 2014; Oh et al., 2014; Veling, 2013). These findings are also consistent with the social identity approach of psychosis, which proposes that ethnic minority status is a significant risk factor for positive and disorganized symptoms

(McIntyre et al., 2016). However, contrary to recent research (Quattrone et al., 2019; Reininghaus et al., 2019), being a part of an ethnic majority group (i.e. white US citizens) was associated with increased scores on the General dimension in the general US population. This finding informs a key area for future research proposed by McIntyre et al. (2016) when they first introduced the social identity approach. Here, the authors rightly suggested that if being a member of an ethnic minority group in a non-indigenous country is a risk factor for psychotic symptomology, then logic dictates that being a member of a majority ethnic group should wield a protective effect. Thus, it would appear that this hypothesis does not hold true. However, there is limited research assessing the association between ethnicity and the General dimension of psychosis and therefore it is difficult to make concrete interpretations of the current findings. One possible explanation for the current findings might be that White ethnic groups may be more vulnerable to affective symptoms such as depression. Being of White ethnicity has been continually demonstrated to increase the vulnerability to depressive symptomology in the US. A systematic review revealed a considerably higher prevalence rate of major depressive disorders amongst White ethnic group members of the US in comparison to their Black counterparts (Barnes & Bates, 2017). In addition, in a study assessing the risk of affective symptomology prior to the onset of mania, White ethnicity was shown to significantly increase the likelihood of developing affective symptoms such as depression, in comparison to African and Afro-Caribbean ethnic groups (Kennedy et al., 2004). In the current study, White ethnicity was positively associated with both the General and Negative symptom dimensions. Quattrone et al. (2019), using a bifactor pentagonal model of psychosis - where the Negative and Depression dimensions were entered into a structural model as distinct latent constructs - showed that Black ethnicity was negatively related to scores on the Depression dimension, but were positively related to scores on the General dimension. Thus,

depressive symptoms may have influenced the association of White ethnicity and the General and specific dimensions in the current study.

Sex differences were also observed with males scoring higher on the General and Mania dimensions, whereas females scored higher on the Negative dimension. These findings are inconsistent with recent research showing that men scored higher on the Negative dimension of psychosis and that there was no significant association between sex and the Mania and General dimensions, in clinical samples (Quattrone et al., 2019; Reininghaus et al. 2019). As with the White ethnicity (Barnes & Bates, 2017), women are considerably more likely to develop a depressive disorder in comparison to men (Eid et al., 2019). Thus, a similar effect may have occurred, whereby the depressive symptoms within the Negative dimension accounted for the association between female sex and the Negative dimension. Regarding the association between sex and the Mania dimension, the specific indicators used to measure manic symptoms in the current study may have influenced this relationship. Two of the three question used to measure mania in the current study related to impulsivity (e.g. Have you often done things impulsively?), and aggressive tendencies (e.g. Have you often had temper outbursts or gotten so angry that you lose control?). Generally speaking, men are more likely to be impulsive (Cross et al., 2011; Knežević, 2018) and display aggressive tendencies (Björkqvist, 2018; Repple et al., 2018), in comparison to women, which may have accounted for the association observed in the current study.

An interesting finding emerged in that increased perceived social support was positively associated with the Mania dimension. Reininghaus et al. (2019) revealed that increased social functioning was also associated with increased scores on the Mania dimension. It is unlikely that improved social functioning and stronger social support networks in and of themselves increase the vulnerability to manic symptoms. Research, however, indicates that manic symptoms positively influence an individual's perceptions of

their own personal capabilities and social connections (Johnson et al., 2005; Mansell & Pedley, 2008).

Surprisingly, given that a considerable literature clearly demonstrates urban living as a risk variable for psychosis, living in an urban environment was not associated with increases on the General or specific dimensions in the current sample (McGrath et al., 2004; Kelly et al., 2010; Vassos et al., 2012). That said, while Quattrone et al. (2019) found that although urban living increased scores on the General, Negative, and Disorganization dimensions in the UK population, no such association was observed within participants living in Spanish cities. The lack of association found by Quattrone et al. (2019) in the Spanish sample and the current study, is most likely due to confounding variables that differ across urban environments. For instance, some research has suggested that exposure to childhood trauma moderates the relationship between urban living and psychotic symptomology (Frissen et al., 2015). Therefore, the inclusion of childhood trauma within the SEM model may have mitigated the association between urban living and psychosis symptoms in the current sample.

Finally, childhood interpersonal trauma was positively associated with the General, Negative, and Mania dimensions, and negatively associated with the Disorganization dimension. The latter finding is inconsistent with the extant theoretical and empirical literature, as is the lack of association observed between childhood interpersonal trauma and the Positive dimension. These findings raise questions as to the reliability and validity of the Disorganization and Positive dimensions, particularly when viewed in the context of the bifactor strength indices. However, the Positive and Disorganization dimensions, as mentioned, also displayed relatively strong associations with lower socio-economic and ethnic minority status, both of which have been robustly demonstrated to increasing the risk of schizophrenic disorders (Cooper et al., 2008; Goldberg et al., 2011; Luo et al., 2019;

Morgan et al., 2010; Werner et al., 2007). Taken together, the overall weight of evidence in the current study indicates that modelling the latent structure of psychosis as a bifactor model provides a more in depth understanding of how risk variables are related to different aspects of psychosis.

4.3.4 Conclusion

In conclusion, the current study investigated which model represented the optimal measurement of psychosis in a general population sample by attempting to replicate and advance previous research. The overall evidence presented in the current chapter indicates that a bifactor model containing a General dimension and four correlated dimensions of positive, negative, manic, and disorganized symptoms represented the optimal measurement model of psychosis. As such, this study thus provides novel empirical support for the validity of a dimensional representation of the structure of psychosis in the general population. Consistent with previous research, evidence emerged of a General dimension of psychosis encompassing both affective and non-affective psychotic symptoms. Moreover, this General dimension of psychosis was shown to be a reliable and valid construct in the general population and was most strongly associated with exposure to interpersonal traumas in early life. Although the specific dimensions, with the exception of the Negative dimension, lacked adequate reliability and replicability, they were however associated with several well-established risk factors. This suggests that they do have conceptual meaning above and beyond the General dimension of psychosis within general population samples.

5.0 Chapter 5: Psychological and Social Mediators of the Association between Childhood Trauma Dimensions of Psychosis

5.1 Introduction

This chapter addresses the fourth objective of the study by answering the following question:

> Do perceived social support, social identity, history of attempted suicide, and PTSD mediate the association between childhood trauma and latent dimensions of psychosis (as identified in objective 1)?

This question is addressed in two sections, both using SEM. First, whether the association between childhood interpersonal trauma and the General and specific dimensions of psychosis are fully or partially mediated by perceived social support, social identity, attempted suicide, and PTSD is investigated. Second, the strength of associations between childhood interpersonal trauma, each mediator, and the General and specific dimensions of psychosis - as well as the significance of each of the paths, are also investigated.

5.2 Results

5.2.1 Descriptive Statistics

Descriptive statistics for childhood interpersonal trauma, attempted suicide, levels of perceived social support are presented in Chapter 4.2.1 In the current study, the mean score of social identity was 6.36 (*SD* = 1.94; *Range* = 0-8). Additionally, 6.4% of participants (*n* = 2339) met the diagnostic requirements for lifetime PTSD.

5.2.2 Direct and Indirect Effects Model Comparison

The fully indirect model (figure 3.2) was an excellent fit of the sample data (χ^2 (390) = 2567.83, $p < .001$; CFI = .985; TLI = .982; RMSEA = .013 [95% CI = .012 - .013]) and explained 24% of the variance in the General dimension, 7% of the variance in the Positive

dimension, 16% of the variance in the Negative dimension, 8% of the variance in the Mania dimension, and 9% of the variance in the Disorganization dimension.

The direct and indirect effects model (figure 5.1) also fit the sample extremely well (χ^2 (385) = 2563.73, $p < .001$; CFI = .985; TLI = .982; RMSEA = .013 [95% CI = .012 - .013]) and explained 24% of the variance in the General dimension, 7% of the variance in the Positive dimension, 16% of the variance in the Negative dimension, 9% of the variance in the Mania dimension, and 9% of the variance in the Disorganization dimension.

To compare the two models, a DIFFTEST analysis was performed and the direct and indirect effects model was found to be a significantly better fit to the data than the fully indirect model (χ^2 (486, N = 35, 251) = 149,207.66, $p < .001$). In light of this, and its consistency with extant theory and evidence, the direct and indirect effects model was chosen as the optimal structural model.

5.2.3 Structural Model

Parameter estimates indicated that childhood interpersonal trauma was negatively associated with perceived social support (β = -.23, $p < .001$) and social identity (β = -.10, $p < .001$), and was positively associated with attempted suicide (β = .25, $p < .001$) and PTSD (β = .25, $p < .001$).

Perceived social support was negatively and significantly associated with the General (β = -.18, $p < .001$) and Negative (β = -.04, $p < .001$) dimensions, and was positively and significantly associated with the Mania dimension (β = .06, $p < .01$). Social identity was negatively and significantly associated with the Negative dimension (β = -.05, $p < .001$). Attempted suicide was positively and significantly associated with the General (β = .13, $p < .001$), Positive (β = .06, $p <.01$), Negative (β = .17, $p < .001$), and Mania (β = .13, $p < .001$) dimensions. PTSD was positively and significantly associated with the General (β = .22, $p <$

.001), Positive (β = .08, p < .001), Negative (β = .25, p < .001), and Mania (β = .12, p < .001) dimensions.

A positive and statistically significant indirect effect was observed between childhood interpersonal trauma and the General dimension via perceived social support (β = .04, *SE* = .00, p < .001), attempted suicide (β = .03, *SE* = .00, p < .001), and PTSD (β = .06, *SE* = .00, p < .001). A positive and statistically significant indirect effect between childhood interpersonal trauma and the Positive dimension was observed via attempted suicide (β = .02, *SE* = .01, p < .01), and PTSD (β = .02, *SE* = .00, p < .001). A positive and statistically significant indirect effect was observed between childhood interpersonal trauma and the Negative dimension via perceived social support (β = .01, *SE* =.00, p < .01), social identity (β = .01, *SE* =.00, p < .001), attempted suicide (β = .04, *SE* = .00, p < .001), and PTSD (β = .04, *SE* =.00, p < .001). A positive, statistically significant indirect effect was observed between childhood interpersonal trauma and the Mania dimension via attempted suicide (β = .04, *SE* = .01, p < .001), and PTSD (β = .05, *SE* = .01, p < .001). There was also a negative and statistically significant indirect effect observed between childhood interpersonal trauma and the Mania dimension via perceived social support (β = -.01, *SE* = .01, p < .05).

