Paranoia in adolescents: Assessment, prevalence, and clinical understanding

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Declaration

The work described in this thesis was carried out under the supervision of Professor Daniel Freeman and Dr Felicity Waite. The work is entirely the thesis authors, with the only exceptions:

- The directed acyclic graphs (DAGs) analysis in Chapter 4 was carried out by Professor Robin Evans (University of Oxford). All other analysis, including the undirected network analyses, were conducted by me.
- The statistical analysis described in Chapter 3 was advised on by Dr Bao S. Loe (University of Cambridge), although I conducted the analysis.

I declare that the work presented has not been submitted for any other degree, in this or any other university or institute of learning.

Abstract

Background

Adolescence is the age when paranoia is most likely to first arise. Believing that others intend to harm you is likely to be corrosive for social relationships; this, in turn, could worsen outcomes for young people with mental health disorders. To date, however, paranoia has been predominantly studied in adults. Very little is known about its clinical presentation in adolescents. In this thesis, a systematic programme of research examining paranoia in adolescents - particularly those in clinical services - was conducted. The aims were to 1) develop an age-appropriate assessment of paranoia for young people, 2) establish the extent to which paranoia is a problem in adolescents attending mental health services, and 3) improve the clinical and theoretical understanding of paranoia at this age.

Method

After a systematic review of existing measures used to assess paranoia in the adolescent literature (Chapter 2), the development of a new measure of adolescent paranoia is described in Chapter 3. This measure was validated extensively using classical test theory and item response theory approaches in two cohorts: adolescents from the general population (n = 801) and patients accessing child and adolescent mental health services (CAMHS) (n = 301). A simulation of 10,000 responses was also conducted to evaluate the potential of the new measure as a computerised adaptive test. Next, this measure was used to examine the prevalence and potential correlates of paranoia in adolescents across the two cohorts of adolescents from a secondary school (Chapter 4) and patients accessing CAMHS (Chapter 5).

In the school cohort, an undirected network model and a Bayesian network with directed acyclic graphs (DAGs) was used to estimate probabilistic causal pathways between paranoia and theoretically important psychological factors and social factors relevant to adolescents (i.e. social media and peer interactions). In the CAMHS cohort, relationships between paranoia and both clinician-report and self-report psychiatric symptoms were examined using linear regressions and undirected network methods. The persistence of paranoia and its relationship with other difficulties several months later was assessed in a subgroup of the patients (n = 105). Finally, an interpretative phenomenological analysis (IPA) study using semi-structured interviews was conducted with 12 adolescent patients with paranoia in the context of non-psychotic mental health problems (Chapter 6).

Results

In Chapter 3, a new 18-item measure of paranoid thoughts for adolescents - the Bird Checklist of Adolescent Paranoia (B-CAP) - was created. The B-CAP was shown to be a valid and reliable measure with excellent psychometric properties for assessing paranoia in clinical and non-clinical populations of youth, with potential as an efficient adaptive test. In Chapter 4, paranoia in the adolescent general population was shown to follow a continuous distribution that closely fit an exponential curve. Occasional suspicions were common, and 15% of adolescents reported elevated levels. Paranoia was significantly higher in adolescent girls compared to boys, and was associated with clinical levels of anxiety, depression, and insomnia. DAGs analysis found paranoia closely interacted with affective processes and bullying, was more likely to impact peer relationships than vice versa, and had no causal relationship with problematic social media use.

The adolescent patients from the CAMHS cohort (Chapter 5) were primarily accessing services for emotional disorders. Only 2% had suspected psychosis. Rates of paranoia in these patients were approximately double those in the general population, with 35% reporting elevated levels. Yet paranoia was recorded in the clinical notes of only one participant. Paranoia was significantly higher in girls than boys and was associated with a range of clinician-rated problems including affective symptoms, self-harm, trauma, and impaired social functioning. Network analyses showed paranoia most strongly interacted with peer difficulties, and that paranoia had a central mediating role in the relationship between peer difficulties and most other symptoms. Follow-up data showed that paranoia remained persistent for three-quarters and was associated with greater psychological problems over time.

In the qualitative study (Chapter 6), young patients described a range of distressing paranoid concerns that were broadly overlooked by clinicians and untreated, despite regular contact with services. The young people's accounts reflected a journey from the emergence of paranoia to the experience, and then, to adjusting to paranoia in daily life. Paranoia onset was rooted in the discovery of interpersonal threat and personal vulnerability, shaped by challenging peer interactions, becoming aware of danger in the world, and personal adverse experience. The paranoia experience included a struggle to trust friends, a state of threat anticipation, intense fear, and defensive strategies to keep safe. The patients described how the paranoia experience was confusing, negatively impacted self-concept, held them back from normal teenage life, and caused a disconnection from friends. Longer term responses to paranoia reflected a tension

between reluctantly resigning to the experience and trying to resist the impact. Decisions about how adolescents respond to paranoia will determine the next stage of their journey.

Conclusions

There is a continuum of paranoia in the adolescent general population. Occasional suspicions are common at this age - more frequent paranoid thoughts, however, may indicate greater psychopathology. In patients attending CAMHS, paranoia is highly prevalent across a range of clinical presentations. It is likely to occur in the context of emotional problems, self-harm, adverse interpersonal experiences, and social impairment. Yet it may often be overlooked in services. Consistent with cognitive models of persecutory delusions, paranoia in adolescents is likely to build upon feelings of vulnerability and is closely linked to anxiety-processes concerned with anticipating danger. At this age, paranoia may involve navigating multiple tensions, with adolescents balancing independence with vulnerability, trust with mistrust, and the desire to socialise with a fear of danger and deception. Although the effects are potentially wide-reaching, there is a clear social impact of paranoia on adolescent peer relationships. Paranoia can be an understandable response to a changing and often-threatening social world in adolescence, but it is not inevitable nor without negative consequence. Greater awareness of paranoia in adolescents attending CAMHS is needed. Once identified, targeted interventions for paranoia, suitably adapted for this age group, would be the next step to help young people feel safer in their daily lives.

Contents

Chapter One

Paranoia in adolescents: An introduction

Paranoia - the unfounded idea that others intend harm - has long been recognised to emerge in adolescence. In a prominent child psychiatry textbook published in 1898, Scottish psychiatrist William Ireland described this evolution of paranoia in young people who later develop psychotic disorders: "Fears of ridicule and suspicions of unfairness and persecution, choke the healthy feelings of youth, and as the individual grows older, pass into full-blown delusions, constituting a form of lunacy to which the name 'Paranoia' is given" (Ireland, 1898). Historical clinical observations also highlight paranoia as a potentially recurrent presentation in young people seeking care. Throughout the 1800s, it was estimated that twenty percent of all children admitted to the Bethlem Royal Hospital in London had paranoid beliefs (Wilkins, 1993), and, in 1867, leading psychiatrist Henry Maudsley described the occurrence of paranoia in adolescents with affective disorders: "With deep depression there may be associated, in older children, a distinct delusion of some kind…[A boy] was when age twelve, afflicted with positive melancholia and delusions of suspicion. He was extremely depressed, and his manner indicated the greatest fear" (Maudsley, 1867).

Although typically considered a symptom of emerging psychosis, the clinical reality is that paranoia is likely to occur across a range of mental health problems in young people. This reality was observed in one of the first papers to examine adolescent paranoia specifically: "Any clinician who has worked with emotionally disturbed children has at some time encountered patients whose overt behaviour is characterized by intense anxiety, suspiciousness… Only a very few of these children continue this line of development to the point where they actually crystallize a clinically discernible paranoid condition replete with persecutory and/or grandiose delusions" (Arthur and Schumann, 1970). To date, however, very little is known about the clinical presentation of paranoia in youth.

This thesis describes a systematic programme of research - likely to be the first on the topic - examining paranoia in adolescence, particularly in clinical services. To inform this work, this chapter will provide an overview of current knowledge about paranoia from the adult literature, including different conceptualisations and explanatory theories. The rationale for a focus on paranoia in adolescence will then be set out and key research priorities will be identified.

