Psychotic-Like-Experiences (PLEs) in perinatal women: The role of psychological distress and cognitive biases

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Executive Summary

Systematic Review

Introduction

The systematic review explored the relationship between Psychotic-Like Experiences (PLEs) and affective psychopathology, such as anxiety and depression, in the absence of psychosis. PLEs have been researched extensively to help elucidate the pre-psychotic stages of a psychosis continuum (Yung et al., 2012), where greater persistence and reoccurrence of PLEs has been found to be predictive of future psychotic onset (Kaymaz et al., 2012), supporting the continuum model of psychosis (van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). However, the high prevalence of PLEs (Johns & van Os, 2001), yet low transition rates to psychosis (Hanssen, Bak, Bijl, Vollebergh, & Os, 2005), suggest PLEs may not only psychotic-related. Low transition rates but with persistence of PLEs has been found over extended periods of follow-up (Dhossche, Ferdinand, Van Der Ende, Hofstra, & Verhulst, 2002; Werbeloff et al., 2012) suggesting it is not as a result of non-emerged psychosis.

Given PLEs (Johns & van Os, 2001) and anxiety and depression (McManus et al., 2016) are highly prevalent and anxiety and depression are considered common co-morbidities of both those at-risk of (Yung, Phillips, Yuen, & McGorry, 2004), and living with psychosis (Buckley, Miller, Lehrer, & Castle, 2009), it raises questions over what the relationship between PLEs and non-psychotic affective symptomology. Exploring this relationship between PLEs and non-psychotic outcomes further has been a growing area of interest within research. Existing evidence indicates PLEs are present across a wide range of non-psychotic disorders and are associated with poorer outcomes (i.e., greater symptomology and functional impairment) in affective disorders in the absence of psychosis (Dhossche et al., 2002; Wigman et al., 2012). The review aimed to provide an up-to-date overview of the current status of the literature by exploring the relationship between PLEs and a range of affective psychopathology, including depression, anxiety disorders, suicidality and psychological distress in non-psychotic samples.

Methods

Included studies explored the relationship between PLEs and affective symptomology, using either self-report or clinician rated measures of PLEs and depression, anxiety disorders, as defined by the DSM-IV (i.e. including social phobia, panic and general anxiety but excluding Obsessive-Compulsive Disorder (OCD) and trauma), suicidality and general psychological distress. Inclusion criteria were any non-help-seeking and non-psychotic help-seeking community samples, across all age groups in western countries. Exclusion criteria were help-seeking individuals defined as at-high risk of psychosis (based on Ultra High risk criteria (Schultze-Lutter, Ruhrmann, Berning, Maier, & Klosterkötter, 2010) and non-western countries, where important differences in cultural interpretations of delusions and hallucinations have been found (Larøi et al., 2014; Viswanath & Chaturvedi, 2012). Search terms were developed and searches were run on three electronic databases: PubMed, PsycINFO and Web of Science. 650 records were identified, following screening twenty-five studies met inclusion criteria for the review.

Findings

Data was synthesised using a narrative review. PLEs were found to be positively associated across all independent variables including depression, anxiety, social phobia, panic disorder, increased suicidality and general psychological distress. PLEs appeared to be particularly associated with depressive symptomology and suicidality. A dose-response effect was reported between greater PLEs and greater severity of psychopathology, suggesting PLEs may exacerbate symptomology. Factorial analysis of PLEs identified that specific subtypes, such as of Bizarre Experiences (BE) and Persecutory Ideation (PI), are more highly associated with specific psychopathology than others, for example BE and PI is more highly associated with depression than anxiety. This suggests that not all PLEs confer the same risk with some subtypes, such as Magical Thinking (MT), potentially being beneficial to wellbeing.

Discussion

Findings that PLEs are associated with a broad range of psychopathology and that severity of psychopathology increased whilst functioning decreased alongside greater

levels of PLEs, support the idea that these groups maybe presenting with psychopathology complicated by the presence of PLEs (Wigman et al., 2012). However, no causal links have been established between PLEs and distress, so the direction of this relationships remains unclear. PLEs could therefore be useful clinical markers of psychopathology severity (Kelleher et al., 2012). Consequently, there could be clinical utility in screening for PLEs to help identify those at-risk of greater severity and poorer prognosis. Given PLEs have been found to be highly prevalent in the adolescent period (Addington, 2003), screening for PLEs in child and adolescent mental health services could be particularly worthwhile. Findings that PLEs may play a role in both psychotic and non-psychotic symptomology suggest there is merit in considering PLEs transdiagnositcally, with researchers suggesting adopting a transdiagnostic clinical staging model to the early intervention paradigm (Fonseca-Pedrero et al., 2018; McGorry & Nelson, 2016).

Strengths and limitations

The lack of longitudinal designs means no causal links can be made about the relationship between PLEs and affective symptomology, meaning it is unclear if PLEs give rise to greater symptomology of vice versa. Additionally, the large heterogeneity across how subclinical psychotic experiences are defined and subsequently measured, makes it difficult to compare and synthesise data meaningfully. Furthermore, the reliance on self-report measures of PLEs, where evidence suggests that self-report measures may lead to over-reporting (Kaymaz et al., 2012) also impacts on generalisability of findings.

Recommendations for future research

Future research needs to focus on longitudinal studies to help establish if causal links exist between PLEs and affective symptomology. Findings from the review ialso ndicate the need for a clearly operationalised definition of subclinical psychotic experiences for PLE research interested in both psychotic and non-psychotic outcomes (Fonseca Pedrero & Debbané, 2017; Lee et al., 2016).

Empirical Piece

Introduction

Accurate and timely identification of emerging psychopathology in the perinatal period has become a U.K. healthcare priority (NHS England, 2016), where untreated perinatal mental health difficulties have been linked to poor long term outcomes for mother and baby (Higgins et al., 2018; Howard et al., 2014). Current identification methods have been criticised as inadequate (Nath et al., 2018; Thombs et al., 2015), generating high levels of false positives which is costly to the NHS (Paulden, Palmer, Hewitt, & Gilbody, 2009). Psychotic-like experiences (PLEs) are subclinical psychotic experiences such as delusional beliefs and hallucinations. Recently greater levels of PLEs have been associated with greater levels of non-psychotic affective psychopathology, suggesting PLEs could be useful clinical makers of psychopathology severity. PLEs have been found to be prevalent in the perinatal period, where greater affective psychopathology predicted greater levels of PLEs.

Maladaptive cognitive appraisals have been found to play an important role in the development and maintenance of positive psychotic symptomology (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001), with an inflated sense of responsibility bias recently also been associated with psychotic symptomology (Ellett et al., 2017). Psychosis related cognitive biases have been associated with PLEs in the general population and could be underpin the relationship between PLEs and affective psychopathology. The empirical piece aimed to explore whether PLEs in the perinatal population are associated with distress and psychosis-related cognitive biases and whether these biases predicted levels of PLEs and distress.

Methods

Using a cross-sectional design, 144 female participants were recruited via social media and General Practice (GP) surgeries in the U.K. Participants completed an online survey, which included measures of PLEs (delusional and hallucinatory experiences), distress (DASS-21) and psychosis-related cognitive biases (CBQp) such as

Threatening Events (TE) and Anomalous Perceptions (AP) and a measure of inflated responsibility (RAS).

Results

Endorsement rates of PLEs in the study were found to be lower compared to previous perinatal samples and community norms for PLEs. No differences were found between levels of delusions pre to postnatally, as previously reported, but hallucinations were found to decrease pre to postnatally, partly supporting previous findings. Jumping-to-conclusions and Intentionalising were the most commonly reported cognitive bias. Distress was significantly correlated with PLEs and cognitive biases of AP, RAS and dichotomous thinking (DT). In regression model RAS was a unique predictor of PLEs however no specific cognitive bias was found to be a unique significant predictor of distress. PLEs remained correlated with distress when controlling for the cognitive biases of TE and DT in partial correlation.

Discussion

PLEs were found to highly associated with distress in perinatal women. Inflated responsibility bias (RAS) was found to be particularly associated with PLEs, over and above psychotic related cognitive biases. RAS could therefore constitute important treatment targets, just as they are in Cognitive Behavioural Therapy for OCD (Veale, 2007). Findings suggest that PLEs could be useful tools in identifying women at-risk of greater affective psychopathology in the perinatal period, however further longitudinal research is needed.

Strengths and limitations

The cross-sectional design means no causality can be inferred from results. Additionally, the poor uptake from GP surgeries meant the sample was largely recruited via social media meaning it was a self-selecting sample, reducing generalisability of findings. The sample being a largely white British, well-educated and well social support group did not represent at-risk women, where evidence suggests single and immigrant women at the greatest risk of developing perinatal mental health problems (Biaggi, Conroy, Pawlby, & Pariante, 2016), which could account for low rates of PLEs and distress.

Recommendations for future research

Future longitudinal research is needed to establish if causal links exist between PLEs and distress. The role of inflated responsibility cognitive bias in PLEs merits further exploration in future research, where authors found no current research exploring RAS in PLEs.

Integration

The empirical piece started as a clinical interest in perinatal mental health, in particular postpartum psychosis (PPP). During initial literature reviews, studies were found which had used PLEs to explore etiological models of PPP and the development of delusional thinking in the perinatal period (MacKinnon et al., 2017; Mannion & Slade, 2014). As I also explored the literature around PLEs there emerged repeated evidence of PLEs having not only a role in psychotic outcome, but also being associated with greater severity in a wide range of psychopathology (Kelleher et al., 2012; Wigman et al., 2012). In view of the high prevalence rates of perinatal depression and anxiety (Fisher et al., 2012) I became interested in how PLEs could be associated with non-psychotic, psychological distress in the perinatal period.

The systematic review therefore focused on exploring the evidence base for PLEs being associated with greater levels of non-psychotic psychopathology and thus provided the rationale for the empirical piece. The review appeared timely as initial searches revealed that within the last five to seven years there had been a sharp increase in research exploring PLEs and non-psychotic outcomes. The review provided an up-to-date summary of the evidence that greater levels PLEs have been associated with greater levels of non-psychotic psychopathology, in particular with depression, suicide and anxiety. The implications of this were that PLEs could be important clinical markers not only as predictors of psychotic onset but also as clinical markers of non-psychotic psychopathology severity (Kelleher & Cannon, 2016). These findings informed the empirical piece by helping me to consider the potential clinical utility of PLEs in perinatal populations and their possible use as clinical screening tools to identify at-risk women (i.e., women at risk of greater severity of affective psychopathology) in the perinatal period.

Impact

There are several potential beneficiaries of the present research including clinicians, researchers interested in PLEs and perinatal mental health and women in the perinatal period. Evidence suggests that there is clinical utility in screening for PLEs in an adolescent age group, where higher reported levels of PLEs could help clinicians identify those at greater risk of psychopathology persistence and recurrence (Hodgekins et al., 2018; Kelleher & Cannon, 2016). In this context PLEs would not be treatment targets but clinical indicators and could be collected alongside other routine outcome measures to inform clinical decision making and risk assessment.

Additionally, given the prevalence of PLEs it is interesting to consider how they are discussed or understood in clinical settings, in particular how they are incorporated in formulation or considered in clinical decision making. Undertaking, qualitative interview with both clinicians and service-users around PLEs in clinical practice, could provide rich information on how PLEs are understood and responded to by both groups. In the longer term, longitudinal research is required in order to establish any causality between PLEs and psychopathology. If a causal link was found in this relationship, PLEs could become evidence based treatment targets for clinicians.

Other beneficiaries of the current research are obstetric healthcare professionals, individuals working in perinatal mental health charity sectors and women in the perinatal period. Findings could be used to normalise the range and variety of experiences during the perinatal period. Women may be reassured to know that PLEs, psychotic-related cognitive biases and inflated responsibility biases are common experiences amongst women during this time and in the general population and do not, per se, indicate a need for care. Accessible toolkits could be developed to share information around these experiences, where numbers downloaded could be used to directly measure impact amongst these groups.

Dissemination

Attempts will be made to disseminated findings at a local level, including staff at my current CAMHS service and psychology discipline meetings. I will aim to publish two academic first-author papers in the following high impact factor (IF), peer-reviewed scientific journals relevant to my research discipline. Given that the biggest

beneficiaries of the research are likely to be clinicians I will also submit the systematic review to the Divisional branch of Clinical Psychology (DCP) of the British Psychological Society (BPS) for publication. I will also seek to attend and/or submit my research for presentation at relevant conferences or symposiums.

Perinatal mental health appears to be a current topical issue, not only with the government's announcement of increased spending on perinatal mental health service (Five Year Forward review, NHS England, 2015) but also a visible increase in broadcast media, with recent television documentaries on the BBC and BBC radio shows and successful maternal mental health awareness campaigns by national charities. Given the current interest around perinatal mental health, I will seek out national media, mainstream and specialist print outlets, including the BBC, Psychologies magazine and relevant charities to take advantage of the current media attention in the area to increase the reach of my research.

A systematic review of the relationship between psychotic-like experiences and affective disorders, suicidality and psychological distress in non-psychotic samples.

Glossary and definitions

AH	Auditory Hallucinations
BE	Bizarre Experiences (PLE subtype)
CAARMS	Comprehensive Assessment of At Risk Mental State
CAPE	Community Assessment of Psychic Experiences
CHR	Clinical High Risk [for psychosis]
CIDI	Composite International Diagnostic Interview
DLEs	Delusional-Like Experiences
DSM-V	Diagnostic and Statistics Manual
HLEs	Hallucination-Like Experiences
K-SADS-PL	Schedule for Affective Disorders and Schizophrenia for School-aged Children, Present and Lifetime
MDD	Major Depressive Disorder
MT	Magical Thinking (PLE subtype)
PA	Perceptual Anomalies (PLE subtype)
PI	Persecutory Ideation (PLE subtype)
PLEs	Psychotic-Like Experiences
SCID-IV	Structured Clinical Interview for DSM-IV
UHR	Ultra-High Risk [for psychosis]
VH	Visual Hallucinations
WISC-IV	Weschler Intelligence Scale for Children Version Four

Abstract

Background: Psychotic-Like Experiences (PLEs) have been conceptualised as part of the subclinical end of a psychosis continuum. Greater persistence of PLEs has been linked to future psychotic onset; however, high prevalence of PLEs, yet low transition rates to psychosis, suggest PLEs are not only psychotic- related. It is unclear how PLEs may relate to other psychopathology in the absence of psychosis, which will be the focus of this review.

Objectives: Thinking about PLEs more transdiagnositcally (i.e., not just psychotic outcomes) may provide insights into the role PLEs play in psychopathology, including shared pathways underpinning both psychotic and common mental disorders. This review investigated the relationship between PLEs and depression, generalised anxiety, specific anxiety disorders, suicide and psychological distress.

Method: A total of 25 quantitative studies, across age groups in western countries, using measures of PLEs, measures of the independent variables listed above, in non-help-seeking and non-psychotic help-seeking samples, were included.

Results: PLEs are highly reported in adolescent samples and are associated with a broad range of psychopathology, in particular with depressive symptomology and suicide. A dose-response effect was reported between greater PLEs and greater severity of psychopathology, suggesting PLEs may exacerbate symptomology. Specific PLE subtypes appear to be highly associated with some psychopathology, suggesting not all PLEs confer the same risk.

Limitations: The large heterogeneity across how PLEs are defined and measured, and the reliance on PLE self-reports, which can lead to over-reporting of PLEs, means generalisability of findings is reduced.

Conclusions and key implications: The prevalence of PLEs reported in adolescent, help-seeking samples and the association found between PLEs and depression and suicide, suggest it might be of benefit to routinely screen for PLEs within child and adolescent mental health services. However, further longitudinal research is needed utilising clinician rated measures of PLES in order to be able to draw causal inferences.

Introduction

Continuum model of psychosis

The continuum model of psychosis proposes that psychosis lies on a continuum of increasing severity, with subclinical psychotic symptoms (i.e., below a diagnostic threshold) lying on one end of the continuum and psychotic disorder (clinical symptoms) falling at the other (Linscott & van Os, 2013). It is proposed that the distribution of psychotic experiences across the population lies on a half normal distribution: at the top of the curve a small but significant proportion experience psychotic symptomology and within the tail of the curve the majority experience very low (subclinical) psychotic symptoms (van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). Additionally, distinctions have been made between the distribution of psychotic *experiences* vs. psychotic *symptoms* across the continuum. Van Os et al., (2009) postulated that (i) subclinical psychotic experiences are the most prevalent (8%) and may or may not be associated with distress and/or help-seeking. These are distinguished from (ii) subclinical psychotic symptoms, which are less prevalent (4%) are associated with some distress and help-seeking, but not enough to reach the threshold for (iii) psychotic disorder, which has the lowest prevalence rate (3%).

However, despite these distinctions, various terms are used to refer to the subclinical manifestations on the continuum. Psychotic-like experiences (PLEs), psychosis proneness and schizotypy are all used interchangeably to refer to both subclinical psychotic experiences and symptomology (Nelson, Fusar-Poli, & Yung, 2012), despite there being no scientific rationale for doing so (Fonseca Pedrero & Debbané, 2017). Additionally, the 'prodromal period' is also used to refer to help-seeking individuals who may be in the pre-psychotic phase leading up to acute psychosis, when there is a period of both clinical and functional decline (Addington, 2003; Carrión, Correll, Auther, & Cornblatt, 2017). For the purposes of this review, the term PLEs shall be utilised and has been defined as: subclinical experiences of hallucinations and delusions, which may or may not elicit distress or prompt help-seeking in individuals (van Os et al., 2009).

In contrast to PLES, which are viewed as transitory (Linscott & Van Os, 2013), schizotypy has been defined as a latent personality structure (Meehl, 1962) and more

recently it has been argued that schizotypy represents a “unifying construct’ which links together a broad range of subclinical and clinical levels of psychotic symptomology (Fonseca Pedrero & Debbané, 2017), including PLEs, psychosis proneness and attenuated psychotic symptoms. This review is interested in the subclinical PLEs which under this conceptualisation constitute the overarching construct, schizotypy.

Psychotic-Like Experiences (PLEs) as risk factors for psychosis

Evidence indicates that there is continuity between PLEs and psychotic disorder, with individuals who report persistent PLEs having an increased risk of developing future psychotic disorder (Dominguez, Wichers, Lieb, Wittchen, & van Os, 2011; Johns & van Os, 2001). Studies have found individuals who report PLEs have 60-fold increase in risk of transitioning to psychosis and this follows a dose-response effect, whereby risk of transitioning increases when multiple psychotic experiences are reported (Hanssen, Bak, Bijl, Vollebergh, & Os, 2005; Kaymaz et al., 2012). Research into PLEs has therefore predominantly focused on their role in psychotic onset and to corroborate etiological models of psychosis (Preti, Bonventre, Ledda, Petretto, & Masala, 2007).

Given PLEs have been found to be highly prevalent across large samples, and have been shown to fall on the continuum of psychosis, one could arguably expect higher rates of psychotic disorder. However, transition rates to psychosis remain very low in the general population (0.02- 3%, (Hanssen et al., 2005; Werbeloff et al., 2012) and only about one third of groups considered at ‘Ultra High Risk’ (UHR) of developing psychosis (28-30%) transition to psychotic onset (Fusar-Poli, Yung, McGorry, & van Os, 2014).

Parallel to this, there is evidence that PLEs are commonly reported in individuals with non-psychotic, affective disorders (van Os, Hanssen, Bijl, & Vollebergh, 2001). Given findings that 1) anxiety and depression are common comorbidities in psychosis (Buckley, Miller, Lehrer, & Castle, 2009); 2) the majority of individuals at UHR initially present with anxiety disorder or major depression (Fusar-Poli, Nelson, Valmaggia, Yung, & McGuire, 2014); 3) anxiety and depression are associated with poorer prognosis for UHR groups (Yung, Phillips, Yuen, & McGorry, 2004); and 4) both PLEs and anxiety and depression are common in the general population (Hanssen et al., 2005; McManus et al., 2016), it raises questions around the possible relationship between PLEs and anxiety and depression, in the absence of psychosis.

PLEs and affective disorders and suicidality: Current state of knowledge

There is increasing evidence suggesting that PLEs are associated with affective disorders (i.e., anxiety and depression) in the absence of psychosis. In longitudinal studies of non-helping seeking individuals, rates of PLEs at baseline were compared with psychiatric diagnoses at 2 year (Kaymaz et al., 2012) and 8 year follow-ups (Dhossche, Ferdinand, Van Der Ende, Hofstra, & Verhulst, 2002). PLEs were associated with diagnoses of non-psychotic, affective disorders at follow-up but not with psychotic disorders. Furthermore, there is evidence that PLEs are also associated with poorer outcomes for affective disorders. Individuals with clinically significant levels of anxiety and/or depression were more likely to report PLEs and showed greater severity of affective symptomology, including greater persistence of symptoms and suicidal thoughts, and poorer prognosis than individuals who did not report PLEs (Hanssen et al., 2003; Wigman et al., 2012). Similarly, a dose-response effect was found between increasing rates of self-reported PLEs and increasing psychological distress and decreasing happiness, where anxiety and depression explained the largest proportion of these associations (Koyanagi, 2017). Although these findings are correlational not causal, they could suggest that PLEs may play a role in exacerbating non-psychotic psychopathology.

In cohort studies of UHR individuals, research has shown that, whilst between 10% to 28% of individuals transition to psychosis the great majority (between 65 to 70%), who do not convert to psychosis, continue to experience PLEs and persistent or recurrent affective disorders (Hui et al., 2013; Lin et al., 2015). These findings have persisted at longer duration follow-ups, suggesting they are not the result of non-emerged psychosis (Lin et al., 2015; Rutigliano et al., 2016; Werbeloff et al., 2012).

Rates of suicide are known to be higher in people living with psychosis and schizophrenia (Bolton, Gooding, Kapur, Barrowclough, & Tarrier, 2007). The Schematic Appraisal Model of Suicide (SAMS; Johnson, Gooding, & Tarrier, 2008) model has attempted to elucidate the psychological processes which may underlie the higher rates of suicidal behaviour in psychosis. It proposes that information processing biases, including appraisals of defeat and entrapment, as well other known contextual factors in suicide, such as social isolation, emotion dysregulation and poor interpersonal problem solving skills, increases risk of suicide for people living with psychosis (Tarrier et al., 2014). Research into PLEs and suicide has shown that odds

of suicide attempts in adolescents with depression and anxiety disorder greatly increased when young people reported psychotic experiences compared to those who did not (Kelleher et al, 2014).

There are several models which outline potential mechanisms through which distress could be linked to PLEs. The stress vulnerability model (Zubin & Springer, 1977) proposes that the experience of psychosocial stressors, alongside a biological predisposition, are important mechanisms which can increase the risk of psychotic onset in some individuals. Garety et al (2001) expanded on this further by incorporating important psychological processes, which describe the route through which psychotic onset develops and is also maintained. According to this model, individuals who experience low mood or anxiety along with misappraisal of anomalous experiences are more likely to experience positive psychotic symptoms.

Evidence that (i) non-helping-seeking individuals who report PLEs experience greater and more persistent affective symptomology, (ii) that individuals with affective disorders and PLEs experience poorer prognosis and increased risk of suicidality (iii) that the majority of PLEs in UHR samples do not form part of a prodromal phase, but are associated with continued affective psychopathology, raises several potential hypotheses. For example, do PLEs constitute a specific risk factor for psychotic disorder or a general risk factor for a wider array of non-psychotic disorder (Nelson et al., 2012), or both (Kelleher et al., 2012)? Alternatively, could individuals be presenting with disorders of anxiety or depression *complicated* by PLEs (Kelleher et al., 2014; Wigman et al., 2012)? In which case, it could be hypothesised that those experiencing PLEs form two distinct groups: the first consisting of individuals with depression and/or anxiety complicated by psychotic-like psychopathology, and the second individuals experiencing PLEs as part of a 'prodrome' to psychotic onset (McAusland et al., 2017; Wigman et al., 2012).

PLEs as non-specific risk factors: Implications for dimensional models of psychosis

If PLEs constitute risk factors for both psychotic and affective disorders and/or are associated with greater affective disorders and increased risk of suicidality, this could have implications for the continuum model of psychosis. As aforementioned, the continuum (dimensional) model postulates that PLEs lie on a continuum, ranging from

'normal' functioning to psychotic disorder and that there is continuity between these experiences (van Os et al., 2009). Thus presence of PLEs do not necessarily indicate future risk of psychotic onset per se. An alternative, quasi-dimensional model has also been posited, stating that PLEs are variants of a disorder (i.e., incompletely expressed schizophrenia), and thus are a discontinuity with the normal population, where those reporting PLEs are at increased risk of developing psychotic disorder (Nelson et al., 2012). Evidence that PLEs are associated with both affective disorders and psychotic disorder, could support this notion of a 'latent categorical structure' within the population underlying the continuum of psychosis: with one group more liable to psychosis and another which is not (Johns et al., 2014).

However, the continuum model itself has been criticised conceptually and methodologically. Conceptually, critics argue a lack of specificity over whether it constitutes a epidemiological continua (i.e. a distribution of traits in the population) or a phenomenological continua (i.e. differences in experience, David, 2010). Methodologically, there are criticisms of the variability across how psychotic related phenomena is 'elicited, checked and verified' within research (David, 2010; van Os et al*.,* 2009). In particular, the lack of discrimination in using measures of PLEs, based partly on an assumption that all PLEs contribute equally to risk of developing psychosis, when research suggests important differences. Appraisals of PLES (i.e. levels of conviction and preoccupation) have been shown to better predict risk of psychotic onset than a simple frequency count of presence of PLEs (Lincoln & Keller, 2008; Preti, Cella, & Raballo, 2011).

This lack of consensus is arguably reflected in the decision to not include Attenuated Psychosis Syndrome (APS) as a diagnostic category in the most recent edition of the DSM-V. APS aimed to identify people at high risk of psychosis, but due to evidence that individuals with sub-threshold psychotic symptoms exhibited high levels of comorbid conditions and a range of non-psychotic outcomes, the diagnostic reliability of APS were deemed insufficient to hold clinical utility (Tsuang et al., 2013).

Transdiagnostic approaches to early intervention

The lack of consensus over the role of subclinical psychotic symptoms may reflect the complexities of understanding the etiology of psychopathology. In a World Health Organisation (WHO) survey of world mental health, across 18 countries, researchers

looked at the associations between subclinical psychotic experience and a plethora of mental disorders, including mental, behavioural, and addiction diagnoses (McGrath et al., 2016). They found PLEs were predicted by all - mood, anxiety and eating disorders, some behavioural disorders and alcohol (but not drug) dependencies - suggesting that PLEs appear to be present across the span of diagnostic classifications. Both the high comorbidity across affective and psychotic disorders, and high rates of co-occurring PLEs cross culturally found in the study, suggest psychopathology is likely to have multiple and varied causes including environmental, cognitive, neurobiological and genetic factors and may best be considered a '*network of symptom dimensions that reciprocally impact on each other over time*' (Wigman et al., 2012).

Therefore, whilst the continuum of psychosis represents a shift away from categorical disorder classification, there is a growing interest in moving further away from disorder specific conceptualisations and towards transdiagnostic approaches to understanding, and responding to, emerging psychopathology. Several such transdiagnostic models have been proposed including The Clinical Staging Model (McGorry & Nelson, 2016) and Network Approaches (Borsboom & Cramer, 2013a), which could account for findings that PLEs are associated with both psychotic and affective psychopathology.