5.3 Discussion

The current study sought to investigate multiple paths from childhood interpersonal trauma to different dimensions of psychosis. Four variables were chosen as plausible mediators in the association between childhood interpersonal trauma and the General and specific dimensions of psychosis including perceived social support, social identity, attempted suicide, and PTSD.

5.3.1 SEM Structural Model

The extant literature indicates that childhood traumatic experiences may directly or indirectly influence the development of psychotic symptomology via numerous biological, psychological, and social variables (Bentall et al., 2014; Read et al., 2005) In light of this, it was first necessary to determine if a fully indirect effects model or a direct and indirect effects model provided the best fit for the data.

Both models provided an excellent fit of the sample data. From a statistical perspective, the fully indirect effects model is the more parsimonious explanation of pathways from childhood trauma to psychotic symptomology (Kline, 2011). However, from a theoretical standpoint, the direct and indirect effects model proposes that childhood interpersonal trauma may influence the development of psychosis independent of perceptions of social support, one's social identity, attempted suicide, and posttraumatic stress symptomology, and is more consistent with existing theory.

As discussed in section 2.2, identifying mechanisms such as mediation effects is a key criterion for determining causation. However, childhood trauma may also influence the development of psychosis directly and apart from mediating factors. For example, Griffiths et al.'s (2019) meta synthesis of qualitative studies assessing the role of the environment on the development of psychosis suggested that respondents' memories of childhood traumatic experiences directly influenced psychotic symptoms such as hallucinations and delusions. This is supported by other research that indicated that the content of hallucinations and delusions are directly influenced by previous traumatic experiences in childhood (Rhodes & Healy, 2017). When considered within the context of the wider literature, a direct and indirect effects model was chosen as the optimal structural model (Figure 5.1). Inspection of the direct effects supported the inclusion of direct paths from childhood interpersonal trauma to the General and specific dimensions of psychosis. For example, positive significant

associations were observed between childhood interpersonal trauma and the General, Mania, and Negative dimensions of psychosis.

Figure 5.1 Multiple mediation model of the association between childhood trauma and the General and specific dimensions of psychosis

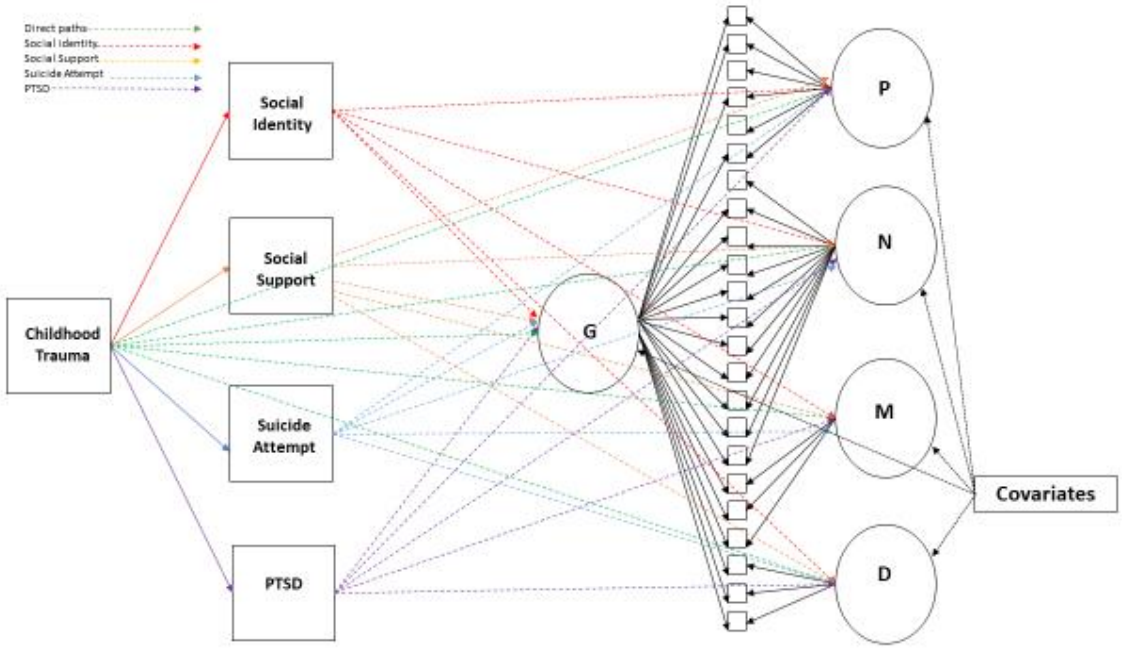


Figure 5.1 depicts a direct and indirect effects model from childhood trauma to the General and specific dimensions of psychosis via social identity, perceived social support, attempted suicide, and PTSD. Note: G = General; P = positive symptoms; N = negative symptoms; M = manic symptoms; and D = disorganized symptoms.

In addition, the SEM results identified multiple mediation effects. The association between childhood interpersonal trauma and the General and specific dimensions was found to be indirect via perceived social support, social identity, attempted suicide, and PTSD; and these effects explained a meaningful level of variance in the General dimension of psychosis, and each of the specific dimensions.

5.3.2 Perceived Social Support

The SEM results indicated that childhood interpersonal trauma had an indirect effect on the General dimension of psychosis via lower levels of perceived social support. However,

the cross-sectional nature of the data precludes any discussion of casual pathways from childhood interpersonal trauma to psychosis. That said, the current results suggests that individuals victimised in childhood (e.g. physical, sexual, emotional abuse, and emotional and physical neglect) report lower levels of social support which is associated with a greater vulnerability to affective and non-affective psychotic symptomology. Although the data investigating the direct mediational effect of perceived social support in the relationship between childhood trauma and psychosis is sparing (Crush et al., 2020), the current findings are wholly consistent with the broader literature which identifies diminished social support as a robust correlate of both psychotic symptomology and childhood trauma (Gayer-Anderson & Mayer, 2013; Norman et al., 2005).

Similarly, perceived social support mediated the association between childhood interpersonal trauma and the Negative dimension. This suggests that beyond a general vulnerability to psychotic symptoms, clinicians should pay particular attention to negative symptomology in those reporting lower levels of perceived social support and childhood trauma. In addition, diminishing social functioning is a core feature of negative symptoms and therefore the association between a lack of perceived social support and the Negative dimension following childhood trauma is consistent with the wider literature (Hooley, 2010). Indeed, negative symptoms have been shown to strongly influence negative perceptions of social, familial, and romantic relationships (Cohen & Davis, 2009; Dickey et al., 2005).

However, the current findings must be interpreted in light of the results from phase one of this study. In phase one, there was no significant association observed between social support and the Negative dimension which raises the question of whether the current finding is a statistical aberration. Further research in clinical samples where the Negative dimension may be more pronounced (e.g. Schizophrenic samples; Reininghaus et al., 2013) will provide

greater clarity regarding the potential mediation effect of social support on the association between childhood trauma and the Negative dimension.

In contrast to the extant literature, there was no mediation effect of social support in the association between childhood trauma and the Positive symptom dimension. Crush et al. (2020) revealed that social support mediated the relationship between childhood trauma and positive symptoms. However, the current study differs from Crush et al. (2020) in that (1) a broader range of psychotic symptoms across the psychosis spectrum were tested in the same model; (2) the current study acknowledged and statistically controlled for the covariation amongst affective and non-affective symptoms of psychosis; and (3) this work also statistically controlled for other possible mediators of the relationship between childhood trauma and positive symptoms, such as PTSD.

Finally, there was a significant pathway from childhood interpersonal trauma to the Mania dimension via higher perceptions of social support. As discussed in 4.3.3, this finding is most likely confounded by an inflated sense of self and social connectedness as a result of manic symptomology (Johnson et al., 2005; Mansell & Pedley, 2008).

5.3.3 Social Identity

Social identity did not mediate the association between childhood interpersonal trauma and any of the dimensions, with the exception of the Negative dimension. This runs contrary to the literature as weaker social identity has been demonstrated to increase the risk of positive symptomology (Cantor-Graae & Selten, 2005; Das-Munshi et al., 2012; McIntyre et al., 2018; Schofield et al., 2011). Moreover, the social identity approach predominantly focused on the mechanisms linking perceptions of outgroup membership to paranoid ideation (McIntyre et al., 2016). For example, the authors proposed that perceptions of social threat from in-group members (ethnic majority groups) towards ethnic minorities may manifest in

paranoid ideation over time (McIntyre et al., 2016). The findings of the current study suggest that broadening the focus to negative symptoms when assessing the association between social identity and psychosis has the potential to advance extant theory and knowledge regarding the social identity approach. The current results further suggest that a lack of social identity following childhood trauma is a risk factor for the development of negative symptoms.

5.3.4 Attempted Suicide

Attempted suicide was a robust mediator of the General and specific dimensions of psychosis. As discussed in Chapter 2.3.11, the suicidal drive hypothesis (Murphy et al., 2018) has recently offered theoretical and empirical support for a proposed reversal of the assumed temporal ordering that psychosis leads to suicide, and not vice-versa. Consistent with the suicidal drive hypothesis, findings suggest that childhood interpersonal trauma was associated with attempted suicide and that this relationship was associated with both affective and non-affective symptoms of psychosis. It must be noted however that it is entirely likely, which is acknowledged by Murphy et al. (2018) and supported by a considerable literature (Huang et al., 2018; San Too et al., 2019; Yates et al., 2019), that affective and non-affective symptomology influences suicidal thoughts and behaviour. Nonetheless, the significant pathway from childhood interpersonal trauma to the General dimension via attempted suicide is consistent with the predictions of the Suicidal-Drive Hypothesis, and provides evidence in support of the view that self-directed threat (i.e., suicide attempt) may be a risk factor for psychosis. Needless to say, the cross-sectional nature of the data means that this interpretation of the data must be made extremely tentatively, and only longitudinal data can resolve this issue effectively. The findings, consistent with the wider literature, also identifies attempted suicide following childhood interpersonal trauma as a mediator to specific symptom constellations (e.g. Positive, Negative, Mania).