1.1. What is paranoia?

First used in ancient Greece as a word to describe being 'out of one's mind' (Lewis, 1970), paranoia is now a widely used term with varying meanings. In this thesis, paranoia is defined as the unfounded idea that other people intend to cause harm (Freeman and Garety, 2000). The type of harm may include any action that one finds distressing, for example social harm (e.g. spreading rumours about me), psychological harm (e.g. trying to upset/control me), financial harm (e.g. trying to steal my possessions), and physical harm (e.g. planning to attack me). Although the content may vary, Freeman and Garety (2000) set out three core features to define persecutory ideation. First, the thoughts of harm are unfounded, that is, they do not reflect an actual current threat from others. Second, the harm is anticipated to occur either currently or in the future, as opposed to threats that only exist in the past. Finally, the threat is targeted at oneself, with others having a deliberate intention to cause harm.

1.1.1 Categorical vs dimensional models

In psychiatry, paranoid ideas have often been situated as a core symptom of psychotic disorders such as schizophrenia or delusional disorder. Almost half of patients with a diagnosis of non-affective psychotic disorders report clinical levels of paranoia (Freeman, Loe, et al., 2019), and severe paranoid ideas held with high conviction - persecutory delusions - are one of the most common clinical presentations (Coid et al., 2013). The traditional view, based on a categorical disease model, is that paranoia is a passive indicator of the underlying psychotic disorder. Challenging this perspective, however, is evidence that paranoia is far from specific to psychotic disorders. For example, non-delusional paranoia is highly prevalent in patients diagnosed with borderline personality disorder (D'Agostino et al., 2019), and, using data pooled across several studies, Freeman, Loe, et al. (2019) recently showed that over a quarter of adults with non-psychotic mental health disorders reported clinical levels of paranoia. Excessive suspiciousness is also one of the most common side effects of substance use and can emerge in some individuals after brain injury (Koponen et al., 2002). Epidemiological studies further suggest paranoia is relatively common in the general population (Freeman et al., 2005).

Rather than a discrete symptom of psychosis, a dimensional perspective suggests that paranoia is a trait existing on a continuous spectrum of severity in the population (Bebbington et al., 2013). From this view, both mild and severe paranoia occur on the same dimension, differing

not by kind but by *degree*. At the lower end, many people may experience mild suspicions that are fleeting and easy to ignore. A smaller proportion of individuals progress higher up the spectrum, with suspicions becoming more frequent, concerned with more unlikely possibilities of harm, and causing increasing distress and impairment. At the extreme end are persecutory delusions, where severe ideas of threat are held with a delusional level of conviction. In support of this dimensional conceptualisation, Bebbington et al. (2013) showed that paranoia in the general population follows a single, continuous distribution that closely fits an exponential curve (R^2 = 0.99; Figure 1). Consistent etiological influences are also shown across the spectrum of severity, with no distinction in heritability between mild and severe paranoia (Zavos et al., 2014).

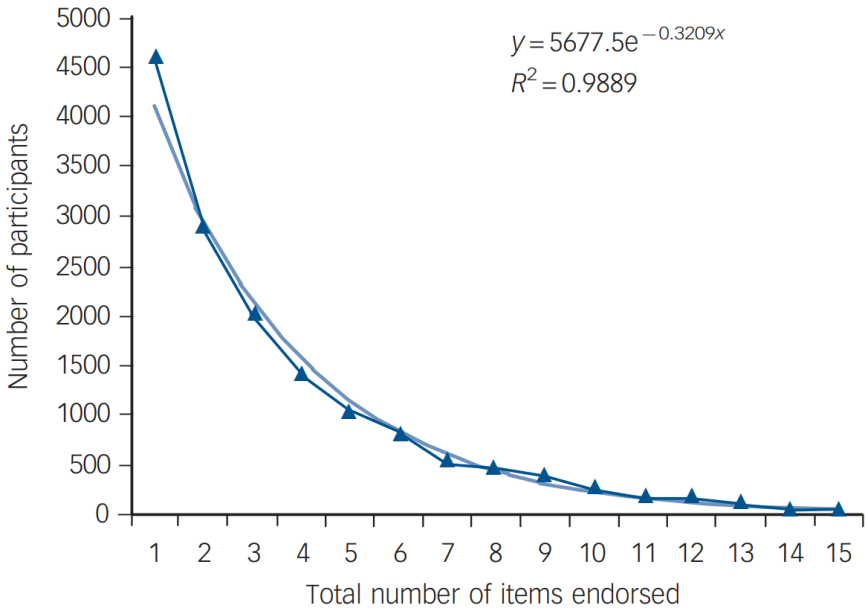

Figure 1. Continuous distribution of paranoia in the general population (Bebbington et al., 2013)

Alongside this continuous distribution, paranoid thoughts of differing severity may be hierarchically arranged, with more severe and consequently rarer ideas occurring alongside more common suspicions (Freeman et al., 2005). This suggests that severe ideas of threat may build upon normal interpersonal concerns, with frequently endorsed worries of social rejection and vulnerability forming the base of a paranoia hierarchy (Figure 2). Ideas of reference that people are watching or talking about the person are thought to build upon these social concerns, from which thoughts of intended harm can subsequently emerge. Ideas of increasingly exaggerated levels of threat become progressively more uncommon, with rarer ideas of severe persecution sitting at the top of the hierarchy.

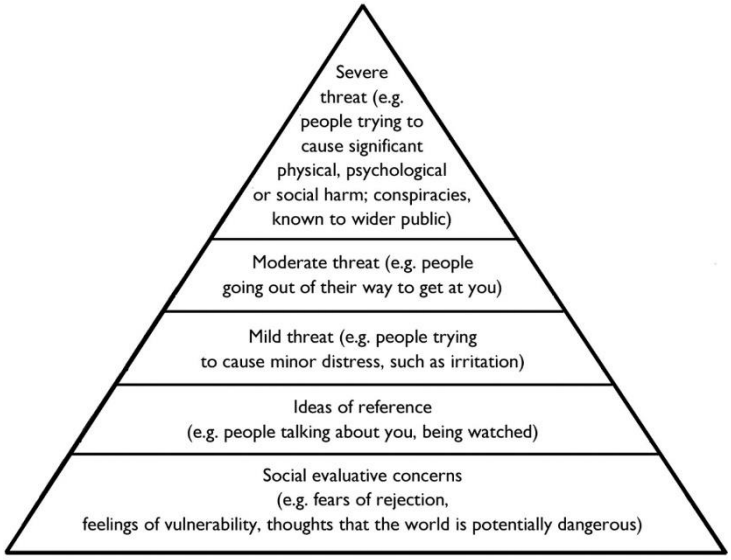

Figure 2. The paranoia hierarchy (Freeman et al., 2005)

1.1.2. Explaining symptom co-variation: A network perspective

The dimensional conceptualisation challenges the notion that paranoia is simply a symptom of an underlying psychotic disorder; however, it remains that paranoia and other psychotic symptoms such as hallucinations, grandiosity, and cognitive disorganisation do typically co-occur. From a categorical disease model, this covariation is interpreted as reflecting an underlying common cause, with each symptom seen as interchangeable markers of the psychotic disorder. However, evidence now suggests that individual psychotic experiences such as paranoia, hallucinations, grandiosity, and cognitive disorganisation are separable phenomenon (found to be distinct in factor analytic studies) (Peralta and Cuesta, 1999; Zavos et al., 2014), that can occur independently of each other (Hermans et al., 2020), and that have a degree of aetiological difference (Garety et al., 2013; Wickham et al., 2014; Zavos et al., 2014). These findings have face validity, as the experience of thinking people intend to harm you is quite different from believing you have special powers or hearing voices that others do not. Psychotic experiences are therefore said to require a degree of difference in explanation and tailoring in treatment. But if psychotic experiences are distinct, why do they so often co-occur?

An alternative perspective from network theory is that psychotic symptoms co-vary because of direct causal interactions *between* them. Rather than passive indicators of the disorder, network approaches position symptoms as active causal agents that interact with each other in meaningful ways. Mental disorders are then understood to reflect a network of interacting

problems, with the symptoms and their causal dynamics constituting the disorder (Borsboom and Cramer, 2013). In a network, each symptom is represented as a "node", with pairs of nodes connected by an "edge". These edges represent direct causal relationships between different symptoms, signalling that activation of one symptom may lead to a cascade of changes in others. These connections play a key role in problem onset and maintenance, with the activation of a strongly connected network resulting in powerful feedback loops that sustain symptoms long after an initial trigger has subsided (Borsboom, 2017) (Figure 3). The causal implication is that interventions targeting key interactions will break these maintenance loops and thus alleviate connecting symptoms in the wider network.