The Clinical Staging Model argues that the psychotic subthreshold concept should become more "*explicitly transdiagnostic*", postulating that the subthreshold stage (encompassing PLEs) is a syndrome which connotes high risk for subsequent psychotic disorders and also for persisting and recurrent mood and anxiety disorders. Under this model, PLEs could be understood as risk factors for both affective and psychotic psychopathology. Yung *et al.,* (2012) makes a similar argument, proposing a pluripotent risk syndrome, which argues for an APS diagnostic category being extended to a range of mental disorders as more general strategy for early intervention. They propose that APS may indicate early signs or risk for both non-affective and affective psychotic disorder of varying severity or also indicate something transitory, which may resolve with or without treatment. This shift from considering outcomes 'per disorder' (i.e., only psychotic outcomes) to multiple outcomes, including conversion to psychotic and non-psychotic disorders, has been increasingly echoed across research (Fusar-Poli et al., 2014; Lin et al., 2015).

Research has recently attempted to better elucidate phenomenon using a network approach to explore psychotic symptomology across the psychosis spectrum,

including PLEs. A novel conceptual and transdiagnostic framework, a network approach, views psychological constructs and processes as complex, interacting systems (Borsboom & Cramer, 2013a). Considering mental disorders as the result of reciprocal interactions between specific symptoms is in direct contrast to diagnostic classification, which views symptoms as passive indicators of underlying disorders, discounting the possibility that symptoms or traits are correlated because of direct causal links (Fonseca-Pedrero et al., 2018; van Rooijen et al., 2017). Findings from this research have indicated that individual psychotic symptoms are related not only within a psychotic 'cluster' but also between a range of other psychopathology 'clusters' (Schmittmann et al., 2013; van Rooijen et al., 2017). Such an approach could account for associations between PLEs and both psychotic and affective psychopathology.

The clinical implications of transdiagnostic approaches for PLEs could mean that PLEs reported in clinic are not solely considered signs of a pre-psychotic state and subsequently directed to specialist early intervention services. Instead PLEs could be considered as broader psychopathological markers, which could serve to enhance prognostic reliability and reduce the unnecessary stigmatisation for service-users of being sent to psychosis specific services (Woods, Walsh, Saksa, & McGlashan, 2010). Furthermore, given existing evidence of the benefit of early intervention in psychosis, with declining transition rates to psychosis (Yung et al., 2007), expanding an early intervention approach within mental health services to include a broader range of psychopathology, including PLEs, may hold greater clinical utility.

Aims and objectives of the current review

The literature has highlighted that PLEs are not solely related to outcomes in psychosis and schizophrenia but have been associated with a range of other psychiatric conditions. Furthermore, PLEs appear to have significance in the outcomes of affective disorders, including anxiety, depression and suicidality, with individuals reporting PLEs experiencing greater symptomology than those who do not report them. PLEs therefore may '*represent transdiagnostic clinical markers of psychopathology severity*' (Kelleher & Cannon, 2016).

Criticisms of the clinical utility of diagnostic classifications; the lack of specificity of the continuum model; the methodological inconsistencies in how PLEs are measured,

alongside the varying, often non-psychotic, outcomes for those at high risk of psychosis and evidence that PLEs are present across affective disorders, have given rise to transdiagnostic approaches, such as the Clinical Staging Model and Network Approaches. Transdiagnostic approaches aim to look beyond distinct categories of mental health disorder to account for co-morbidity and varying psychiatric outcomes within clinical settings. Such approaches opens-up a range of research possibilities, including the need to further explore non-psychotic outcomes for those who report PLEs, where the focus on demarcating mental disorder (i.e., between 'psychotic' versus 'non-psychotic') has been criticised as hindering research and clinical practice as co-occurring symptoms are often not considered (Van Os, 2015).

This review is interested in the relationship between PLEs and affective disorders and general psychological distress in both non-help-seeking and help-seeking populations. Reviewing the evidence-base to explore this relationship further aims to gain further insights into the extent to which PLEs are present across psychopathology and how the presence of PLEs may affect prognosis of affective disorders, including severity and chronicity. These findings may provide insights into the shared pathways that may underpin both psychotic disorders and common mental disorders. Furthermore, it is hoped that reviewing the empirical evidence in this area may help elucidate the factors that are relevant in leading to, or protecting from, the need for care and how this may inform clinical interventions.

The following research question was generated for the review:

i) What is the relationship between psychotic-like experiences and depression, anxiety disorders, psychological distress and suicidality in non-clinical and (non-psychotic) clinical samples?

Methods

Eligibility Criteria

Participants

Included studies looked at the relationship between PLEs and common mental health disorders and included help-seeking and non-helping individuals across the life span, ranging from late childhood to older adults. Help-seeking was defined as individuals being supported by mental health services but excluded those at UHR or 'clinical high' risk of psychosis within specialist services. This is due to the assessment criteria utilised by these service which includes greater severity of psychotic symptomology: assessment tools used are based on UHR risk criteria (Schultze-Lutter, Ruhrmann, Berning, Maier, & Klosterkötter, 2010), which encompasses two different subgroups within the prodromal phase 1) Attenuated Psychotic Symptoms (APS); psychotic symptoms (delusions, hallucinations) of a reduced frequency or severity and 2) Brief Limited Intermittent Psychotic Symptoms (BLIPS); overt psychotic symptoms (delusional and/or disorganised thoughts, suspiciousness and perceptual abnormalities) that are fleeting and spontaneously resolve (Comprehensive Assessment of At Risk Mental State (CAARMS), Yung et al., 2005). APS and BLIPS have been as conceptualisation as lying further along the continuum towards psychotic disorder (Fonseca Pedrero & Debbané, 2017). As this review was interested in PLEs in the general population, it was deemed that UHR groups constitute a different clinical population from non-help seeking or non-psychotic help-seeking groups and were excluded.

Studies in non-western populations were also excluded. Whilst PLEs are not limited to western cultures, it is important to explore them whilst taking into account the cultural context and its influences. Evidence suggest that cultural differences play an important role in understanding of psychosis and the interpretation of PLEs (Viswanath & Chaturvedi, 2012) and hallucinatory experiences (Larøi et al., 2014). Due to concerns this could limit the ability to meaningfully compare findings, non-Western cultures were excluded from the current review. However, a separate systematic review to look at the same processes in other cultures would be a valuable future direction.

Independent variables

The main outcome variables were measures of depression, anxiety disorders, suicidality and psychological distress. The DSM-V definition of anxiety disorders was utilised, which includes social phobia, panic disorder, agoraphobia, and generalized anxiety disorder but not does not include Obsessive-Compulsive Disorder (OCD) and trauma and stressor-related disorders, which are conceptualised as separate anxiety disorders. Studies which only included measures of OCD or trauma were therefore excluded. Studies which included any measure of suicidality, including suicidal ideation, behaviour, intent of plans were included whilst studies focusing only on self-injury or self-harm intent or behaviour were screened out. Only studies which used validated measures of psychological distress, such as the General Health Questionnaire (GHQ) were included.

Outcome variables

The main outcome variable was measures of PLEs. All types of measurement were included in the review (e.g. self-report and clinician rated). Furthermore, all known definitions of PLEs were included and developed with support of an information specialist from University library services (see search terms below).

Study Designs

Primary empirical research studies and all quantitative study designs were included (e.g. cross-sectional, longitudinal and intervention; within and between participant designs). Only one related paper was found which included a qualitative (narrative) design but was a review paper, so was not included. A date limitation of publications between 1980 up to present day was chosen because 1980 is the date of the first publication describing psychotic like experience (Chapman & Chapman, 1980). Articles were not required to be published in peer review journals. Only studies written in English were considered for review and no grey literature search took place.

Sources of Information

Studies were identified by searching electronic databases: PubMed, PsycINFO and Web of Science. Searches were completed in December 2018.

Search Strategy

Key words within the search strategy used for all databases were

- First concept: “PLEs” OR "psychotic like experience*" OR “psychotic-like experience*” OR "delusional like experience*' OR "delusional-like experience*"OR "unusual subjective experience*" OR “attenuated psychotic symptom*” OR “subclinical psychotic symptom*” OR “self-reported hallucination*” OR “self reported hallucination*” OR “subthreshold psychotic experience*” OR “hallucination-like experience*” OR “hallucination like experience*” AND

- Second concept: "depression" OR "Anxiety Disorders" OR "Major Depression" OR anxi* OR depressi* OR panic* OR worry OR “suicidal” OR “psychological distress”

Both PLEs and anxiety disorders, depression, suicidality and psychological distress were searched for as keywords in the abstract or title.

Data Collection

The data collection process followed the practice guidelines of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher, Liberati, Tetzlaff, Altman, & Group, 2009) (see Figure 1). Reference lists were not systematically screened to further identity papers and citation chaining was not used.

- The author carried out the search for the identification of studies, using the pre-specified search criteria outlined above.
- All duplications between databases were removed.
- Titles and abstracts were independently screened for eligibility by the author.
- Articles considered relevant were retrieved in full text.
- The author assessed the eligibility of the retrieved articles.
- Exclusions were recorded in an Excel spreadsheet, with reasons given.
- Any disagreements were resolved by an independent reviewer (post-doctoral colleague) to result in a final group of studies for analysis.

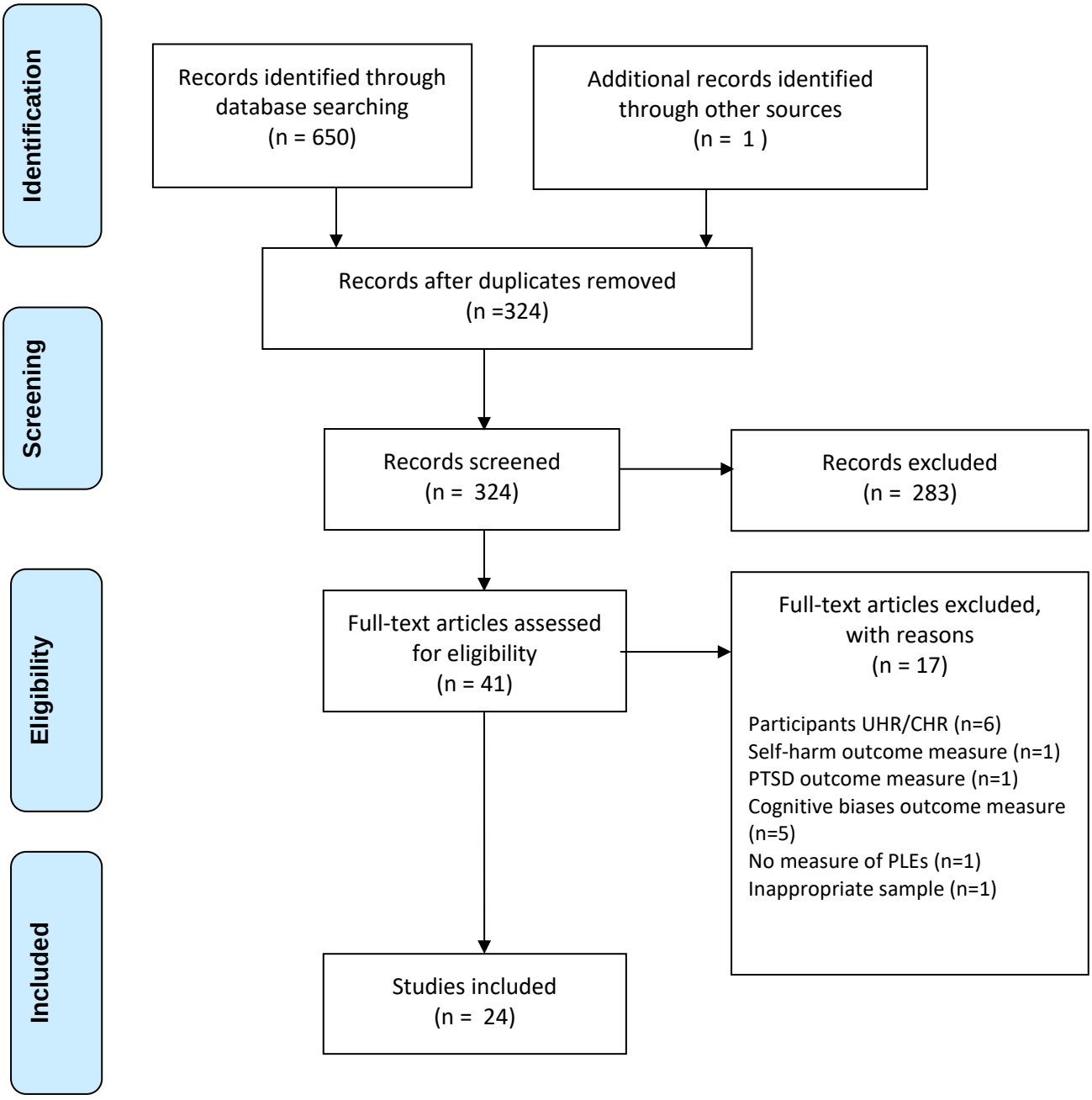

Figure 1. Study Search Process (PRISMA)

Data Extraction

For each included study the following details were extracted:

a) Study information:

Author, year of publication, setting, study design, sampling and sample characteristics (including sample size, age, gender, ethnicity).

b) Assessment tools:

Instruments used to measure PLEs

c) Associations between PLEs and independent variables:

Correlates and associations between PLEs and depression, anxiety disorders, suicide and psychological distress.

Quality Assessment

A bespoke assessment tool was used to determine risk of bias amongst included studies, based on the Mixed Methods Appraisal Tool (MMAT, Pluye, 2010) and the National Institute of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (see Table 1). The vast majority of included studies were cross-sectional designs (22 of 24 of the included studies) therefore the appraisal tool includes assessment of external validity (sample representativeness, response rate) and internal validity (valid and reliable measures of exposures and outcomes, different levels of exposures measured, controls for confounds). One question specific to internal validity cohort designs was included. This question was selected from the MMATI, which includes the same, one question to quality appraise cohort designs. Questions omitted from the original MMAT and NIH tools were either not relevant (i.e. they related to cohort or case-control questions) or were a duplication of MMAT questions already included (i.e. they related to sample size, power, response rate). When quality appraising literature, it has been argued that an overall quality score is not as informative as descriptive summaries using checklist of criteria (Pluye, 2010; Boland, Cherry, & Dickson, 2017). Thus no total score is derived, but a descriptive summary of methodological quality is included in the results.

Two reviewers (the author and a post-doctoral colleague) conducted the quality assessment. The first reviewer(author) quality assessed all of the included studies and the second reviewer quality assessed 50% of included studies. Disputes between rating were resolved between the two reviewers. Inter-rater reliability was assessed using Cohen's Kappa. There was substantial agreement between reviewers (Cohen's Kappa = 0.81)

Table 1

Quality Assessment Appraisal Tool

External validity	
Sampling clear and representative	*Was sample suitable to assess PLEs in community or non-psychotic clinical sample? i.e., consider whether the sample is representative of the population* • *Did the study used inclusion and/or exclusion criteria?* ➢ *Both needed for yes*
Adequate response rate	• *Did study have a low response rate (<70%). If so authors should clearly discuss any reasons for non-response and compare persons in the study to those not in the study, particularly with regards to their socio-demographic characteristics.* ➢ *Yes, if the response rate is higher than 70% OR if the authors have assessed and not found any non-significant differences between responders and non-responders.*
Internal validity	
Reliable and valid measurements used for PLEs	• *Were diagnostic interviews used **or** questionnaires which had either a) been used in previous studies or b) developed for the study and had reliability of 0.7* ➢ *Yes, if authors used diagnostic interview **or** questionnaire (which had been used in previous studies or had a reliability of 0.7).*
Different levels of PLEs examined	• *Were multiple categories of that exposure assessed? (i.e., high or low frequency and/or severity of PLEs, subtypes of PLEs).* ➢ *Yes, if authors used different levels of PLEs*

Reliable and valid measures of correlates	• *Were objective or self-report measures used. Were measures either a) used in a previous study or b) they were developed for the study and had reliability of 0.7 (e.g. internal consistency or inter-rater reliability).* ➢ *Yes, if authors used diagnostic interview **or** questionnaire (which had been used in previous studies or had a reliability of 0.7) for a majority of the correlates.*
Potential confounders controlled for	• *Did authors conduct multivariate analysis, i.e. partial correlations, multiple regression, adjusted odds ratio etc?* ➢ *Yes, if multivariate analysis is completed*
For cohort studies, PLEs assessed prior to outcome	• *Did authors enroll cohort then determine the PLEs status of members of cohort or was cohort selected on basis of PLEs status?* ➢ *Yes, if exposure status of members of the cohort was determined at the beginning of the study before the outcomes occurred*

Data Synthesis

None of the included studies were intervention studies. This, in addition to the large degree of heterogeneity in both definitions and measurements of PLEs and across measurements of the independent variables, meant statistical analysis (i.e. meta-analysis) of study results was not possible. Consequently, a narrative synthesis of data was utilised describing and evaluating the reviewed studies and associations between PLEs and independent variables to answer aims and objectives of the review.

Results

Study selection

From the 650 studies identified, 24 articles meet inclusion criteria for review (see Figure 1).

Overall study characteristics

Study characteristics, grouped by independent variables (anxiety and depression, specific anxiety disorders and psychological distress) are shown in Tables 2-5. The vast majority of included studies used cross-sectional designs (n = 22), with only two utilising cohort designs. Six of the studies included 'help-seeking' samples, where participants not presenting with psychotic disorder were recruited from outpatient mental health services. The remaining studies recruited participants from schools (n = 5), universities (n = 6) or were population based (n = 6). Finally, one study recruited participant from gymnasiums. Overall, the twenty-four studies relate to twenty-four data sets; nineteen studies used separate datasets, two studies used one dataset, another two studies used the same dataset and one study used three datasets. All twenty-four studies were published between May 2002 and August 2018.

The majority of the sample were adolescents and young adults: 12 studies having an age range of between 11-27 years-old and two studies had an age range of 17-35 years-old. Four studies had samples across the life span, with age ranges between 16-65 years-old. Eight studies were conducted in Australia; four were conducted in Spain, four was also conducted Italy, two were completed in the U.S.A., one described multinational research (across Australia and Italy) and the remaining five articles were conducted across Ireland, Germany, Greece, Holland and the U.K. respectively. Samples sizes ranged from 35 to 10,554 (median; 713, inter-quartile range; 167-1384) and overall, 44,818 participants were included.

How PLEs were measured across studies

Although all of the included studies measured PLEs quantitatively, there was heterogeneity across how PLEs were defined and assessed, from including subclinical delusional, hallucinatory and persecutory experiences to just one of these

experiences. Fourteen studies used self-report measures which assessed for auditory hallucinations (AH), visual hallucinations (VH), delusions and persecutory ideation. Going forward these shall be referred to collectively as 'PLEs'. Three studies only measured AH and VH, with two using validated measures and one using an item each for AH and VH, which were created by the authors. Going forward these shall be referred to as Hallucination-Like-Experiences (HLEs), the term utilised in existing literature to describe subclinical hallucinatory experiences. Two other studies only measured AH, using one or two self-report items created by the author. These shall be referred to as AH-only. Finally, three studies only measured delusional-like experiences using clinician rated measurements. Going forward these shall be referred to as Delusional-Like-Experiences (DLEs).

Overall, sixteen studies measured PLEs using only self-report measures, four studies used only clinician-rated measures of PLEs and four studies used both self-report and clinician-rated. Nineteen studies used validated self-report measures of PLEs and a large array were used across all studies. The Community Assessment of Psychic Experiences (CAPE) was the most frequently used (n = 7), followed by the Peters Delusion Inventory (PDI-21, n = 3), the Launay-Slade Hallucination Scale (LSHS, n = 3), the Prodromal Questionnaire (PQ, n = 2), Schizotypal Personality Questionnaire (SPQ, n = 2) and the Revised Hallucination Scale (RVS, n = 1). Two studies used self-report measures of PLEs that included only one or two items taken from other validated scales. One study used a single item to assess PLEs, created by the authors.

Of the eight studies which used clinician-rated measures, seven used validated diagnostic interviews. Three of the four studies which used the Composite International Diagnostic Interview (CIDI) psychosis items to measure PLEs, were large-scale population surveys and were not conducted by healthcare professionals, but a team of laypeople who door-stepped participants. One study reported using a 'clinical interview' to validate self-reported PLEs for frequency and distress and to also create subgroups within the sample, but did not report the interview schedule.

How independent variables were measured across studies

The large majority of included studies used validated, self-report measures to assess levels of anxiety, depression, specific anxiety disorders (i.e. social phobia, panic) and distress (n = 18). There was large heterogeneity across how these were measured,

with twenty-two different self-report measures used. Two studies included self-report measures assessing suicidality using two or more items, which were created by the authors. Overall, six studies measured both anxiety and depression, six studies measured depression only, three studies measure specific anxiety disorders, three studies measured suicide and four studies measured general psychological distress. Three studies measured general psychological distress using the General Health Questionnaire (GHQ) and one used the Kessler scale of psychological distress (K10, Saha et al., 2011b). Three studies used clinician only measures to identify lifetime presence of anxiety and depression, rather than severity, one of which also used clinician only measures to identify lifetime presence of suicide. Finally, one study used both self-report measures and a clinician measure to rate levels of functioning. Five studies also included measures of functioning, one study included a measure of subclinical negative symptoms of psychosis and one other included self-esteem.

Data synthesis

Key findings relating to the associations between PLEs and a broad range of psychopathology were extracted from the included studies and grouped by the independent variables: anxiety and depression, specific anxiety disorders, suicidality and psychological distress.

Association of PLEs with anxiety and depression

Overall, fourteen studies explored relationship between anxiety and depression (see Table 2). Eight studies explored the relationship between PLEs and both anxiety and depression. Five studies found significant associations between HLEs (Langer, Cangas, Perez-Moreno, Carmona, & Gallego, 2010), DLEs (Saha, Scott, Varghese, & McGrath, 2012), PLEs (Unterrassner, Wyss, Wotruba, Haker, & Rössler, 2017; Varghese et al., 2011), AH-only (Kelleher et al., 2012) and anxiety and depression. These findings were found across the general population (n = 4, age range: 17-65 years-old), within school samples (n = 1, age range: 11-16 year-olds), university sample (n = 1, average age: 21.9 years-old) and in help-seeking samples (n = 2, age range: 8-25 years-old). Several studies found a dose-response relationship between increasing DLEs (Saha et al., 2012) and AH (Kelleher et al., 2012) and increasing severity of anxiety and depression.

Six studies solely looked at the relationship between PLEs and depression. Of these, all used measures of PLEs and all reported significant relationships between PLEs and depression. Four of these studies complete Principal Component Analysis and identified subtypes of PLEs (Armando et al., 2010; Barragan, Laurens, Navarro, & Obiols, 2011; Yung et al., 2006; Yung et al., 2009). Specific PLE subtypes were found to be more highly associated with depression than others. Across all four studies, PLE subtypes of Bizarre Experiences (BE) and Persecutory Ideas (PI) were found to be associated with increased levels of depression. These findings were found across both help-seeking samples (n = 2) and non-helping seeking samples (recruited from schools and university) within the age ranges of 14-25 years-old. One of the studies only looking at depression and PLEs used a cohort design (Yung et al., 2007). They found that participants depressed at baseline but not at 6 months, had a significantly lower PLE scores, whilst those who remained depressed at 6 months experienced significantly higher levels of PLEs (where PLEs were measured at baseline and follow-up).

As with depression, certain PLEs subtypes were found to be specific predictors of anxiety: ideas of reference, unusual perceptual experiences, and dissociative anomalous perceptions, were all predictors of anxiety. Ideas of reference was specifically implicated across both anxiety and depressive symptoms (Unterrassner et al., 2017). Differences were also found in the 'type' of PLEs with VH found to be specific predictors of anxiety, whilst AH were found to be specific predictors of depression (Langer et al., 2010).

One of the included studies used a cohort design and measured HLEs and a range of psychopathology, including depression and anxiety (Dhossche et al., 2002). Participants who self-reported AH in particular, were more frequently diagnosed with a range of psychiatric disorders, including anxiety and depression. At eight-year follow-up, AH were particularly associated with increased risk for a diagnosis of depressive disorder. Similarly, AH ((Hodgekins et al., 2018; Kelleher et al., 2012) and PLES (Unterrassner et al., 2017) were not confined to any one disorder but rather were associated with a range of psychopathology.

However, two studies found no significant relationship between PLEs and anxiety or depression (Hodgekins et al., 2018; Pontillo, De Luca, Pucciarini, Vicari, & Armando, 2016). The study using only a clinician-rated measure found individuals reporting PLEs

did not significantly differ on number of psychiatric diagnoses or levels of anxiety or depression from those without PLEs (Pontillo et al., 2016). The other study used both a self-report and clinician rated measure and only found significant relationships between PLEs and anxiety and depression when scores on both measures were combined, but not when clinician only scores were used (Hodgekins et al., 2018). Additionally, not all PLE were associated with psychological burden, with findings suggesting that some delusional-like PLE subtypes might beneficial to subjective well-being (as measured by SCL-90-R subscales of interpersonal sensitivity and emotional stability) of some individuals (Unterrassner et al., 2017).

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
Armando et al., 2010	Australia Italy	Cross Sectional High school students were recruited from 34 secondary schools in Melbourne. University students were recruited from 3 Italian Universities.	Total *n* = 1,777 (high school *n* = 848, University, *n*= 929) 15-26 year olds 18 years (± *3.5*) 34.7% (*% male)*	*Self-Report:* Community Assessment of Psychic Experiences (CAPE).	▹ Study included Principal Component Analysis (PCA) of subtypes of positive dimensions of the CAPE. Reported four subtypes of positive PLEs: Bizarre Experience (BE), Perceptual Abnormalities (PA) and Persecutory Ideation (PI) and Grandiosity (GR). ▹ Specific subtypes of PLEs were more likely to be associated with psychological difficulties than other subtypes. BE and PI were found to be significantly associated with increased distress, depression and poor functioning.
Barragan et al., 2011	Spain	Cross Sectional Stratified sampling of 14 schools in Barcelona, with participants randomly selected from each school	*n* = 777 13-17 years old 14 years (± *0.59*) 49.2% (*% male)*	*Self-report:* CAPE	▹ Study included PCA of subtypes of positive and negative PLEs. Reported four subtypes for positive dimensions; Persecutory Ideation, Grandiosity, Hallucinatory Experiences and Self-referential Thinking, and three subtypes for negative dimensions; Social Withdrawal, Affective Flattening and Avolition. ▹ Specific subtypes of positive PLEs, (Persecutory Ideation and Hallucinatory

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Reference	Location	Design Sampling	Sample Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	Measure of PLEs	Associations between PLEs and depression and anxiety
					Experiences) and negative subtypes (Social Withdrawal and Avolition) were associated with depressive symptoms.
Dhossche et al., 2002	Holland	Cohort A random sample was drawn in 1983 using municipal birth registers of a province in Holland. Participants were followed up over 10 years, at two year intervals. Data for this study was taken from participating adolescents between the ages 11-18 (T4, 1989), who were then re-assessed at ages 19-26 (T6, 1997).	*n* = 914 at T4 *n* = 796 at T6 (87%) 14.1 years old (± *2.1*) at T4, 23.1 years old (±*2*) at T6 47% (*% male*) at T4.	*Self-report:* Two items (one item for auditory hallucinations and one for visual, from the Youth Self Report (YSR). A dichotomous measure indicating positive versus negative self-report of hallucinations was then created	▹ Self-reported AH and VH were associated with high scores on Internalizing (anxiety, depression, social withdrawal) and Externalizing (aggression, defiance) scales. ▹Participants with self-reported Auditory Hallucinations (AH) were more frequently diagnosed with any disorder, including depression, PTSD and substance use disorder, compared with controls (no self-reported AH or Visual Hallucinations (VH)). ▹ 44% of participants with AH and 27% with VH had diagnosable disorders at follow-up compared to controls (16% and 18% respectively). No participants with AH or VH were diagnosed with a brief psychotic disorder at follow-up. Self-reported AHs increased the risk for a diagnosis of depressive disorder 8 years later.