5.3.5 PTSD

The SEM results also identified PTSD as a robust mediator of the association between childhood interpersonal trauma and the General and specific dimensions. These findings offer support to extant literature, which identified PTSD as a significant risk factor for psychosis – particularly positive symptoms following childhood trauma (Berenbaum et al., 2008; Choi et al., 2015; Hardy et al., 2016; Powers et al., 2011). This adds to previous research by demonstrating that PTSD mediates the association between childhood interpersonal trauma and a broad range of affective and non-affective symptoms. Moreover, this effect remained even when controlling for other established risk factors for psychosis.

5.3.6 Conclusion

In conclusion, the current study examined multiple mediators of the association between childhood interpersonal trauma and psychosis in a large, nationally representative sample of the US adult general population. A direct and indirect effects model indicated that childhood interpersonal trauma may directly influence a vulnerability to all symptoms of psychosis and specific symptom constellations, as well as indirectly influence vulnerability to psychosis via perceptions of social support, social identity, attempted suicide, and PTSD symptomology. The current findings thus provide a useful theoretical framework (Figure 5.1) for potential use in both cross-sectional and longitudinal samples, in order to further elucidate the aetiology of psychosis following childhood adversity. Moreover, this study provides clinical insights regarding treatment strategies that can target modifiable risk variables that may help to alleviate the severity of psychotic symptoms following childhood interpersonal trauma.

6.0 Chapter 6: Psychosis and CPTSD in Former Residents of Institutional Care Facilities

6.1 Introduction

This chapter addresses the fifth and final research objective of this thesis by answering the following questions:

> Are CPTSD and psychosis significantly associated in a sample of former residents of institutional care facilities?

This question was addressed in two sections. First, frequency analyses were used to assess the levels of childhood trauma, psychosis, PTSD, and CPTSD, in the current sample. Secondly, independent samples t-tests and chi-square tests were used to determine if there were significant associations between total scores and meeting the diagnostic criteria for psychosis and PTSD/CPTSD.

6.2 Results

6.2.1 Psychosis

The frequencies of endorsement of each psychotic symptom are presented in Table 6.1. The demographic information for the current sample is presented in Table 3.4. Overall, there were high levels of psychotic symptom endorsement. The most frequently endorsed psychotic symptoms were 'Mind reading' (53.3%) and 'Spying' (53.3%). The least frequently endorsed psychotic symptom was 'TV/radio' (e.g. *Have you ever had messages sent just to you through TV or radio?*) (33.3%).

Table 6.1 Frequencies of psychosis indicators for the current sample of former residents of institutional care facilities (*N* = 45)

	Frequency	%
Psychosis Indicators		
Mind Reading	24	53.3
TV/radio	15	33.3
Spying	24	53.3
Auditory hallucinations	23	51.1
Controlled	18	40.0
Visual hallucinations	21	46.7
Grandiosity	18	40.0

6.2.2 CPTSD Symptoms

Frequencies for each PTSD and DSO symptom, and meeting the diagnostic criteria for re-experiencing, avoidance, sense of threat, affective dysregulation, negative self-concept, disturbed relationships, and PTSD and CPTSD are presented in Table 6.2. There were high levels of endorsement across individual items and symptom clusters of both PTSD and CPTSD. More participants met the diagnostic criteria for CPTSD (40.0%) than PTSD (17.8%).

Table 6.2 Frequencies of PTSD and CPTSD symptoms for the current sample of former residents of institutional care facilities (*N* = 45)

	Frequency	%
PTSD symptoms		
Re-experiencing in the here and now	34	75.6
Upsetting dreams	28	62.2
Reliving the event in the here and now	31	68.9
Avoidance	36	80.0
Internal avoidance (thoughts, feelings etc.)	30	66.7
External avoidance (people, places etc.)	32	71.1
Sense of threat	38	84.4
Being on guard	34	75.6
Jumpy/easily startled	31	68.9
DSO symptoms		
Affective dysregulation	39	86.7
Long time to calm down	32	71.1
Feeling numb	34	75.6
Negative self-concept	37	82.2
Failure	36	80.0
Worthlessness	33	73.3

Disturbed relationships	40	88.9
Feel cut-off from others	31	68.9
Difficulty staying close to others	34	75.6
ICD-11 diagnostic criteria		
ICD-11 PTSD	8	17.8
ICD-11 CPTSD	18	40.0

6.2.3 Childhood Interpersonal Trauma

Frequencies for childhood interpersonal traumas are presented in Table 6.3. There were high levels of childhood interpersonal trauma reported in the current sample. The most frequently endorsed childhood interpersonal trauma was 'Verbal abuse' (88.6%), and the least frequently endorsed childhood interpersonal trauma was 'Sexual abuse' (63.6%).

Table 6.3 Frequencies of childhood interpersonal trauma for the current sample of former residents of institutional care facilities (*N* = 45)

	Frequency	%
Childhood Interpersonal Traumas		
Verbal Abuse	39	86.7
Physical abuse	33	73.3
Sexual abuse	28	62.2
Emotional neglect	37	82.2
Physical neglect	37	82.2

6.2.4 Total scores

The descriptive statistics for the total score of psychosis, PTSD, DSO, CPTSD, and childhood interpersonal trauma are presented in Table 6.4. There were high levels of childhood interpersonal trauma endorsed in the current sample. The current sample displayed moderately high levels of psychosis, PTSD, DSO, and CPTSD.

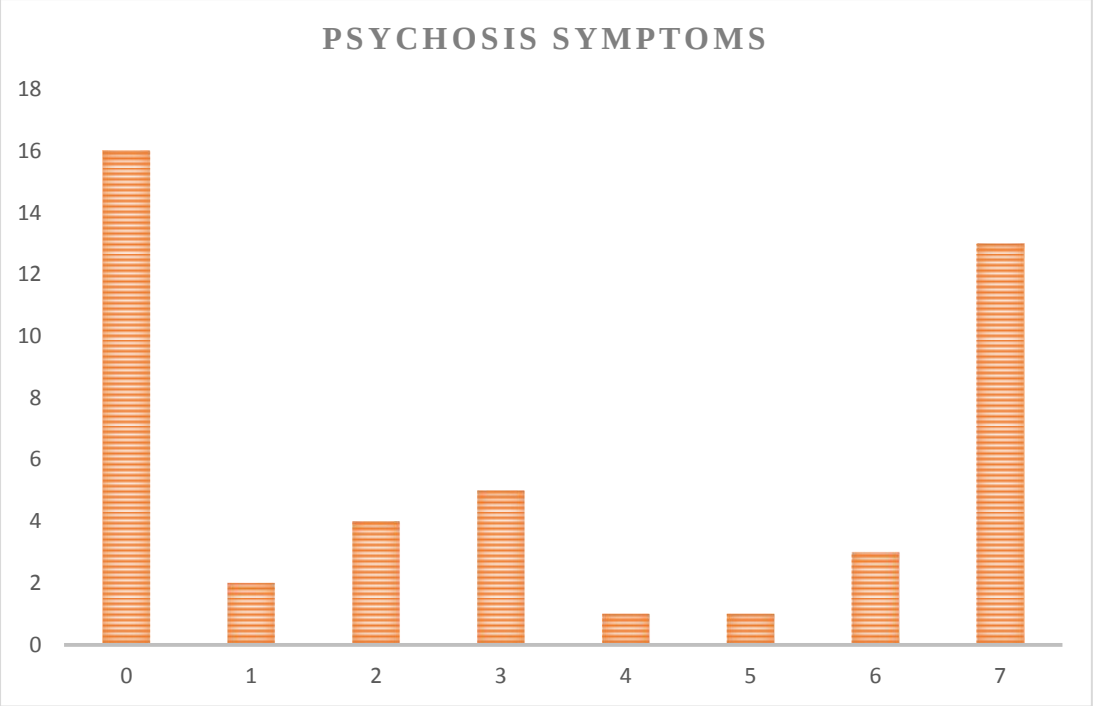
Table 6.4 Descriptive statistics of all continuous variables

	Mean (95% Confidence Intervals)	Std. Error Mean	Median	SD	Range
Psychosis	3.25 (2.34-4.16)	.45	3	2.99	0-7
PTSD	13.43 (11.40-15.47)	1.0	15	6.69	1-24
DSO	14.86 (13.23-16.50)	.81	13	5.37	5-24
CPTSD	24.96 (24.96-31.63)	1.65	26	10.97	11-48
ACE	3.93 (3.57-4.29)	.18	4	1.19	0-5

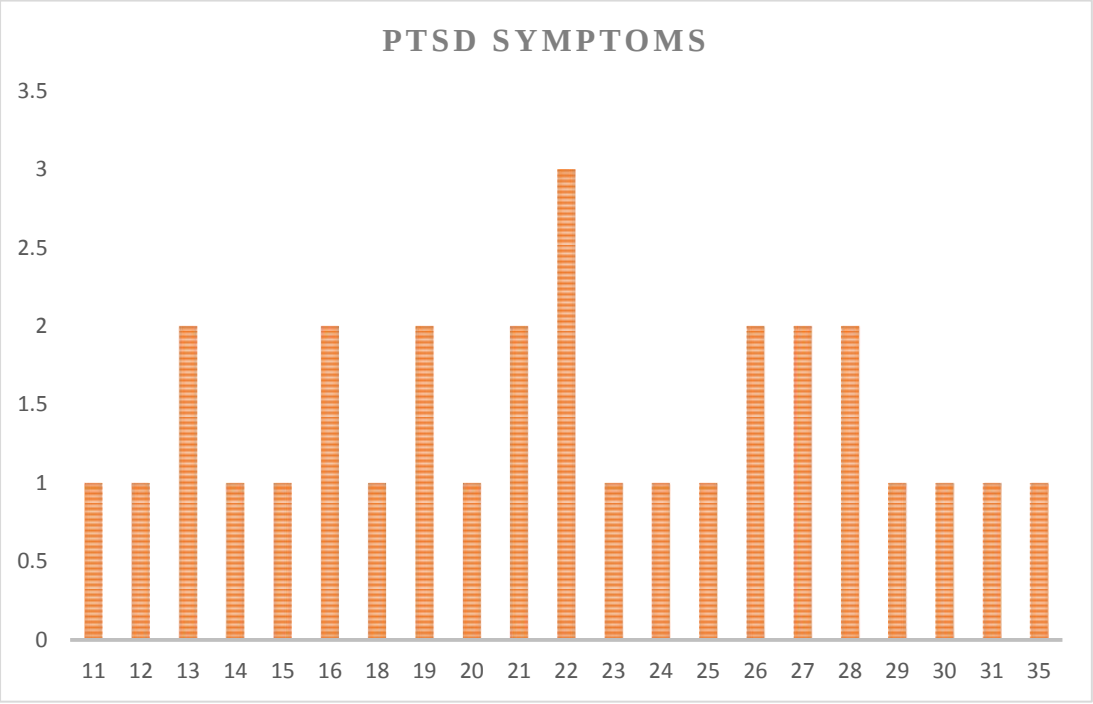
6.2.5 Assumptions of Normality

The variation in scores on the continuous psychosis variable followed a U-shape distribution with the majority of scores at the extreme ends of the distribution (see Graph 6.1). In general terms, however, the majority of variance within the PTSD (Graph 6.2), DSO (Graph 6.3), CPTSD (Graph 6.4), and childhood interpersonal trauma (Graph 6.5) continuous variables centred in and around the mean and were therefore deemed to be normally distributed.