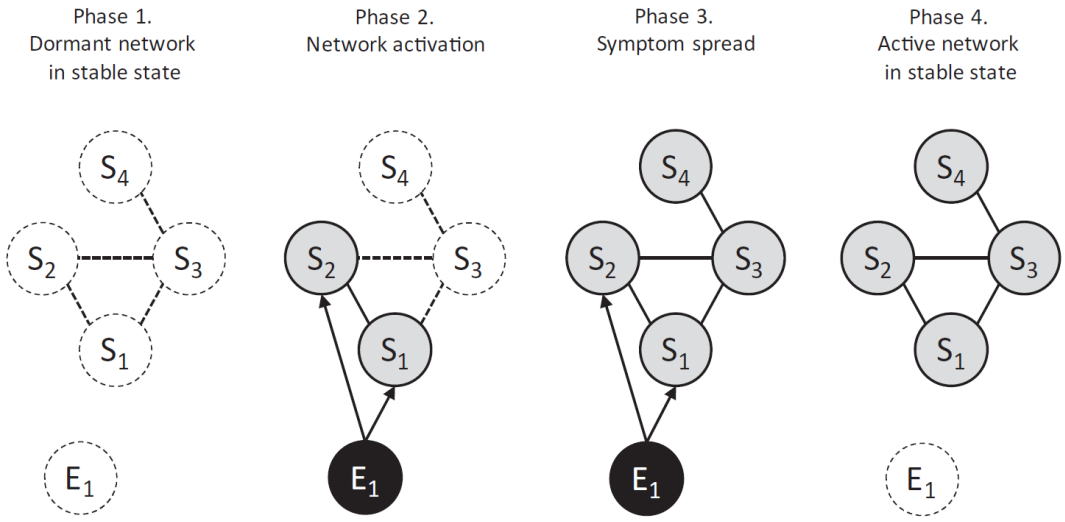

Figure 3. Phases in the development of mental disorders according to network theory, from Borsboom, 2017). Following a dormant state of interaction (Phase 1), events in the external field (E) activate symptoms (S) (Phase 2) that, in turn, activate a cascade of changes in other symptoms (Phase 3) that interact to form self-sustaining feedback loops (Phase 4).

Although strong interactions will likely exist between symptoms associated with the same disorder, intrinsic to a network perspective is that interactions will not stop at arbitrary diagnostic lines. Causal interactions may occur with problems characteristic of other disorders *and* clinically relevant factors not traditionally seen as 'symptoms', such as psychological processes, functional impairments, and patterns of behaviour. These wider networks of interaction may vary for individual psychotic symptoms due to differences in content that drive the mechanistic route from one symptom to another. For example, social relationships could be especially affected by paranoia due to the inherent mistrust of others contained in the thinking. A targeted approach to understand the causal drivers and consequences of specific symptoms such as paranoia is therefore required.

1.2. Why do people experience paranoia?

Paranoia is most likely best conceptualised as a dimensional trait that presents clinically across a range of disorders and interacts with other problems in meaningful ways. Understanding why people experience paranoia to differing degrees, however, is crucial for developing effective interventions.

1.2.1. Evolutionary perspectives

Judgements about the intentions of others are inherently uncertain, and in a world where interpersonal threats do exist, trusting the wrong people can have serious consequences. Mistrust could therefore be adaptive at times, and from an evolutionary perspective may have evolved as a mechanism to quickly detect and avoid uncertain social threat (Green and Phillips, 2004). Within this framework, paranoid interpretations could be explained by the 'smoke detector principle' (Haselton and Nettle, 2006; Nesse, 2001): in uncertain situations, it is favourable to err on the side of caution by expecting harm even if this is unlikely. In other words, it is better to be safe than sorry. Yet the balance of risk for inaccurate judgements about people is not always clear (Raihani and Bell, 2019). Suspiciousness of strangers when alone at night may have few downsides compared to the potential harm but mistrusting friends can corrode relationships and lead to social isolation. Judgements of trust therefore involve a complex evaluation of interpersonal risk within a particular social context.

Beyond the detection of individual threat, paranoid thoughts also commonly focus on threats from groups of people, and particularly in severe cases, can involve conspiracy ideas that others are plotting against you. To explain this tendency towards conspiratorial thinking and the influence of social context, Raihani and Bell (2019) suggest that a core adaptive function of paranoia may be the detection of *coalitional threat*. The formation of competing social groups, or coalitions, is an intrinsic part of human behaviour, and the risk of persecution from such groups is evident throughout history. Often targeting those viewed as outsiders or belonging to a less powerful social group, this persecution ranges from direct physical aggression (e.g. hate crimes, terrorism, and genocide) to forms of social oppression (e.g. discrimination, gossip, and public degradation).

To defend against these threats, humans are thought to have evolved a propensity to assimilate within protective social alliances and categorise others into groups to predict their behaviour.

Raihani and Bell (2019) conceptualise paranoia as an extension of this propensity, emerging from an evolved tendency to be suspicious in situations where the chance of coalitional threat is high. The coalitional perspective also suggests the significance of potential social threat - and, thus, the need to take defensive action - is swayed by the perceived *consequences* of threat for an individual in their social context (Raihani and Bell, 2019). These consequences may be heightened, for example, for individuals of a lower social rank who lack supportive alliances from others to protect them. In other words, the more vulnerable an individual is the more important it is for them to be cautious and on edge.

1.2.2. Cognitive perspectives

The capacity for paranoia may build upon adaptive mechanisms for staying safe in a complex social world; being overly suspicious, however, is corrosive for one's relationships, mental health, and general wellbeing (Freeman, Startup, et al., 2014; Pinkham et al., 2016). The mechanisms shifting individuals along the paranoia spectrum are likely complex and multifaceted; no single factor will fully explain why some are more mistrustful than others. Several potentially important factors, however, are highlighted by cognitive theories of persecutory delusions.

1.2.2.1. Paranoia as a defence model

The defence model suggests persecutory delusions arise from a tendency to blame others for negative events (i.e. external attribution bias) to deflect awareness of one's own flaws and preserve self-esteem (Bentall et al., 1994). This strategy, however, was said to then maintain paranoia by provoking negative thoughts about others and creating vigilance towards interpersonal threat. A subsequent version of this model described a cyclical relationship between external attributions and self-representations where the attribution bias only partially protects against negative self-attributions, triggering low implicit self-esteem which further provokes external attributions (Bentall et al., 2001). A key prediction of this model is that people with persecutory delusions will have fluctuating self-esteem and a discrepancy between low implicit self-esteem and high explicit self-esteem. A recent meta-analysis, however, found that although paranoia is associated with an external attribution bias and self-esteem instability, people with persecutory delusions do not display high explicit self-esteem (Murphy et al., 2018). The notion of paranoia as a defence has also been criticised as evidence of an external attribution bias does not indicate its function (Freeman et al., 2002).

1.2.2.2. 'Poor me' vs 'bad me' paranoia

Building on the defence model, Trower and Chadwick (1995) proposed two types of paranoia: *'poor me'* and *'bad me'* paranoia. 'Poor me' paranoia involves a feeling of being unfairly victimised that emerges from an insecure sense of self and defends against negative emotions. On the other hand, 'bad me' paranoia involves a feeling that persecution is deserved, emerging as a direct manifestation of negative views of the self as bad and inferior. However, although rarely directly tested, this theory has not been well supported by general evidence over time. As discussed in section 1.1.1, epidemiological studies show paranoia exists on a single dimension in the general population (Bebbington et al., 2013). Judgements about the deservedness of harm also fluctuate within individuals (Melo et al., 2006) and, in general, 'bad me' paranoia is rare in patients with persecutory delusions (Fornells-Ambrojo and Garety, 2005). Rather than two distinct types with separate causes, this theory may be argued to reflect one component of paranoid thought content, that is, attributions of whether harm is deserved (Freeman, 2016).