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
Fonseca-Pedrero et al., 2011	Spain	Cross Sectional Stratified sampling of schools based on geographic location and stage of education.	*n* = 1384 14-17 years old 15.7 (± *1.01*) 48.6% (*% males)*	*Self-report:* Schizotypal Personality Questionnaire-Brief (SPQ-B)	▹ Significant correlations were found between PLEs and depression (*r* = 0.15-0.50). These associations were slightly larger in boys, but not significantly. ▹ Study included a Component Factor Analysis (CFA) of SPQ-B scales and depression scale. Authors propose a 4-dimensional model: Positive, Interpersonal, Disorganized and Depressive Symptoms, which was invariant across age or sex.
Hodgekins et al., 2018	United Kingdom (U.K.)	Cross Sectional Non-psychotic, help seeking, young people experiencing severe mental health difficulties were recruited from secondary mental health services.	*n* = 133 14-25 years old 18.4 years old (± *2.7*) 34.2% (*% male*)	*Self-report:* Prodromal Questionnaire (PQ-16) *Clinician rated:* The Primary Care Checklist (PCC) was used to assess prodromal symptoms of psychosis.	▹ Higher levels of self-report PLEs and clinician rated PLEs were significantly associated with high levels of social anxiety and depression. ▹ Individuals reporting higher levels of PLEs also reported a higher number of traumatic life events and experienced more pathways into care (i.e. accessed more services) ▹ Clinician-rated PLEs on their own were not significantly associated with anxiety, depression, functioning, trauma or pathways to care.

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
Kelleher et al., 2012	Ireland	Cross Sectional Sample comprised of 4 population studies of early and mid-adolescence and psychotic symptoms (2 population surveys (study 1 and 2,), 2 clinical interview studies (study 3 and 4)). For studies 1 and 2 participants were recruited from secondary schools. For study 3 a subgroup of participants from study 1 were invited for clinical interview. For study 4 participants were recruited using a stratified random sampling of catchment area of a child and adolescent mental health team. A comparison group, matched for gender and geographic area were also recruited.	Survey Study 1: *n* = 1131, 11-13 years old Survey Study 2: *n* = 1112, 13-16 years old Interview Study 3: *n* = 212, 11- 13 years old Interview Study 4: *n* = 117, *HC* = 173, 13-15years old	*Self-report: Survey Study 1 & 2:* One question on auditory hallucinations taken from the Adolescent Psychotic Symptom Screener (APSS) *Clinician rated: Interview Study 3&4:* Schedule for Affective Disorders and Schizophrenia for School-aged Children, Present and Lifetime versions (K-SADS-PL) was used to assess psychotic symptoms	▹ The majority of adolescents who reported psychotic symptoms had at least one diagnosable non-psychotic psychiatric disorder, with affective disorders being the most prevalent. ▹ Nearly 80% of the mid-adolescence sample who reported psychotic symptoms had at least one diagnosis, compared with 57% of the early adolescence sample. ▹ A range of psychiatric disorders were associated with PLEs. A particularly strong relationship was found between PLEs wand more severe psychopathology, with prevalence of PLEs increasing in a dose–response fashion with the number of diagnosable disorders i.e. adolescents who reported PLEs were at high risk of having multiple co-occurring diagnoses. ▹ PLEs were found to become increasingly predictive of diagnosable psychopathology with increasing age i.e. associations between PLEs and diagnosable disorder were stronger in older adolescents

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
Langer et al., 2010	Spain	Cross Sectional Convenience sample of Spanish University students	*n* = 265 21.9 years old (± *5.95*) 38% (*% male*)	*Self-report:* Revised Hallucination Scale (RHS)	▹ The strongest predictors of auditory hallucinations were depression and experiential avoidance. Strongest predictors of visual hallucinations were obsession-compulsion, phobic anxiety and experiential avoidance. ▹ Authors conclude that greater tendency toward HLEs is related to greater clinical symptoms, in particular depression and experiential avoidance.
Pontillo et al., 2018	Spain	Cross Sectional Help seeking young people were recruited from an outpatient mental health clinic	*n* = 60, PLE groups *n* = 46, No PLEs *Total n* = 106 8-17 years old 12.6 years (± *2.4*)	*Clinician rated:* Structured Interview for Psychosis-Risk Syndromes (SIPS-19).	▹ Participants with PLEs did not significantly differ on number of psychiatric diagnoses or levels of anxiety or depression from those without PLEs. ▹ Participants with PLEs demonstrated significantly poorer global, social and role functioning than patients without PLEs, which remained when covariates of cognitive functioning, anxiety and depression levels and severity of psychiatric disorder were controlled for.
Saha et al., 2012	Australia	Cross Sectional Sample drawn from the Australian Survey of	*n* = 10,554 18-65 year olds 45% *(% male)*	*Clinician rated:* Composite International	▹ A lifetime diagnosis of either any anxiety disorder or Major Depressive Disorder (MDD) was significantly associated with the endorsement of PLEs. This association

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
		Mental Health and Wellbeing 1997 using a stratified multistage area sampling (one person >18 years old per dwelling invited to respond) of persons living in all States and Territories of Australia. Interviews were conducted by trained interviewers from the Australian Bureau of Statistics.		Diagnostic Interview (CIDI)* Three items in CIDI are designed to identify psychotic symptoms: 3 screening items, which if endorsed are followed-up 'probe items' ***NB** CIDI was not conducted by healthcare professionals	was found for each of the main anxiety disorders when examined separately, with no difference in effect sizes for each disorder. ▹ There was a dose-response relationship between increasing severity of MDD and higher odds of PLE endorsement, independent of comorbid psychiatric illnesses and selected environmental and demographic risk factors.
Unterrassner et al., 2017	Germany	Cross Sectional A large online sample representative of the Swiss general population (N = 1,580) was previously recruited. 91 individuals from this survey were contacted	*n* = 206 20-60 year olds 65% (% male)	*Self-report:* The Schizotypal Personality Questionnaire (SPQ). Paranoia and psychoticism subscales were used to control for psychosis.	▹ Majority of affective symptoms correlated positively with all PLEs. ▹ Specific subtypes of PLEs (ideas of reference, unusual perceptual experiences, and dissociative anomalous perceptions) were predictors of anxiety, phobic anxiety and somatization. Ideas of reference might specifically be implicated in affective

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	Location	Design Sampling	Sample Participants *(n)* Age range, Mean age *(SD)*, Gender *(% male)*, Ethnicity (*% white)*	Measure of PLEs	Associations between PLEs and depression and anxiety
		and consented to participate in current study. 146 additional participants were recruited from general population by online ads, pamphlets and word-of-mouth.		Magical Ideation Questionnaire The Revised Exceptional Experiences Questionnaire (PAGE-R)	difficulties (anxiety symptoms and depressive symptoms). ▹ Partial associations were found between negative symptoms and PLEs. Suspiciousness was a unique predictor of negative-like symptoms (physical anhedonia, no close friends and constricted affect). ▹ Specific PLEs were unique predictors of other subclinical symptoms: ideas of reference and suspiciousness predicted interpersonal sensitivity and emotional instability. ▹ Not all PLE were associated with psychological burden, suggesting some PLEs (delusional-like) might even be beneficial for subjective well-being.
Varghese et al., 2011	Australia	Cross Sectional Sample taken from Mater-University Study of Pregnancy (MUSP): prospective study of 7223	*n* = 2405 18-23 years of age 20 years old 52% (*% male*)	*Self-report:* Peters Delusion Inventory (PDI-21) *Clinician rated:* Endorsement of	▹ Young adults with either MDD or an anxiety disorder were significantly more likely to report PLEs compared with those with no mental disorders. This remained present when adjusted for comorbidity with alcohol and illicit substance misuse.

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	Location	Design Sampling	Sample Participants *(n)* Age range, Mean age *(SD)*, Gender *(% male)*, Ethnicity (*% white)*	Measure of PLEs	Associations between PLEs and depression and anxiety
		women and their children who received antenatal care in Brisbane Hospital between 1981-1984. Only cross-sectional data collected at 21-year follow-up used in study.		CIDI psychosis items. Cohort was divided into four groups: those who reported a) no CIDI hallucination b) one or more CIDI hallucination c) no delusions and d) one or more delusion items.	▹ The odds of endorsing any CIDI hallucination or delusion item was increased in those with a MDD or anxiety disorder. The presence of current anxiety disorder symptoms was significantly associated with higher PLE scores.
Yung et al., 2006	Australia	Cross Sectional Help-seeking young people referred to a specialized youth mental health service, who were considered non-psychotic nor at immediate risk of developing psychotic disorder, were recruited over 6 months period. Participants were young people both accepted to service (58% of sample) and those who were not.	*n* = 150 15-24 years old 17.7 years old 43% (*% male*)	*Self-report:* CAPE	▹ Study included PCA of PLE dimensions and identified three PLE subtypes: Bizarre Experiences (BE), Persecutory Ideas (PI) and Magical Thinking (MT). PI was the most prevalent PLE subtype (97.9%), followed by BE (73.6%) and MT (64.3%). ▹ Participants with a current mood disorder had significantly higher levels of BE and PI, as well as total PLEs overall, than those without a Mood Disorder. ▹ Following regression analysis only the PI subtype was significantly positively correlated with depression, whilst Magical

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
					Thinking (MT) was significantly *negatively* correlated with depression. ▹ Frequency of PLEs (especially BE and PI subtypes) were significantly correlated with lower overall functioning. However, once level of depression was controlled for, PLEs were no longer associated with poor functioning.
Yung et al., 2007	Australia	Cohort Help-seeking young people referred to a specialized youth mental health service, who were considered non-psychotic nor at immediate risk of developing psychotic disorder, were recruited over 6 months period. Participants were young people both accepted to service (58% of sample) and those who were not. Participants were approached again for follow-up 6 months later.	*n* = 105 15-24 years old 17.7 years old 43% (*% male*)	*Self-report:* CAPE	▹ There was a statistically significant reduction in PLEs between time points (6-month follow-up). This was true for the CAPE total score and the three subscales (Bizarre Experiences, Persecutory Ideas and Magical Thinking). ▹ Participants depressed at baseline but not at 6 months had a significantly lower PLE scores than those who remained depressed at 6 months. Those who remained depressed experienced significantly higher levels of PLEs. ▹ Correlations between change in levels of depressive symptomatology and change in PLEs between baseline and 6 months

Table 2
Summary of sample characteristics, assessment of PLEs and key findings grouped by anxiety and depression

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and depression and anxiety**
					found greater reduction in depression was significantly associated with greater decrease in PLEs.
Yung et al., 2009	Australia	Cross Sectional High school students were recruited from 34 secondary schools in Melbourne.	*n* = 875 13.7 - 17.6 years old 15. 6 years old (*±0.46*) 46.9% (*% male*)	*Self-report:* CAPE	▹ Study included PCA of PLE dimensions. Identified four PLE subtypes: Bizarre Experiences (BE), Persecutory Ideas (PI) and Magical Thinking (MT). ▹ Self-reported depressive symptoms, distress and poor functioning were strongly significantly correlated with PLEs. Depressive symptoms were significantly correlated with all subscales, but more weakly correlated with MT.

Table 3

Summary of sample characteristics, assessment of PLEs and key findings grouped by specific anxiety disorders

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and specific anxiety disorders** (*social anxiety and panic disorder)*
Armando et al., 2013	Italy	Cross-Sectional Participants with diagnosis of Social Anxiety Disorder (SAD) recruited from community psychiatric outpatient service. Healthy Controls (HC) recruited from University, matched for location, age and gender. SAD group split into two sub samples: SAD with clinically meaningful PLEs (SAD + PLEs) and those without (SAD - PLEs)	*n* = 128, *HC* = 41 19-25 year olds 21.1 years (±*4.7)* 26% (*% male)*	*Self-Report:* CAPE *Clinician-Rated:* Clinicians conducted re-interviews to validate self-reported PLEs. PLEs were rated 'clinically meaningful' if respondents scored PLEs as severe and distressing	▹24% of the patients with SAD reported clinically relevant PLEs, compared with 5% of the healthy controls. Level of PLEs was not related to sociodemographic variables, including cannabis or other substance abuse. ▹SAD + PLEs group showed higher level of anxiety, depression, and intolerance of uncertainty (IU) than SAD - PLEs group, especially depression and IU. ▹An increase in the frequency and distress of PLEs was related to an increase in anxiety and IU levels.
Cooper et al., 2014	United States of America (U.S.A.)	Cross Sectional Undergraduate University students were recruited via an online participant recruitment website.	*n* = 1378 17–35 years old 20.5 years old (*±2.40*) 27.6% (*% male)* 59.4% (*% white*)	*Self-report:* The Prodromal Questionnaire (PQ)	▹ Social phobia was significantly correlated with each subscale of the PQ suggesting that social anxiety is associated with a range of PLEs. ▹ Authors created sub-group from PQ for PLEs rated as distressing. Correlations between social anxiety and PLEs reported with distress subscales were substantially lower than correlations with PLEs reported without distress.

					▹ Component Factor Analysis (CFA) did not find that social anxiety items loaded differentially on paranoia and/or suspiciousness subscales, suggesting social anxiety is a separate construct to paranoia and suspiciousness.
Masdrakis et al., 2017	Greece	Cross Sectional Patient with diagnosis of Panic Disorder (PD) (confirmed by SCID-II interview) were recruited from Outpatient Clinic, prior to starting any treatment.	*n* = 35 *32.2* years old *(±7.0)* 26% (*% male*)	*Self-report:* Psychoticism and Paranoid Ideation Subscale of the SCL-90-R 'Psychosis proneness' scale, calculated by adding the scores of the SCL-90-R psychoticism and paranoid ideation subscales.	▹ A significant positive association were found between the severity of panic symptoms and the levels of PLEs ▹ In regression analyses, PLEs were found to be most strongly associated with panic-related beliefs. ▹ Scores on 'psychoticism proneness' scale were significantly correlated with both catastrophic thinking and reports of somatic symptoms.

Table 4

*Summary of sample characteristics, assessment of PLEs and key findings grouped by suicidality***.**

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD),* Gender *(% male),* Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and suicidal ideation, attempts and plans**
Capra et al., 2015	Australia	Cross Sectional Undergraduate University students were recruited via student emails invitation and through snowballing recruitment methods (participants circulating to their own contacts).	*n* = 1610 17–27 years old 22.1 years old (± *5.1*) 24% (*% male*) 59.4% (% white)	*Self-report:* CAPE-P15: a 15-item version developed by authors from the original 20 item CAPE positive scale.	▹ PLE subtypes, Perceptual Abnormalities (PA) and Persecutory Ideation (PI) had the highest correlations with lifetime suicidality, which remained when adjusted for age, sex, family history of mental illness, family of origin income and lifetime drug use.
DeVylder et al., 2015	U.S.A.	Cross Sectional Psychology undergraduate University students were recruited during introductory classes.	*n* = 622 18.8 years old (± *1.8*) 42.2% (*% male*) 53.4% (*% white*)	*Self-report:* Single item assessing auditory hallucinations. Taken from a published study developing a self-report questionnaire for screening pre-psychotic symptoms (Liu *et al.*2013).	▹ Greater severity of suicidal ideation, plans, and attempts were associated with greater prevalence of auditory hallucinations. This association remained when adjusted for stress sensitivity, self-esteem, ethnicity and sexuality. ▹ Auditory hallucinations were significantly associated with stress sensitivity but not self-esteem, when confounds were controlled for
Saha et al., 2011a	Australia	Cross Sectional Sample was drawn from the Australian Survey of Mental Health and	*n* = 8773 18-65 year olds 49.6% (% male)	*Clinician rated:* Composite International Diagnostic Interview (CIDI)*	▹ Individuals reporting PLEs were two to four times as likely to report lifetime suicidal ideation, plan, or attempts. These associations persisted when adjusted for potential confounding factors.

	Wellbeing 2007 using a stratified multistage area sampling (one person >18 years old per dwelling invited to respond) of persons living in all States and Territories of Australia. Interviews were conducted by trained interviewers from the Australian Bureau of Statistics.	Three items in CIDI are designed to identify psychotic symptoms: 3 screening items, which if endorsed are followed-up 'probe items' *__NB__ CIDI was not conducted by healthcare professionals	▹ An association between PLEs and suicide attempt was only found in those with a lifetime history of any mental disorder.

Table 5:
Summary of sample characteristics, assessment of PLEs and key findings grouped by psychological distress

Reference	**Location**	**Design** **Sampling**	**Sample** Participants *(n)* Age range, Mean age *(SD)*, Gender *(% male)*, Ethnicity (*% white)*	**Measure of PLEs**	**Associations between PLEs and psychological distress**
Preti et al., 2007	Italy	Cross Sectional Participants were a convenience sample recruited from local gymnasium in the geographic area of the University	*n*= 240 16-59 years old 29.9 years (± *9.4*) 50% (*% male*)	*Self-report:* Peters Delusion Inventory (PDI-21) Launay Slade Hallucination Scale-Revised (LSHS-R)	▹ Psychological distress was significantly correlated with PLEs. Higher scores of psychological distress were associated with greater levels of PLES. ▹ Authors explored if distress mediated relationship between higher reporting of hallucinatory experiences and greater reporting and conviction of psychotic-like beliefs. However, psychological distress was not a mediator in the relationship between scores of hallucination-proneness and scores of delusion-like beliefs.
Preti et al., 2014	Italy	Cross Sectional Undergraduate University students were recruited via a snowball procedure.	*n*= 649 19-25+ years old 24 years (± *3.4*) 47% (*% male*)	*Self-report:* Extended Launay-Slade Hallucination Scale (LSHS-E)	▹ Participants experiencing high levels of Hallucinatory-Like Experiences (HLEs) reported significant psychological distress. ▹ Study included a CFA analysis. CFA revealed four subtypes from the LSHS-E: Intrusive thoughts, Vivid Daydreams, Multisensory HLEs and Auditory/ visual HLEs. ▹ Auditory/visual and multisensory HLEs were associated with lower levels of wellbeing.

					▹ Latent class analysis (LCA) revealed three latent classes: a large class with no HLEs (70% of participants), followed by multisensory HLEs class (18.8%), and a high hallucination-proneness class (11%).
Saha et al., 2011b	Australia	Cross Sectional Sample was drawn from the Australian Survey of Mental Health and Wellbeing 2007 using a stratified multistage area sampling (one person >18 years old per dwelling invited to respond) of persons living in all States and Territories of Australia. Interviews were conducted by trained interviewers from the Australian Bureau of Statistics.	*n* = 8841 18-65 year olds 49.6% (% male)	*Clinician rated:* Composite International Diagnostic Interview (CIDI)* Three items in CIDI are designed to identify psychotic symptoms: 3 screening items, which if endorsed are followed-up 'probe items' *CIDI not completed by healthcare professionals	▹ Individuals with moderate and severe psychological distress were significantly more likely to endorse one or more PLE, which remained when adjusted for trauma exposure, anxiety and depressive disorders and other potential confounding factors (age, gender, substance misuse). ▹ Participants in the highest quartile for psychological distress had an increased risk of PLE endorsement. Significant associations between higher psychological distress and greater PLE endorsement were also present in participants in the lowest quartile of psychological distress and for those who reported no lifetime history anxiety or depression.
Vellante, et al., 2012	Italy	Cross Sectional Sample selected from University Undergraduates. Selection procedure not reported.	*n*= 437 18-34 years old 24.7 years (± *3.4*) 41% (*% male*)	*Self-report:* LSHS-R PDI-21.	▹ Individuals with higher levels of psychological distress reported higher frequencies of PLEs (scores on LSHS-E and PDI-21). High scores on hallucination proneness (LSHS-E) was associated with poor self-rated mental health. ▹ Study included a CFA, which revealed four subtypes from the LSHS-E: Intrusive thoughts, Vivid Daydreams, Multisensory HLEs and Auditory/ Visual HLEs. Intrusive Thoughts were associated with a lower level of perceived wellbeing.

Association of PLEs with specific anxiety disorders

Two studies found significant associations between social anxiety and PLEs (Armando et al., 2013; Cooper, Klugman, Heimberg, Anglin, & Ellman, 2016), across both help-seeking and non-help seeking (university) samples (age range: 17-35 year-olds; see Table 3). Individuals with PLEs rated as distressing (both in self reports and in clinician ratings) and who had social anxiety, also have higher levels of general anxiety than individuals who did not report PLEs as distressing (Armando et al., 2013). One study found a significant positive association between the severity of panic symptomatology and levels of PLEs in a help-seeking population (average age: 32-years-old; (Masdrakis, Legaki, Papageorgiou, & Markianos, 2017).

Association of PLEs with suicidality

AH (DeVylder, Lukens, Link, & Lieberman, 2015), DLEs (Saha, Scott, Johnston, et al., 2011) and PLEs (Capra, Kavanagh, Hides, & Scott, 2015) were also significantly associated with suicide ideation, plans and attempts (see Table 4). These findings were found across the general population (age range: 18-65-years-old) and non-help seeking university samples (age range: 17-27-years old): none of the included studies explored PLEs and suicide in a help seeking sample. Specific PLE subtypes of Perceptual Abnormalities (PA) and Persecutory Ideation (PI) had the highest correlations with lifetime suicidality, which remained when adjusted for age, sex, family history of mental illness, family of origin income and lifetime drug use (Capra et al., 2015).

Association of PLEs with psychological distress

Higher scores of psychological distress were associated with greater levels of PLEs and HLEs in non-help seeking university samples (age range: 18-34-years old)(Preti et al., 2007, 2014; Vellante et al., 2012) (see Table 5). In the general population, individuals with moderate and severe psychological distress were significantly more likely to endorse one or more DLE, which remained when adjusted for trauma exposure, anxiety and depressive disorders and other potential confounding factors (Saha, Scott, Varghese, & McGrath, 2011). A subtype of HLEs, Intrusiveness of Thought, was specifically associated with a greater levels of psychological distress (Vellante et al., 2012).

Association of PLEs with functioning

Although not included in the review question, six studies also explored the relationship between PLEs and general functioning, in addition to association between PLEs and independent variables laid out in the review question. Five studies found significant associations between PLEs and functioning (Armando et al., 2010; Kelleher et al., 2012; Yung et al., 2006; Yung et al., 2009), even when no relationship between PLEs and anxiety and depression were found (Hodgekins et al., 2018; Pontillo et al., 2016). Specific PLE subtypes, Bizarre Experience and Persecutory Ideations, were significantly correlated with lower overall functioning (Armando et al., 2010; Yung et al., 2006; Yung et al., 2009).

Methodological quality

The methodological quality of included studies is summarised in Table 6. A tick denotes criteria was present and a cross indicates it was not. Additional 'other' ratings were also used to indicate whether the criteria could not be determined, was not reported or was not applicable.

External validity

Eleven out of twenty-four studies reported inclusion and exclusion criteria and used a representative sample. Twelve studies reported adequate response rates (i.e. above 70% or compared persons in the study to those not in the study in relation socio-demographic characteristics). Due to study design and sampling strategy (i.e. population studies, convenience sampling), seven of the studies did not report response rates or they could not be determined. Six studies did not include information on response rates.

Internal validity

Nineteen out of twenty-four studies used valid and reliable measures of PLEs. Six studies did not used valid measures: two used only one or two items to assess presence PLEs, which were created by authors for the purpose of the study, three studies used three items of CIDI, which were not administered by clinicians. Finally,

one study used a Spanish version of the CAPE but did not report if it had been validated for use in Spanish. Eleven studies measured different levels of PLEs: six studies examined severity of PLEs (i.e. level of distress) five studies examined PLEs subtypes and their relationship on independent variables (anxiety, depression, social phobia, panic, suicide, distress). The majority of studies (n = 20) used valid and reliable measures for the independent variables and used multivariate statistics to control for potential confounds (n = 17). Of the two included cohort studies, one was a retrospective cohort, where depression (outcome) had already preceded PLEs (exposure), i.e. was present as baseline.

Table 6

Methodological quality ratings for included studies

Other* CD = Cannot Determine, NR = Not reported, NA = Not applicable

	External Validity		*Internal Validity*				
References	Sampling clear & representative? **Yes/No/ Other***	Adequate response rate? **Yes/No/ Other***	Reliable & valid measurements of PLEs? **Yes/No/ Other***	Different levels of PLEs examined? **Yes/No/ Other***	Reliable & valid measurements of correlates? **Yes/No/ Other***	Potential confounders controlled for? **Yes/No/ Other***	Cohort: PLEs assessed prior to outcome? **Yes/No/ Other***
Armando et al., 2013	✓	NR	✓	✓	✓	×	NA
Armando et al., 2010	×	✓	✓	✓	×	✓	NA
Barragan et al., 2011	×	✓	NR	✓	×	✓	NA
Capra et al., 2015	✓	✓	✓	✓	×	✓	NA
Cooper et al., 2014	×	NR	✓	✓	✓	×	NA
DeVylder et al., 2015	✓	✓	×	×	✓	✓	NA
Dhossche et al., 2002	✓	✓	×	×	✓	✓	✓
Fonseca-Pedrero et al., 2011	×	×	✓	✓	✓	✓	NA
Hodgekins et al., 2018	✓	✓	✓	×	✓	×	NA
Kelleher et al., 2012	×	✓	✓	✓	✓	✓	NA
Langer et al., 2010	×	NR	✓	×	✓	✓	NA
Masdrakis et al., 2017	✓	×	✓	×	✓	✓	NA
Pontillo et al., 2018	✓	NR	✓	×	✓	×	NA
Preti et al., 2007	×	✓	✓	×	✓	×	NA
Preti et al., 2014	×	×	✓	✓	✓	✓	NA
Saha et al., 2011a	×	CD	×	×	×	✓	NA
Saha et al., 2011b	×	✓	×	×	✓	✓	NA
Saha et al., 2012	×	✓	×	×	✓	✓	NA
Unterrassner et al., 2017	✓	NR	✓	✓	✓	✓	NA
Varghese et al., 2011	✓	×	✓	✓	✓	✓	NA
Vellante, et al., 2012	×	NR	✓	×	✓	×	NA
Yung et al., 2006	✓	✓	✓	✓	✓	✓	NA
Yung et al., 2007	✓	✓	✓	×	✓	✓	×
Yung et al., 2009	×	×	✓	×	✓	×	NA

Discussion

Overview of study findings

This systematic review was interested in the relationship between PLEs and non-psychotic psychopathology. In line with existing research, the review focused on the relationship between PLEs and common mental difficulties, which included: depression, anxiety, specific anxiety disorders, suicide and general psychological distress.

Overall, PLEs were found to be highly associated with anxiety and depression, with 12 of 14 studies finding positive associations. Some of the included studies reported a dose-response effect with greater levels of PLEs being associated with greater severity of anxiety and depressive and symptomology (Hodgekins et al., 2018; Kelleher et al., 2012; Langer et al., 2010; Saha et al., 2012). Included studies, which identified PLE subtypes through the use of Principal Component Analysis (PCA), repeatedly found that the specific subtypes of Bizarre Experiences (BE) and Persecutory Ideation (PI) were strongly associated with depression (Armando et al., 2010; Barragan et al., 2011; Yung et al., 2009; Yung et al., 2006). Whilst, the subtype Perceptual Anomalies (PA) was found to be more strongly associated with anxiety (Unterrassner et al., 2017).

PLEs were also found to be strongly associated with suicidality, even when confounds (including age, gender, lifetime presence of current mood and/or anxiety disorders, self-esteem, substance misuse) were controlled for (Capra et al., 2015; DeVylder, Lukens, et al., 2015; Saha, Scott, Johnston, et al., 2011). One study reported a dose-response effect between increasing PLEs and greater lifetime suicidal ideation, plans and attempts (Saha, Scott, Johnston, et al., 2011). As with depression and anxiety, specific PLE subtypes of PI and PA were also found to be associated with lifetime suicidality (Capra et al., 2015). Finally, although not an included aim of the review, four of six studies that included outcome measures of psychosocial functioning found a negative association between increased levels of PLEs and reduced levels of functioning (Armando et al., 2010; Kelleher et al., 2012; Pontillo et al., 2016; Yung et al., 2009).