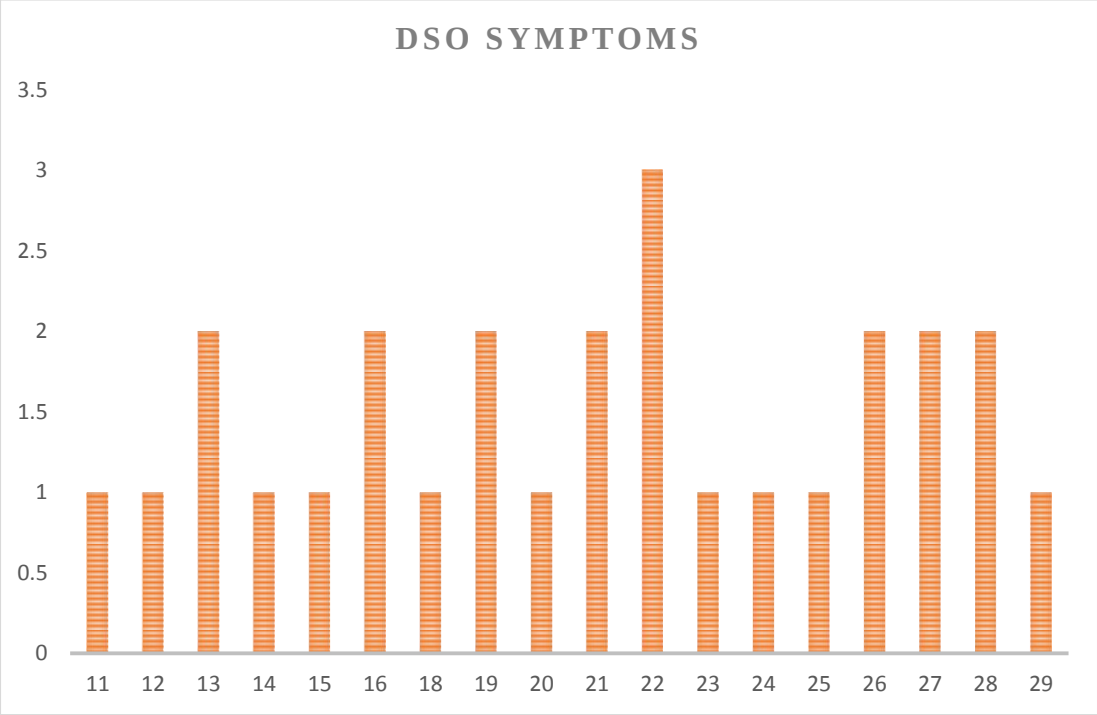
Graph 6.1 Distribution of scores for the psychosis continuous variable



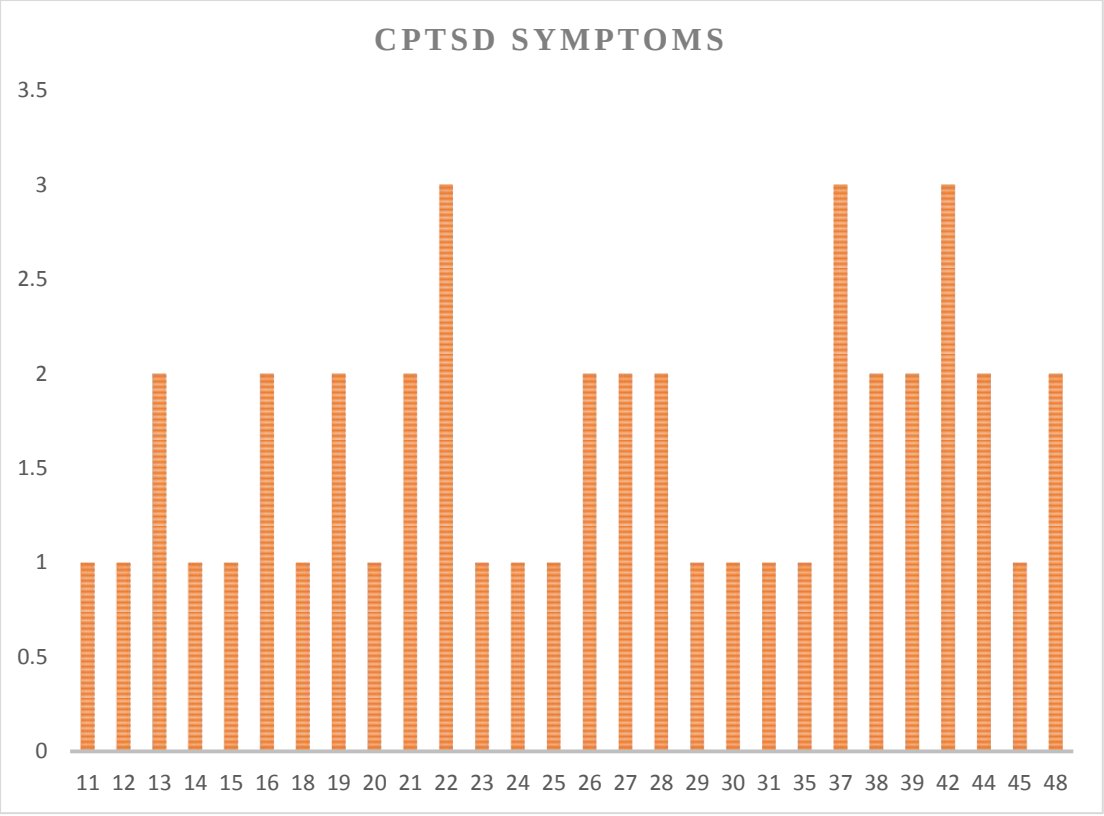
Graph 6.2 Distribution of scores for the PTSD continuous variable



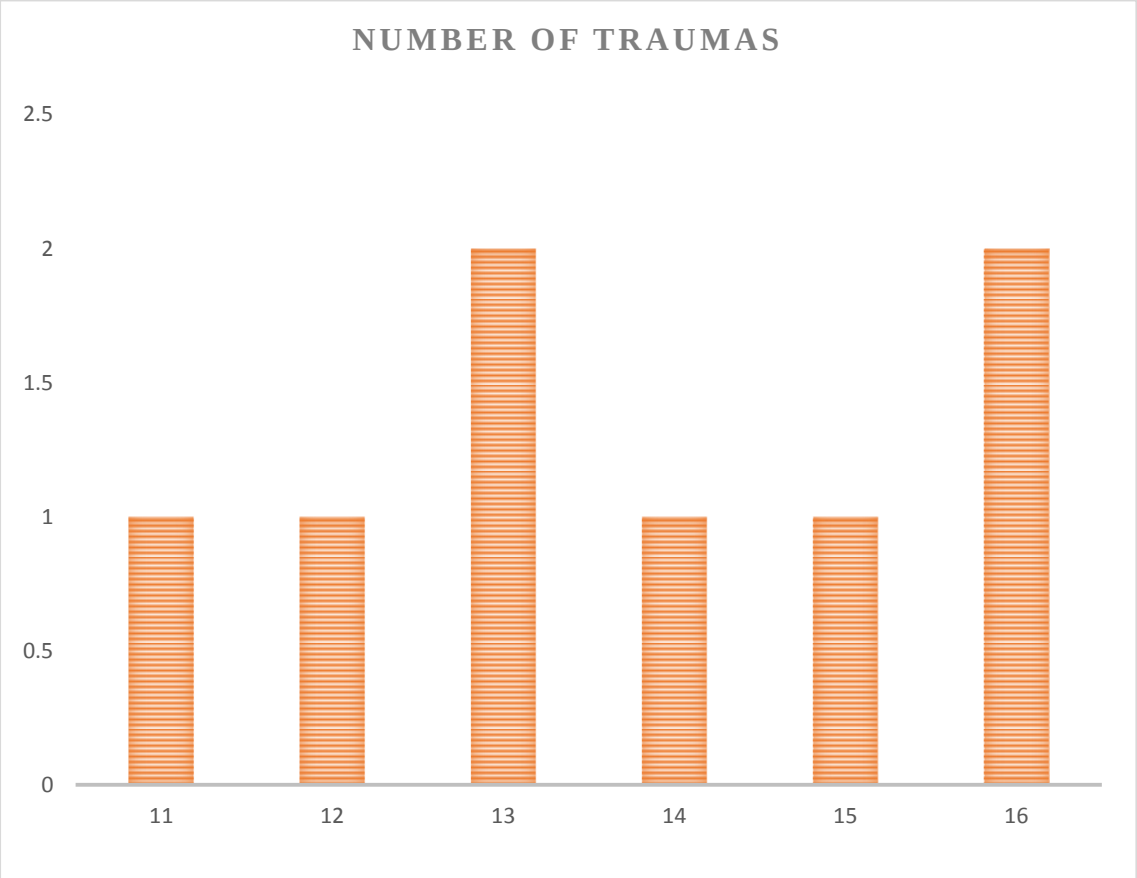
Graph 6.3 distribution of scores for the DSO continuous variable



Graph 6.4 distribution of scores for the CPTSD continuous variable



Graph 6.5 distribution of scores for the childhood interpersonal trauma continuous variable



6.2.6 Inferential Statistics

6.2.7 Psychosis and CPTSD

There was no significant difference in PTSD scores for participants with symptoms of psychosis (*M* = 14.38, *SD* = 6.23) and those without symptoms of psychosis (*M* = 11.56, *SD* = 7.16), t(43) = -1.38, *p* = .35, two-tailed. The magnitude of the differences in the means (mean difference = -12.82, 95% CI: -6.94 to 1.30) was small (eta squared = .04). There was also no significant difference in CPTSD scores for participants with symptoms of psychosis (*M* = 28.59, *SD* = 11.11) and those without symptoms of psychosis (*M* = 27.75, *SD* = 10.69), t(43) = -.25, p = .99, two-tailed. The magnitude of the differences in the means (mean difference = -.84, 95% CI: -7.72 to 6.05) was very small (eta squared = .001).