1.2.2.3. The threat anticipation model

Instead of having a defensive function, the idea underlying the threat anticipation model is that persecutory delusions directly reflect an individual's emotional state (Freeman et al., 2002). This multi-factorial model provides a framework for understanding how persecutory delusions emerge and identifies several mechanisms that maintain paranoia over time. The theoretical model is supported by extensive evidence, including causal-interventionist tests where each mechanism is targeted experimentally to show the effect on paranoia (verified with mediation tests) (Freeman, 2016). Based on this empirical grounding, the threat anticipation model is the primary cognitive model of paranoia that will guide this thesis.

At the centre of the model is a conceptualisation of persecutory delusions as 'unfounded threat beliefs' that others will cause harm (Freeman, 2016). From this view, persecutory delusions activate the same adaptive, fear-based threat system involved in all forms of anxiety; the only difference is the type of threat one fears. When an individual feels under threat, anxiety-related cognitive processes concerned with anticipating danger, such as attentional hypervigilance, worry, and threatening imagery, are engaged (Freeman, 2016). These processes lead to a preoccupation with danger and reinforce the feeling that threat is imminent. As with all anxiety disorders (Grupe and Nitschke, 2013), excessive activation of these anticipatory mechanisms is a central feature of paranoid thinking (Freeman, 2016). Consequently, individuals with paranoia

become hypersensitive to potential social threat and tend to overestimate the likelihood that harm will occur (Barnby et al., 2020; Jack and Egan, 2016). This threat sensitivity is supported by neurobiological evidence that the amygdala is highly reactive in those with paranoia (DeCross et al., 2020; Pinkham et al., 2015).

Persecutory threat beliefs are proposed to develop in a context of biopsychosocial vulnerability (Freeman, 2016; Freeman et al., 2002), in line with evidence for an equal contribution of genetic and environmental risk (Zavos et al., 2014). The specific genes underpinning paranoia remain elusive, but there is a considerable literature showing paranoia is associated with specific environmental triggers, such as stressful events, substance use, and sleep disturbance (Freeman et al., 2011; Johns et al., 2004; Reeve et al., 2015). There is particularly clear evidence that paranoia often arises from social adversity. This adversity begins early in life, with evidence that paranoia is associated with childhood experiences of parental neglect (Sitko et al., 2014; Wickham and Bentall, 2016), emotional abuse (Hardy et al., 2016), physical abuse, and being raised in institutional care (Bentall et al., 2012). Paranoia is then associated with a range of social adversities in adulthood including social and economic deprivation (Wickham et al., 2014), poor social support (Freeman et al., 2011), ethnic discrimination (Shaikh et al., 2016), bullying (Moffa et al., 2017), and physical assault (Freeman et al., 2013).

Although several routes from adversity to paranoia are likely, one key proposal is that negative experiences lead to learned beliefs about others (i.e. as threatening), the world (i.e. as hostile), and the self (i.e. as vulnerable) upon which paranoia flourishes (Freeman, 2016). From an evolutionary view this is adaptive, as humans are hard-wired to use past experiences to anticipate future threats (Grupe and Nitschke, 2013). These negative beliefs may also be influenced by insecure attachment styles - developed through negative carer experiences - that cloud one's expectations of others with worry, mistrust, and fears of abandonment (Bentall and Fernyhough, 2008). In support of this, empirical studies report a consistent moderate association between paranoia and insecure attachment styles (Murphy et al., 2020), whilst epidemiological evidence has shown the relationship between paranoia and childhood neglect is fully mediated by insecure attachment (Sitko et al., 2014).

Alongside learned negative beliefs, persecutory delusions are theorised to initially develop through an interaction of affective, cognitive, and perceptual factors (Freeman et al., 2002). Once developed, however, six key factors are proposed to maintain the persecutory beliefs:

worry, negative self-beliefs, anomalous experiences, reasoning biases, sleep dysfunction, and safety-seeking behaviours (Figure 4). This list was not intended to be exhaustive but focused on factors that were common, amenable to treatment, and that patients often want help with (Freeman, Taylor, et al., 2019). None of these factors are thought to be necessary for the persistence of paranoia in the model and it is recognised that their relevance will vary across individuals. Instead, each factor is viewed as a potentially important component that, if present, may increase the probability that paranoia emerges and/or persists (Freeman, 2016).

Figure 4. The maintenance of persecutory delusions (Freeman, 2016)

Worry

Worry (i.e. repeatedly thinking about the worst happening) maintains paranoia by bringing unlikely scenarios of danger to mind, exacerbating them, and increasing distress (Freeman, 2016). In support of this claim, worry is highly prevalent in patients with psychosis with high paranoia (Freeman, Taylor, et al., 2019; Startup et al., 2007) and has been shown to predict the persistence of (non-clinical and clinical) paranoia over time (Freeman et al., 2012; Vorontsova et al., 2013). Providing strong causal evidence, a randomised controlled trial (RCT) of a worry intervention in 150 patients with persecutory delusions produced significant reductions in paranoia that were mediated by changes in worry (Freeman, Dunn, Startup, et al., 2015). Similar to other emotional disorders, worry in patients with persecutory delusions is fuelled by factors

such as a perseverative thinking style, intolerance of uncertainty, beliefs about worry being uncontrollable, and a need to control thoughts (Startup et al., 2016).

Negative self-beliefs

Paranoia thrives from the feelings of vulnerability that negative self-beliefs provoke (Freeman, 2016). There is a consistent relationship between paranoia and low self-esteem in the general population (Kesting and Lincoln, 2013; Tiernan et al., 2014), and individuals with persecutory delusions frequently endorse negative self-schemas (Collett et al., 2016). Negative ideas of the 'social self' are particularly central in paranoia - that is, viewing yourself as inferior to others and believing others view you harshly. In support of this, paranoia is more strongly correlated with ideas of social rejection than global self-worth (Lincoln et al., 2010) and is closely associated with interpersonal sensitivity (Meisel et al., 2018), a trait involving "feeling vulnerable around others due to the expectation of criticism or rejection" (Bell and Freeman, 2014). Paranoia is also associated with perceived low social rank (Gilbert et al., 2005), a relationship that is mediated by critical self-comparisons (Freeman, Evans, et al., 2014). This sense of inferiority may have been learned from negative experiences in life that create feelings of defeat and submission (Valmaggia et al., 2015), fuelling a view of oneself as separate, powerless, and, thus, more vulnerable (Freeman, 2016).

Anomalous experiences

Paranoid ideas may also arise as explanations for anomalous sensations and perceptions, including unexplained arousal, dissociative experiences, aberrant salience, and hallucinations. Alongside directly contributing to the formation of a persecutory belief, ongoing anomalous experiences maintain feelings of threat via the fearful interpretations they elicit (Freeman et al., 2002). From a Bayesian perspective, these experiences reflect 'error signals' that clash with prior expectations about the world, and, so, create an unsettling uncertainty about one's surroundings (Diaconescu et al., 2019). The arrival at a paranoid interpretation may be driven in part by this uncertainty, as ambiguity in the environment means one is unprepared for potential danger. However, Freeman et al. (2002) suggest negative affective processes make paranoid explanations of anomalous perceptions especially likely. In support of a causal role, experimental studies in the general population show anomalous experiences uniquely predict paranoid reactions but not social anxiety in virtual reality (VR) (Freeman, Gittins, et al., 2008), and, together with negative

affect, fully account for increases in paranoia following cannabis intake (Freeman, Dunn, Murray, et al., 2015).