How do review findings fit with previous research?

Overall, findings from the included studies are consistent with existing research that in both longitudinal and cross-sectional, adolescent, non-help seeking samples, PLEs are associated with greater levels of psychopathology (Dhossche et al., 2002; Koyanagi, 2017). Findings that higher presence of PLEs are associated greater severity of psychopathology are also consistent with dose-response effect found in existing literature and the postulation that these groups may be presenting with psychopathology complicated by presence of PLEs (Kaymaz et al., 2012; Wigman et al., 2012). This is also corroborated by included studies which explored relationship between PLEs and specific anxiety disorders (SAD or Panic Disorder, PD): findings that individuals with higher PLEs also reported greater levels of SAD or PD symptomology, suggest these groups may represent a more severe subgroup of SAD or PD and indicate greater need for care (Armando et al., 2013; Masdrakis et al., 2017). However, as these studies are correlational, no causality can be inferred thus is remains unclear whether PLEs give rise to greater psychopathology or vice versa.

Two of the included studies' findings were not supportive of the association between PLEs and anxiety and depression (Hodgekins et al., 2018; Pontillo et al., 2016). Interestingly, these were the only included studies to use clinician-rated, comprehensive measures of PLEs. One of these studies only found supportive relationships between PLEs and social anxiety and depression when both self-report and clinician-rated measures were combined (Hodgekins et al., 2018). However, only 41% of the sample agreed to face-to-face clinical interviews, with those completing interviews having higher levels of functioning compared to those who did not, suggesting that may not be representative of the sample, which could account for non-significant findings. These findings could also be supportive of the existing, conflicting evidence over the validity of using self-report PLE measures (Lee et al., 2016) (see Strengths and Limitations).

Furthermore, although included studies found a positive association between presence of PLEs and suicidal ideation, plans and attempts, findings of subsequent studies have not been supportive of this association. The huge array of potential search terms relating to PLEs, due to a historic lack of consensus, meant these papers

were not captured by the search terms used in the current review (discussed further below). In a cohort study using clinician-rated measures of PLEs, researchers found the association with depression and suicide was substantially stronger than the association between PLEs and suicide, with PLEs alone adding little to the predictive risk of suicidal behaviour over and above depression (Sullivan et al., 2015). In a follow-up study to the included study, DeVylder et al., (2015) found this greater association between PLEs and suicidal behaviours was eliminated when adjusted for childhood sexual trauma, bullying and sexual orientation. They argued these findings went against the idea of a causal explanation for the associations between PLEs and suicidal ideation and highlighted the role of psychosocial factors. However, Kelleher *et al.,* (2014) found PLEs remained a strong marker for suicide risk even when multi-morbidity was accounted for and suggested one explanation could be the shared risk factor of adverse childhood events in both PLEs and suicidal behaviour.

Strengths and limitations of included studies

Strengths of the included studies are the large sample sizes, with over 44,000 participants included overall, and the use of valid and reliable measures of independent variables used across the majority of studies (n= 20). Another strength of the included studies is the measurement of different levels of PLEs, which revealed dose-response relationships and the identification of PLE subtypes through statistical analyses. Exploration of individual PLE subtypes with the independent variables elucidated more nuanced associations, highlighting which subtypes may confer greater risk (BE and PI) and those which may constitute a normal personality variant (Odd/ Magical Thinking (Yung et al., 2009)) or contribute to wellbeing (Unterrassner et al., 2017).

A major limitation of the included studies is that the vast majority (n =22) used cross-sectional designs, meaning no causality can be inferred from findings. For one of the two included studies that used a cohort design, the exposure (depression) was already present at baseline and cross sectional analysis was used, limiting the causal inferences that could be made (Yung et al., 2009). Due to the overreliance on cross-sectional designs for research into PLEs, the use of inclusion and exclusion criteria and determining response rates, including exploring difference between responders and non-responders, were used by less than half of the included studies, potentially

reducing the generalisabiltiy of findings. One of the included cohort studies reported that AH decreased in young adults compared to adolescence (Dhossche et al., 2002). Wider evidence suggest PLEs are most prevalent in mid-adolescence (Fonseca Pedrero & Debbané, 2017; Spauwen, Krabbendam, Lieb, Wittchen, & van Os, 2003) and that they appear to decline with age (Rössler et al., 2007). The large age range across the included studies (8-60-years-old) makes it difficult to compare findings and could also account for study findings which were not supportive, where one of the unsupportive studies had the youngest age range (8-17-years old) and the average age (12-years old).

Secondly, as previously alluded to, the use of self-report PLEs measures used by the vast majority of included studies may reduce the internal validity of the included studies. Self-reported measures of PLEs have been found to create greater numbers of false-positives, with rates of misidentification found to range from 7% to 61% (Kaymaz et al., 2012). However, self-report measures of only AH have been found to hold the greatest predictive power of psychotic symptomology (Horwood et al., 2008; Kelleher, Harley, Murtagh, & Cannon, 2011). Whilst, high rates of false positives have also been found amongst clinician-rated measures of PLEs, they were still found to be associated with future psychotic disorder at follow-up (Bak et al., 2003). However, CIDI has also been found to over-estimate rates of lifetime psychosis and non-affective disorders (Dhossche et al., 2002).

Four of the included studies used only self-reports of AH, with the vast majority using self-report measures of PLEs (n = 17), whilst four used only self-report DLE measures. The CIDI was one of the mostly widely used clinician-rated measure of both PLEs and non-affective disorders in the included studies (n= 9). These findings questioning the validity of self-report PLE measures are pertinent to the current review given two of the included studies which found no association, used clinician-rated measures which were not the CIDI. Subsequently, caution is needed when generalising from overall findings of the current review due to the potential methodological weakness of self-reported PLE measures.

Strengths and limitations of current review

A strength of this review is that, to the authors knowledge, it is one of the first to systematically review literature on PLEs and a broad range of psychopathology and affective disorders, which given the sharp increase in PLE research from 2016 onwards (17 published studies in 2011 vs. 57 in 2018, PubMed), meant review was also timely. In an earlier systematic review, Kaymaz *et al.,* (2011) explored risk of conversion to psychotic and non-psychotic disorder given presence of subclinical psychotic experiences in the general population. However, non-psychotic outcomes only included depression and anxiety, which were dichotomised to three-levels (i.e., not present, weak, strong), limiting sensitivity. Additionally, Nelson and Yung (2012) conducted a non-systematic, narrative review of selected PLE studies, however, the aim was exploring PLEs role in psychotic onset. Additionally, this review only compared non-helping seeking and non-psychotic help-seeking samples, excluding studies which used samples from UHR groups. This may enhance the generalisabiltiy of findings whereby being a more homogenous groups (i.e. with more comparable levels of subclinical psychotic experiences) may allow for more reliable comparisons.

A limitation of the current review were the search terms, which were not able to capture all related studies. However, this limitation arguably reflects broader constraints in this area of research. The large heterogeneity of terms relating to subclinical psychotic symptomology and the interchangeable use of them, has meant substantial variation in how subclinical terms are defined and measured (David, 2010; Lee et al., 2016). Despite consulting experts in the field and information specialists (who ran their own searches) to develop search terms for this review, it was a challenge to capture all terms. Several studies exploring PLEs used the term ‘psychotic symptoms’ or ‘psychotic experiences’, which generated a large amount of irrelevant (i.e., only psychotic-related) studies during searches. Whilst some publications also used several PLE terms interchangeably to refer to the same phenomenon (Preti et al., 2007; Vellante et al., 2012), others used unconventional terms (i.e., ‘hallucination predisposition’, (Castiajo & Pinheiro, 2017). Reflecting on the learning process, exploring such a large research area as psychosis, along with the broad review aims of establishing PLEs and various psychopathology, highlights the value of working within teams when undertaking comprehensive reviews.

This challenge may reflects the wider conflict within the literature over the conceptualisation of the continuum model of psychosis, including the overlap between terms used to refer to subclinical psychotic symptoms and the prodrome (Lawrie et al., 2010; Preti et al., 2011). The ambiguity of PLE terms in research may reflect how the focus of PLE research has predominantly been to corroborate etiological models of psychosis (Preti et al., 2007) and to elucidate risk factors for UHR groups to enhance clinical screening for psychosis (Yung et al., 2005). It indicates the need for a clearly operationalised definition of subclinical psychotic experiences for PLE research interested in both psychotic and non-psychotic outcomes (Fonseca Pedrero & Debbané, 2017).

Theoretical implications

Evidence presented in this review, that PLEs are not only associated with a range of psychopathology but that the severity of psychopathology appears to increase alongside greater levels of PLEs, provide support for PLEs being a risk factor not just for psychotic disorder but also affective symptomology and suggest they may play a role in exacerbating affective psychopathology. These findings support the preposition that PLEs could be '*transdiagnostic clinical markers of psychopathology severity',* with the presence of PLEs associated with lower levels of functioning, poorer prognosis and greater comorbidity (Kelleher & Cannon, 2016; Kelleher et al., 2014; Wigman et al., 2012). However, due to the over reliance on correlational designs, the direction of this relationship remains unclear, whether it is PLEs giving rise to distress or distress giving rise to greater levels of PLEs.

Current review findings also lend weight to a broader conceptualisation of UHR states: rather than considering PLEs, depressive or anxiety symptomology as representing distinct conditions, it may hold greater clinical utility to consider psychopathology as networks 'reciprocally impacting' on each other (Wigman et al., 2012) as proposed by Network Approaches (Borsboom & Cramer, 2013a). Such an approach could accommodate findings that a broad spectrum of psychotic experiences are associated with depression, rather than the current, narrower diagnostic categories of depression with psychotic features and the negative symptoms of psychosis (Fried, 2015; Kelleher et al., 2014). Findings could also be supportive of the hypothesis that vulnerability to

psychopathology lies on a continuum, with those predisposed to anxiety and depression also being predisposed to PLEs and vice versa (Fusar-Poli, Nelson, et al., 2014; McGorry & Nelson, 2016; Yung et al., 2012).

The conflicting evidence over the relationship between PLEs and suicide (DeVylder, Jahn, et al., 2015; Sullivan et al., 2015) and the postulation that the mechanism between PLEs and suicidal behaviour could be the shared risk factors of adverse childhood events (Kelleher et al., 2014) could also be consistent with a transdiagnostic, clinical staging approach. Both pluripotent and clinical staging models incorporate the interplay between psychopathology and psychosocial, neurobiological and genetic risk factors, where progression of symptoms may or may not occur depending on these and other resilience factors (McGorry, Nelson, Goldstone, & Yung, 2010; McGorry & Nelson, 2016; A. R. Yung et al., 2012). Evidence that PLEs have also been associated with low self-esteem (Espinosa, Valiente, Varese, & Bentall, 2018); disturbed sleep (Andorko et al., 2017) and attachment (Bolhuis et al., 2018) would also been consistent with this approach. Developing a transdiagnostic approach to early intervention chimes with a wider movement within clinical psychology to move away from diagnostic classification to a framework that incorporates personal meaning of distress and the associated socio-cultural factors (Power Threat Meaning Framework; Johnstone & Boyle, 2018).

Research implications

Research into PLEs has predominantly used cross-sectional, correlational designs, meaning no casual conclusions can be drawn from the relationship between PLE and non-psychotic psychopathology. There is longitudinal research in the role of PLEs and UHR populations (Hui et al., 2013; Lin et al., 2015; McAusland et al., 2017; Rutigliano et al., 2016) but select few amongst non-help-seeking and non-psychotic help-seeking populations. Greater longitudinal research in PLEs in the general population would help further elucidate the role PLEs play in psychopathology, where the greater severity of psychotic symptomology amongst UHR populations limit generalisability.

A potential hindrance to future PLE research however, is arguably the varying definitions of subclinical psychotic symptomology, the interchangeable use of these terms and the variety of PLE assessment tools created to measure varying PLEs

constructs. In a systematic review of PLE definitions and assessment tools, authors found large variation across how PLEs were defined and what PLE assessment tools were measuring, from thoughts and perceptions to the phenomenon of PLEs (Lee et al., 2016). They argued this substantial heterogeneity may have given rise to conflicting results across both psychotic and non-psychotic outcomes and limited the extent to which results can be generalised and synthesised to draw firmer conclusions. Authors subsequently recommended future research first focus on better elucidating the phenomenology of PLEs, using qualitative methodology.

The majority of PLE research, including studies in the current review, used only quantitative methodology to assess PLEs. Concerns over validity of PLEs definitions and assessment tools in conjunction with concerns over the validity of both self-report and clinician-rated measures of PLEs (Bak et al., 2003; Kaymaz et al., 2012) reduces the ability to meaningful compare results, further limiting the generalisabiltiy of findings from included studies. Establishing greater consensus and homogeneity amongst definitions of subclinical psychotic symptomology, which could then in turn enhance PLEs assessment tools, would be an important future research aim. To this aim, conceptual distinctions have recently been proposed to differentiate between PLEs and schizotypy traits (Fonseca Pedrero & Debbané, 2017). Authors argue that PLEs are unstable (i.e. transitory states) which relate to positive psychosis symptomology only whilst schizotypy traits are stable over time and are multidimensional constructs, covering perceptual, interpersonal and disorganised (i.e. odd speech) anomalies. These distinctions could help in operationalizing measures of subclinical psychotic manifestations. Additionally, aforementioned Network Approaches may be well placed to further refine psychotic phenomenology across the psychotic spectrum by exploring interconnectivity not only within clusters of psychotic symptomology but between clusters of other psychopathology (van Rooijen et al., 2017). Greater specificity within PLE tools could also potentially promote greater homogeneity across research, when a more limited but well validated number of tools can be used.

Findings that PLEs are more prevalent in adolescence (Fonseca Pedrero & Debbané, 2017; Spauwen et al., 2003) and that they maybe transitory, decreasing with age (Rössler et al., 2007; Wikström, Tuulio-Henriksson, Perälä, Saarni, & Suvisaari, 2015), suggests potential underlying neurobiological mechanisms in PLEs. Adolescence is a time of significant reorganisation, particularly within the prefrontal cortex (Konrad, Firk,

& Uhlhaas, 2013), an area known to be important in development of metacognitive abilities (Fleming & Dolan, 2012). Dysfunctional cognitive appraisals are known to play an important role in formation and maintenance of positive psychotic symptomology (Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001) and constitute an important treatment target (Peters et al., 2017). Increasing evidence suggests that cognitive appraisals of PLEs may play an important role in the relationship between PLEs and non-psychotic psychopathology.

In cross-sectional research comparing individuals with AH, with or without the need for care, differences in cognitive appraisals were found between groups. Individuals with need for care reported greater levels of Jumping to Conclusions (JTC) and Attention to Threat (Johns et al., 2014). This has been corroborated in the general population. Amongst university undergraduates, the relationship between depression and PLEs, and social anxiety and PLEs, was moderated by Attention to Threat bias, whilst External Attribution bias moderated the link between anxiety and PLES (Prochwicz & Klosowska, 2018; Prochwicz, Kłosowska, & Karpowska, 2017). Furthermore, it could be hypothesised that the mechanism underlying findings from the current review that specific PLE subtypes of BE and PI confer differential levels of risk for psychopathology (including subtypes that are protective of wellbeing), are cognitive appraisals. Research exploring the role of cognitive bias and PLEs amongst adolescent population could further elucidated underlying mechanisms.

Practice implications

If PLEs' association with depression and anxiety (including SAD and PD) constitute another 'step up' in terms of clinical risk (Fusar-Poli, Yung, et al., 2014; A. R. Yung et al., 2012), and/or constitute a variety of individual psychotic-related symptoms interconnected with other disorder specific symptomology, then this may have important clinical implications. If in the future causal links between PLEs and distress were established, then routine screening for PLEs could form an important part of assessment within Child and Adolescent Mental Health Services (CAMHS), where young people reporting PLEs may be at risk of greater psychopathology severity and poorer prognosis (Hodgekins et al., 2018; Kelleher & Cannon, 2016; Kelleher et al., 2014). Evidence of the link between PLEs and suicide is more conflicting, with some research suggesting that screening for both PLEs and depressive symptoms to identify

adolescents at greater risk of suicidal behaviour, would be of limited clinical value (Sullivan et al., 2015). More prospective longitudinal research is needed within help-seeking groups to clarify the role PLEs may play in suicidal behaviours.

However, a potential barrier to screening for PLEs, may be the stigma associated with them. Research has found that young people are more likely to report depression than PLEs, describing greater levels of stigma (Liu & Wang, 2018). A network approach to PLEs, may facilitate non-stigmatising discussion with help-seeking young people, highlighting that PLEs are symptoms which are known to occur across a broad range of disorders and do not indicate imminent risk of psychotic onset (Kelleher et al., 2014). Professionals too may benefit from considering PLEs within a transdiagnostic framework, in which they are not only related to psychotic outcomes, and may welcome a new approach to discuss PLEs with service-users in a way that is non-stigmatising and help better support their direct care.

Conclusion

In conclusion, findings from this review suggest that PLEs are associated with a broad range of psychopathology, with evidence that reported levels of PLEs increase alongside increasing psychopathology severity suggesting they may play role in exacerbating psychopathology. This, in conjunction with evidence that greater levels of PLEs are associated with decreased functioning, suggests that screening for PLEs may assist in identifying individuals at greater risk of poorer outcomes. However, due to the largely cross-sectional designs, no causality can be inferred and therefore caution must be taken when interpreting results as the direction of the relationship between PLEs and distress remains unclear. Additionally, the lack of clinician rated measures of PLEs, where evidence suggests that self-reported PLEs may lead to an over reporting of PLEs, may also threaten the validity of findings. The vast array of terms used to refer to subclinical psychotic symptomology represented not only a methodological limitation for included studies, where the heterogeneity of PLE measures measuring different constructs, limited the ability to synthesise and compare findings challenging, but also when conducting searches for the current review. The large number of subclinical psychotic terms resulted in relevant studies not being identified. Future research would benefit from a more unified conceptualisation of PLEs, which could aid the development of PLE measures and/or the use of one 'gold standard' measure of PLEs to enable more meaningful comparison of findings. A move

away from correlation designs to longitudinal studies exploring role of PLEs in trajectory of psychopathology, would also enable causality inferences to be made.

Psychotic-Like-Experiences (PLEs) in perinatal women: The role of psychological distress and cognitive biases

Abstract

Background: Accurate and timely identification of emerging psychopathology in the perinatal period has become a U.K. healthcare priority. Psychotic-like experiences (PLEs) are subclinical psychotic experiences such as delusional beliefs and hallucinations. Recently greater levels of PLEs have been associated with greater levels of non-psychotic affective psychopathology, suggesting PLEs could be useful clinical makers of psychopathology severity. PLEs have been found to be prevalent in the perinatal period, where greater affective psychopathology predicted greater levels of PLEs. Specific cognitive biases have been associated with PLEs in the general population and could be underpin the relationship between PLEs and affective psychopathology.

Objective: The current study aims to explore whether PLEs in the perinatal population are associated with distress and psychosis-related cognitive biases and whether these biases predicted levels of PLEs and distress.

Methods: In a cross-sectional design, 144 female participants were recruited via social media and General Practice (GP) surgeries in the U.K. and completed an online survey which included measures of PLEs (delusional and hallucinatory experiences), distress and psychosis-related cognitive biases, including Threatening Events (TE), Anomalous Perceptions (AP) and inflated responsibility (RAS).

Results: Endorsement rates of PLEs were lower compared to previous perinatal samples and community norms. No differences were found between levels of delusions pre to postnatally, but hallucinations were found to decrease pre to postnatally, partly supporting previous findings. Jumping-to-conclusions and Intentionalising were the most commonly reported cognitive bias. Distress was significantly correlated with PLEs and cognitive biases of AP, RAS and dichotomous thinking (DT). RAS was a unique predictor of PLEs. No specific cognitive bias was a unique significant predictor of distress. Secondary moderation analysis revealed that pre or postnatal groups or primiparity did not significantly contribute to an increase in the variance explained.

Conclusion: PLEs could be useful tools in identifying women at-risk of greater affective psychopathology in the perinatal period. RAS was particularly associated with PLEs and merits further exploration. Future longitudinal research is needed to establish if causal links exist between PLEs and distress.

Introduction

Mental health difficulties in the perinatal period: a U.K. priority

The prevalence of women developing mental health difficulties in the perinatal period is estimated at 10-20% (NICE, 2016). The 'perinatal' period is defined as the time from conception until 12 months after the birth of the child (NHS England, 2016). The estimated cost of perinatal depression, anxiety and psychosis in the United Kingdom (U.K) is around £8.1 billion, with the bulk of these costs falling on the National Health Service (NHS) and social services (£1.2 billion, Centre for Mental Health, 2015). Postpartum psychosis (PPP), especially, carries high financial burden due to the associated high risk of maternal suicide and infanticide necessitating admission to Mother and Baby Units for periods of time (MBUs, (Heron, McGuinness, Blackmore, Craddock, & Jones, 2008).

Untreated perinatal mental health difficulties have been associated with poor infant and mother health outcomes and have been shown to adversely affect parental cognitions and beliefs, attachment to the infant, and the caregiver-infant relationship (Fisher et al., 2012; Higgins et al., 2018; Hoffman, Dunn, & Njoroge, 2017; Robertson & Lyons, 2003). Due to the potential immediate and long-term impact of untreated perinatal mental health difficulties on mother and baby, prompt identification and effective treatment has become a healthcare priority in the U.K. (National Collaborating Centre for Mental Health, 2018). An additional £365 million has been allocated to meet the objective of improving access to specialist perinatal mental health support for an additional 30,000 women by 2021 (NHS England, 2016).

Identification of perinatal mental health difficulties

The identification of perinatal mental health difficulties has been deemed inadequate, due to evidence criticising the accuracy of screening instruments, their clinical effectiveness, acceptability and cost-effectiveness (Howard et al., 2014). The National Institute for Health and Care Excellence guidelines (NICE, 2014) recommend healthcare providers ask two brief, generic case finding questions relating to depression at several points during pregnancy and postpartum ('Whooley questions'). If positive responses are given to the 'Whooley questions', the Edinburgh Post-Natal Depression Scale (EPDS) is recommended as a further screening tool to detect

depression in perinatal women. However, there has been a number of criticism to this method, particularly the lack of randomised controlled trials, the small sample sizes of perinatal women from which estimates of sensitivity and cut-off scores of the EPDS are drawn from and the inclusion of women already diagnosed with depression (Thombs et al., 2015).

NICE (2014) guidelines were also updated recommending the inclusion of two questions exploring perinatal anxiety. This was in response to evidence suggesting that perinatal anxiety was often diagnostically overshadowed by depression, resulting in perinatal anxiety being minimised or under identified despite it being highly prevalent (Miller, Pallant, & Negri, 2006) and particularly associated with negative impacts on child emotional outcomes (e.g., emotional difficulties when aged 2-5-years-old, Rees, Channon, & Waters, 2019). However, findings from a recent systematic review indicated false-positives and authors concluded they may not be helpful for maternity services (Nath et al., 2018). This raises concerns about the high emotional and financial impact of false-positives of current screening methods screening method (Hewitt et al., 2009; Nath et al., 2018). The strongest evidence for improvement in perinatal mental health identification has come from integrated screening and treatment programmes; however, such a resource-heavy approach may not be cost-effective for the NHS (Paulden, Palmer, Hewitt, & Gilbody, 2009).

There is limited data on psychological risk factors in the perinatal period, bar previous history of psychopathology (Howard et al., 2014; Lancaster et al., 2010), with literature focusing on psychosocial risk factors such as social support and socioeconomic status (Biaggi, Conroy, Pawlby, & Pariante, 2016). Specifying how “at risk” women differ from “protected” women on measures of cognition (and behaviour) may help the future development of screening tests with greater accuracy (Davies, 2017). Increasing evidence suggests Psychotic-Like-Experiences (PLEs) play a role in a broad array of psychopathology, including anxiety and depression, across clinical, at-risk and non-clinical groups (Kelleher & Cannon, 2016). In view of this, the exploration of PLEs in perinatal populations and their potential role in perinatal symptomology could be merited. PLEs and the evidence for their role in non-psychotic psychopathology will first be outlined, before moving onto PLEs in perinatal populations.

Psychotic Like Experiences (PLEs)

PLEs are subclinical experiences of hallucinations and delusions, which may or may not elicit distress or prompt help-seeking in individuals (van Os et al., 2009). Data suggests that PLEs are highly prevalent in the general population, with estimates ranging from 5-7.2%; substantially higher than the prevalence of psychotic disorders (0.02-3%, Hanssen et al., 2005). Psychosis has been conceptualised as lying on a continuum of severity, with PLEs falling on the lower (subclinical) range, moving up towards psychotic disorder on the higher (clinical) range (Linscott & van Os, 2013). Greater persistence and recurrence of PLEs have been associated with greater risk of psychotic-onset (Dominguez et al., 2011). Accordingly, PLEs are believed to play an important role in the early identification and subsequent prevention of psychotic onset (Addington, 2003).

PLEs as non-specific risk factors for non-psychotic psychopathology

Depression and anxiety are considered common comorbidities for people with psychosis, but research has begun exploring the prevalence of PLEs in individuals with diagnoses of depression and/or anxiety in the absence of psychosis. In a longitudinal study (Dhossche et al., 2002), PLEs were associated with non-psychotic disorders at eight-year follow-up but not with psychotic disorders in a community sample of adolescents. Increasing rates of self-reported PLEs have also been associated with increasing rates of psychological distress (Vellante et al., 2012), anxiety and depression (Kelleher et al., 2012) and decreasing happiness in a large (n = 7,363) adult sample (Koyanagi, 2017). Furthermore, in a cross-sectional study with a community sample of young adults, those reporting both affective and psychotic-like psychopathologies showed greater severity and poorer prognosis than those who did not report these psychopathologies (Wigman et al., 2012). Researchers argued that given these findings occur in large sample sizes, and due to the low prevalence of psychosis and low reported transition to psychosis (Nelson et al., 2012; Yung, Yuen, et al., 2007), it seemed unlikely these findings could all be explained as part of a pre-psychotic phase only. They argued that help-seeking individuals presenting as ‘high risk’ for psychosis may in fact be presenting with disorders of anxiety or depression *complicated* by PLEs.

These findings suggests that PLEs could therefore be risk factors for both psychotic disorder and general risk factors for a wider array of non-psychotic disorders (Koyanagi, 2017; Nelson et al., 2012). These findings have potential implications for the continuum model of psychosis, where is it unclear whether those experiencing PLEs form two distinct groups: the first consisting of individuals with depression and/or anxiety complicated by psychotic-like psychopathology and the second, individuals experiencing PLEs as part of a 'prodrome' to psychotic onset (i.e. a discontinuation from a single continuum). This has lead researchers to suggest that subthreshold concept for psychotic outcomes (Clinical Staging Model of psychosis, McGorry, Nelson, Goldstone, & Yung, 2010) should become more '*explicitly transdiagnostic*', postulating that the subthreshold stage (encompassing PLEs) is a syndrome which connotes high risk for psychotic disorders *and* for persisting and recurrent mood and anxiety disorders (McGorry & Nelson, 2016). This chimes with a wider movement within clinical psychology to move away from diagnostic classification and disorder-specific protocols to considering psychopathology more transdiagnositcally, that is the shared processes underpinning them (McElroy, Fearon, Belsky, Fonagy, & Patalay, 2018; Norton & Paulus, 2017). Under a transdiagnostic framework, PLEs could be understood as risk factors for both affective and psychotic psychopathology.