A chi-square test of independence indicated no significant difference between having psychotic symptoms and meeting the diagnostic criteria for CPTSD (X^2 (1, n = 45) = .00, p = .10, *phi* = .04). Likewise, there was no significant association between psychotic symptoms and meeting the diagnostic criteria for PTSD (X^2 (1, n = 45) = .08, p = .78, *phi* = .10).

6.3 Discussion

The current study was conducted to assess the association between psychosis and CPTSD responses in a sample of individuals who had resided in an institutional care facility prior to their 18th birthday, as an understudied population in the academic literature, especially considering their increased risk of childhood adversity and psychopathology (Biehal, 2014; Carr et al., 2020; Lueger-Schuster et al., 2018; Sherr et al., 2017; Sköld, 2013; Uliando & Mellor, 2012). The association between psychosis symptoms and CPTSD symptoms has also received little empirical attention. Overall, this phase of the study found that the current sample had been exposed to multiple childhood interpersonal traumas, on average, and displayed high levels of psychosis and PTSD/CPTSD symptoms. Nonetheless, there was no statistically significant association between psychosis and CPTSD symptoms.

6.3.1 Childhood Interpersonal Trauma

Given the levels of childhood trauma experienced by those who have resided in institutions prior to their 18th birthday, it was unsurprising that levels of childhood interpersonal trauma were frequently reported by the current sample. On the whole, the high levels of child abuse experienced by the current sample is consistent with previous research (Carr et al., 2010, 2019, 2020; Lueger-Schuster et al., 2014, 2018). There were, however, some notable differences between the current sample and previous findings. Within an Irish context, Carr et al. (2010) reported endorsement levels of over 90% for physical and emotional abuse, as well as physical and emotional neglect. The endorsement levels reported in this study for physical and emotional abuse, and physical and emotional neglect ranged

from 73% to 86%. There was, however, a higher endorsement of sexual abuse (62%) in the current sample, compared to levels of 47% reported by Carr et al. (2010). The higher levels of sexual abuse reported in the current study may be explained by the majority of the sample being female (62%), as research indicates that females are more likely to experience sexual abuse (Tolin & Foa, 2008). Likewise, males are more likely to experience physical abuse (Haahr-Pedersen et al., 2020), which may also explain the difference between the current study and that conducted by Carr et al. (2010).

In comparison to Scottish institutional abuse survivors, participants in the current sample reported considerably higher levels of neglect, with over 80% of this cohort reporting physical and emotional neglect in comparison to Scottish survivors who reported lower levels of physical (37%) and emotional (51%) neglect (Carr et al., 2019). Levels of sexual abuse (68%) in Austrian survivors were higher than the current sample. However, the current sample displayed higher levels of physical and emotional abuse than their Austrian counterparts (Lueger-Schuster et al., 2014). These findings converge to indicate that residing in institutional care during childhood and adolescence is associated with an increased risk of having experienced childhood trauma. To contextualise this, the global average for physical (8%), sexual (1%), and neglect (4%) gathered from multiple nationally and regionally representative surveys of the general population, is considerably less than those who have spent time in institutional care facilities (Kessler et al., 2010).

6.3.2 Posttraumatic Stress Responses

The levels for CPTSD and PTSD were high in the current sample. This is the second study to assess the proportion of CPTSD and PTSD in former residents of institutional care facilities. Similar to the first study conducted by Knefel and Lueger-Schuster (2013) there were higher levels of diagnostic criteria endorsed for CPTSD than for PTSD, in the current sample. However, the levels of CPTSD (40%) in the current sample were greater than those

observed in Knefel and Lueger-Schuster (2013) (e.g. 21%). Different measures used in Knefel and Lueger-Schuster (2013) and the current study may explain these differences in diagnostic levels. As the ICD-11 measure for CPTSD had not yet been fully developed, Knefel and Lueger-Schuster (2013) used a number of proxy measures gathered the Posttraumatic Stress Disorder Checklist Civilian Version (PCL-C; Weathers et al., 1991). It is likely that the ITQ – having been thoroughly validated prior to its use in this study – was better equipped to detect CPTSD than the PCL-C. However, this will need further empirical investigation. That said, the findings from both Knefel and Lueger-Schuster (2013) and the current study indicate that individuals who have resided in institutional care facilities are at an increased risk of PTSD and CPTSD, with nearly two-thirds of the current sample meeting diagnostic criteria for one of the two post-traumatic stress disorders. To put this in context, recent studies examining the prevalence of ICD-11 PTSD and CPTSD among general population samples have generally observed between 1.5% to 9% for PTSD and from 0.5% to 3.5% for CPTSD across nations with varying levels of conflict and adverse childhood experiences (Ben-Ezra et al., 2018; Cloitre et al., 2019; Maercker et al. 2018).

Importantly, the current findings suggest that previous research assessing the levels of PTSD in survivors of institutional abuse may have failed to recognise a considerable cohort of individuals who were experiencing DSO symptoms (Lueger-Schuster et al., 2018; Sen et al., 2008; Sherr et al., 2017; Sköld, 2013; Uliando & Mellor, 2012). For instance, in Carr et al. (2010) and Wolfe et al. (2006) the levels of clinical PTSD was above 40%. In the current study, endorsement levels of PTSD were 17% whereas CPTSD were 40%. This is important from a clinical perspective. If levels of CPTSD are higher than PTSD in institutional abuse survivors, but not screened for or diagnosed, the treatment options and approaches for clinicians are restricted in their capacity to provide effective care (Karatzias et al., 2019). From a theoretical perspective, institutional abuse meets all the criteria for the type of trauma

necessary to influence the development of CPTSD rather than PTSD (Brewin, 2020). The current findings offer empirical support to this theory, in that individuals who have resided in institutional care are more likely to have experienced complex childhood trauma (Biehal, 2014; Gallagher, 1999; Sen et al., 2008; Sherr et al., 2017; Sköld, 2013; Uliando & Mellor, 2012). To date, and while the current study did not assess the length of time participants had resided in an institution, the available evidence indicates that institutional abuse may pose a greater risk for CPTSD than PTSD. Moreover, while two studies with small sample sizes are insufficient to draw any specific conclusions, the available evidence (Knefel & Lueger-Schuster, 2013) and theoretical literature both indicate that further investigation into the prevalence of CPTSD in comparison to PTSD in survivors of institutional abuse is warranted.

6.3.3 Psychosis

The presence of psychotic symptoms in the current sample were high. In light of the overall literature, this is unsurprising given that prevalence estimates of psychiatric disorders are consistently high in samples of institutional abuse survivors (Carr et al., 2010, 2019, 2020; Daly, 2018). With regards to global estimates of psychosis symptomology, there was a considerable disparity between the levels of psychosis symptoms in the current sample. For example, McGrath et al. (2015) indicate that approximately 5% of the global population experience some form of psychotic experiences. Likewise, Linscott and van Os (2013) suggest that approximately 7% of those who experience psychotic symptoms, eventually develop clinical levels of psychotic symptomology. In some instances, the levels for individual symptoms were approximately ten times higher in the current sample, with over 50% of respondents endorsing ‘auditory hallucinations’, ‘mind reading’, and ‘spying’. As the levels of childhood interpersonal trauma indicate, the current sample experienced considerable trauma and are thus more likely to develop psychotic symptoms (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Varese et al., 2012a). Even when

compared to other traumatised populations, the levels of psychosis symptoms in the current sample remain high. The prevalence estimates from Frost et al. (2019), who utilised the APSS in sample of individuals who had experienced trauma serves as a useful comparison. Here, the most highly endorsed psychotic symptom was 'Spying' (21.3%) with 'Special messages' receiving the lowest endorsement rate (3.3%). The findings of the current study suggest that the presence of psychotic symptoms warrant further investigation in those individuals who have resided in institutional settings during childhood and adolescence.

6.3.4 Psychosis and Posttraumatic Stress Responses

There was no significant difference observed between those individuals who reported psychotic symptoms versus those who did not on levels of PTSD or CPTSD. Likewise, there was no significant association observed between psychosis and clinical criteria of PTSD or CPTSD. The present findings are inconsistent with extant literature, where psychosis and PTSD have consistently been demonstrated to be strongly associated across varying samples and methodologies, particularly in individuals who have experienced childhood trauma (Hardy et al., 2016; Rafiq et al., 2018; Varese et al., 2011; Williams et al., 2018). Additionally, and although sparsely researched, the existing literature indicates that psychosis and CPTSD are related constructs (Frost et al., 2019). These findings are also inconsistent with the theoretical frameworks presented in the current thesis. As discussed in section 2.2, the relationship between psychosis and childhood trauma is most likely causal, whereby psychosis is a response to stressful experiences in the individual's environment, much like the development of PTSD and CPTSD. From the current data, it appears that CPTSD and psychosis, although commonly observed, are not related constructs in former residents of institutional care facilities. Therefore, treatment programs should seek to address both of these disorders separately. However, the statistical analyses employed in the current study were underpowered due to the small sample size and therefore may not have been able to

detect an existing relationship between these constructs (i.e. a Type II error). More research is therefore required among larger samples to fully elucidate the association between psychosis and posttraumatic stress responses, with particular regard to the relationship between CPTSD and psychosis.