Reasoning biases

Paranoid interpretations of ambiguous situations are thought to be influenced by reasoning biases associated with delusions (Garety, 1991). The central reasoning style in delusions is summarised by Ward and Garety (2019) as involving a strong tendency for 'fast thinking' (i.e. instinctive, emotionally driven reasoning) with a limited or ineffective engagement of 'slow thinking' (i.e. reflective and analytic thinking involving higher-order cognitive processes). Fast thinking manifests as a 'jumping to conclusions' (JTC) data-gathering bias where threatening interpretations are rapidly made with limited evidence. The reduced use of slow thinking then primarily occurs through a lack of 'belief flexibility', the meta-cognitive ability to reflect on paranoid beliefs, revise them in line with alternative evidence, and generate alternative possibilities (Garety et al., 2005). Experimental evidence shows belief inflexibility and JTC biases are associated with paranoid reactions in VR; interventions targeting these biases also lead to reductions in paranoia (Garety et al., 2015; Waller et al., 2015). These reasoning biases, however, do not drive the content of paranoia; instead, they reflect a liability for delusions (Dudley et al., 2016; McLean et al., 2017) that increase the likelihood of paranoid ideas being held with high conviction (Freeman, Pugh, et al., 2008).

Sleep disturbance

Another factor contributing to the maintenance of paranoia may be sleep disturbance. The theorised causal route is primarily indirect, with sleep disturbance worsening other problems known to influence paranoia. This includes increased negative affect, worry, and anomalous perceptions, and a reduced ability to consider alternative possibilities (Freeman, 2016). Clinical levels of insomnia are reported by approximately half of patients with persecutory delusions (Freeman et al., 2009). Findings from the general population show insomnia and paranoia are strongly associated (Freeman, Brugha, et al., 2010), and that insomnia predicts the onset and persistence of paranoia after 18 months (Freeman et al., 2012). Furthermore, an RCT in almost 4,000 university students found an insomnia intervention led to reductions in paranoia that were largely mediated by changes in insomnia (Freeman et al., 2017). Experimental evidence has also shown that restricting sleep leads to significant increases in paranoia that are almost entirely mediated by increases in negative affect (Reeve et al., 2018).

Safety-seeking behaviours

When danger is anticipated, individuals carry out 'safety-seeking behaviours', that is, actions aimed at preventing harm from occurring and protecting themselves (Salkovskis, 1991). For paranoid concerns, safety-seeking behaviours are often referred to as 'defences' and may include avoiding certain people and places where harm may occur, escaping situations of perceived threat, seeking protection from others, keeping a low profile, or being ready to act if attacked (Freeman et al., 2007). When fears of harm are unfounded, these defensive strategies prevent individuals from accessing disconfirmatory evidence, and, so, maintain the paranoid belief (Freeman, 2016). In support of this mechanism, evidence shows safety-seeking behaviours are highly common in patients with persecutory delusions (Freeman et al., 2007), and interventions encouraging patients to drop their defences in social situations lead to significant reductions in paranoia (Freeman et al., 2016; Pot-Kolder et al., 2018).

1.3. Paranoia in adolescence

The past 20 years has seen significant advances in the theoretical and empirical understanding of paranoia in adults. So far, however, there has been limited consideration of paranoia in adolescence. Starting at the onset of puberty, adolescence is a formative period of neurobiological and socio-developmental change that ends, by definition, with the achievement of autonomous adult roles (Sawyer et al., 2018). This transition from childhood to adulthood is a vulnerable period for the onset of mental health problems and psychotic experiences more broadly (Kessler et al., 2007; McGrath et al., 2016). Notably, global epidemiological estimates suggest three quarters of anxiety/fear related disorders start before the age of 25, with over half starting before the age of 18 (Solmi et al. 2021). Paranoia, as a threat belief rooted in feelings of fear, is therefore also likely to commonly emerge in adolescence. Persistent feelings that others will cause harm may leave adolescents feeling unsafe in social situations, mistrustful in relationships, and isolated. This social impact may be especially corrosive during adolescence, a sensitive age for social interaction when the negative effects of isolation may be amplified (Orben et al., 2020). When paranoia occurs alongside mental health disorders, it is plausible that the disruption to adolescent relationships may worsen outcomes (Ford et al., 2017).

1.3.1. Prevalence in the general population

Similar to the adult literature, a number of studies suggest paranoia may be relatively common in the adolescent general population. However, it is difficult to obtain clear prevalence estimates due to substantial variation in how the categorical presence of paranoia has been determined (Table 1). All available estimates fundamentally reflect endorsement rates of individual paranoia items, but there are wide disparities in item content (both between and within measures), the time frame of responses, and the threshold at which endorsement is defined. The extent of this variation is reflected in the reported prevalence rates that range from 1-99%.

Table 1. Studies reporting the prevalence of paranoia in children and adolescents from the general population

Study	*N*	Age	Measure	Prevalence criteria	%
Armando (2010)	848	15.0 (1.5)	CAPE	At least 1 item sometimes +	92
				At least 1 item nearly always	5
Galbraith (2014)	392		CAPE	At least 1 item sometimes +	99
Wigman (2011)	5,422	14.0 (1.3)	CAPE	At least 1 item sometimes +	90
				At least 1 item often +	26
	2230	11.1 (0.6)	CAPE	At least 1 item sometimes +	90
				At least 1 item often +	26
Yung (2009)	857		CAPE	At least 1 item sometimes +	92
				At least 1 item nearly always	6
Wong (2014)	1086	11.3 (1.6)	SMS	Item endorsement of "yes"	3-18
	1412	11.5 (1.7)	SMS	Item endorsement of "yes"	4-10
Zhou (2018)			SMS	Item endorsement of "yes"	1-10
Ronald (2014)	4,743		SPEQ	Item endorsement at least weekly	1-23
Brown (2020)	9,244	15.2 (1.5)	Single item	Endorse as true: "People often make fun of me behind my back?"	18
Dolphin (2015)	5910	15.0 (1.6)	Single item	Endorse as yes, definitely: "Have you ever thought that people are following or spying on you?"	13

Note: SPEQ = Specific Psychotic Experiences Questionnaire; CAPE = Community Assessment of Psychic Experiences; SMS = Social Mistrust Scale

The most frequently used measure in studies reporting prevalence rates in adolescence is a paranoia scale from the Community Assessment of Psychic Experiences (CAPE) (Konings et al., 2006). Across five studies, this measure produced lifetime prevalence estimates exceeding 90% from a low threshold of rating *any* of the five paranoia items at least sometimes (i.e. 1+ on a scale of 0-4, where 0 = never, 1 = sometimes, 3 = often, and 4 = nearly always). These

estimates reduce to a very large degree with stricter thresholds, lowering to 26% for a rating of 2+ and 5-6% for 3+ (Table 1). Although reported in each study as overall prevalence rates, these estimates just represent the one item that is most commonly endorsed. Only two studies using the CAPE provide individual item endorsement rates (Armando et al., 2010; Yung et al., 2009); in these studies, the reported prevalence of 92% was from feeling that "people are not what they seem to be" (Table 2). Consequently, these prevalence rates are based on an item that does not reflect true paranoid ideation.

Table 2. Individual item endorsement rates for the CAPE paranoia scale

CAPE Item	**Armando (2010)** *n* = 848		**Yung (2009)** *n* = 857	
Items start with: "Have you ever felt…"	1+	3+	1+	3+
1. As if people seem to drop hints about you or say things with a double meaning?	80.0	3.3	71.4	1.9
2. That people look at you oddly because of your appearance?	60.9	4.2	65.7	5.0
3. As if some people are not what they seem to be?	92.3	5.0	91.5	5.7
4. As if there is a conspiracy against you?	35.6	2.0	42.1	3.1
5. That you are being persecuted in some way?	42.3	0.9	53.4	1.7
6. As if things in magazines or on TV were written especially for you?	/	/	40.0	1.3
7. As if a double has taken the place of a family member, friend, or acquaintance?	/	/	25.3	1.0

Note: 5-item and 7-item CAPE paranoia scale used by Armando et al. (2010) and Yung et al. (2009), respectively.

Differences in item prevalence can also be seen with the Specific Psychotic Experiences Questionnaire (SPEQ) paranoia scale used in the Longitudinal Experiences and Perceptions (LEAP) study – an investigation of psychotic experiences in 4,743 16-year-old twin pairs (Ronald et al., 2014). Weekly endorsement for the 15 paranoia items ranged from 1-23% in this sample, although individual rates were only reported for two of these items - 15% for "I need to be on my guard against others" and 1.9% for "I am under threat from others." The variation in these two estimates would be expected due to the differing severity levels that each paranoid thought represents (Freeman et al., 2005). Together, the available studies highlight the importance of examining both the content of paranoia items and the endorsement thresholds when reporting and synthesising prevalence rates.