PLEs in perinatal population

Studying PLEs in non-clinical populations has often been used to help corroborate etiological models of psychosis (Preti et al., 2007). This approach has also begun to be used in perinatal populations to explore risk factors in PPP. This has the advantage of easier access to this population, where prevalence of PPP is very low in the general population (1–2 in 1000 births) (VanderKruik et al., 2017) and non-exposure to confounds such as anti-psychotic medication. Research found that PLE rates occurred frequently in the perinatal period (80% endorsement rate of experiencing PLEs) and were more prevalent prenatally than postnatally (MacKinnon et al., 2017; Mannion & Slade, 2014). The same research identified no significant associations between some of the known risk factors for PPP (i.e. poor social support, fear of childbirth) and PLEs, but did find depression and anxiety significantly predicted levels of PLEs across the perinatal period.

PLEs and cognitive bias

Taken together, these findings across populations (general and perinatal), suggest a bi-directional relationship between PLEs and affective symptomology. It also raises questions over which mechanisms may drive the relationship between increased affective symptomology and levels of PLEs. One hypothesis being explored in PLEs in the general population is the role of cognitive biases. Cognitive biases are known to play an important role in the transition to, and maintenance of, positive psychotic symptomology, where maladaptive appraisals and coping styles in response to anomalous experiences can result in greater distress and help-seeking behaviour (Garety et al., 2001). Research has indicated that whilst PLEs are not inherently experienced as distressing, help-seeking individuals are more likely to report being distressed by PLEs if they are more preoccupied by them and hold them with greater conviction (Lincoln & Keller, 2008; Preti, Cella, Raballo, & Vellante, 2012). These findings suggests that appraisals of, and responses to, PLEs are important predictors of distress, rather than their presence alone (Preti et al., 2011).

In a cross-sectional design, differences in appraisals of PLEs were found between clinical (psychosis) groups and non-clinical (control) groups (Brett, Heriot-Maitland, McGuire, & Peters, 2014; Brett et al., 2007; Lovatt, Mason, Brett, & Peters, 2010). Greater levels of distress were predicted by appraisals of anomalous experiences as being caused by 'other people' (i.e. personalizing appraisals) and a threat to self rather than normalising or supernatural appraisals. These findings have also been replicated in studies using experimental induction of PLEs across clinical (psychosis) groups, non-clinical (adults in the general population with persistent PLEs) and control groups (adults in general population without PLEs, Peters et al., 2017). Clinical groups reported greater levels of personalising appraisals. Authors concluded that central to distinguishing between those with or without need for care were higher ratings on personalising appraisals, specifically, whether they involve the malevolent intent of other people ('intentionalising'). Such threat-based appraisals were also found to be the strongest predictor of PLEs in non-clinical samples (Prochwicz & Kłosowska, 2018a). Threat-based appraisals therefore appear to play an important role in distress associated with PLEs and greater clinical need.

In addition, there is evidence that self-blaming appraisals are associated with greater positive psychotic symptomology. Positive associations between inflated responsibility, a cognitive bias known to play a significant maintenance role in Obsessive Compulsive Disorder (OCD,(Salkovskis, 1985), and command hallucinations and persecutory delusions (Ellett et al., 2017) have been found. Self-blaming attributional styles were also found to be associated with persecutory delusions in both clinical and non-clinical groups over and above personalising styles (Mehl et al., 2014), suggesting that blaming oneself for negative events may play an important role in the maintenance of positive psychotic symptomology.

These findings are also consistent with literature on persecutory paranoid delusions, where it has been proposed that there are two types of paranoid: individuals with 'Poor Me' (PM) paranoia, who tend to blame others and see themselves as the victim, and individuals with 'Bad Me' (BM) paranoia, who tend to blame themselves or see themselves as bad people (Trower and Chadwick, 1995). Bentall, Corcoran, Howard, Blackwood, & Kinderman (2001) argued that PM and BM are unstable traits that can change over time (i.e. either could be activated) in response to day-to-day events (i.e. in response to perceived success or failure) and are formed in response to early insecure attachment styles.

Thus, consistent with cognitive models of positive psychotic model (Garety et al., 2001), greater propensity to specific cognitive biases, such as greater attention to and self-blaming appraisals, could trigger the development and subsequent maintenance of PLEs and associated distress (affective psychopathology). Additionally, as in the cognitive model, biopsychosocial vulnerability, such as early attachment difficulties and trauma, could also contribute to the predisposition to specific biases and subsequent development of PLEs. However, it remains unclear whether greater distress or greater levels of PLES increase the likelihood of maladaptive appraisals in response to anomalous experiences.

Current Study

Given, (i) the poor identification, yet high prevalence and significant impact of perinatal mental health problems, (ii) that PLEs have been identified as risk factors for both affective and psychotic psychopathology and (iii) specific cognitive bias, in particular

threatening events and responsibility biases, have been linked to both greater prevalence of PLEs and greater distress in the general and clinical population, exploration of the role of cognitive biases in the relationship between psychological distress and PLES in the perinatal period could be important in further elucidating mechanistic underpinnings. To our knowledge, there exists no published literature exploring the role of cognitive biases and PLEs in the perinatal population. The aim of the current study will be to investigate whether (1) PLEs are associated with psychological distress in perinatal women, (2) whether psychosis-related cognitive biases are associated with greater levels of PLEs and (3) if psychosis-related cognitive biases predict greater levels of PLEs and distress. We hypothesise that threatening appraisals of events and high responsibility beliefs will predict greater prevalence of PLEs and anxiety and/or depression symptomology. Supportive findings may help in the identification of at-risk women in the perinatal period, an identified U.K. healthcare priority.

Methods

Participants

A community sample of pregnant and post-partum women were recruited between October 2018 and March 2019 via advertisements on social media and via advertisements (poster and flyers) at General Practice (GP) surgeries in the north and north-west Thames region. Eligibility criteria were women over the age of 18-years-old and who were either in their second or third trimester of pregnancy or who were up to 12-months postpartum (i.e., had an infant 12-months or younger). Women who were under the age of 18-years old, women who were not proficient in English reading and comprehension, and men, were all excluded from the study. Due to the inclusion of the Responsibility Attitude Question (RAS, see measures section), women who scored more than three standard deviations on OCI were excluded in order to control for Obsessive Compulsive Disorder (OCD) symptomology. Additionally, the sample was screened for drug use, as illicit substance use has been linked to reporting higher levels of PLEs (Ruiz-Veguilla et al., 2013).

Of the 205 responses, 127 participants completed the entire battery and an additional 18 participants completed all measures except the final measure (the RAS, equal to a 94% completion rate), leaving a total of 145 participants (a 70% response rate). One participant was subsequently removed due to their OCI score being greater than 3 SDs (Field, 2013) suggesting they fell within clinical ranges of OCD. One participant reported drug use in the past six months but as they were three months pregnant it was unclear if this fell within the perinatal period and they were kept in the study. The total final sample therefore consisted of 144 participants.

Participant demographic information is presented in Table 7 and obstetric information in Table 8. The majority of the sample were white British, married, employed and highly educated. Around half of the sample reported no religious beliefs and just under half reported being Christian. The sample had a greater number of women who were postpartum and the majority of the sample reported having one or more children (77%). Almost 10% of the sample reported lifetime history of perinatal depression and/or anxiety, which is consistent with prevalence rates of perinatal depression and anxiety (11%-13%; 13%, (Howard et al., 2014).

Table 7

Participant demographics

	n	Mean *(SD)*	Range
Age (years)	144	32.9 (*3.32*)	23-43
Prenatal (weeks pregnant)	57	23.6 (*8.3)*	4-39
Postnatal (weeks postpartum)	87	22.4 (*12.7)*	1-48
		Total n *(%)*	
Marital Status[a]			
Single		3 *(2.1)*	
Co-habiting		33 *(22.8)*	
Married		104 *(71.7)*	
Ethnicity[b]			
Asian		3 *(2.1)*	
Black British		2 *(1.4)*	
Mixed Heritage		3 *(2.1)*	
White British		121 *(83.4)*	
White Other		10 *(6.9)*	
Employment[c]			
Employed		121 *(87.7)*	
Unemployed		15 *(10.8)*	
Student		2 *(1.2)*	
Educational Attainment[d]			
Non-graduate		13 *(9)*	
Graduate		119 *(82)*	
Other		7 *(4.8)*	
Religion[e]			
No religion (Atheist/ Agnostic)		74 *(51)*	
Christian		60 *(41.4)*	
Sikh		1 *(0.7)*	
Other		4 *(2.8)*	

[a, b,] number of participants = 140, five did not provide data
[c] n = 138, seven did not provide data
[d, e] n = 139, six did not provide data

T-tests were run to compare those who completed a full dataset to those who did not. No significant differences were found between the groups on age, relationship, ethnicity, employment, education, religion, lifetime or perinatal mental health. The only difference found was between the number of existing children, where women who indicated they had more than one childr were less likely to complete more than 94% of the dataset ($t(22) = 2.50$, $p = .02$). This suggests that the completion length of the

test battery may have played a role in the response rate for mothers with several children.

Table 8

Participants' obstetric information

	n *(%)*
First pregnancy[a]	
Yes	44 *(48.9)*
No	46 *(51.1)*
Number of existing children[b]	
0	30 *(20.7)*
1	75 *(51.7)*
2	36 *(24.8)*
3	1 *(0.7)*
Previous experience of pregnancy	
Miscarriage	31 *(21.4)*
Termination	7 *(4.8)*
Still birth	2 *(1.4)*
Lifetime perinatal mental health	
Pre/post-natal depression	14 (9.7%)
Perinatal anxiety	12 (8.3%)
Perinatal OCD	2 (1.4%)
PTSD related to birth trauma	5 (3.4%)

[a] *n = 90, fifty-five did not provide data*
[b] *n = 142, three did not provide data*

Design

A cross-sectional, within-participants, online survey design was used.

Settings

Participants were recruited via two routes 1) via advertisement on social media, using both convenience and snowballing sampling and 2) via GP practices, using convenience sampling, to enhance representativeness of the sample. Pre-natal and mother and baby groups on social media were targeted for advertisement and women were invited to share the survey with other pre- or post-natal women. Contact details of GP services in the north Thames region were provided by the primary care research network in North Thames (Noclor). Practice and research managers were contacted by phone and email and invited to participate by placing study posters and flyers in visible areas of the practices. Visits were also made to the same identified GP services

to invite them to participate. Relevant healthcare professionals (i.e., community midwives, GPs with obstetric special interests) were also invited to provide flyers to women in clinics who met the inclusion criteria. For GP services in the north-west Thames region, the Research and Development (R&D) manager for north-west London Clinical Research Network (CRN) circulated an invite to participate, along with study materials, to GP managers within the network.

Power analysis

Power calculations were based on analytic strategy of correlations and multiple regression analysis to test hypotheses. Estimation of effect sizes were based on comparable studies within the same area, who used the same PLE measures in adult community samples in cross sectional designs (MacKinnon et al., 2017; Mannion & Slade, 2014). Both studies found small effect sizes (*d* = 0.04 and 0.09, respectively). Using these effect sizes as estimates, a power analysis calculated via Gpower indicated a required sample size of 126 (1-ß = 0.8, p < 0.5, f^2= 0.09). All participants were included in all analysis except those which required RAS scores, where 127 participants were included. This number still met the minimum required sample size for adequate power.

Measures

Demographic and obstetric information

Demographic information was collected including: age, ethnicity, educational attainment, employment status, marital status, religiosity and any lifetime history of mental health difficulties (see Appendix 1). Obstetric information collected included: perinatal status (i.e., stage of pregnancy (trimester) and/or months postpartum), number of children, previous experiences of pregnancy and lifetime history of any perinatal related mental health difficulties. Participants were also asked about alcohol and drug use over the past six months.

Psychotic Like Experiences (PLEs)

Peters Delusions Inventory (PDI-21; Peters, Joseph, Day, & Garety, 2004).

The PDI-21 is a widely used 21-item scale designed to assess the presence, distress, conviction and preoccupation with delusional ideation, in both clinical and non-clinical populations (see Appendix 2). Four separate scores are summed to obtain an overall total score of 'psychosis proneness' that ranges from 0 to 336, with higher total scores reflecting increased presence and severity of delusional ideation. Peters et al., (2004) reported good reliability (α = 0.82) and convergent validity (r = 0.61) when correlated with the Foulds Delusions-Symptoms-State Inventory. The PDI-21 has been utilised in perinatal populations in which they were observed to have good internal reliability (α = 0.70-0.72; (Mannion & Slade, 2014). Cronbach's alpha for the study was 0.94, indicating very good internal reliability.

The Launay–Slade Hallucination Scale–Revised (LSHS-R, Bentall et al., 1985).
The LSHS is a 12-item self-report measure of hallucination proneness in non-clinical samples (see Appendix 3). Each item is rated on a 4-point scale (1 = certainly does not apply to you, 4 = certainly does apply to you). Scores range from 12 to 48, with higher scores indicating a greater predisposition toward hallucinating. Its test–retest reliability is good (r =0.81; (Aleman, Nieuwenstein, Böcker, & De Haan, 1999). The LSHS-R has been utilised in perinatal populations in which it was observed to have good internal reliability (α = 0.73; (Mannion & Slade, 2014). Cronbach's alpha for the study was 0.84, indicating very good internal reliability.

Cognitive biases

Cognitive Biases Questionnaire for Psychosis (CBQp, Peters et al., 2014)
The CBQp comprises five different types of cognitive biases relevant to both psychosis (jumping to conclusions, intentionalising) and anxiety and depression (three 'Beckian' cognitive bias of catastrophising, dichotomous thinking and emotional reasoning). It consists of 30 scenarios describing everyday situations, which can be divided into the five cognitive biases or also into two broader, separate themes of anomalous perceptions (AP) and threatening events (TE), with 15 statements per theme (see Appendix 4). The CBQp has demonstrated good internal consistency (Cronbach's alpha, a=0.89). Although this questionnaire has not been used in the perinatal population, questionnaires assessing similar constructs have been used (Hugill, Fletcher, & Berry, 2017). Cronbach's alpha for the study was 0.68, indicating acceptable internal reliability.

Responsibility Attitudes Questionnaire (RAS, Salkovskis et al., 2000).

The RAS was used to capture the cognitive bias of inflated responsibility beliefs (see Appendix 5). It is a 26-item self-report measure that assesses general (i.e., 'most of the time') responsibility attitudes. Each item is rated on a 7-point scale (1= totally agree, 7 = totally disagree). Total scores range from 26 (high responsibility) to 182 (low responsibility score), with higher scores indicating stronger responsibility beliefs. The RAS has high reported internal consistency (Cronbach's alpha, a=0.92) and test-retest reliability (r=0.94). Cronbach's alpha for the study was 0.93, indicating very good internal reliability.

Psychological Distress

Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1995).

The DASS is a widely used 42-item scale designed to assess the core symptoms of depression, anxiety and stress over the last week (see Appendix 6). Items are rated on a 4-point Likert scale (0 = Did not apply to me at all, 4? = Applied to me very much, or most of the time). Anthony et al. (1998) reported good reliability (α = 0.92-0.97) and concurrent validity (*r* = 0.44-0.84) when correlated with other measures of depression and anxiety in non-clinical samples. The DASS-21 is recommended for use in perinatal populations (Miller et al., 2006). Cronbach's alpha for the study was 0.90, indicating very good internal reliability.

Control measures

Obsessive Compulsive Inventory (OCI) – (Foa, Kozak, Salkovskis, Coles, & Amir, 1998)

The OCI is a 42-item self-report measure assessing OCD symptoms and was used in the current study to control for OCD symptoms (see Appendix 7). It composes of seven subscales: Washing, Checking, Doubting, Ordering, Obsessing, Hoarding, and Mental Neutralising. Each item is rated on a 5point (0-4) Likert scale of symptom frequency and associated distress (0= Not at all, 4= extremely). A total distress and score can also be calculated to give an indication of overall OCD severity. Total distress scores range from 0 to 168. A cut-off on total distress score is indicative of clinical levels of

OCD. The OCI has reported high internal consistency (alpha = 0.86 -0.95) and test-retest reliability (r= 0.84 among OCD patients and 0.90 for non-anxious controls). The Obsessive Compulsive Inventory (OCI) has demonstrated good convergent validity (*r* = 0.65) when compared to other measures of OCD (Hajcak, Huppert, Simons, & Foa, 2004). Cronbach's alpha for the study was 0.92, indicating very good internal reliability.

Procedure

Women who met the inclusion criteria accessed the online survey by following a URL link included on social media posts. Women in GP surgeries could access the survey by either scanning QR codes on displayed posters, which opened the survey link, taking tear-ads from posters or taking a flyer, which contained a shortened version of the link (tiny URL link) to enter the address manually. Women could also use details on the poster and flyers to contact the researcher by email to be sent the survey link via email. These details could also be used to contact the researcher with any questions regarding the online survey or for further details about the study. Participants were presented with the participant information sheet (see Appendix 11) where they could then choose to consent or not participate (see Appendix 12). Following completion of the survey and/or if participants clicked the exit button/ did not consent, they were presented with the debrief sheet (see Appendix 13). The online survey was constructed and hosted on Qualitrics™ (digital software platform) and was compatible for use on mobile devices and personal computers.

Piloting

The test battery was piloted with postpartum women for troubleshooting purposes and to gather feedback on time taken to complete the survey and ease of completion. Women who piloted the survey took an average completion time of 23 minutes. Amendments from their recommendations, which largely related to grammatical structure and clarification, were implemented. Feedback from one women pertained to the length and detail of the Participant Information Sheet (PIS, see appendix 11) provided at the start of study. However, in order to comply with NHS ethics, information on the PIS could not be shortened further.

Ethics

NHS ethical approval was granted by East of Scotland Research Ethics Committee and approved by the Health Research Authority (reference: 18/ES/0097, see Appendices 8-9). R&D approval for north Thames was granted from Noclor, who acts as the local R&D for north Thames CRN, and R&D approval for north-west Thames was granted by the R&D manager for north-west Thames CRN. Ethical approval was also granted by Royal Holloway University of London through the self-certification process as NHS ethical approval had been granted.

Analytic strategy

Data was analysed using IBM SPSS Statistics version 21. Data was screened for normality and descriptive statistics were computed for demographic and obstetric variables. The distribution of scores for continuous variables were tested for skew and kurtosis to determine whether normality could be assumed. DASS, PDI, LSHS, CBQ-TE and CBQ-AP variables were positively skewed ($z > 3.29$). Winsorizing of outliers and log10 transformation of these variables failed to achieve normality. Bootstrapping was subsequently utilised with parametric tests for analysing study data, using the recommended 1,000 bootstrapped samples, as this is a robust method of analysis which can allow for non-normal distributions and outliers (Field, 2013).

To investigate the relationship between PLEs and psychological distress, and PLEs and cognitive biases, Pearson Produce Moment Correlation Coefficients were conducted, and both *p*-values and Bootstrapped 95% Confidence Intervals (BCa 95% CI) were reported. Correlation coefficients were used to interpret effect sizes for correlations, using the following convention: ±.1 representing a small effect, ±.3 a medium effect and ±.5 a large effect (Cohen, 1992). The exploratory nature of the current research has implications for multiplicity corrections and consequently Bonferroni corrections were used to control for the increased likelihood of Type I error in the study design (Bender & Lange, 2001). To explore the extent to which cognitive biases predicted PLEs and distress, multiple linear regression was used. In the presence of significant relationship between the independent and dependent variables hierarchical linear regression was used to explore the interaction term between pre and postnatal groups and primiparity, and cognitive bias on the relationship with PLEs and distress (main study outcomes).

Results

Descriptive statistics

The descriptive statistics for main study variables, the rate of PLEs (PDI and LSHS) endorsed by the sample are shown in Table 9 alongside comparative data from community norms and other perinatal samples for the PDI and LSHS. Overall, rates of PLEs endorsement in the current sample were lower than rates found in the general population. Rates of PDI endorsed by current the sample were lower prenatally than postnatally, but this difference was not significant ($t(141) = -1.37$, $p > .05$). There was no difference between rates of LSHS pre or postnatally. These findings were in contrast to other perinatal samples, which found the reverse (i.e. PDI and LSHS were both found to be higher prenatally than postnatally; MacKinnon et al., 2017; Mannion & Slade, 2014). Endorsement rates of LSHS in the current study did fall marginally pre- to postnatally suggesting a potential trend more consistent with existing findings (Mannion & Slade, 2014).

Table 9

Scores of PLEs (PDI and LSHS) comparative to community and perinatal samples

	Age range	n	Mean *(SD)*	Range
Community norm for PLEs (female samples)				
PDI total[a]	16-67	385	61.0 *(47.5)*	0-336
LSHS total[b]	17-33	98	11.7	0-48
PLEs in perinatal samples				
Present Study	23-43	145		
Prenatal (4-39 weeks) PDI total		57	17.2 *(18.8)*	0-106
Prenatal LSHS total			8.5 *(7.6)*	0-39
Postnatal (1-48 weeks) PDI total		87	23.8 *(29.9)*	0-165
Postnatal LSHS total			8.2 *(7.4)*	0-35
Mannion and Slade (2014)	19-39	101		
Prenatal (28-42 weeks) PDI total		101	29.2 *(27.1)*	-
Prenatal LSHS total			8.4 *(6.0)*	
Postnatal (5-38 days) PDI total		66	13.3 *(20.1)*	
Postnatal LSHS total			5.2 *(5.0)*	
MacKinnon et al., (2017)	-			
Prenatal 1 (12-14 weeks) PDI total		316	23.9 *(21.4)*	0-91
Prenatal 2 (32-32 weeks) PDI total		300	18.8 *(19.9)*	0-92
Postnatal (7-9 weeks) PDI total		287	19.3 (*22.4*)	0-98

[a] Data from (Peters et al., 2004)

[b] Data from (MacBeth, Schwannauer, & Gumley, 2008)

Table 10 shows descriptive statistics for study variables. There was no difference between scores in the current sample compared to community norms for the DASS-21 (Henry & Crawford, 2005), with the exceptions of the stress subscale, which was slightly higher. Reported levels of cognitive biases varied: reported levels of TE were the same as community norms, levels of AP were slightly higher compared to community norms. Four of the subscales were slightly higher than community norms (JTC, DT, Int and Cat) with one subscale (ER) was the same as community norms. Scores on RAS were lower than found in previous perinatal samples.

Table 10

Means scores for measures of psychopathology and cognitive biases

Variable	Prenatal Mean *(SD)*	Postnatal Mean *(SD)*	Perinatal total Mean *(SD)*	Comparative community norms	Variable Range *Study range*
DASS-Total	9.1 *(6.9)*	9.1 *(7.2)*	9.2 *(7.3)*	9.4 *(9.7)*[a]	0-68 *0-34*
DASS-Depression	2.2 *(2.7)*	2.1 *(2.53)*	2.2 *(2.6)*	2.8 *(3.9)*[a]	0-21 *0-14*
DASS-Anxiety	2.0 *(2.0)*	1.6 *(2.1)*	1.8 *(3.4)*	1.9 *(3.0)*[a]	0-21 *0-10*
DASS-Stress	4.8 *(3.2)*	5.2 *(3.5)*	5.1 *(3.4)*	4.7 *(4.2)*[a]	0-21 *0-15*
CBQ-TE theme	20.3 *(2.8)*	20.5 *(3.2)*	20.4 *(3.0)*	19.0 *(1.7)*[b]	15-45 *15-31*
CBQ-AP theme	20.7 *(2.1)*	20.8 *(2.4)*	20.8 *(2.4)*	17.5 *(1.6)*[b]	15-45 *18-33*
CBQ subscales					
JTC	9.5 *(1.3)*	9.3 *(1.6)*	9.4 *(1.5)*	8.5 *(1.3)*[b]	6-18 *6-14*
DT	7.2 *(1.2)*	7.5 *(1.4)*	7.2 *(1.3)*	6.5 *(0.7)*[b]	6-18 *6-12*
Int	9.2 *(0.9)*	9.15 *(0.9)*	9.16 *(0.9)*	7.3 *(1.1)*[b]	6-18 *7-11*
ER	7.1 *(1.2)*	7.1 *(1.7)*	7.1 *(1.6)*	7.2 *(1.1)*[b]	6-18 *6-16*
Cat	7.9 *(1.4)*	8.2 *(1.5)*	8.1 *(1.5)*	7.1 *(0.9)*[b]	6-18 *6-13*
RAS total	89.5 *(21.8)*	89.3 *(24.5)*	89.6 *(23.3)*	100(prenatal)[c] 113(postnatal)	26-182 *34-133*

[a] Data from (Henry & Crawford, 2005)
[b] Data from (Peters et al., 2014)
[c] Data from (Barrett, Wroe, & Challacombe, 2016)

Hypotheses Testing

Hypothesis 1: PLEs (PDI and LSHS) will be associated with psychological distress (total DASS score)

Correlations were run to explore the first hypothesis. Table 11 shows correlations between PDI (delusions) and LSHS (hallucinations) and overall psychological distress (total DASS score). Both PDI and LSHS were significantly correlated with distress (*r* =.23, p = .006, BCa 95% CI [.07, .36]; *r* = .21, p = .01, BCa 95% CI [.07, .35], respectively) supported by both the *p*-values and bootstrapped confidence intervals. The effect size of the relationship between the variables was small.

Table 11

Bivariate correlations between PLEs (PDI and LSHS) and overall distress (DASS-21, n= 144)

Variables	*r*	p value	BCa 95% CI
PDI	.23	.006	[.07, .36]*
LSHS	.21	.01	[.07, .35]*

* correlations significant at the p ≤ .01 level

Table 12 shows the correlation between PLEs and separate DASS-21 subscales of depression, anxiety and stress. Using Bonferroni corrections (p < .01) only PDI and the anxiety subscale were significantly correlated (*r* = .207, p = .01, BCa 95% CI [-.02, .42]), however, the lower and upper ranges of bootstrapped confidence intervals have crossed zero indicating that the relationship is not significant (i.e., relationship could be either positive or negative). The correlation between the depression subscale and the PDI is close to Bonferroni corrected significance (*r* = .194, p = .02, BCa 95% CI [.04, .36]) and the bootstrapped confidence intervals did not cross zero, indicating this relationship is significant.

Table 12

Bivariate correlations between PLEs (PDI and LSHS) and DASS subscales (n= 144)

Variables	*r*	p value	BCa 95% CI
Depression subscale			
PDI	.19	.02	[.04, .36]
LSHS	.16	.06	[.01, .31]
Anxiety subscale			
PDI	.21	.01	[-.02, .42]*
LSHS	.18	.03	[.03, .36]
Stress subscale			
PDI	.20	.02	[.09, .32]
LSHS	.19	.03	[.05, .33]

*correlations significant at the $p \leq .01$ level

Hypothesis 2: Psychosis-related cognitive biases, in particular, threatening event bias and inflated responsibility bias, will be associated with PLEs (PDI and LSHS).

Correlations were also run to explore the second hypothesis, which found that the AP theme and RAS were significantly correlated with the PDI and the LSHS, with a small to medium effect size, whilst the TE theme was only significantly correlated with the LSHS. A multiple regression with bootstrapping was run in order to explore the unique contribution of each cognitive bias to PLEs (see hypothesis 3)

Correlations were also run between the five subscales of the CBQ (Jumping to conclusion (JTC), Dichotomous thinking (DT), Intentionalising (Int), Emotional reasoning (ER) and Catastrophizing (Cat). Using Bonferonni corrected *p*-values (p = .005), only Cat was significantly correlated with the PDI ($r = .325$, $p < .001$, BCa 95% CI [.16, .48]) and only ER and Cat were significantly correlated with the LSHS ($r = .302$ $p < .001$, BCa 95% CI [.14, .48]; $r = .310$ $p < .001$, BCa 95% CI [.11, .47], respectively). The effect size of the relationship between these variables was medium.