6.3.5 Conclusion

In conclusion, this phase of the study examined the association between psychosis and post-traumatic stress responses in a sample of former residents of institutional care facilities, primarily based in the Republic of Ireland. The outcomes of this study highlight the need for increased attention on the levels of psychosis symptoms and CPTSD amongst survivors of institutional abuse in both the clinical and academic spheres, as an understudied population in the academic literature. Although the current study found no significant relationship between psychosis and post-traumatic stress-responses, the very high levels of childhood interpersonal trauma, PTSD, CPTSD, and psychosis suggest that these relationships warrant further exploration.

Chapter 7: Conclusion

Mounting empirical research now indicates that the categorical distinction between affective and non-affective psychotic disorders used in traditional diagnostic manuals is arbitrary. The nature of psychosis is now understood to be best represented in the context of a quantitative model including a General dimension of psychosis, which accounts for an overlap of affective and non-affective symptoms, and five specific dimensions reflecting positive, negative, depressive, manic, and disorganized symptoms (Quattrone et al., 2019; Reininghaus et al., 2013, 2016, 2019). Previous research, however, has primarily focused on clinical manifestations of psychosis and consequently, comparatively less is known about the nature of psychosis in non-clinical samples. In addition, childhood trauma is causally associated with psychosis (Bentall & Varese, 2012), however, this relationship does not occur in a vacuum and is often mediated by psychological and social variables (Williams et al., 2018). To date, no research has examined if psychological and social variables mediate the association between early life trauma and the quantitative dimensions of psychosis identified in empirical research. Finally, CPTSD is a new disorder in the diagnostic literature that is robustly predicted by sustained and complex trauma history (Brewin et al., 2020). However, relatively little is known regarding the association between CPTSD and psychotic disorders. Given the shared aetiological risk of complex trauma history (Brewin et al., 2020; Read et al., 2005; Shevlin et al., 2008), gaining a better understanding of the association between psychosis and CPTSD is warranted.

Thus, this thesis was conducted to add novel and important data to emerging fields of inquiry, which seek to better understand the nature of psychosis, how childhood trauma may ultimately manifest in psychotic symptomology via psychological and social mediators, and how psychosis relates to other psychopathologies that are also influenced by trauma history.

7.1 Key findings

7.2 Contribution to Theory

The findings from the first phase of the current study (Chapter 4) serve as an important addition to extant literature in relation to the nature of psychosis. The finding of a General dimension of psychosis which encapsulates the shared variance across affective and non-affective symptomology adds to a growing literature that undermines the Kraepelinian dichotomy between manic-depression and schizophrenia which has informed conventional diagnostic manuals for decades.

That said, although the bifactor model of psychosis represented the best empirical measurement model of psychosis, the exact nature of the General and specific dimensions represent more broadly, is still debated. The current findings add to this literature by addressing two key criteria proposed by the extended phenotype theory of psychosis (van Os & Reininghaus, 2016). Firstly, by demonstrating that a General dimension and four specific dimensions of positive, negative, manic, and disorganized symptoms best represents the latent structure of psychosis in the general US population, the current research is consistent with the extended phenotype theory of psychosis. A bifactor model with four specific dimensions of psychosis found in Chapter 4 is further phenomenologically consistent with the bifactor pentagonal model observed, in that a General dimension accounts for the shared variance between affective and non-affective symptoms. Thus, these findings satisfy the first criteria of the extended phenotype of psychosis (phenomenological consistency).

However, the results from the bifactor strength indices offer a potentially unique insight into the nature of psychosis within the general US population that has not yet been established in the literature. Whereas research in clinical samples has shown both the General and specific dimensions to be reliable and well-defined latent constructs (Quattrone et al.,

2019; Reininghaus et al., 2019), only the General and Negative dimensions satisfied these criteria in the current study. These findings indicate that from a theoretical perspective the latent structure of psychosis might be best conceptualise as representing a general vulnerability to all forms of affective and non-affective symptomology within non-clinical samples.

Secondly, the extended phenotype theory of psychosis (van Os & Reininghaus, 2016), dictates that demographic, environmental, and biological factors that confer risk for psychosis must be consistent at all points across the psychosis spectrum. The results of the SEM analysis in Chapter 4 represent a significant addition to the literature in this regard. Although previous research has shown consistency of risk for clinical and non-clinical manifestations of psychosis across demographic and environmental factors (Das-Munshi et al., 2012; Freeman & Fowler, 2009; McGrath et al. 2015; Morgan et al., 2009; Varese et al., 2012a), none has yet demonstrated that a General dimension of psychosis is meaningfully correlated with established risk factors for psychosis in a general population sample. Shevlin et al. (2016), following their finding of a bifactor pentagonal model of psychosis in the general US population, questioned if the General dimension represented other factors beyond the shared variance of affective and non-affective symptomology. Recent research suggests that the covariation observed between affective and non-affective psychotic symptomology captured within a General dimension may be due to a shared genetic and environmental risk (Quattrone et al., 2019; Reininghaus et al., 2019). The current findings indicate that a meaningful proportion of the variance in scores of affective and non-affective symptoms within the General dimension of psychosis in the US adult population was explained by demographic, developmental, social, and psychological risk factors.

The findings of phase one of this study represent an important advancement of the research literature on bifactor models of psychosis by demonstrating that childhood trauma is

associated with the General dimension of psychosis within the bifactor framework. Given the robust association between childhood trauma and psychosis (Bailey et al., 2018; Matheson et al., 2013; Palmier-Claus et al., 2016; Trotta et al., 2015; Varese et al., 2012a), this is a critical contribution to the extant literature which seeks to elucidate the properties of a General dimension of psychosis. Finally, by demonstrating multiple associations between recognised risk factors for psychosis and the General and specific dimensions of psychosis, the current research satisfies concerns related to the validity of the bifactor models of psychosis in the general population (Greene et al., 2019).

The lack of specificity observed between recognised risk factors for psychosis and the Positive, Negative, Manic, and Disorganization dimensions has additional implications for extant theory. Returning to the discussion on specificity presented in the literature review (Chapter 2.2.5), the idea that specific aetiological antecedents are uniquely related to specific psychotic symptoms was not supported in the current data. Therefore, the current findings are consistent with theory proposing that if a causal relationship exists between environmental factors and psychosis, it is most likely a contributory association rather than a direct cause and effect relationship (Bentall & Varese, 2012). Moreover, the testing of the association between childhood trauma and the General dimension of psychosis within a bifactor framework supports the consistency criterion (Chapter 2.2.4) within the Bradford-Hill framework in that childhood trauma remains associated with psychosis in an emerging conceptualisation of psychotic symptomology.

The findings from phase two of the current study also provide an important addition to the theoretical literature. Following their systematic review of psychological mediators of childhood adverse experiences and psychosis, Williams et al. (2018) called for the examination of multiple indirect effects from childhood adversity to psychosis within an appropriate structural model to elucidate individual processes. Statistically controlling for the

inter-correlations between multiple mediating variables, while simultaneously assessing their effects on multiple dimensions of psychosis, offers a novel, viable framework (Figure 5.1) through which to assess a broad range of biological, psychological, and social variables in future cross-sectional and longitudinal research.

As discussed in section 2.2.8, another criterion for determining a causal relationship between childhood trauma and psychosis is the identification of plausible mechanisms to explain how exposure to childhood trauma may ultimately manifest in psychotic symptom expression. The findings from Chapter 5 provide empirical support for individual processes that may be involved in the development of a general vulnerability to symptoms of psychosis following childhood interpersonal trauma. Firstly, the current findings offer novel insight into the debate regarding the mediation effect of PTSD on the association between childhood trauma and psychosis. Whereas extant literature has primarily employed positive symptoms and schizotypal personality disorder as dependent variables when assessing the mediation effect of PTSD on childhood trauma and psychotic symptomology (Berenbaum et al., 2008; Choi et al., 2015; Hardy et al., 2016; Powers et al., 2011), the model set forth in Chapter 5 proposes that an individual victimised in childhood may develop post-traumatic stress responses, which may, in turn, ultimately result in an increased vulnerability to both affective and non-affective psychotic disorders.

Secondly, the suicidal-drive hypothesis is a novel and emerging concept that offers an alternative explanation to how suicidality and psychosis symptoms are related (Murphy et al., 2018). The current findings support a plausible mechanism whereby attempted suicide influences a susceptibility to affective and non-affective psychotic symptomology following trauma exposure in childhood. While this requires extensive future research, these findings lend support to this emerging theoretical framework. Third, although a lack of perceived social support is robustly related to psychosis (Gayer-Anderson & Morgan, 2013, 2015) and

childhood trauma (Lagdon et al., 2018; Sperry & Widom, 2013; Zerach & Elklit, 2020) very little research has directly assessed the mediational effect of perceived social support on the association between childhood trauma and psychosis (Crush et al., 2020). The findings from Chapter 5 provide empirical support for a mechanism whereby an individual who experiences trauma in childhood, and also perceives lower levels of social support, may ultimately lead to an increased risk for affective and non-affective psychotic disorders. Finally, the social identity approach proposes that individuals may internalise adverse experiences to an extent where these experiences becomes part of the victim's identity. Moreover, weaker social bonds may also influence the development of psychotic symptoms due to the perceptions of exclusion from society (McIntyre et al., 2016). The current research indicates that although childhood trauma decreases a person's perception of social bonds (i.e. their social identity) this relationship does not influence the development of a general vulnerability to affective and non-affective symptoms, within the General dimension of psychosis.