A notable finding across several general population studies is that adolescent girls often report higher paranoia than boys. This difference was found in the LEAP study (Ronald et al., 2014)

and in 5 of 7 studies that assessed CAPE paranoia scores in relation to gender (Armando et al., 2010; Eilbracht et al., 2015; Galbraith et al., 2014; Jack and Egan, 2018; Wigman et al., 2011). The relationship between paranoia and age within young people is mixed - two studies report older adolescents had higher paranoia than younger adolescents (Eilbracht et al., 2015; Wigman et al., 2011), one reported younger children had higher suspiciousness than older children (Wong et al., 2014), and three reported no relationship (Armando et al., 2010; Galbraith et al., 2014; Zhou et al., 2018).

1.3.2. Prevalence in adolescents with mental health problems

Very little is known about the occurrence of paranoia in young people attending child and adolescent mental health services (CAMHS). Only two clinical studies report prevalence rates for paranoia (alongside other psychotic experiences) and both are limited in measurement. In a study of 150 adolescents with non-psychotic mental health problems, Yung et al. (2006) reported a prevalence rate of 98% using the low endorsement threshold (any paranoia item at least sometimes) on the CAPE. The second study found that, out of 108 adolescents referred to CAMHS, 36% reported clinically verified beliefs of "being followed or spied upon" using the K-SADS (Kelleher et al., 2014). This estimate, however, only reflects ideas of reference so the prevalence of persecutory ideas in CAMHS is unclear. Beyond these prevalence estimates, there is some evidence that paranoia in adolescent patients is associated with other psychiatric problems including social anxiety (Pisano et al., 2016), depression (Catone et al., 2020; Yung et al., 2006), borderline personality disorder (Thompson et al., 2019), and suicidality (Lindgren et al., 2017; Thompson et al., 2020).

Although clinical studies are limited, it is likely that paranoia is prevalent in CAMHS due to evidence from the adolescent general population showing associations between paranoia and higher psychopathology. This includes severer anxiety and depression (Armando et al., 2010; Galbraith et al., 2014; Yung et al., 2009; Zavos et al., 2014), self-harm (Zhang et al., 2016), conduct problems (Havers et al., 2019; Wigman et al., 2011; Wong et al., 2014), and other psychotic experiences (Campbell and Morrison, 2007; Zavos et al., 2014). Several studies also report a strong relationship between paranoia and peer difficulties (Ronald et al., 2014). These relationships may persist over time, with evidence from the LEAP study showing persistent paranoia is associated with greater emotional, behavioural, and peer relationship problems (Havers et al., 2019).

More research is needed to examine the extent to which paranoia occurs in patients attending child and adolescent mental health services (CAMHS). Once identified, however, clinical approaches to paranoia may need to be tailored specifically for young people to acknowledge the unique life-stage issues, clinical needs, and behaviours associated with adolescence (McGorry, 2007), and the potential differences in how paranoia presents at this age.

1.3.3. The dynamics of emerging mental health problems

There is a growing recognition that adolescent mental health problems require a different conceptual framework to the traditional categorical model used in adult psychiatry. The categorical model emphasises the identification of fully formed mental disorders, defined by a polythetic group of symptoms and diagnostic 'thresholds' (Parnas, 2015). However, this conceptualisation of mental health disorders is rooted in the static presentation of adults in secondary care for whom problems are often longstanding and well-established. In adolescence, emerging difficulties are typically characterised by a heterogeneous mix of symptoms that interact and fluctuate along unpredictable paths over time (McGorry and Nelson, 2016). These symptoms often do not meet traditional diagnostic thresholds in terms of form or intensity, but they are still associated with high distress, impairment, and, thus, a need for care (Shah et al., 2020).

The heterogeneity and fluidity of emerging psychopathology underpin the need to 1) adopt a dimensional approach to paranoia in adolescence; 2) consider the potentially complex interactions with other evolving problems; and 3) differentiate early presentations of paranoia from those developed over many years. Paranoia in adolescence may require a degree of difference in explanation and treatment compared to persecutory delusions in adults, which arguably represent a much later stage of symptom progression.

1.3.4. Sensitive period of social development

Especially pertinent to understanding paranoia in adolescence are developmental changes in how adolescents interact with their social environment. Adolescence is said to be a sensitive period of social development as, during this time, there is a maturation of the 'social brain' (i.e. regions that process social information) and various other aspects of social cognition (i.e. mental processes for understanding other people) become more advanced (Kilford et al., 2016). These cognitive advances include an improved ability to understand complex and subtle social cues

that may have multi-layered meanings, and, importantly, to consider other people's perspectives and intentions (Blakemore and Mills, 2014).

This growing insight into other people's minds helps adolescents to navigate social networks that become increasingly complex as they get older (Blakemore and Mills, 2014). These networks expand through a reorientation where adolescents not only spend more time with their peers than their family (Lam et al., 2014), but peer relationships become more important (Somerville, 2013). With this peer socialisation, adolescents become increasingly self-conscious, sensitive to social comparison, and influenced by peer approval (Albert et al., 2013; van der Aar et al., 2018; Westenberg et al., 2004). Fears of peer rejection also become heightened - adolescents report stronger emotional responses to perceived exclusion than children and adults (Sebastian et al., 2010) and avoiding negative peer evaluation drives a large degree of adolescent behaviour (Blakemore, 2018).

1.3.5. Challenging social context

Paranoia may also be shaped by the often-challenging social world in which young people live. In adolescence, friendships become more intimate than they are in childhood and tend to occur in 'cliques' of several adolescents that socialise together (Crockett et al., 1984; McNelles and Connolly, 2010). These friendships are often turbulent and frequently change (Poulin and Chan, 2010), and also exist in a larger peer group with a clear status hierarchy. The social dynamics of this peer group facilitate an increase in bullying and peer aggression during adolescence, typically as an effective means of establishing and maintaining popularity (Troop-Gordon, 2017). Aggression is primarily overt and physical (i.e. hitting, pushing, throwing objects) in early adolescence, but as adolescents get older aggression is more subtle, strategic, and focused on inflicting social harm. This so called 'relational aggression' dominates the social life of adolescents and includes spreading rumours, humiliation, social exclusion, and intentionally withdrawing friendship (Archer and Coyne, 2005). Adolescents often encourage this aggressive behaviour and are unlikely to defend each other (Troop-Gordon, 2017), with enhancing one's social status often prioritised over existing friends (LaFontana and Cillessen, 2010).

1.3.6. Evidence for causal factors of paranoia in adolescents

A key question is the extent to which putative causal factors highlighted in the cognitive model of persecutory delusions also influence paranoia in young people. The factor that has received

the most attention in previous studies is social adversity. Data from the LEAP study indicate small associations between paranoia and both stressful events and childhood bullying - although these may be explained to a degree by shared genetic influences (Shakoor et al., 2016; Shakoor, McGuire, et al., 2015). There is also recent evidence for a relationship between paranoia in the adolescent general population and negative parental behaviours such as overprotectiveness and verbal/physical abuse (Brown et al., 2020). A small number of studies in adolescent patients with mental health problems further demonstrate associations between paranoia and bullying (Catone et al., 2017; Masillo et al., 2019), violent trauma (Kline et al., 2016), neighbourhood crime (Wilson et al., 2016), and attachment insecurity (Fett et al., 2016; Korver-Nieberg et al., 2013). Beyond social adversity, evidence from the adolescent general population has also found associations between paranoia and cannabis use (Shakoor, Zavos, et al., 2015), sleep problems (Taylor, Gregory, et al., 2015), and negative beliefs about the self and others (Campbell and Morrison, 2007; Galbraith et al., 2014).

Only one clinical study has examined the causal mechanisms of paranoia over time (Bird et al., 2017). In a sample of 34 adolescent patients with mental health problems and elevated paranoia, this study found medium-large associations between paranoia at 3 months and baseline affective symptoms, worry, negative self-beliefs, perceptual anomalies, insomnia, bullying (online and in person), perceived stress, and affective reactivity to social media. After baseline severity was controlled, the factors that continued to predict paranoia persistence with a medium effect size included perceived stress, affective reactivity on social media, insomnia, worry, negative self-beliefs, and bullying. Notably, only 1 patient showed a JTC bias and there was no relationship between paranoia and JTC (Bird et al., 2017). Further examination of potential causal factors of paranoia in the broader context of adolescence is needed.