Hypothesis 3: Do psychosis-related cognitive biases (TE, AP, RAS) predict greater levels of PLEs and/ or greater levels of distress?

Cognitive biases predicting PLEs

A multiple regression with bootstrapping was performed with PDI as the dependent variable and three cognitive biases (TE, AP and RAS), as the independent variables. Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (TE, Tolerance = .71, VIF = 1.42, AP, Tolerance = .71, VIF = 1.40, RAS, Tolerance = .89, VIF = 1.13). The three variables accounted for a significant amount of the variance in the total PDI score (R^2 = .12, adjusted R^2 = .10; F (3,125) = 5.77, p = .001). The partial regression coefficients showed that RAS had a significant, unique contribution to PDI total (B =.25, β = .26, t(125) = 2.91, p = .03, BCa 95% CI: .10, .44). See Table 14. Secondary analysis exploring the interaction term between RAS and pre and postnatal groups and subsequently RAS and primiparity on the relationship with PDI were run. The interaction term for pre and postnatal groups and with RAS did not significantly contribute to an increase in the variance of PDI explained (ΔR^2 = .01, ΔF (1, 120) = 1.21, β = .05, t (120) = 1.10, p = .32) nor did the interaction term between RAS and primiparity (ΔR^2 = .01, ΔF (1, 118) = 1.19, β = .03, t (118) = 1.09, p = .28).

Table 14

Multiple regression analyses for cognitive bias predicting levels of delusions (PDI)

	PDI			
Variable	B	SE	β	BCa 95% CI
Threatening Events	.93	.65	.12	[-.34, 2.26]
Anomalous Perceptions	.66	.92	.06	[-1.09, 2.51]
Inflated Responsibility	.25	.10	.26*	[.10, .44]

Notes R^2 = .12 (p = .001)
*p < .05. **p < .01

The same multiple regression was run with LSHS as the dependent variable and the same cognitive biases as independent variables. These variables accounted for the significant amount of variance in the total LSHS score (R^2 = .14, adjusted R^2 = .12; F (3,125) = 6.83, p = .001). The RAS was again the only variable to have a significant unique contribution to LSHS (B =.06, β = .22, t(125) = 2.46, p = .02, BCa 95% CI: .02, .11). See Table 15. Secondary analysis exploring the interaction term between RAS and pre and postnatal groups and subsequently RAS and primiparity on the relationship with LSHS were run. The interaction term for pre and postnatal groups and RAS did not significantly contribute to an increase in the variance of LSHS explained (ΔR^2 = .01, ΔF (1, 120) = 0.93, β = .05, t (120) = -.01, p = .41) nor did the interaction term between RAS and primiparity (ΔR^2 = .00, ΔF (1, 118) = .30, β = -.01, t (118) = -.54, p = .58).

Table 15

Multiple regression analyses for cognitive bias predicting levels of hallucinations (LSHS)

	LSHS			
Variable	B	SE	β	BCa 95% CI
Threatening Events	.35	.21	.15	[-.07, .76]
Anomalous Perceptions	.41	.28	.13	[-.10, 1.01]
Inflated Responsibility	.06	.02	.22*	[.02, .11]

Notes R^2 = .12 (p = .001)
*p < .05. **p < .01

Cognitive biases predicting distress

A multiple regression with bootstrapping was performed with distress (total DASS scores) as the dependent variable and three cognitive biases (TE, AP and RAS), as the independent variables. These three variables accounted for a significant amount of the variance in the total DASS score (R^2 = .11, adjusted R^2 = .09; F (3,125) =4.91, p = .003). The partial regression coefficients indicated that TE was a unique significant contributor to levels of distress (B =.55, β = .23, t(125) = 2.22, p = .05, BCa 95% CI: -.02, 1.09). However, the bootstrapped confidence intervals crossed zero indicating it was not a significant relationship. See table 16.

Secondary analysis exploring the interaction term between RAS and pre and postnatal groups and subsequently RAS and primiparity on the relationship with distress were run. The interaction term for pre and postnatal groups and RAS did not significantly contribute to an increase in the variance of distress explained ($\Delta R^2 = .01$, ΔF (1, 120) = 0.93, $\beta = .05$, t (120) = -.01, p = .41) nor did the interaction term between RAS and primiparity ($\Delta R^2 = .00$, ΔF (1, 118) = .30, $\beta = -.01$, t (118) = -.54, p = .58).

Table 16

Multiple regression analyses for cognitive bias predicting levels of distress (DASS)

	DASS			
Variable	B	SE	β	BCa 95% CI
Threatening Events	.55	.29	.23*	[-.02, 1.09]
Anomalous Perceptions	.28	.41	.08	[-.60, 1.07]
Inflated Responsibility	.03	.03	.11	[-.02, .09]

Notes $R^2 = .11$ ($p < .005$)
*$p < .05$. **$p < .01$

Discussion

Overview of findings

The findings of the current study support the primary hypothesis that PLEs (identified through PDI and LSHS measures) are associated with distress in a perinatal sample. PLEs were found to be significantly correlated with depression, anxiety and stress subscales; however, only the anxiety subscale remained significantly associated with the PDI measure (delusional beliefs) once Bonferroni correction had been applied. The second hypothesis that the psychosis-related cognitive biases are associated with PLEs was partly supported, with TE being significantly correlated with LSHS scores (hallucinatory experiences) but not with the PDI. The AP cognitive bias and the RAS (inflated responsibility) bias was found to be significantly associated with both the PDI and LSHS. The third hypothesis that the cognitive biases, TE, AP and RAS, would predict greater levels of PLEs was supported and the RAS was found to be a unique, significant contributor in the regression model. TE, AP, and RAS biases were also found to significantly predict distress but no individual bias was a unique significant contributor in predicting greater levels distress. Secondary analysis (using hierarchical linear regression) explored the moderation effect of pre and postnatal groups and primiparity on the relationship between RAS and PLEs and distress, that were found to be significant in initial multiple regression models. The inclusion of these interaction terms did not significantly contributed to an increase in the variance explained by the model and therefore suggest that they did not significantly moderate these relationships.

Results in the context of previous findings

Findings that PLEs are associated with overall distress in perinatal women is supportive of existing evidence that increasing levels of PLEs are associated with increasing levels of distress in the general population (Koyanagi, 2017). Existing research into perinatal PLEs found that depression scores predicted PDI prenatally but not postnatally (Mannion and Slade, 2014). However, depression also fell prenatally to postnatally in this sample. These findings could be further evidence of the relationship between PLEs and psychopathology, with psychopathology decreasing alongside PLEs. In these studies anxiety was also found to predict PLEs prenatally (MacKinnon et al., 2017) but no measure of anxiety was taken postnatally to observe

if the same trend occurred. Taken together with findings from the current study, they are arguably consistent with the supposition that PLEs may be clinical markers of psychopathology severity across a broad range of psychopathology, including mood, anxiety and eating disorders (Kelleher & Cannon, 2016; McGrath et al., 2016) in the general population and also the perinatal population.

Comparing differences on DASS-21 scores between study sample and community samples (Henry & Crawford, 2005), there were no differences in rates of overall distress, anxiety or depression. They are also lower than DASS-anxiety and depression subscale scores found in a comparative perinatal sample (Barrett et al., 2016). It could be that as the sample comprised of mostly white women, in their early thirties with high levels of social support (95% of sample where either married or co-habiting with a partner), that the current sample do not represent the most vulnerable women in the perinatal period, where a recent systematic review indicates that the biggest predictor of perinatal mental health difficulties is lack of social partner or social support (Biaggi et al., 2016). However, within the same review, previous lifetime mental health issues were also found to be a predictor of perinatal mental health difficulties. The sample's reported lifetime history of mental health and perinatal mental health difficulties was consistent with known prevalence rates, suggesting the samples were representative in this respect.

The majority of the sample were multiparous women (i.e., not their first child, 77%). The role of primiparity (i.e., first time pregnancy) in increasing the risk of perinatal depression and anxiety is unclear: there are mixed findings over whether primiparous or multiparous women are at greater risk (Biaggi et al., 2016). Explanations for either groups range from greater levels of uncertainty for primiparous women (Räisänen et al., 2014), to greater demands and stress levels for multiparous women (Redshaw & Henderson, 2013). Thus making it difficult to ascertain if the sample, comprising of predominantly multiparous women, impacts on current study findings and interpretations made.

Findings that (i) TE was correlated with LSHS but not the PDI and (ii) RAS was the greatest predictor of PLEs, rather than TE or AP cognitive, was inconsistent with previous findings which found TE cognitive bias was strongly correlated with, and the strongest predictor of, delusional beliefs (Prochwicz & Gaweda, 2016; Prochwicz &

Kłosowska, 2018a, 2018b). However, findings that RAS was significantly correlated with both delusional and hallucinatory experiences in the current study are consistent with existing evidence that inflated responsibility is significantly associated with positive psychotic symptomology in clinical samples (Ellett et al., 2017). It may be that inflated responsibility plays an important role, above and beyond attentional biases (TE), in the development and maintenance of PLEs. This is perhaps not surprising given the known overlap of clinical characteristics between OCD and psychosis (Poyurovsky & Koran, 2005).

It could be argued that the association between RAS and PLEs may be a facet of the perinatal sample, where finding greater levels of responsibility in expectant or new mothers could be expected. However, RAS scores in the current sample are lower than those found in both community and other perinatal samples (Barrett et al., 2016), where no difference in RAS scores was found between pre and postnatal groups.

As aforementioned, research exploring parity as a risk factor for perinatal mental health difficulties have been inconsistent, with some studies indicating it increases risk whilst others indicating it had no impact on risk or even decreased risk (Lancaster et al., 2010; Biaggi et al., 2016). No research exploring RAS in the perinatal period in which primiparity was included as variable of interest, was found. Secondary analysis including the interaction term between RAS and primiparity did not contribute to an increase in the variance explained in the models. Therefore, it could be suggested that primiparity does not significantly moderate the relationship between RAS and PLEs.
However, it is important to note that in the current study women with more children were less likely to complete the full battery and thus less likely to complete the RAS, the final measure in the battery. It could be therefore that the findings reflect fewer women with more than one child completing the RAS.

It could be hypothesised that women with more children were less likely to complete the whole battery due to having a greater number of distractions or less time available. This could be overcome in the future by completing face-to-face, reducing the potential for distractions. Due to the exploratory nature of the current study the battery was lengthy. Future studies with more specific research questions could shorten the length of the battery, which could increase likelihood of primiparous women completing the entire battery. Additionally, the questionnaire battery blocks could have been

randomised in order to reduce the impact of the final measure in the battery being missed.

Studies exploring cognitive biases and PLEs in non-clinical populations have focused on psychosis-related cognitive bias and a search of existing literature revealed responsibility belief biases in PLEs has not been previously explored. Consequently, findings that the RAS was highly correlated with PLEs, but not with levels of distress, suggests RAS may play a role in the development and/or maintenance of PLEs and further exploration of the relationship is merited. The pathways from PLEs to distress and/or affective psychopathology however, is less clear.

Findings from partial correlations, which showed that PDI was not significantly correlated with distress once LSHS was controlled for, could be supported by existing findings that the association between hallucinations and psychotic onset is moderated by delusional ideation in non-clinical samples (Krabbendam et al., 2004). Authors found that hallucinations give rise to delusion formation, where delusional ideation, as a secondary belief or cognitive appraisal, was the psychological mechanism which placed individuals at increased risk of psychotic onset. The current study, in line with existing research into PLEs, used delusional experiences as outcome measures of PLEs (Preti et al., 2007; Prochwicz & Kłosowska, 2018b; Varghese et al., 2011; Vellante et al., 2012). However, utilising measures of delusional ideation as a cognitive bias (Bell, Halligan, & Ellis, 2006; Krabbendam et al., 2004) may further elucidate the pathways underpinning PLEs and non-psychotic psychological distress, where delusional ideation appears to demarcate a greater need for clinical care.

Interpreting findings through a transdiagnostic lens

These findings could be understood within a transdiagnostic clinical staging approach to emerging psychopathology, where subclinical psychotic experiences connote high risk for both psychotic disorder and also persisting and recurrent affective disorders (McGorry & Nelson, 2016). Transdiagnostic approaches are in contrast to categorical diagnostic classifications, where boundaries are placed between syndromes and phenotypes, and can accommodate both the high rates of comorbidity across, and the multidimensionality of, psychopathology (McGorry et al., 2010). Network approaches

have provided a conceptual framework for considering psychopathology more transdiagnositcally.

Network approaches (Borsboom & Cramer, 2013b) argue it is more useful to consider mental disorders as resulting from the causal interplay between symptoms (i.e., worry causes insomnia which causes fatigue), rather than separate disease entities. Unlike physical health, mental health conditions do not exist independently of their symptoms (i.e., you cannot have major depression without symptoms of depression, whereas it is possible to have lung tumour without symptoms of breathlessness). Symptoms are therefore seen as mutually interacting and reciprocally reinforcing aspects of a complex network (i.e., feedback loops) and it is these relationships which give rise to mental disorders. Viewing psychopathology as a causal network of symptoms has implications for interventions, where treatment targets shift from finding and treating a 'root cause' (i.e., major depression) to targeting the symptoms and the relationships between symptoms.

Current study findings could be accommodated within a network approach, placing PLEs as symptoms within a network connected to other symptoms, such as anxiety and anomalous perceptions. Due to the correlational design, no causality between the network can be inferred. However, a network analysis of schizotypy in a large, cross-cultural sample found that Magical Thinking and Unusual Perception domains were more interconnected in the general schizotypal network than other included behaviour, belief or feeling domains (Fonseca-Pedrero et al., 2018). This is consistent with current study findings that AP was highly correlated with PLEs and it could also be hypothesised that the association between PLEs and greater psychopathology severity is causally linked, with different elements of PLEs, (i.e., hallucinations and delusions) causally impacting on symptoms of anxiety and depression over time, and where responsibility beliefs and delusional ideation may act as feedback loops.

Limitations

As aforementioned there was a bias in the sample of white, highly educated women with high levels of social support. The sample was a self-selecting group recruited overwhelmingly from social media sites. Despite efforts to broaden the representativeness of the sample by also recruiting from GP surgeries in inner city

areas with greater diversity of ethnic and socioeconomic backgrounds, uptake was very poor (n = 3). Thus the generalisability of findings is limited by these factors.

The main focus of the current study was exploring cognitive processes and PLEs across the perinatal period and accordingly analysis was run on the sample as a whole. Future studies could benefit from a longitudinal approach operationalising the pre and postnatal period and its influence on cognitive and emotional processes over several time points, given that dichotomously coding these variables as pre or postnatal may not capture the potential variance in these processes across the perinatal time period. Additionally, although the impact of pre and postnatal groups status and primiparity as moderators were explored in this study, tt could be beneficial in future studies to include other moderators, such as age, immigration status and social support, as these have been found to be relevant in existing studies (Howard et al., 2014; Lancaster et al., 2010).

The use of self-report measures of delusional and hallucinatory experiences may also represent a limitation, where self-report measures have been found to identify high numbers of false-positives (Lee et al., 2016). Furthermore, the multidimensionality of PLEs means that self-report tools are open to subjective interpretations which cannot be verified, meaning they may not be capturing the intended constructs, whilst the 'leading' nature of phrasing often used in self-report measures (i.e., many people report these experiences) has been criticised for increasing rates of false-positives (David, 2010).

Descriptive analysis looking at rates of PLEs across the pre and postnatal period found rates of reported PLEs were higher postnatally than prenatally. This was in contrast with existing studies which found a greater number of reported PLEs prenatally than post (see Table 3; MacKinnon et al., 2017; Mannion & Slade, 2014). Although the current sample was similar in demographic factors to comparative studies (age, ethnicity, education, multiparity), the comparative studies followed participants longitudinally (pre to postnatally) whilst the current study recruited one perinatal sample. The differences in findings therefore could be accounted for by the greater number of postnatal women in current study relative to prenatal women. This therefore limits the conclusions that can be drawn when comparing the current findings.

These differences could also highlight the importance of specific 'high-risk' time points of psychopathology in the perinatal period. The current and comparative studies explored perinatal PLEs used differing obstetric ranges, from between 12-14 weeks to 28-42 weeks prenatally and 1-9 weeks to 4-39 weeks postnatally (comparative studies to current study, respectively). Evidence suggests that perinatal anxiety is highest in the third trimester (28 weeks onward) although prevalence of anxiety disorders continued to remain higher than controls 1-24 weeks postpartum (Dennis, Falah-Hassani, & Shiri, 2017). Similarly, depression was found to be highest in the first three months (1-12 weeks) postpartum (Gavin et al., 2005). Therefore, it maybe that comparative studies finding higher PLE endorsement rates overall and that PLEs were higher in the prenatal period may support existing findings that these time frames are periods of greatest risk.

Clinical and scientific implications

Evidence that between 10-20% of women will develop a mental health difficulty during the perinatal period (Howard et al., 2014) suggests it is a time of high risk for women experiencing psychological distress. Findings that PLEs are associated with depression, anxiety and suicide in the general population, have led researchers to recommend potential screening of PLEs in clinic (Kelleher & Cannon, 2016), where PLEs presence may represent an increased clinical risk for adverse outcomes (Hodgekins et al., 2018). In view of this evidence and findings from the current study that PLEs increase alongside levels of distress for perinatal women, it could be argued that screening for PLEs during this period could be a helpful clinical tool in identifying women at risk, where they may indicate greater severity and poorer prognosis.

Given the developmental, psychological (Stein et al., 2014) and financial costs (Bauer, Parsonage, Knapp, Iemmi, & Adelaja, 2014) of untreated perinatal mental health difficulties and the criticisms of current screening tools in effectively identifying vulnerable women (Howard et al., 2018; Nath et al., 2018), more accurate screening tools are needed. PLEs could be useful transdiagnostic markers for clinicians screening perinatal women who may be at greater risk. Health visitors could also be made aware of PLEs as potential risk factors and could include screening within their postnatal visits, alongside existing screening tools. However, further replication and establishing causal evidence of the link between PLEs and psychopathology would

need to be established before this could a considered as a feasible option (see future directions below).

Best evidence for the efficacy of Whooley questions in identifying at risk women is whether or when they are asked sensitively by healthcare providers, as women can be reluctant to disclose difficulties (Howard et al., 2018). This could represent a further barrier to utilising PLEs as screening tools, where evidence suggests individuals may fear stigmatisation when disclosing PLEs (Liu & Wang, 2018). However, this could be optimised as above, with clinicians broaching the subject sensitively.

Findings that RAS were predictive of PLEs and PLEs are associated with distress, suggest that interventions targeting responsibility beliefs, similar to how responsibility beliefs are important treatment targets in Cognitive Behaviour Therapy for OCD (Veale, 2007) could be beneficial both in the perinatal and general population. If this finding was further replicated clinically relevant and interventions could be adapted from OCD, as they have been in the treatment of postpartum OCD (Barrett et al., 2016). Evidence that associations between PLEs and lower levels of functioning have repeatedly been found (Armando et al., 2010; Kelleher et al., 2012; Pontillo et al., 2016), add further weight to the value of targeting the mechanisms which maybe underpinning PLEs.

Suggestions for future research

The current state of knowledge around PLEs and their role in broader psychopathology is currently limited to correlational designs, meaning no causal links have been established. Future research should focus on utilising longitudinal and experimental designs in order to establish any causal relationships between levels of PLEs and greater severity of affective psychopathology. Furthermore, recent research has explored whether psychosis-related cognitive biases moderate the relationship between anxiety and/or depression and PLEs in the general population (Prochwicz & Kłosowska, 2018b). External attribution bias was found to moderate the relationship between anxiety and PLEs, whilst the relationship between depression and PLEs was moderated by attention to threat biases. Further exploration of the role of cognitive bases in the relationship between distress and PLEs using mediational and/or

moderation analysis, including inflated responsibility bias, would be an important future direction for research.

Subsequent to this, future research into perinatal PLEs could benefit from targeting periods of known higher vulnerability in the perinatal period to see how these rates may differ, such as the third trimester and/or three months postpartum. It could be hypothesised that rates of psychopathology *and* PLEs would be higher in these 'at-risk' time periods, which if found to be true, could provide further support for the potential clinical utility of screening for PLEs in the perinatal period. Considering 'at-risk' perinatal groups further, evidence indicates that teenage mothers represent a subgroup of the perinatal population more vulnerable to perinatal mental health difficulties (Siegel & Brandon, 2014). This, in addition to evidence that PLEs are more highly prevalent in adolescence and young adulthood (Nelson et al., 2012), suggests that exploring PLEs in teenage mothers could be merited.

Research has also found that specific subtypes of PLEs (identified through factor analysis) are differentially associated with psychopathology, with some subtypes conferring greater risk for psychopathology, whilst others were found to be protective (Unterrassner et al., 2017; A. R. Yung, Buckby, et al., 2007). Consequently, replication of those associations between PLE subtypes and distress in perinatal population could allow for greater accuracy in identifying those at–risk of greater levels of distress.

Conclusions

The finding that PLEs are associated with distress in the perinatal period, provides further evidence that PLEs may be useful clinical markers of psychopathology severity and thus could be helpful in identifying at-risk women. Recommendations from research that PLEs be screened for within CAMHS (Kelleher & Cannon, 2016), could therefore also be extended to perinatal populations, where identifying and treating mental health problems in the perinatal period is a current U.K. healthcare priority. However, further research is needed in establishing whether PLEs play a causal role in psychopathology. The finding that inflated responsibility beliefs are unique predictors of PLEs, suggests it warrants further exploration of its potential exploratory value. Further replication of this findings could also lend weight to responsibility beliefs could forming an important treatment target in reducing PLEs and their impact on distress indirectly. Findings are also consistent with transdiagnostic approaches to

psychopathology, such as network approaches, where PLEs may be part of a network of symptoms, causally impacting on other connected symptoms. Interventions which target transdiagnostic processes therefore, such as third wave CBT or transdiagnostic CBT approaches, could be useful in treating perinatal mental health difficulties.

Integration

Interest in the research topic

The empirical piece started as a clinical interest in perinatal mental health, in particular postpartum psychosis (PPP). During initial literature reviews, studies were found which had used PLEs to explore etiological models of PPP and the development of delusional thinking in the perinatal period (MacKinnon et al., 2017; Mannion & Slade, 2014). PLEs had been used in psychosis literature to help corroborate the continuum model (DeRosse & Karlsgodt, 2015). Using PLEs to explore risk factors for PPP was advantageous due to the low prevalence rates of PPP (making them a hard-to-access group). They further enabled me to adopt a quantitative design, which I felt would be beneficial, as my research would be exploratory in nature. As I also explored the literature around PLEs, however, there emerged repeated evidence of PLEs having not only a role in psychotic outcome, but also being associated with greater severity in a wide range of psychopathology (Kelleher et al., 2012; Wigman et al., 2012). In view of the high prevalence rates of perinatal depression and anxiety (Fisher et al., 2012), where the perinatal period is a time of heightened risk for women developing mental health problems (Anderson, Hatch, Comacchio, & Howard, 2017), I became interested in how PLEs could be associated with non-psychotic, psychological distress in the perinatal period.

The systematic review therefore focused on exploring the evidence base for PLEs being associated with greater levels of non-psychotic psychopathology and thus provided the rationale for the empirical piece. The review appeared timely as initial searches revealed that within the last five to seven years there had been a sharp increase in research exploring PLEs and non-psychotic outcomes. The review provided an up-to-date summary of the evidence that greater levels PLEs have been associated with greater levels of non-psychotic psychopathology, in particular with depression, suicide and anxiety. The review also highlighted that as a result of these consistent findings, some researcher-practitioners had proposed that PLEs could be useful screening tools for identifying those at-risk of greater persistence and poorer prognosis of non-psychotic psychopathology, especially in adolescent and young adult populations (Hodgekins et al., 2018; Kelleher & Cannon, 2016).

The implications of this were that PLEs could be important clinical markers not only as predictors of psychotic onset but also as clinical markers of non-psychotic psychopathology severity (Kelleher & Cannon, 2016). These findings informed the empirical piece by helping me to consider the potential clinical utility of PLEs in perinatal populations and their possible use as clinical screening tools to identify at-risk women (i.e., women at risk of greater severity of affective psychopathology) in the perinatal period. Subsequently, I felt there could be merit in exploring PLEs in the perinatal period and their relationship with affective psychopathology. This rationale was due to both the high prevalence of affective psychopathology during the perinatal period (Anderson et al., 2017) and empirical evaluations of the efficacy of current perinatal mental health screening tools, which indicated their sensitivity was inadequate (Howard et al., 2018; Nath et al., 2018). This potential gap in research (and practice) led to the exploration of considering or developing possible alternates.

Undertaking the systematic review, I was surprised by the substantial heterogeneity across definitions of PLEs, the variety of tools to measure them and the varying ways in which these same tools were being used to measure PLEs, for example schziotypy questionnaires being used to capture PLEs. Upon reflection, I would may be would have made a different choice and not included papers which used schizotypy measures in order to better differentiate PLEs from other related constructs.

Reflections on transdiagnostic approaches

Reviewing the literature on PLEs and the proposition that they could be involved across a broader range of diagnostic presentations, also led me to investigate in greater depth the literature around transdiagnostic approaches to understanding psychopathology. Clinically, I had already become interested in understanding psychopathology more transdiagnositcally following experiences working in a primary care mental health setting. Within the service, Cognitive Behavioural Therapy (CBT) interventions were predominantly used following disorder specific treatment protocols. However, many clients presented with several comorbid anxiety disorders or anxiety and depression. At times, this left me feeling uncertain about treatment decisions, questioning which disorder-specific protocol I should follow given the evidence base is centred on disorder specific protocols (Newby, McKinnon, Kuyken, Gilbody, &

Dalgleish, 2015). How should I make those decisions? Or could I find a way to integrate protocols?

I was relieved and surprised to find this was a common issue amongst clinicians within the service and I become more drawn to third wave CBT approaches, such as Acceptance and Commitment Therapy (ACT) and Compassion Focused Therapy (CFT). The focus of these approaches on an individual's relationship to thought and emotion and changeable transdiagnostic processes rather than content (Hayes & Hofmann, 2017) and adhering to protocols for specific disorders (based on diagnosis classifications), allowed for working with various comorbidities. I also began reading about transdiagnostic CBT, which similar to third wave approaches, applies generic evidence based CBT techniques such as cognitive restructuring to target the common, shared cognitive, emotional and behavioural processes underpinning anxiety and depression (Craske, 2012; Norton & Paulus, 2017). I liked the way these transdiagnostic, process-based approaches, which could also integrate contextual and psychosocial factors, allowed me to work clinically with a range of difficulties. This was particularly useful in healthcare settings where challenging 'thought content' using CBT-thought restructuring techniques could be rendered ineffective when negative thoughts were more realistic (i.e., life-limiting illness).

Consequently, these experiences informed my decision to interpret the findings from my empirical piece using theoretical transdiagnostic lenses, such as network approaches, as opposed to transdiagnostic clinical practice. However, given that the perinatal period can be a time of great upheaval, with greater responsibility, reduced sleep and increased stress (Lancaster et al., 2010) and there is high comorbidity of perinatal anxiety and depression (Fisher et al., 2012), transdiagnostic CBT or third wave approaches are well placed to respond to both the contextual factors and the shared psychological processes underpinning perinatal anxiety and depression (Bonacquisti, Cohen, & Schiller, 2017).