The findings from phase three of the current study adds to extant literature by assessing the stress responses in former residents of institutional care facilities; an understudied cohort at higher risk of adverse psychosocial outcomes (Carr et al., 2010, 2019, 2020). The development of psychosis in this population has been particularly neglected. It is understandable that affective and non-affective psychotic disorders have not been assessed with institutional abuse survivors as frequently as Internalising and Externalising disorders. Institutional abuse survivors represent a small subsection of society who have been considerably traumatised and are likely to suffer from severe psychological distress and lack of education (Carr et al., 2020; Lueger-Schuster et al., 2014, 2018; Sherr et al., 2017; Sköld, 2013). As such, institutional abuse survivors are a hard to reach and vulnerable population. With this in mind, it is likely that previous research has primarily focused on Internalising and Externalising disorders when assessing institutional abuse survivors because these

psychiatric disorders are far more prevalent than psychotic disorders (Steel et al., 2014). However, the current findings indicate that institutional abuse survivors are also likely to exhibit high levels of psychotic symptoms and thus warrant closer attention in the research literature. As seen in previous research with institutional abuse survivors (Knefel & Lueger-Schuster, 2013), the levels of CPTSD in the current sample were considerably higher than PTSD. These findings offer support to the extant CPTSD literature which theorises that individuals who are exposed to sustained and varying traumatic experiences are more likely to develop CPTSD rather than PTSD (Brewin 2020; Herman, 1992; Maercker et al., 2013). Finally, as CPTSD is an emerging disorder, very little is understood with regards to its relationship with psychosis. Frost et al. (2019), in the first study to assess the relationship between CPTSD and psychosis, indicated that these were related psychometric constructs. Despite valid theoretical grounds to assume that these constructs are related owing to the shared aetiological risk factor of complex trauma (Brewin 2020; Herman, 1992; Maercker et al., 2013; Shevlin et al., 2008; Trotta et al., 2015; Varese et al., 2012a), the current findings indicate that there is no association between CPTSD and psychosis.

7.3 Contribution to Practice

Although the bifactor model of psychosis has rectified a number of relevant criticisms of traditional diagnostic models of mental illness, the implementation of this framework in clinical practice raises considerable concerns regarding how to apply General and specific dimensions of psychosis. Ruggero et al. (2019) propose three principles to guide the application of dimensional models of psychopathology in clinical practice. First, higher scores on specific dimensions of psychosis (e.g. Positive, Negative, Depression, Mania, and Disorganization) represent the severity of specific symptoms and not categorical distinction. For example, higher scores on the Positive, Negative, and Disorganization dimensions (e.g. non-affective symptoms) does not necessarily preclude the possibility of increasing scores on

the Manic and Depression dimensions (e.g. affective symptoms). While acknowledging the dimensionality of symptoms, researchers can superimpose diagnostic cut-offs in a categorical fashion on both the General and specific dimensions to facilitate more accurate diagnoses (Ruggero et al., 2019). However, some have criticised the practice of superimposing categorical cut-off scores onto dimensional models of psychopathology, stating that such a practice may be just as arbitrary as traditional binary diagnostic decisions (Bebbington, 2015). Secondly, psychopathology is hierarchical in nature. That is, clinical treatment must acknowledge that, in some cases, specific psychiatric phenomena may independently manifest (e.g. persecutory delusions); and in other cases, these symptoms are an indication of broader manifestation of psychotic symptomology (e.g. non-affective psychosis; Ruggero et al., 2019). Thirdly, in contrast to traditional diagnostic models of mental illness, symptoms are distinct from functional impairment. Although functional impairment should continue to be used to inform treatment, the nature of psychosis should be considered as independent from impaired functionality (Ruggero et al., 2019).

As discussed in section 2.1.7, a key focus of the extant literature on the bifactor model of psychosis has been to test its clinical utility. Thus far research indicates that (1) the General dimension can accurately classify individuals at the affective and non-affective ends of the psychosis spectrum; (2) higher scores on specific symptom dimensions can accurately distinguish between categorical diagnoses; and (3) the General and specific dimensions can accurately predict functional impairment. As the current study did not assess the clinical utility of a bifactor model in the general population, it is difficult to make any concrete conclusions in relation to Ruggero et al.'s (2019) recommendations. How to maximise the utility of a bifactor model of psychosis in early intervention and prevention measures within the general population, however, warrants further discussion.

Tentatively, the current findings suggest that the greatest clinical utility in the application of a bifactor framework in the general population may lie in the General dimension. As discussed in 2.1.7, preliminary evidence suggests that specific constellations of psychosis (e.g. Positive, Negative, Mania, Disorganization) may not become distinctly manifest from the General dimension until symptoms become more severe over time (Reininghaus et al., 2013). As such, practitioners could initially determine if indicators of psychosis, such as positive symptoms (e.g. delusions and hallucinations) are present. Having clarified if an individual is displaying psychotic symptoms, a practitioner could, in theory, use a total score of affective and non-affective symptoms to assess the risk of developing an affective or non-affective psychotic disorder. It may be that treatment plans vary across the continuum of psychotic expression. For subclinical manifestations, treatment plans may be better targeting a broad range of symptoms, at either the affective or non-affective ends of the psychosis spectrum. As time passes, and symptoms increase in severity, specific constellations may become more distinct, allowing clinicians to target specific symptom groupings. Thus, the bifactor four-factor model of psychosis supported in the current research is applicable to clinical practice – in line with Ruggero et al.'s (2019) recommendations – in that (1) the General dimension may be used to categorically distinguish affective and non-affective vulnerability to psychosis and (2) specific symptoms may be used to indicate a broader hierarchy of psychotic symptomology. As psychotic symptoms were determined based on functional impairment in the current study, findings are not applicable to Ruggero et al.'s (2019) third recommendation.

It must be noted, however, that the current findings and the extant research are insufficient to justify an overhaul of traditional diagnostic manuals. As such, clinical practice should continue to utilise conventional diagnostic manuals as they provide clinically useful information for diagnoses and treatment, despite relevant criticisms of their validity. Ruggero

et al. (2019) propose that clinicians may use DSM-5 and ICD-11 measures in a manner that mirrors the nature of psychosis. Indeed, both the DSM-5 and ICD-11 acknowledge the dimensionality of psychotic symptoms and allow for continuously distributed scores on specific symptom constellations. Firstly, scores for affective and non-affective symptoms can be grouped together to create a total score of psychosis which accounts for the overlap in schizophrenic and bipolar disorders. Scores from this measure may be used to provide an indication of the affective or non-affective nature of the symptoms an individual is experiencing. Secondly, total scores of specific symptom dimensions may be used to provide an indication of the severity of symptoms. For example, an individual presenting to clinical practice with a schizophrenic disorder might exhibit high scores on the Positive, Negative, and Disorganization dimensions.

Importantly, from a clinical perspective, the 'mediator' variables tested in phase 2 of the current study can be considered modifiable. That is, clinical practice can implement strategies to enhance social support networks and identification with familial and societal groups, as well as design therapeutic interventions to treat those who have attempted suicide or those diagnosed with PTSD. The associations observed in the current study provide useful clinical insight, including that targeting perceptions of social support, as well as providing clinical intervention for individuals who have attempted suicide or have been diagnosed with PTSD following childhood interpersonal trauma, may help to alleviate affective and non-affective symptoms of psychosis. Indeed, research indicates that trauma-focused therapy in patients with comorbid PTSD and psychosis is successful in treating both sets of symptoms (Buck et al., 2019; Tong et al., 2017; van Minnen et al., 2016). Given the severity of psychotic symptoms and their considerable effect on the individual's quality of life (Galuppi et al., 2010; Saarni et al., 2010), identifying viable indirect variables which may enhance the treatment of psychosis following childhood trauma is of significant clinical relevance.

Although biological factors certainly influence the development of psychosis, and psychopathology more broadly (Gonçalves et al., 2018; Leucht et al., 2017), the current findings illustrate the importance of acknowledging the role of environmental factors in the aetiology of psychosis. Despite this, biological interventions for psychotic symptoms are increasing in recent years (Heald et al., 2020). Moreover, research indicates that antipsychotic drugs are, in some instances, prescribed for factors outside of psychotic disorders such as loneliness in older adults (Boehlen et al., 2015). General medical practitioners are often the first point of contact for those seeking intervention for psychological distress (O'Callaghan et al., 2010). The available evidence suggests that general medical practitioners are either not aware of the efficacy of long-term antipsychotic use (Johnson et al., 2017), or prescribe antipsychotic medication as a cheaper and less time-consuming alternative to non-medical intervention, such as therapy (Murphy et al., 2016b). The findings of the current thesis illustrate that by focusing on environmental factors there is a possibility of reducing the risk of individuals developing affective and non-affective psychosis.

Research indicates that practitioners deem treating individuals who have experienced institutional abuse more challenging than those who have experienced childhood abuse in the general population (Wolters, 2008). A number of specific outcomes from this research are particularly relevant to the findings in the current study. When asked, clinicians indicated that institutional abuse survivors displayed more profound levels of anger, shame, and a lack of emotional development, social support networks, and coping skills (Wolters, 2008). These outcomes are strikingly similar to DSO symptoms assessed in the current study. The findings from phase 3 indicate that survivors of institutional abuse are likely to exhibit negative sense of self, poor affect control and ability to build and maintain relationships (e.g. high levels of DSO). By specifically screening for and treating DSO symptoms clinicians may see a reduction in factors that have posed challenges to the treatment of institutional abuse

survivors. In addition, and although the current findings are preliminary, they suggest that treating psychosis and CPTSD independently may be a more useful clinical practice.

7.4 Contribution to Policy

The findings from the literature review and Chapter 6 further substantiate that individuals who have resided in institutional care during childhood and adolescence are at risk of experiencing considerably high levels of childhood trauma and psychological distress. In the Republic of Ireland, the Irish government acknowledged the right of survivors of institutional abuse to claim monetary compensation for the trauma and the subsequent distress that they suffered owing to their time in state/religious-run institutions. Correspondingly, independent state bodies, such as Caranua, established by the Residential Institutions Statutory Fund Act 2012, uses funds from the Irish religious congregations to address the health, housing and education needs of survivors living in Ireland and other parts of the world. Given the severity of both childhood trauma and psychological distress suffered by survivors of institutional abuse, this funding should remain indefinitely available throughout the lifetime of survivors.

In addition to this, however, there are a number of key policy changes that have been proposed by advocacy groups, which have been outlined in Hamber and Lundy (2020). First, all policies related to institutional and other forms of abuse should take a victim-centred approach and survivor-led committees should be established to inform governmental policy in all matters related to survivors of institutional abuse. Survivor specific counselling services should also be established, especially in light of previous concerns voiced by clinicians treating institutional abuse survivors (Wolters, 2008). In addition, the housing, educational, and medical needs of survivors should be met by governments around the world. Finally, current findings indicating the role of social support in the relationship between childhood trauma and psychosis suggest that increased government funding should be made available to

institutional abuse advocacy and social support groups such as Survivors and Victims of Institutional Abuse Northern Ireland, Right of Place, and the Aislinn Centre. By doing so, such groups may continue to offer a social outlet to survivors.