1.4. Aims of this thesis

Despite long being recognised as a clinical problem emerging in adolescence, paranoia at this age has largely been a neglected area of research. The thesis therefore describes a systematic programme of research, likely to be the first on the topic, examining paranoia in adolescence, particularly in clinical services. The aims were threefold: to examine the assessment, prevalence, and theoretical understanding of paranoia in adolescents.

The first aim of the thesis was thus to establish a precise method for assessing paranoia in adolescents for use in both research and clinical services. To do this, a review was first conducted to evaluate existing assessment tools that have been used to measure paranoia in the adolescent literature, identifying the potential issues affecting precision (Chapter 2). Informed by this work, the objective was then to develop a new dimensional measure of paranoia in adolescents that was valid, reliable, and age-appropriate, with clinical utility for use as an outcome measure in services (Chapter 3). The second aim was then to determine - using the new measure - the extent to which paranoia is a problem in adolescents. But differentiating potentially clinically relevant paranoia from normative levels at this age will require study of its full spectrum of severity, and, so, the objective was to assess the prevalence of paranoia in adolescents from both the general population (Chapter 4) and patients attending CAMHS (Chapter 5).

The third aim was to improve the theoretical understanding of paranoia in adolescence, and, thus, identify potential treatment targets. Putative maintenance factors highlighted in cognitive models of persecutory delusions are likely to be important, but potential differences in the core features, causal drivers, and consequences of newly emerging paranoia may require a tailored approach. Consideration of the interactions between paranoia and other emerging symptoms and social factors pertinent to adolescence will be especially important. The objective was thus to examine - using bivariate and network analytic approaches - the relationships between paranoia and psychiatric symptoms, psychological processes, and social factors in adolescents (Chapters 4 and 5). Network approaches provide a means of statistically estimating complex systems of interaction, providing insights into the mechanisms linking these factors. To enhance the depth of understanding provided by quantitative observations, the final objective was to examine the lived experience of paranoia in adolescent patients with non-psychotic mental health problems (Chapter 6).

Chapter Two

A systematic review of self-report measures used in adolescents to assess paranoia

2.1. Introduction

As described in Chapter 1, there is a clear need for targeted research to improve the clinical recognition and understanding of paranoia in adolescence. The validity of these findings, however, will depend on precise measurement. This requires assessment tools capable of measuring paranoia as intended (i.e. they are valid), accurate in their estimates (i.e. they are reliable), and importantly, suitable for adolescents (i.e. they are age-appropriate). In this chapter, a review will be conducted to identify and evaluate the assessment tools previously used to assess paranoia in young people. There are multiple ways in which paranoia could be assessed, including interview tools, clinician, self, and parent report questionnaires, and experimental methods. To determine the best approach for measuring paranoia in young people - and thus the focus of this review - the advantages and drawbacks of each of these methods is considered.

2.1.1. Assessing paranoia

Interview-based tools are typically considered the gold standard method for assessing psychiatric symptoms. A clear benefit of the interview format is the ability to confirm or deny the presence of paranoid thoughts and clarify misinterpretations - both from the respondent and the interviewer. However, formalised interview tools are often lengthy and resource intensive, typically requiring time and specialist training to both administer and interpret. In clinical practice, these types of assessments are therefore mostly used in specialist centres or for a particular clinical purpose in line with service priorities - for example, to establish diagnostic criteria for an early intervention in psychosis service. Indeed, a limitation of current formal interview assessments of paranoia is they are often designed as diagnostic assessments for psychosis and/or other disorders. Consequently, ratings typically focus on the presence or severity of paranoia as a general symptom, and often defined by characteristics of delusions such as conviction and implausibility (e.g. Kay et al., 1987; Yung et al., 2005). As a result, existing interview-based tools have limited utility for assessing the wider spectrum of paranoia.

A more practical and versatile option for assessing paranoia is using a questionnaire. A substantial advantage of questionnaires is the ease with which they can be administered and scored. Questionnaires are also well-suited to assess a construct dimensionally, with multiple items and response options providing a wide range in which one could score. Multiple informants can be used, including clinicians, parents, or the young person themselves. However, as paranoid thoughts are inherently internal experiences, only the young person will truly know the extent to which they occur. Clinicians and parents could make a general judgement on the presence/severity of paranoid ideas in a young person, but insight into their content, frequency, associated distress, and degree of conviction will depend on what the young person has shared. It is also plausible that mistrust inherent in paranoia could prevent adolescents from openly discussing their suspicions with clinicians and parents. Parent reports may be especially unreliable due to reduced tendency for adolescents to discuss difficulties with their parents at this age. Indeed, evidence shows parents often do not detect the presence of clinically verified psychotic experiences in young people (Kelleher et al., 2011). Consequently, the most accurate questionnaire assessment of paranoia in young people will be via self-report.

Self-report questionnaires capture an individual's perspective on their own experiences, albeit limited by the items and scale of the questionnaire. When used as a screening tool, self-report measures may improve the detection of paranoia in adolescents accessing services. But in counterpoint to clinician and parent measures which risk underreporting paranoia, self-report measures can lead to 'false positives', that is, when items are endorsed despite a lack of paranoia. On an individual basis, this is easy to clarify by asking the person about their answers. However, false positives could inflate estimates when assessing paranoia across a group of individuals where opportunities for clarification are limited. In the assessment of paranoia, an important factor that may lead to false positives is when thoughts of intended harm are justified, and, thus, not paranoid. It is impossible in questionnaires alone to determine if concerns of harm from others are unfounded; a degree of measurement error with genuine victimisation is inevitable. But this problem is not confined to questionnaires - even in clinical interviews it is hard to know whether a person is truly at risk from others, and the extent to which suspicions are exaggerated, particularly those lower down the severity spectrum, is often unclear.

To overcome this problem, experimental tasks have been developed to directly assess the occurrence of paranoid ideation in response to neutral social environments using virtual reality

(VR). Characters in these computer-generated environments are programmed to be neutral, so any thoughts of intended harm are inherently unfounded (Freeman, 2008). Such VR environments therefore provide an accurate assessment of state paranoid ideation. However, VR is not a practical option for routine outcome monitoring and does not provide a detailed insight into the occurrence of paranoia in daily life. Consequently, self-report questionnaires provide the most precise and clinically useful method of assessing paranoia.

2.1.2 Chapter aims

The aim of this chapter was to provide a broad evaluation of the self-report assessment tools that have previously been used to assess paranoia in children and/or adolescents. A systematic review was therefore conducted to identify which measures have been used, evaluate their psychometric properties, and determine the extent to which they provide valid and reliable estimates of paranoia in young people. Key issues affecting precision in the assessment of paranoia will then be discussed.

2.2. Method

The methodology of this review was guided and adapted from the consensus-based standards for the selection of health-based measurement instruments (COSMIN) guideline for systematic reviews of patient-reported questionnaires (Prinsen et al., 2018).

2.2.1. Search strategy

A systematic search was carried out on Pubmed in September 2020 to identify peer reviewed published studies with the following terms in the title or abstract: (paranoi* OR persecut* OR suspicious*) AND (child* OR teenager* OR adolescen* OR "young people" OR youth). Limits were applied to only include studies that were written in English and had been published since the year 2000. This timeframe was selected to mirror advances in adult paranoia research over the past 20 years.

2.2.2. Screening and selection process

The search yielded 1,607 unique results that were screened and assessed for eligibility. Only peer-reviewed studies available in English were included if they met the following criteria:

1. Used a sample (or defined subsample) of young people aged 18 or under. Where the upper age limit of the sample exceeded 18 years, the study was only included if the mean age was below 18 years.
2. Included self-report questionnaire measure of paranoia. No limits were imposed on how paranoia was defined beyond the inclusion of a variable described as measuring paranoid, persecutory, suspicious, or mistrustful cognition.