Reflections on design of empirical piece

Whilst there were direct links between the systematic review and empirical piece, working on both concurrently meant that factors highlighted by the review, which could have further informed the empirical piece were not able to be implemented. In

particular, the review highlighted the poor reliability and validity of using self-report measures of PLEs. Utilising clinician-rated measures of PLEs, perhaps on a randomly selected number of participants could have enhanced validity. However, due to the exploratory nature of the research, I feel utilising self-report measures in an online survey, which we hoped would help busy mothers access the study, was appropriate at this stage. Adopting mixed methodologies could have been useful in order to obtain richer details about women's experiences of PLES (i.e., qualitative; in-depth interviews). However, as I was interested not only in identifying delusion and hallucinatory-like experiences in perinatal woman but also the potential associated cognitive processes, which required larger samples, I felt a quantitative methodology was most appropriate.

Reflections on ethics, SU involvement and recruitment

I was concerned about using the term 'psychotic like experiences' in participant information and debrief sheets due to concerns it may cause undue alarm in participants, owing to the stigma associated with psychosis (Baba et al., 2017). This was raised in my application for ethics and subsequently the term 'unusual subjective experiences' was employed instead. Piloting of the online survey was completed with two prenatal women and one postnatal woman, where I raised this concern directly. Two of the participants felt as first-time mothers that the term may unintentionally raise unnecessary anxiety, where they noted that pregnancy was a time of great uncertainty and change, not only physically but emotionally and psychologically too. Thus, research naming psychotic-like experiences could raise concerns around postpartum psychosis or speculation that increased PLEs were another possible outcome of pregnancy. They therefore felt the term 'unusual subjective experiences' was preferable. However, the postpartum mother did not agree with these fears and felt either terms would be acceptable. I felt this may be a reflection of the greater anxiety around birth and motherhood reported in primiparous women compared to postpartum or multiparous women (Biaggi et al., 2016) and in order to be considerate of this, I utilised the term unusual subjective experiences within participant and debrief information.

I was surprised to note during recruitment, the difference in the interest and willingness to participate amongst women who accessed the research via social media compared

to GP surgeries. Women on social media appeared very interested in the research and several mentioned a personal interest in perinatal mental health and the importance of supporting research in this area. They noted their personal experience of mental health issues not being explicitly raised or discussed and feeling this was a missed opportunity. They were also proactive in sharing the link amongst other friends who met inclusion criteria. In contrast, accessing perinatal women in GP surgeries was very difficult. I found attempts to contact practice managers or lead GPs challenging and often (but understandably) closely protected by administrative staff. With the exception of one GP, staff would agree to forward emails but not allow me to speak directly on the phone to GPs and/or practice managers. Similarly, when attending practices, posters, flyers and contact details were accepted but led to poor follow-up outcomes. For GP services in the north-west Thames region however, the advantages of having an indirect route of contact to surgeries was demonstrated when the R&D manager circulated study details to the primary care research contacts, who subsequently informed me that one practice had agreed to display my posters and flyers.

When in contact with Noclor, it was postulated that the research could be an 'easy sell' for practices due to the minimum input required by them, however I did not find this to be case. I felt disappointed, as social media had suggested there was an interest of individuals participating in perinatal mental health research, which may have also benefitted from the recent raised profile of perinatal mental health issues following increased government spending. Additionally, I had hoped recruitment from GPs would increase representativeness of the sample, as the interest on social media and demographics suggested the included sample may be a more self-selecting group.

Impact

Personal impact of research

Exploring the literature around PLEs has impacted on my own clinical practice and how I respond to PLEs. Prior to training, I had worked predominantly with people living with psychosis and Bipolar Disorder across various settings. Moving to work outside specialist psychosis settings, I was interested in the way healthcare professionals anecdotally responded to individuals who reported psychotic-like phenomena, such as delusional beliefs or hallucinatory experiences. Outside of assessing if these experiences reached threshold for early intervention for psychosis services, or were

being viewed as magical thinking consistent with OCD presentations, it seemed that PLEs were difficult to incorporate within most disorder specific formulations and were often put aside. Associations found between PLEs and greater severity, particularly during the adolescent period, have directed me to listen out for these experiences in the young people I see in community-based Child and Adolescent Mental Health Services (CAMHS) and reflect upon what it may tell me about the severity of their distress.

Impact on beneficiaries

Research into PLEs in the perinatal period is very much in its infancy, with the current empirical piece being very exploratory in nature, and therefore it remains quite far away from direct clinical impact. Similarly, the use of largely only correlational designs, means no causal relationships can be established between the findings of the review that PLEs are associated with greater severity of non-psychotic psychopathology. However, I feel there are several groups of beneficiaries at this stage of the research, perhaps most notably clinicians, researchers interested in perinatal mental health and women in the perinatal period.

Perhaps, due findings that PLEs the most prevalent in adolescence period (Nelson et al., 2012), the biggest potential beneficiaries of the current research are clinicians working in CAMHS. Researchers have argued that there is clinical utility in screening for PLEs in an adolescent age group, where higher reported levels of PLEs could help clinicians identify those at greater risk of psychopathology persistence and recurrence (Hodgekins et al., 2018; Kelleher & Cannon, 2016). In this context PLEs would not be treatment targets but clinical indicators and could be collected alongside other routine outcome measures to inform clinical decision making and risk assessment.

Undertaking both the review and my empirical research has led to me to also consider how PLEs, given their prevalence, are discussed or understood in clinical settings. I wondered if clinicians are unsure over how to respond to PLEs when reported. Subsequently, perhaps the next phase of research in this area could use a qualitative methodology to interview clinicians about how they understand and respond to PLEs in practice. This could provide more detailed and rich information on how the phenomenology of PLEs are understood by clinicians, how they are incorporated or thought about within formulations and how they are experienced alongside other

psychopathology by service-users. In the longer term, longitudinal research is required in order to establish any causality between PLEs and psychopathology. If a causal link was found in this relationship, PLEs could become evidence based treatment targets for clinicians. In the same way processes are the focus of transdiagnostic or third wave CBT approaches, such as mindfully observing thoughts and what they give rise to, PLEs, such as delusional-like experiences, could be viewed as the potential mechanisms that give rise to distress.

Other beneficiaries of the current research could be researchers with an interest in perinatal mental health, who could undertake the shorter term or longitudinal research outlined above to provide further insights into the role of PLEs in non-psychotic psychopathology. Additionally, obstetric healthcare professionals, individuals working in perinatal mental health charity sectors as well as women in the perinatal period may all benefit from research as findings could be used to normalise the range and variety of experiences during the perinatal period. Women may be reassured to know that PLEs, psychotic-related cognitive biases and inflated responsibility biases are common experiences amongst women during this time and in the general population and do not, per se, indicate a need for care. Accessible toolkits could be developed to share information around these experiences, where numbers downloaded could be used to directly measure impact amongst these groups. The digital tool Altmetric could be used to assess number of citations globally, not just amongst academic populations but also non-academic populations (e.g., social and mainstream media, public policy documents, research blogs), which could give some indication of the broader interest in the research area.

Dissemination

Local level

At a local level, I have disseminated findings from the empirical piece to staff and students at Royal Holloway University. I have plans to disseminate findings from the systematic review to staff at my current CAMHS service during an allocated slot within regular team meetings (dedicated to disseminating research), as well as at a Continued Professional Development session at bimonthly psychology discipline meetings.

Publication

I will aim to publish two academic first-author papers in the following high impact factor (IF), peer-reviewed scientific journals relevant to my research discipline. Based on the journals' impact ratings (according to the h-index, SCImago, 2018) and if these publications have previously published articles exploring PLEs and non-psychotic outcomes, the following order of preference for submission is *Psychological Medicine (IF 6.159), Clinical Psychology and Psychotherapy (IF 2.508)* and the *British Journal of Clinical Psychology (IF 1.879)*. A large number of articles relating to PLEs and non-psychotic outcomes have also been published in *Schizophrenia Research (IF 3.958)* and *Schizophrenia Bulletin* and thus submissions could also be made to these journals. The empirical piece will be submitted to the *Journal of Affective Disorders (IF 3.786), Obstetrics and Gynecology (IF 4.982)* and *Archives of Women's Mental Health (IF 2.565)* due to previously published articles relating to perinatal mental health and/or their target audience being professionals working in perinatal services. Given that the biggest beneficiaries of the research are likely to be clinicians, I will also submit the systematic review to the Divisional branch of Clinical Psychology (DCP) of the British Psychological Society (BPS) for publication.

Toolkits

Following further research into potential causal links between PLEs and/or how clinicians respond to PLEs with non-psychotic outcomes, and depending on the outcomes of such research, findings could be used to develop PLE toolkits for clinicians. Toolkits could provide clinicians with practical guidance on how to talk and think about PLEs with other healthcare staff and service users to share ideas on how they have been held in formulations. Toolkits could not only collate evidence-based findings and help share practical advice but could also be developed to evaluate the impact of this (i.e., what has it changed in terms of awareness, skills, attitudes of clinicians) by using follow-up surveys. Additionally, co-producing these toolkits by engaging with relevant service-user groups would likely help to strengthen its impact making it more relevant and meaningful

Conferences and wider dissemination

I would seek to attend and/or submit my research for presentation at relevant conferences or symposiums. For example, the annual BPS Conference or similar upcoming events to the Conference on Transdiagnostic Approaches to Mental Health Challenges held at MRC Cognition and Brain Sciences Unit, University of Cambridge (#transdx2018). These conferences not only provide an opportunity to present the research but also keep up-to-date with latest research news and practice and glean the perspectives of others working in the field (academic and research) and other stakeholders (policy, advocates, patients, service users) to strengthen future research. Furthermore, there is also the potential to live tweet from talks to share developments in the field with those beyond the room, to broaden discussions and encourage others to join the conversation, which can help target a broader audience for the current research.

Perinatal mental health appears to be a current topical issue, not only with the government's announcement of increased spending on perinatal mental health service (Five Year Forward review, NHS England, 2015) but also a visible increase in broadcast media, with recent television documentaries on the BBC and BBC radio shows, including Women's Hour and All in the Mind podcast, as well as successful maternal mental health awareness campaigns (#MaternalMentalHealthAwareness) by national charities, advocates, service-user and community groups. Given the current interest around perinatal mental health, I will seek out national media, mainstream and specialist print outlets, including the BBC, Psychologies magazine and relevant charities (e.g., Maternal Mental Health Alliance), to take advantage of the current media attention in the area to increase the reach of my research. Finally, given the positive reaction on social media, authoring lay blog posts that can be shared via online digital platforms and channels (e.g., Twitter, Facebook and Instagram) can further help promote and inform the research.

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Appendix 1: PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	15
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	17
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	18-25
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	26
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	The review is not registered on PROSPERO but was agreed by university research committee
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	27-28
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	28-29
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	30
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	29

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	31
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	28
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	58
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	31
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	33

Section/topic	**#**	**Checklist item**	**Reported on page #**
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	31-33
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n/a
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	29
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	39-54
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	56-57
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	n/a – narrative synthesis used
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a – narrative synthesis used
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	58

Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	59-68
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	61-64
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	68-69
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	n/a – funding not sought for review

Appendix 2: Demographic and obstetric information for online survey

D*emographics*

1. Are you under 18 years old
   - Yes (taken to exit survey)
   - No

2. What is your age?
   Open text box

3. What is your current relationship status?
   Single
   Co-habiting with partner
   Married/civil partnership
   Divorced
   Separated
   Prefer not to say

4. What is your ethnicity?
   White- British
   White- Irish
   White- any other background
   Mixed heritage – white and black African
   Mixed heritage – white and black Caribbean
   Mixed heritage – any other background
   Asian/ Asian British – Chinese
   Asian/ Asian British – Indian
   Asian/ Asian British – Pakistani
   Asian/ Asian British – any other background
   Black/ Black British – African
   Black/ Black British – Caribbean
   Black/ Black British – any other background
   Other ethnic group – Arab
   Other ethnic group – any other background
   Prefer not say

5. What is your current employment status?
   Employed – part time (less than 39 hours per week)
   Employed – full time (40+ hours per week)
   Employed – self employed
   Full time student
   Unemployed – not looking for work
   Unemployed – looking for work
   Not able to work
   Prefer not to say

6. What is your highest educational attainment?
   GCSEs
   A Levels/BTEC/Baccalaureat/ National Diploma
   Degree

Masters Degree
Doctorate
Other
Prefer not to say

7. What is your religion?
   No religion/ Atheist
   Agnostic
   Christian (all denominations)
   Buddhist
   Hindu
   Jewish
   Muslim
   Sikh
   Any other religion
   Prefer not to say

Obstetric Information

1. If you are currently pregnant, how many weeks pregnant are you? *(if not applicable please skip to question 3)*
   Open text box

2. Is this your first pregnancy/ child?
   Yes
   No

3. If you are post-partum, how old is your baby?
   Open text box

4. How many children do you have?
   Open text box

5. What, if any, are your previous experiences of pregnancy (tick all apply)
   Miscarriage
   Termination
   Still birth
   None of the above
   Prefer not to say

6. Have you experienced any previous mental health difficulties during or after pregnancy? (Please tick any that apply)
   Ante/post-natal depression
   Perinatal anxiety
   Perinatal Obsessive Compulsive Disorder (OCD)
   Post-partum psychosis
   Post-Traumatic Stress Disorder (PTSD)/ traumatic birth
   None of the above
   Prefer not to say

7. Have you ever experienced any mental health difficulties unrelated to pregnancy/ child birth? (Please tick all that apply)
   Depression
   Anxiety
   Panic attacks
   Obsessive Compulsive Disorder (OCD)
   Psychosis
   Bi-Polar Disorder
   Substance or alcohol misuse
   Post-Traumatic Stress Disorder (PTSD)
   Eating disorder
   Other
   None of the above
   Prefer not to say

8. During the last 6 months, how often on average, have you consumed alcohol?
   Every day
   3-5 times a week
   twice a week
   once a week
   2 to 3 times a month
   once a month
   Less than once a month
   Not applicable to me
   Prefer not to say

9. During the last 6 months, have you taken any illicit or illegal substances?
   Yes
   No
   Prefer not to say

10. During the last 6 months, how often have you taken any illicit or illegal substances?
    Every day
    3-5 times a week
    twice a week
    once a week
    2 to 3 times a month
    once a month
    Less than once a month
    Not applicable to me

Appendix 3: Peter's Delusion Inventory (PDI-21, Peters, Joseph, Day, & Garety, 2004)

The following questions are designed to measure beliefs and vivid mental experiences. We believe that they are common and that most people have had some such experiences during their lives. Please answer the following questions as honestly as you can. There are no right or wrong answers, and there are no trick questions.

For the questions you answer YES to, we are interested in:

(a) how distressing these beliefs or experiences are
(b) how often you think about them; and
(c) how true you believe them to be.

1. Do you ever feel as if people seem to drop hints about you or say things with a double meaning? NO YES *(please circle)*	Not at all distressing … Very distressing 1 2 3 4 5 Hardly ever think about it … Think about it all the time 1 2 3 4 5 Don't believe it's true … Believe it is absolutely true 1 2 3 4 5
2. Do you ever feel as if things in magazines or on TV were written especially for you? NO YES *(please circle)*	Not at all distressing … Very distressing 1 2 3 4 5 Hardly ever think about it … Think about it all the time 1 2 3 4 5 Don't believe it's true … Believe it is absolutely true 1 2 3 4 5
3. Do you ever feel as if some people are not what they seem to be? NO YES *(please circle)*	Not at all distressing … Very distressing 1 2 3 4 5 Hardly ever think about it … Think about it all the time 1 2 3 4 5 Don't believe it's true … Believe it is absolutely true 1 2 3 4 5
4. Do you ever feel as if you are being persecuted in some way?	Not at all distressing … Very distressing 1 2 3 4 5 Hardly ever think about it … Think about it all the time 1 2 3 4 5

NO YES *(please circle)*	Don't believe it's true 1 2 3 4 5 Believe it is absolutely true

5. Do you ever as if there is a conspiracy against you? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
6. Do you ever feel as if you are, or destined to be, someone very important? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
7. Do you ever feel that you are a very special or unusual person? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
8. Do you ever feel that you are especially close to God ? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
9. Do you ever think people can communicate telepathically? NO YES	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time

(please circle)	Don't believe it's true 1 2 3 4 5 Believe it is absolutely true

10. Do you ever feel as if electrical devices such as computers can influence the way you think? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
11. Do you ever feel as if you have been chosen by God in some way? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
12. Do you believe in the power of witchcraft, voodoo or the occult? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
13. Are you often worried that your partner may be unfaithful? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
14. Do you ever feel that you have sinned more than the average person? NO YES	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time

(please circle)	Don't believe it's true 1 2 3 4 5 Believe it is absolutely true

15. Do you ever feel that people look at you oddly because of your appearance? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
16. Do you ever feel as if you had no thoughts in your head at all? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
17. Do you ever feel as if the world is about to end? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
18. Do your thoughts ever feel alien to you in some way ? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
19. Do your thoughts ever feel so vivid that you were worried other people would hear them?	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time

NO YES *(please circle)*	Don't believe it's true 1 2 3 4 5 Believe it is absolutely true

20. Do you ever feel as if your own thoughts were being echoed back you? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true
21. Do you feel as if you are a robot or zombie without a will of your own? NO YES *(please circle)*	Not at all distressing 1 2 3 4 5 Very distressing Hardly ever think about it 1 2 3 4 5 Think about it all the time Don't believe it's true 1 2 3 4 5 Believe it is absolutely true

Appendix 4: Launay Slade Hallucination Scale (LSHS-R, Bentall et al., 1985).

	0= certainly **does not** apply to me	1= possibly **does not** apply to me	2= unsure	3= possibly applies to me	4= certainly applies to me
1. No matter how hard I try to concentrate, unrelated thoughts always creep into my mind	0	1	2	3	4
2. In my daydreams I can hear the sound of a tune almost as clearly as if I were actually listening to it	0	1	2	3	4
3. Sometimes my thoughts seem as real as actual events in my life	0	1	2	3	4
4. Sometimes a passing thought will seem so real that it frightens me	0	1	2	3	4
5. The sounds I hear in my daydreams are usually clear and distinct	0	1	2	3	4
6. The people in my daydreams seem so true to life that sometimes I think they are	0	1	2	3	4
7. I often hear a voice speaking my thoughts aloud	0	1	2	3	4

8. In the past I have had the experience of hearing a person's voice and then found that no one was there	0	1	2	3	4
9. On occasions I have seen a person's face in front of me when no one was in fact there	0	1	2	3	4
10. I have heard the voice of the devil	0	1	2	3	4
11. In the past I have heard the voice of God speaking to me	0	1	2	3	4
12. I have been troubled by hearing voices in my head	0	1	2	3	4

Appendix 5: Cognitive Bias Questionnaire for Psychosis (CBQp, Peters et al., 2014)

In this questionnaire you will find a number of descriptions of everyday events. After each situation are different ways that people might react, labelled A, B, or C. Please imagine yourself in each situation as vividly as possible.

Once you have imagined that the event is happening to you, please choose the option that best describes how you might think about the situation. If none of the options matches completely how you might react, choose the one which is the closest. If more than 1 option applies, choose the one which would run through your mind most often.

When you have decided which option you are most likely to think, put a circle around the letter next to it.

There are no right or wrong answers. Work through the questions fairly quickly, making sure you pick the option that is nearest to what your immediate reaction might be.

1. Imagine you receive a letter and you notice it is not sealed. *I am most likely to think: (please circle A, B or C)*	A: Someone has deliberately opened this letter already B: I wonder if this may have been opened again after it was written C: I don't think anything of it
2. Imagine that you are walking down the street when you hear your name being called, but when you look around you don't see anybody. *I am most likely to think: (please circle A, B or C)*	A: Something strange is going on B: There is something really dangerous about this C: I must be imagining things
3. Imagine your food tastes different from usual. *I am most likely to think: (please circle A, B or C)*	A: Someone may have done something to my food on purpose B: This food must have been prepared with a different ingredient today C: Someone has deliberately spiked my food

4. Imagine that on your way to work you notice that all the traffic lights turn red as you approach them. *I am most likely to think: (please circle A, B or C)*	A: It's going to take me longer to get in this morning B: That's all I need, I'm going to be really late now C: My day is going to be ruined
5. Imagine you are standing at a bus stop when the bus you have been waiting for drives past half empty without stopping. *I am most likely to think: (please circle A, B or C)*	A: People are always so nasty B: People aren't very nice sometimes C: The driver must be in a bad mood today
6. Imagine you have a really bad pain in your head. *I am most likely to think: (please circle A, B or C)*	A: There must be something wrong with me B: There's lots of different reasons why I might have this pain C: I must have something really serious, like a brain tumour
7. Imagine that while on the bus you notice a stranger staring at you. *I am most likely to think: (please circle A, B or C)*	A: The way this person is staring at me is a bit worrying B: This person must mean me harm to be staring at me that way C: This person is being really rude to be staring at me in that way
8. Imagine you are sitting at home and suddenly you feel very odd. *I am most likely to think: (please circle A, B or C)*	A: I wonder why I feel odd, could something sinister be going on somewhere B: This feeling is proof that there is something bad happening somewhere to someone I know

	C: I must be overtired or something
9. Imagine you applied for a job and did not get it. *I am most likely to think: (please circle A, B or C)*	A: Perhaps I can get some feedback about why I did not get this job B: I wonder if I did not do very well at the interview C: I'll never be able to get a job
10.Imagine that you are on a train when you suddenly have a strong feeling you have been there before. *I am most likely to think: (please circle A, B or C)*	A: This is some kind of premonition that something awful has happened or will happen B: I wonder whether this is some kind of premonition C: This is a weird, but common experience
11. Imagine you get turned down to go out by someone you like or a friend. *I am most likely to think: (please circle A, B or C)*	A: I quite often get rejected in this situation B: You win some, you lose some C: I always get rejected for anything I try
12. Imagine that one day you enter a shop and you hear people laughing. *I am most likely to think: (please circle A, B or C)*	A: They must be laughing at me B: I wonder if they are laughing at me C: The laughing is probably nothing to do with me

13. Imagine there are police cars outside your house. You suddenly realise you feel uncomfortable. *I am most likely to think: (please circle A, B or C)*	A: Funny how just seeing the police has this unsettling effect on people B: I wonder why I feel so uncomfortable, could the cars be something to do with me C: I must have done something wrong to feel so uncomfortable, they've come to get me
14. Imagine you are watching television, and suddenly the screen goes blank. *I am most likely to think: (please circle A, B or C)*	A: Weird things are always happening B: This sort of thing seems to happen quite a lot C: There must be something wrong with the TV today
15. Imagine two people in a queue at a supermarket both look your way at the same time and then immediately start to talk to each other. *I am most likely to think: (please circle A, B or C)*	A: This is not the first time this has happened B: This sort of thing can happen in queues C: This always happens wherever I go
16. Imagine you are waiting in a café for an acquaintance to arrive, and you suddenly feel a strange shivery feeling inside. *I am most likely to think: (please circle A, B or C)*	A: Feeling shivery is a bad omen, I don't think I should meet this person B: I must be nervous about meeting this person C: I wonder if feeling shivery means something bad might happen
17. Imagine you think you see a shadowy figure moving across the wall of an empty room.	A: I wonder what that was

I am most likely to think: (please circle A, B or C)	B: My eyes must be playing tricks on me C: There must have been someone or something there
18. Imagine that the phone rings. When you answer, the other party hangs up. *I am most likely to think: (please circle A, B or C)*	A: I wonder if there's something suspicious about this B: Somebody is definitely checking up on me C: Someone's probably got the wrong number
19. Imagine you are watching the news on TV about a recent disaster, and you find yourself feeling guilty. *I am most likely to think: (please circle A, B or C)*	A: If I feel guilty I must be responsible in some way B: It's normal to feel guilty when a disaster has happened to someone else C: I wonder why I feel guilty, maybe I'm unwittingly responsible in some way
20. Imagine you are listening to the radio and suddenly there is crackling interference. *I am most likely to think: (please circle A, B or C)*	A: Someone has deliberately tampered with my radio so that it is no longer tuned properly B: I wonder if someone has been fiddling with my radio C: There is some sort of interference on the radio waves
21. Imagine that you are sitting on a train, and you think you can hear two people behind you talking about you. When you look round they are reading their papers and not talking to each other.	**A: They were definitely talking about me, they're just pretending to be reading their paper**

I am most likely to think: (please circle A, B or C)	**B: I'm sure I heard them talking about me, maybe I was wrong** **C: I should find out if anyone else ever has this kind of experience before deciding what really happened**
22. Imagine you are at home; everything is quiet when you hear a sudden fast banging on the walls. *I am most likely to think: (please circle A, B or C)*	A: The neighbours are doing this deliberately to upset me B: The neighbours could be doing some kind of home improvements C: The neighbours might be trying to tell me something
23. Imagine you a reading a newspaper or magazine, and you read an article which has some special relevance to you. *I am most likely to think: (please circle A, B or C)*	A: This article seems to have been written with people like me in mind B: I wonder if someone may have written this article for me C: Someone has definitely written this article for me specifically
24. Imagine you notice that a person you don't know is looking at you. You suddenly find yourself feeling unsettled. *I am most likely to think: (please circle A, B or C)*	A: Feeling this unsettled means this person intends to do me harm B: I wonder why I feel this unsettled, could this mean this person is thinking bad things about me

	C: Being looked at can make people feel unsettled, I don't worry about it
25. Imagine that one evening you are sitting at home alone when a door suddenly slams by itself in another room. *I am most likely to think: (please circle A, B or C)*	A: Someone or something must have got into the house B: I wonder if somebody or something's there C: It's probably a draught
26. Imagine someone you know calls you just as you were thinking about them. As you pick up the phone you suddenly realise you are feeling upset. *I am most likely to think: (please circle A, B or C)*	A: It's odd that I should feel upset, but I don't read too much into it B: I wonder why I feel upset, could there be something peculiar about this call C: Feeling upset means something, it must be bad news
27. Imagine you are walking down the road when you suddenly notice a careers poster which seems to stand out from your surroundings. *I am most likely to think: (please circle A, B or C)*	A: I wonder why my eyes seem so drawn to that poster B: Maybe I'm noticing it because my career isn't such a success C: It's a sign that my life is such a failure
28. Imagine you are on a bus; the driver keeps stopping abruptly, so that you stumble each time. *I am most likely to think: (please circle A, B or C)*	A: I wonder if he's doing it on purpose to wind people up B: This bus driver can't drive properly C: He's doing it on purpose to humiliate me

29. Imagine you hear that a friend is having a party and you have not been invited. *I am most likely to think: (please circle A, B or C)*	A: I wonder if they don't like me as much as I thought they did B: Perhaps I can try to find out a bit more about the situation before making any assumptions C: They obviously don't like me
30. Imagine you are dozing on the sofa in front of the TV and you suddenly wake up startled. *I am most likely to think: (please circle A, B or C)*	A: I tend to always wake up startled when I'm dozing B: The TV must have woken me C: I can never get any sleep

Appendix 6: Responsibility Attitudes Questionnaire (RAS, Salkovskis et al., 2000)

This questionnaire lists different attitudes or beliefs which people sometimes hold. Read each statement carefully and decide how much you agree or disagree with it.

For each of the attitudes, show your answer by putting a circle round the words which BEST DESCRIBE HOW YOU THINK. Be sure to choose only one answer for each attitude. Because people are different, there is no right answer or wrong answer to these statements.

To decide whether a given attitude is typical of your way of looking at things, simply keep in mind what you are like MOST OF THE TIME.