Second, hearing the testimony, and facilitating the healing and treatment of survivors. Although the restorative effect of victim testimony has been proposed in the literature (Moon, 2009), the extant evidence is equivocal (Hamber, 2015; Mendeloff, 2009). To maximise the potential benefits of survivor testimonies, adequate reparations and the socio-economic needs of survivors must be met to ensure that the survivors feel that their testimonies have made an impact (Hamber, 2009; Stover, 2004). The Irish government must reconsider their recent proposal to seal official documents which exposed the legacy of abuse perpetrated by religious/state run institutions. The sealing of such documents may cause considerable distress to survivors. In addition, survivors who have given testimony should continue to be supported by governmental bodies.

Third, preventing the instrumentalising of survivors. Survivors of institutional abuse should not be used for political gain or opportunism (i.e. as pawns in political conflict). The Historical Inquiry into Institutional Abuse in Northern Ireland is a clear example of how survivors can be used as instruments for political gain. Survivors in Northern Ireland indicated that they believed that their testimony was merely a 'ticking the box' exercise so that the residing government could appease the mounting political pressure for justice and reconciliation (Hamber & Lundy, 2020). The trauma that survivors of institutional abuse have suffered is manifold and these experiences have a had a considerably detrimental effect of their psychological well-being. Religious/State-run institutions are culpable for the abuse of survivors and therefore should humbly acknowledge the debt that is owed to survivors, and not reduce their lived experience to political appeasement.

7.5 Limitations

The current findings should be interpreted in light of a number of strengths and limitations. First, the large representative sample of the US general population increases the generalisability of these findings from phases one and two to the wider population. Phase one was the first study to employ Rodriguez et al.'s (2016) bifactor strength indices and utilise well-established risk variables to examine the construct reliability, replicability, and external validity of a bifactor model of psychosis in a general population sample, which can be considered a major strength. To my knowledge, phase two of the current thesis is also the first empirical study to simultaneously examine multiple mediators that have been found to account for the association from childhood interpersonal trauma to the General and specific dimensions of psychosis. In addition, phase three was the first study to simultaneously assess both CPTSD and psychosis in individuals who resided in institutional care during childhood/and or adolescence, addressing a clear gap in the literature.

In relation to the limitations of phases one and two, a fully diagnostic tool of psychosis was not available in the AUDADIS-5. Moreover, as the NESARC-III adopted the most recent version of the AUDADIS, the indicators used to model psychosis in the current study did not fully align with those of the AUDADIS-IV selected by Shevlin et al. (2016). Additionally, the absence of detail regarding the timing of symptom onset precludes the ascertainment of the chronology of symptoms in this sample. Similarly, the cross-sectional nature of this research made it impossible to determine any casual relationships between risk variables and the General and specific dimensions of psychosis. Finally, although the NESARC-III is considered nationally representative, those in the military service, homeless, cognitively impaired, under the influence of alcohol or drugs, currently incarcerated, or living in remote locations were excluded from data collection. Therefore, it is unknown if the findings from phases one and two generalise to these populations. Likewise, the research

conducted on the bifactor model of psychosis in clinical and general population samples has been primarily conducted among Western nations, particularly in the US and Europe. Therefore, it is unknown if these findings generalise to other cultures.

In phase two, it was decided that the key strength of this data (e.g., generalisability) superseded the necessity for bootstrapping reliability estimates. This may have affected the reliability of the findings. However, given the size of the NESARC-III data set, it is likely that the findings of the current study are reliable. In addition, it is impossible to determine the temporal ordering of the variables used in the current study, as the data were correlational in nature. It is entirely possible that psychosis symptoms indirectly effect perceptions of social support, one's identification with familial, societal, or ethnic groups, attempted suicide, and PTSD symptomology. The majority of the items used in this study were measured in terms of lifetime occurrence. Thus, it is difficult to ascertain if the associations observed in the present study were currently active in the NESARC-III sample. Finally, the nature of this sample makes it difficult to generalise to clinical samples.

In phase three, the small sample size in the study significantly decreases the capacity to adequately test the association between post-traumatic stress responses and psychosis in institutional abuse survivors. Also, institutional abuse survivors are a hard to reach population and there were considerable difficulties in recruiting participants for the current study. As such, it is difficult to determine how well the current findings represent all survivors of institutional abuse. It is likely that survivors who do engage in research and actively participate in survivor groups are different to those who do not. Finally, a considerable proportion of the survivor cohort was born outside of Ireland. Although there were consistently high levels of childhood trauma and psychological stress observed in the current sample, there were likely differences in cultural and societal factors for those who spent time in institutions outside of Ireland.

7.6 Implications for Future Research

In line with the extended phenotype theory of psychosis, future research should endeavour to determine if genetic biomarkers of affective and non-affective psychotic disorders are significantly associated with the General dimension of psychosis in non-clinical samples. Such research would significantly bolster previous findings that indicate that the General dimension, in part, represents a response to demographic, environmental and genetic risk factors for psychosis. How individuals progress through psychosis symptom development within the bifactor framework is an area that can be considerably expanded upon. The current findings suggested that the specific dimensions were not reliable constructs, save for the Negative dimension. It is of particular interest to researchers and clinicians alike to ascertain greater clarity regarding the stages of illness where the specific dimensions become more prominent than that observed in the current study. Initially, research with secondary data obtained from multiple samples with varying degrees of symptom severity, ranging from general population samples to individuals with chronic and severe schizophrenic disorders may be used to determine the prominence of the General and specific dimensions across varying levels of psychotic symptom expression. However, longitudinal research where participants are tracked over time offers the greatest potential to understand the trajectory of psychotic symptomology.

The bifactor model of psychosis offers considerable potential in early intervention and prevention efforts by maximising the shared variance of affective and non-affective symptoms. Following the current findings, which indicate that the General dimension is a valid and reliable psychometric construct in a non-clinical sample, future research should determine if the General dimension can accurately predict diagnoses of affective and non-affective psychotic disorders. Ruggero et al. (2019) also recommended that the nature of

psychopathology be detached from functional impairment. As such, it is necessary to assess if the structure of psychosis holds in the absence of functional impairment.

In line with the findings and limitations of phase two, research should endeavour to test these pathways in clinical samples to provide a clearer understanding of active relationships between childhood interpersonal trauma, psychosis, and perceptions of social support, social identity, attempted suicide, and PTSD symptomology. Longitudinal research is required to fully elucidate the temporal ordering of the pathways identified in the current work. Moreover, the current findings indicate that social identity may be strongly related to Negative symptoms. Although previous research has identified ethnicity as a risk factor for schizophrenic disorders, none has specifically examined the association between Negative symptoms and social identity. Future research should examine this association in a broad array of samples with varying levels of symptom severity to provide a closer estimation of the strength of this relationship.

The findings from phase three highlight a number of areas that could significantly enhance the extant literature through future research. Firstly, research should seek to determine the prevalence of psychotic symptomology in survivors of institutional abuse on a global scale. Considering the types and duration of abuse are similar across the majority of institutional abuse survivors (Biehal, 2014; Carr et al., 2020; Sherr et al., 2017; Sköld, 2013), this cohort is at increased risk of developing psychotic disorders. Secondly, the available data indicates that levels of CPTSD are higher than PTSD in institutional abuse survivors in Ireland and Austria. Future research should establish if this relationship remains consistent on a global scale, as this information would significantly inform clinical practice. Finally, the association between psychosis and CPTSD is a burgeoning area of research, and therefore this relationship should be tested in larger samples with complex trauma histories to ascertain a better understanding of how these to psychopathological constructs are related.

7.6 Conclusion

In conclusion, the findings from this study provide novel empirical support for a dimensional representation of the nature of psychosis in the general population. In the general US adult population the nature of psychosis was best represented by a General dimension encompassing both affective and non-affective psychotic symptoms, and four specific dimensions positive, negative, manic, and disorganized symptoms. The General dimension was shown to be a valid and reliable construct and was associated with a number of developmental, demographic, social, and psychological variables. These findings suggest that the nature of psychosis in the general US adult population represents a general vulnerability to affective and non-affective symptoms of psychosis and is, in part, influenced by factors in one's childhood, demographics, perceptions of social support, and history of suicide attempt. The risk for both affective and non-affective symptoms of psychosis following childhood trauma may also be influenced by PTSD, social support networks, and a history of suicide attempt. Finally, although levels of psychosis and CPTSD were high in former residents of institutional care facilities the current findings suggest that these constructs may be best treated individually in clinical practice, within this cohort.

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Appendix A

Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

David Murphy
27 Cherrywood Crescent
Clondalkin
Dublin 22

25 September 2018

Re: Institutional psychosis: An Investigation of psychotic experiences among former residents of institutional facilities

Application 08/2018/02 - Approval of submitted amendments

Dear David,

Thank you for your submission of further amendments to the above proposal to the HPM/CGH REC.

The REC has given ethical approval to the proposed amendments.

Yours sincerely,

Prof Charles Normand
Chair of the HPM/CGH REC

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Appendix B

Descriptive statistics for 'Sample 1' participants (N = 13)

	N (%)
Sex	
Male	01 (07.7)
Female	12 (92.3)
Age in Years	
18-29	04 (30.8)
30-44	00 (00.0)
45-59	03 (23.0)
60+	06 (46.2)
Place of birth	
Republic of Ireland	08 (61.5)
Outside of Ireland	05 (38.5)
Income	
On or above median wage	07 (53.8)
Below median wage	06 (46.2)
Relationship status	
In a committed relationship	04 (30.77)

Not in a committed relationship	09 (69.23)

Appendix C

Descriptive statistics for 'Sample 2' participants (N = 32)

	N (%)
Sex	
Male	16 (50.0)
Female	16 (50.0)
Age in Years	
18-29	12 (37.5)
30-44	16 (50.0)
45-59	02 (06.25)
60+	02 (06.25)
Place of birth	
Republic of Ireland	26 (81.2)
Outside of Ireland	06 (18.8)
Income	
On or above median wage	15 (46.9)
Below median wage	17 (51.1)

Relationship status	
In a committed relationship	25 (78.1)
Not in a committed relationship	07 (21.9)