1. I often feel responsible for things which go wrong.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

2. If I don't act when I can foresee danger, then I am to blame for any consequences if it happens.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

3. I am too sensitive to feeling responsible for things going wrong.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

4. If I think bad things, this is as bad as doing bad things.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

a. I worry a great deal about the effects of things which I do or don't do.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

6. To me, not acting to prevent disaster is as bad as making disaster happen.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

7. If I know that harm is possible, I should always try to prevent it, however unlikely it seems.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

8. I must always think through the consequences of even the smallest actions.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

9. I often take responsibility for things which other people don't think are my fault.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

10. Everything I do can cause serious problems.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

11. I am often close to causing harm.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

12. I must protect others from harm.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

13. I should never cause even the slightest harm to others.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

14. I will be condemned for my actions.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

15. If I can have even a slight influence on things going wrong, then I must act to prevent it.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

16. To me, not acting where disaster is a slight possibility is as bad as making that disaster happen.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

17. For me, even slight carelessness is inexcusable when it might affect other people.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

18. In all kinds of daily situations, my inactivity can cause as much harm as deliberate bad

    intentions.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

19. Even if harm is a very unlikely possibility, I should always try to prevent it at any cost.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

20. Once I think it is possible that I have caused harm, I can't forgive myself.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

21. Many of my past actions have been intended to prevent harm to others.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

22. I have to make sure other people are protected from all of the consequences of things I do.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

23. Other people should not rely on my judgement.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

24. If I cannot be certain I am blameless, I feel that I am to blame.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

25. If I take sufficient care then I can prevent any harmful accidents.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

26. I often think that bad things will happen if I am not careful enough.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

Appendix 7: Depression Anxiety Stress Scale (DASS-21, Lovibond & Lovibond, 1995)

DASS21

Name:

Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	12	3
2 (a)	I was aware of dryness of my mouth	0	12	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	12	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	12	3
5 (d)	I found it difficult to work up the initiative to do things	0	12	3
6 (s)	I tended to over-react to situations	0	12	3
7 (a)	I experienced trembling (e.g. in the hands)	0	12	3
8 (s)	I felt that I was using a lot of nervous energy	0	12	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself			
10 (d)	I felt that I had nothing to look forward to	0	12	3
11 (s)	I found myself getting agitated	0	12	3
12 (s)	I found it difficult to relax	0	12	3
13 (d)	I felt down-hearted and blue	0	12	3
14 (s)	I was intolerant of anything that kept me from getting on with what I			

	was doing			
15 (a)	I felt I was close to panic	0	12	3
16 (d)	I was unable to become enthusiastic about anything	0	12	3
17 (d)	I felt I wasn't worth much as a person	0	12	3
18 (s)	I felt that I was rather touchy	0	12	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	12	3
20 (a)	I felt scared without any good reason	0	12	3
21 (d)	I felt that life was meaningless	0	12	3

Appendix 8: Obsessive Compulsive Inventory (OCI, Foa et al., 1998).

OCI

The following statements refer to experiences which many people have in their everyday lives. In the column labelled DISTRESS, please CIRCLE the number that best describes HOW MUCH that experience has DISTRESSED or BOTHERED YOU DURING THE PAST MONTH. The numbers in this column refer to the following labels: 0 = Not at all 1=A littte 2=Moderately 3=A lot 4 = Extremely

	DISTRESS
1. Unpleasant thoughts come into my mind against my will and I cannot get rid of them	0 1 2 3 4
2. I think contact with bodily secretions (perspiration, saliva, blood, urine, etc) may contaminate my clothes or somehow harm me.	0 1 2 3 4
3. I ask people to repeat things to me several times, even though understood them the first time.	0 1 2 3 4
4. I wash and clean obsessively.	0 1 2 3 4
5. I have to review mentally past events, conversations and actions to make sure that | didn't do something wrong.	0 1 2 3 4
6. I have saved up so many things that they get in the way.	0 1 2 3 4
7. I check things more often than necessary	0 1 2 3 4
8. I avoid using public toilets because | am afraid of disease or contamination.	0 1 2 3 4
9. I repeatedly check doors, windows, drawers etc.	0 1 2 3 4

10. I repeatedly check gas and water taps and light switches after turning them off.	0 1 2 3 4
11. I collect things I don't need.	0 1 2 3 4
12. I have thoughts of having hurt someone without knowing it.	0 1 2 3 4
13. I have thoughts that | might want to harm myself or others	0 1 2 3 4
14. I get upset if objects are not arranged properly	0 1 2 3 4
15. I feel obliged to follow a particular order in dressing, undressing and washing myself.	0 1 2 3 4
16. I feel compelled to count while I am doing things	0 1 2 3 4
17. I am afraid of impulsively doing embarrassing or harmful things.	0 1 2 3 4
18. I need to pray to cancel bad thoughts or feelings.	0 1 2 3 4
19. I keep on checking forms or other things | have written	0 1 2 3 4
20. | get upset at the sight of knives, scissors and other sharp objects in case I lose control with them.	0 1 2 3 4
21. I am excessively concerned about cleanliness.	0 1 2 3 4
22. I find it difficult to touch an object when | know it has been touched by strangers or certain people.	0 1 2 3 4
23. I need things to be arranged in a particular order	0 1 2 3 4

24. I get behind in my work because I repeat things over and over again.	0 1 2 3 4
25. I feel | have to repeat certain numbers.	0 1 2 3 4
26. After doing something carefully, I still have the impression I have not finished it.	0 1 2 3 4
27. I find it difficult to touch garbage or dirty things.	0 1 2 3 4
28. I find it difficult to control my own thoughts	0 1 2 3 4
29. I have to do things over and over again until it feels right	0 1 2 3 4
30. I am upset by unpleasant thoughts that come into my mind against my will.	0 1 2 3 4
31. Before going to sleep | have to do certain things in a certain way.	0 1 2 3 4
32. I go back to places to make sure that I have not harmed anyone.	0 1 2 3 4
33. I frequently get nasty thoughts and have difficulty in getting rid of them.	0 1 2 3 4
34. I avoid throwing things away because | am afraid | might need them later.	0 1 2 3 4
35. I get upset if others change the way I have arranged my things.	0 1 2 3 4

36. I feel that I must repeat certain words or phrases in my mind in order to wipe out bad thoughts, feelings or actions.	0 1 2 3 4
37. After I have done things, I have persistent doubts about whether I really did them.	0 1 2 3 4
38. I sometimes have to wash or clean myself simply because I feel contaminated	0 1 2 3 4
39. I feel that there are good and bad numbers.	0 1 2 3 4
40. I repeatedly check anything which might cause a fire.	0 1 2 3 4
41. Even when I do something very carefully I feel that it is not quite right.	0 1 2 3 4
42. I wash my hands more often or longer than necessary.	0 1 2 3 4

Appendix 9: Research Ethics Committee favourable opinion

NHS SCOTLAND

East of Scotland Research Ethics Service *(EoSRES)* **Research Ethics Service**

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

TAyside medical Science Centre
Residency Block Level 3
George Pirie Way
Ninewells Hospital and Medical School
Dundee DD1 9SY

Ms Katy Bovis
55 Leigham Vale
London
SW16 2JQ

Date: 11 October 2018
Your Ref:
Our Ref: LR/18/ES/0097
Enquiries to: Mrs Lorraine Reilly
Direct Line: 01382 383878
Email: eosres.tayside@nhs.net

Dear Ms Bovis

Study Title: **Psychotic Like Experiences (PLES) in perinatal women: The role of psychological distress and cognitive biases**
REC reference: **18/ES/0097**
Protocol number: **n/a**
IRAS project ID: **247390**

Thank you for your letter of 19 September 2018, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to make a request to postpone publication, please contact hra.studyregistration@nhs.net outlining the reasons for your request.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA and HCRW Approval (England and Wales)/ NHS permission for research is available in the Integrated Research Application System, at www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from the HRA. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

The Committee has not yet completed any site-specific assessment (SSA) for the non-NHS research site(s) taking part in this study. The favourable opinion does not therefore apply to any non-NHS site at present. We will write to you again as soon as an SSA application(s) has been reviewed. In the meantime no study procedures should be initiated at non-NHS sites.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [First Reply to RHUL Research Sub-Committee]		30 January 2018
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [Second Reply to RHUL Research Sub-Committee]		12 March 2018
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [Statement of Approval from RHUL Research Sub-Committee]		13 March 2018
Copies of advertisement materials for research participants [Study Advertisement v3]	3	04 October 2018
Copies of advertisement materials for research participants [Study Flyer v2]	2	04 October 2018
Covering letter on headed paper [Provisional Opinion Response Letter]	1	19 September 2018
Covering letter on headed paper [Second Response Letter to Committee]	1	
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Professional Indemnity Insurance]		26 July 2018
GP/consultant information sheets or letters [Information Sheet for Clinicians v3]	3	04 October 2018
IRAS Application Form [IRAS_Form_20092018]		20 September 2018
IRAS Checklist XML [Checklist_20092018]		20 September 2018
IRAS Checklist XML [Checklist_05102018]		05 October 2018
Other [Email clarification re CI and sponsor details]		27 July 2018
Other [Email with online survey link]		19 September 2018
Other [Online survey]		
Participant consent form [Consent Forms (highlighted changes)]	2	12 September 2018
Participant information sheet (PIS) [Participant Information Sheet v3]	3	04 October 2018
Participant information sheet (PIS) [Participant Debrief Sheet v3]	3	04 October 2018
Research protocol or project proposal [Research Proposal]	1	20 June 2018
Summary CV for Chief Investigator (CI) [Summary CV for Chief Investigator]		10 July 2018
Summary CV for supervisor (student research) [Summary CV for Supervisor]		
Summary CV for supervisor (student research) [CV Olga Luzon]		
Validated questionnaire [Cognitive Bias Questionnaire for Psychosis (CBQp)]		
Validated questionnaire [Depression Anxiety Stress Scale (DASS21)]		
Validated questionnaire [Launay Slade Hallucination Scale (LSHS-R)]		
Validated questionnaire [Obsessive Compulsive Inventory Questionnaire (OCI)]		
Validated questionnaire [Peter's Delusion Inventory (PDI)]		
Validated questionnaire [Responsibility Attitude Scale		

Questionnaire (RAS)]		

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

18/ES/0097	**Please quote this number on all correspondence**

Yours sincerely

for Dr Robert Rea
Chair

Email: eosres.tayside@nhs.net

Enclosures: "After ethical review – guidance for researchers"

Copy to: Ms Annette Lock, Royal Holloway, University of London
Ms Sylvia Westrup, West London Research Network

Appendix 10: Health Research Authority approval

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Ms Katy Bovis
55 Leigham Vale
SW16 2JQ

Email: hra.approval@nhs.net
Research-permissions@wales.nhs.uk

26 October 2018

Dear Ms Bovis

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**Psychotic Like Experiences (PLES) in perinatal women: The role of psychological distress and cognitive biases**
IRAS project ID:	**247390**
REC reference:	**18/ES/0097**
Sponsor	**Royal Holloway, University of London**

I am pleased to confirm that HRA and Health and Care Research Wales (HCRW) Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales, as well as any documentation that has been updated as a result of the assessment.

Following the arranging of capacity and capability, participating NHS organisations should **formally confirm** their capacity and capability to undertake the study. How this will be confirmed is detailed in the "*summary of assessment*" section towards the end of this letter.

You should provide, if you have not already done so, detailed instructions to each organisation as to how you will notify them that research activities may commence at site following their confirmation of capacity and capability (e.g. provision by you of a 'green light' email, formal notification following a site initiation visit, activities may commence immediately following confirmation by participating organisation, etc.).

It is important that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details of the research management function for each organisation can be accessed here.

IRAS project ID	247390

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?
HRA and HCRW Approval does not apply to NHS/HSC organisations within the devolved administrations of Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) has been sent to the coordinating centre of each participating nation. You should work with the relevant national coordinating functions to ensure any nation specific checks are complete, and with each site so that they are able to give management permission for the study to begin.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?
HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?
The document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

I am a participating NHS organisation in England or Wales. What should I do once I receive this letter?
You should work with the applicant and sponsor to complete any outstanding arrangements so you are able to confirm capacity and capability in line with the information provided in this letter.

The sponsor contact for this application is as follows:

Name: Katy Bovis
Tel: 07971296608
Email: katy.bovis.2016@live.rhul.ac.uk

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **247390**. Please quote this on all correspondence.

Yours sincerely

Simon Connolly

IRAS project ID	247390

Senior Assessor

Email: hra.approval@nhs.net Research-permissions@wales.nhs.uk

Copy to: *Annette Lock, Royal Holloway, University of London*
Sylvia Westrup, West London Research Network

IRAS project ID	247380

List of Documents

The final document set assessed and approved by HRA and HCRW Approval is listed below.

Document	*Version*	*Date*
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [First Reply to RHUL Research Sub-Committee]		30 January 2018
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [Second Reply to RHUL Research Sub-Committee]		12 March 2018
Confirmation of any other Regulatory Approvals (e.g. CAG) and all correspondence [Statement of Approval from RHUL Research Sub-Committee]		13 March 2018
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Copies of advertisement materials for research participants [Study Advertisement v3]	3	04 October 2018
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Covering letter on headed paper [Second Response Letter to Committee]	1	
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Public liability 2018-19]		19 July 2018
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Professional Indemnity Insurance]		26 July 2018
GP/consultant information sheets or letters [Information Sheet for Clinicians v3]	3	04 October 2018
HRA Schedule of Events [HRA Schedule of Events Validated]	2.0	
HRA Statement of Activities [Statement of Activities Validated]	2.0	13 August 2018
IRAS Application Form [IRAS_Form_20092018]		20 September 2018
Other [Full MS Word survey outline including demographic questions]	1	23 October 2018
Other [Email with online survey link]		19 September 2018
Other [Email clarification re CI and sponsor details]		27 July 2018
Participant consent form [Consent Forms (highlighted changes)]	2	12 September 2018
Participant information sheet (PIS) [Participant Debrief Sheet v3]	3	04 October 2018
Participant information sheet (PIS)	4	25 October 2018
Research protocol or project proposal [Research Proposal]	1	20 June 2018
Summary CV for Chief Investigator (CI) [Summary CV for Chief Investigator]		10 July 2018
Summary CV for supervisor (student research) [Summary CV for Supervisor]		
Summary CV for supervisor (student research) [CV Olga Luzon]		
Validated questionnaire [Cognitive Bias Questionnaire for Psychosis (CBQp)]		
Validated questionnaire [Depression Anxiety Stress Scale (DASS21)]		
Validated questionnaire [Launay Slade Hallucination Scale (LSHS-R)]		
Validated questionnaire [Obsessive Compulsive Inventory Questionnaire (OCI)]		
Validated questionnaire [Peter's Delusion Inventory (PDI)]		
Validated questionnaire [Responsibility Attitude Scale Questionnaire (RAS)]		

IRAS project ID	247380

Summary of assessment

The following information provides assurance to you, the sponsor and the NHS in England and Wales that the study, as assessed for HRA and HCRW Approval, is compliant with relevant standards. It also provides information and clarification, where appropriate, to participating NHS organisations in England and Wales to assist in assessing, arranging and confirming capacity and capability.

Assessment criteria

Section	Assessment Criteria	Compliant with Standards	Comments
1.1	IRAS application completed correctly	Yes	No comments
2.1	Participant information/consent documents and consent process	Yes	No comments
3.1	Protocol assessment	Yes	No comments
4.1	Allocation of responsibilities and rights are agreed and documented	Yes	A statement of activities has been submitted and the sponsor is not requesting and does not expect any other site agreement to be used.
4.2	Insurance/indemnity arrangements assessed	Yes	Where applicable, independent contractors (e.g. General Practitioners) should ensure that the professional indemnity provided by their medical defence organisation covers the activities expected of them for this research study
4.3	Financial arrangements assessed	Yes	No external funding application made.
5.1	Compliance with the Data Protection Act and data security issues assessed	Yes	No comments
5.2	CTIMPS – Arrangements for compliance with the Clinical Trials Regulations assessed	Not Applicable	No comments

IRAS project ID	247390

Section	Assessment Criteria	Compliant with Standards	Comments
5.3	Compliance with any applicable laws or regulations	Yes	No comments
6.1	NHS Research Ethics Committee favourable opinion received for applicable studies	Yes	No comments
6.2	CTIMPS – Clinical Trials Authorisation (CTA) letter received	Not Applicable	No comments
6.3	Devices – MHRA notice of no objection received	Not Applicable	No comments
6.4	Other regulatory approvals and authorisations received	Not Applicable	No comments

Participating NHS Organisations in England and Wales

This provides detail on the types of participating NHS organisations in the study and a statement as to whether the activities at all organisations are the same or different.
There will be a single type of participating NHS organisation where potential participants will be provided with information about taking part in the survey. The Chief Investigator or sponsor should share relevant study documents with participating NHS organisations in England and Wales in order to put arrangements in place to deliver the study. The documents should be sent to both the local study team, where applicable, and the office providing the research management function at the participating organisation. Where applicable, the local LCRN contact should also be copied into this correspondence. If chief investigators, sponsors or principal investigators are asked to complete site level forms for participating NHS organisations in England and Wales which are not provided in IRAS, the HRA or HCRW websites, the chief investigator, sponsor or principal investigator should notify the HRA immediately at hra.approval@nhs.net or HCRW at Research-permissions@wales.nhs.uk. We will work with these organisations to achieve a consistent approach to information provision.

Principal Investigator Suitability

This confirms whether the sponsor position on whether a PI, LC or neither should be in place is correct for each type of participating NHS organisation in England and Wales, and the minimum expectations for education, training and experience that PIs should meet (where applicable).
No principal investigator or local collaborator is required at participating NHS organisations. GCP training is not a generic training expectation, in line with the HRA/HCRW/MHRA statement on training expectations.

IRAS project ID	247380

HR Good Practice Resource Pack Expectations

This confirms the HR Good Practice Resource Pack expectations for the study and the pre-engagement checks that should and should not be undertaken
No need for access arrangements to NHS care facilities are expected for this study.

Other Information to Aid Study Set-up

This details any other information that may be helpful to sponsors and participating NHS organisations in England and Wales to aid study set-up.
The applicant has indicated that they do not intend to apply for inclusion on the NIHR CRN Portfolio.

Appendix 11: Approval from north-west London R&D manager

From: [R&D manager email]
Sent: 18 July 2018 12:38
To: Bovis, Katy (2016)
Cc: studysupport.crnnwlondon@nihr.ac.uk
Subject: Re: Participating in perinatal research Katy Bovis

Dear Katy

Once you have obtained HRA approval for your study we would be happy to emailed details and the poster to our research active practices to ask whether they would be happy to put up your poster.

Best wishes

R&D Manager (Non portfolio studies) / OUM MPH UK Project Manager
West London Research Network (WeLReN CIC)
Room 334, Reynolds Building
St Dunstan's Road
London W6 8RP

Supporting research with primary care and community organisations in NW London. This currently includes the primary care organisations of Brent, Ealing, Harrow, Hammersmith & Fulham, Hillingdon, Hounslow, Kensington & Chelsea (West london CCG) and Westminster (Central London CCG); and Central London Community Healthcare NHS Trust (covering community services in K&C, H&F and Westminster)

Appendix 12: Participant Information Sheet

Participant Information Sheet
Version 3: 4th October 2018
IRAS: 247390

Department of Psychology,
Royal Holloway, University of London,
Egham, Surrey, TW20 0EX

Unusual subjective experiences in perinatal women: the role of emotions and thinking styles

We are researchers at Royal Holloway, University of London, and we would like to invite you to take part in a study exploring *mother's thoughts and experiences during and after pregnancy.* This research study is being conducted as part of an educational qualification (Doctoral Programme in Clinical Psychology, Royal Holloway).

Joining the study is entirely up to you and it is important that you understand why the research is being done and what participation would involve for you, before deciding to take part. Please take the time to read the following information carefully and feel free to ask if there is anything that maybe unclear or if you would like further information. You may also wish to talk to others about the study before deciding whether you wish to take part. Thank you for taking the time to read this.

What is the study about?

Pregnancy and early motherhood can be a period of great joy and also a time of upheaval and adjustment. We are interested in the range of thoughts, feelings and beliefs expectant and new mums experience during this period (known as the perinatal period; the time from conception until 12 months after the birth of your child). Research tells us it is very common for women to experience anxious or negative thoughts during pregnancy and following birth. Mothers often report feeling reluctant to disclose their feelings to their GP or a health visitor. We hope our research will help normalise these common experiences for women and also help identify those in need of support

Who can take part?

Any woman who is currently beyond their first trimester of pregnancy (i.e. beyond the first 12 weeks of pregnancy) or who currently has a baby under 12-months-old. You **do not** have to be a first time mother in order to be able to take part.

What will the study involve?

If you decide to take part in the research, you will be invited to complete an online survey asking about some of your thoughts, feelings and beliefs. The survey should take between 20-25 minutes to complete. We will also invite you to be contacted again for a follow-up period after 12 months, or slightly longer.

What are the potential disadvantages of taking part?

You will be asked to complete some brief questionnaires about the way you think and some of the emotions you have been experiencing in the last week or so. Some people might find it useful to reflect on the way they are feeling, however, for some it might be somewhat concerning or distressing to focus on these experiences. If this happens we expect this to be short lived. However, if it persisted we are happy to be contacted and are trained to deal with emotional difficulties (contact details are provided below). You will also be provided with a list of relevant organisations and how to seek further support that may be available to you.

What are the potential benefits of taking part?

By taking part in the study you will be helping us to improve our knowledge of mother's experiences during and after pregnancy. As a thank you for taking part you will also be invited to enter into our prize draw of a £50 Mothercare™ voucher. The prize draw will be drawn following completion of data collection, which we anticipate to be by Spring 2019. The winner will be contacted on the email address provided and the voucher sent electronically or posted to them (subject to their preference).

Will the data provided by myself be kept confidential?

All information will remain confidential and has been approved by NHS and University ethics. Your contact details removed from all information and the data will be made anonymous. Electronic data will be stored on password protected files and computers. When the study has finished, data which has been collected for the purpose of this research will be stored on Royal Holloway, University of London's secure data depository, Figshare and destroyed after 5 years. Confidentiality will only be breached when a risk to yourself, your child or others becomes known to the researcher. Unless otherwise indicated, the researcher will share their concerns with you and the actions they recommend being taken.

What if I want to withdraw my data from the study?

You will have the right to withdraw at any stage of the research and it will not affect you in any way. If you wish to withdraw from the study you will need to contact the research team via email. This will mean that the data that you have given us will not be used in the study. Due to this research forming part of doctoral thesis, and the nature of collecting data through online surveys, there is a time limit from when data can be withdrawn. Data will unable to be withdrawn after 4th March 2019.

Who has reviewed the study?

The East of Scotland Research Ethics Service REC 1, which has responsibility for scrutinising all proposals for medical research on humans, has examined the proposal and has raised no objections from the point of view of research ethics. It is a requirement that data collected be made available for scrutiny by monitors from Royal Holloway, University of London and Central and North West London NHS Trust, whose role is to check that research is properly conducted and the interests of those taking part are adequately protected. The Royal Holloway Research Ethics Committee has also reviewed this research (Reference number:).

What will happen to the results of this study?

The results from the study may be published in an academic journal. Nobody who takes part in the study will be identifiable. If you would like to receive a summary of these findings then you can contact katy.bovis.2016@live.rhul.ac.uk to request these. We anticipate findings will be available by June 2019.

How do I find out more?

If you have any additional questions regarding this research or to discuss any concerns relating to participating, then please feel free to contact the researcher (Katy Bovis) at katy.bovis.2016@live.rhul.ac.uk or the study supervisor (Dr. Olga Luzon) at: olga.luzon@rhul.ac.uk.

Data Protection

Royal Holloway, University of London is the sponsor for this study, based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for

looking after your information and using it properly. Royal Holloway, University of London will keep information about you for 5 years after the study has finished.

The researchers will collect information from you for this research study in accordance with our instructions. The researchers will keep your contact details confidential and separate from other data collected and will not pass this information to Royal Holloway, University of London. The researchers will use this information as needed, to contact you about the research study. Royal Holloway, University of London will only receive information without any identifying information. The people who analyse the information will not be able to identify you and will not be able to find out your name or contact details. The researchers will keep identifiable information about you from this study until the prize draw has been made, by summer 2019. It will then be destroyed.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study after the specified deadline, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible. If you want to find out more about how we use your information please contact the researcher contact on katy.bovis.2016@live.rhul.ac.uk

YES, I WANT TO TAKE PART!

If you have read the following information and would like to take part then simply follow the online link below:

<<survey link>>

Appendix 13: Participant consent form

Consent Form
Version 2: 12th September 2018
IRAS: 247390

Department of Psychology,
Royal Holloway, University of London,
Egham, Surrey, TW20 0EX

Please tick to indicate whether you give your consent or not before continuing

1. I confirm that I have read the participant information sheet dated for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐
3. I agree to take part in the above study. ☐
4. I understand that Royal Holloway, University of London will have access to my data, which will be stored for 5 years and that only the researchers will have access to my contact details for the prize draw, if I choose to provide them. These details will be destroyed following the completion of the prize draw by summer 2019. ☐
5. I give my permission to being contacted in the future for potential related follow-up research ☐

Appendix 14: Participant debrief sheet

Department of Psychology,
Royal Holloway, University of London,
Egham, Surrey, TW20 0EX

Participant Debrief Information
Version 3: 4th October 2018
IRAS: 247390

Participant Debrief Information

Unusual subjective experiences in perinatal women: the role of emotional and cognitive processes

Thank you for participation in this research study, it is greatly appreciated.

What is the study about?

Unusual subjective experiences, such as hearing or seeing things or having uncommon beliefs, are often reported in the general population, including during the perinatal period (the time from conception until 12 months after the birth of your child). For most, these experiences are short-lived with no associated distress or long term impact. However, for some these experiences can be more troublesome and associated with distress. We would like to better understand if the way women think, what we call thinking styles, is associated with these experiences and/or any distress arising from them. We hope our research will help to normalise some of these common experiences for women and also help identify those in need of support. We anticipate findings from this study will be available by May 2019. If you would like to receive a summary of the findings you can contact katy.bovis.2016@live.rhul.ac.uk.

Your information

Your data will be stored confidentially and anonymously. You have the right to withdraw your information from this study without giving a reason. If you wish to withdraw then please contact katy.bovis.2016@live.rhul.ac.uk. Please note, due to the data forming part of a doctoral thesis there is a time limit for when data can be withdrawn. Data will not be able to be withdrawn after 4th March 2019. If you have consented to being contacted after a follow-up period of 12 months or longer then the research team may contact you again using the email details your provided. If contacted in the future, you have the right to decline to participate again.

Who can I contact if I have any questions or need some support?

If you have any additional questions regarding this research or to discuss any issues related to participating then please feel free to contact the researcher (Katy Bovis) at: katy.bovis.2016@live.rhul.ac.uk or the study supervisor (Dr. Olga Luzon) at: olga.luzon@rhul.ac.uk who are NHS clinicians who are trained to support people struggling with emotional difficulties.

Who can I contact if I want any further support or information?

If you feel you would like further support for, or information on, perinatal mental health difficulties, then you can follow the links provided below. Additionally, you can contact your GP to discuss your concerns further.

For information and a directory of services:

For more information on perinatal mental health difficulties and finding support in your local area, please go to the following web page provided by Mind, the mental health charity, for a directory of local services, groups and charities:

https://tinyurl.com/yczx9hya

Finding further support locally:

If you feel that you would like to seek further support with any difficulties you may experiencing with your anxiety or low mood, then please speak to your GP or contact your local Improving Access to Psychological Treatment (IAPT) service, where you can self-refer online or over the phone. You can find the details of your local service by typing your postcode into the following website:

https://www.nhs.uk/Service-Search/Psychological-therapies-(IAPT)/LocationSearch/10008

Crisis and emergency help:

If you feel concerned about your current mental state and are worried that you are unable to keep yourself, your child or others safe from harm, or, you are at risk of harm from others, then please contact Emergency Services by calling 999 or go to your local A&E department. You can find your nearest A&E by typing your postcode into the following website:

https://www.nhs.uk/Service-Search/Accident-and-emergency-services/LocationSearch/428