Studies that met the following criteria were excluded:

1. Included only combined symptom domains (e.g. 'paranoia and hallucinations' or broad 'delusions') without a distinct paranoia variable.
2. Used a paranoia measure in a language other than English.
3. Descriptive case studies and dissertations.

2.2.3. Evaluation of measures

As the objective was to provide a broad evaluation of the measures currently used in the literature, neither the findings nor the quality of individual studies identified in the systematic search were assessed. Instead, the questionnaires used across the identified studies were collated

and the measurement properties of each were evaluated in turn. For this evaluation, the content of each questionnaire was examined alongside the available evidence from other papers where its development and/or validation have been described. The appraisal was guided by the COSMIN checklist which identifies nine specific measurement properties, ordered by their importance, that can be used to evaluate self-report questionnaires. However, as the study of paranoia in adolescent populations is in its infancy it was not expected that the available measures would demonstrate all of these properties. Consequently, the six most important properties were evaluated, including content validity, three indicators of internal structure (structural validity, internal consistency, and measurement invariance), test-retest reliability, and criterion validity (Prinsen et al., 2018). Content validity and internal structure primarily relate to the quality of individual items within a scale, whereas test-retest reliability and criterion validity refer to the overall quality of the summed scale score.

2.2.3.1. Content validity

Content validity is the extent to which a scale represents the construct it is meant to assess (i.e. paranoia), and, as a result, is the most important measurement property to determine. As part of the evaluation of content validity, it is helpful to consider how the scale was initially developed including its intended purpose (Prinsen et al., 2018). However, central to the evaluation of content validity is a theoretical examination of the content of each item. Terwee et al. (2018) describe three key features that determine good content validity: relevance (i.e. all items in the scale are relevant to paranoia), comprehensiveness (i.e. important features of paranoia are not missing), and comprehensibility (i.e. the measure is understood as intended) (see Box 2.1). Here, comprehensibility is used to judge the age-appropriateness of items in terms of their readability for an adolescent population. Ratings for content validity are therefore confined to how well the items reflect paranoid content in terms of relevance and comprehensiveness, regardless of their age-appropriateness.

2.2.3.2. Internal structure

Internal structure refers to how related the items within a scale are, and, consequently, indicates whether they can be combined into a meaningful score (Prinsen et al., 2018). Three components of internal structure are assessed: structural validity, internal consistency, and measurement invariance.

Structural validity

Structural validity refers to the dimensionality and factor structure of a questionnaire and, crucially, whether the items within a scale can be treated as a single construct. The dimensionality of a scale is typically determined through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is often used in the initial validation of a measure to extract latent factors from a set of items using the pairwise correlations (Osborne, 2014). CFA is then used to test the hypothesised relationships between items and latent factors. CFA is closely related to EFA and is typically used to verify or refine the structural validity of a measure, based either on previous EFA or a theoretically informed model (Brown, 2006). In CFA, the model is estimated and evaluated on how well it fits the data using model fit indices (Hu and Bentler, 1999). Here, evidence for the unidimensionality of each scale (or subscale) from which a paranoia score is reported will be examined.

Internal consistency

Internal consistency reliability refers to the extent to which a set of items measuring a particular construct produce consistent estimates at a single time point (Tang et al., 2014). Cronbach's alpha is the most widely used measure of internal consistency and is calculated from the item correlations. An underlying assumption of internal consistency measures is that items are unidimensional, and, so, the structural validity of a scale must be determined before internal consistency can be meaningfully assessed (Streiner, 2003). As a result, internal consistency estimates for each measure in this review are only examined if there is at least partial evidence for its unidimensionality.

Measurement invariance

Measurement invariance implies that a questionnaire assesses a given construct similarly across different demographic groups (i.e. gender, age, culture, and clinical populations) - an essential assumption for the valid comparison of means between such groups. The opposite (i.e. measurement variance) may occur when the construct being measured holds a different meaning for individuals or when the sources of unexplained error differ between these groups. The result of this variance is that scores from participants in different groups do not represent the same construct. One method of examining measurement invariance is multi-group CFA (MG-CFA) (Schmitt and Kuljanin, 2008). In a MG-CFA, the model fit for a proposed factor structure is evaluated in each group separately and then compared for three levels of invariance: configural

(the overall factor structure is consistent), metric (the factor loadings are equivalent), and scalar (the item intercepts do not vary) (Milfont and Fischer, 2010). Measurement variance can also be evaluated using an item response theory (IRT) approach with differential item functioning (DIF) analysis to identify items where individuals from different groups with the same level of the trait (i.e. paranoia) have a different probability of responding (Holland and Wainer, 2012).

2.2.3.3. Score properties

Test-retest reliability

Test-retest reliability indicates the extent to which a scale produces stable and consistent results over multiple measurement points, and, consequently, a precise assessment of an individual's true score. Measurements are usually taken approximately 1-2 weeks apart to provide enough of an interval to avoid recall but not so long that genuine change would have occurred. The recommended method of evaluating test-retest reliability for continuous scores is a two-way mixed-effects intraclass correlation coefficient (ICC) which accounts for the within-person variance between time points (Koo and Li, 2016). However, it is also common to assess test-retest reliability using simple correlations.

Criterion validity

Criterion validity refers to extent to which scale scores are related to other validated indicators of the same construct. In other words, criterion validity determines whether a scale is measuring what it intends to measure. Ideally, criterion validity is assessed against a "gold standard" of the construct; however, such standards are rarely available in psychology (Prinsen et al., 2018). Here, criterion validity is assessed using either the correlations with other validated measures of paranoia (i.e. concurrent validity) or by examining whether the measure predicts paranoid symptoms verified via clinical interview or experimental methods (i.e. predictive validity).

2.2.4. Criteria for evaluating measurement properties

The criteria used to evaluate the six measurement properties, shown in Box 1, were adapted for the purpose of this study from the COSMIN criteria (Prinsen et al., 2018; Terwee et al., 2018). These five measurement properties were initially assessed in the population for which the questionnaire had been designed, and then, if initially validated in adults, evidence for these properties specifically in young people was examined. Based on the available evidence and the COSMIN guidance for evaluating psychometric properties, each indicator was given a rating of

red (●) if insufficient, amber (●) if partial, green (●) if sufficient, and grey (●) if indeterminate (i.e. not enough information was available to decide).

Box 1. Criteria to evaluate measurement properties of paranoia questionnaires included in the review. Adapted from the COSMIN criteria (Prinsen et al., 2018; Terwee et al., 2018).

Measurement property	**Criteria**
Content validity	
Relevance	• Items are relevant for the assessment of paranoia. • Items relevant for assessing paranoia in clinical settings. • Response options are appropriate. • Recall period is appropriate
Comprehensiveness	• No key aspect of the paranoia construct measured is missing. • Includes a range of paranoia thoughts concerns (e.g. social, emotional, and physical harm).
Age-appropriateness (i.e. comprehensibility)	• Items likely to be understood by young people as intended. • Items are appropriately worded. • Response options match the questions.
Structural validity	• Evidence for unidimensionality of paranoia scale using high quality exploratory or confirmatory factor analysis. • EFA: factor structure does not include cross-loading of items from other factors and explains >50% of variance. • CFA: Model fit indices above recommended thresholds. • CFA: Unidimensionality shown with first-order model or using second-order or bi-factor model to account both for single overarching dimension and multiple subfactors.
Internal reliability	• Alpha reliability ≥ 0.70 (or equivalent) for each scale. Not rated if insufficient evidence for scale's unidimensionality.
Measurement invariance	• No evidence of invariance between group factors such as age, gender, or ethnicity in multiple group confirmatory factor analysis or differential item functioning (DIF) analyses.
Test-retest reliability	• Intra-class correlation (ICC) or simple correlation ≥ 0.70 between measurement points at least two weeks apart.
Criterion validity	• Relationships with other measures of paranoia as expected.

2.3. Results

2.3.1. Search results

Of the 1,607 papers screened, 55 met criteria for inclusion in the review. These papers reported a total of 37 unique datasets including 57,188 young people aged 6-18 years. Most of these samples were based in the UK (n = 9) and Australia (n = 7) (see Appendix A for sample characteristics). Most participant samples included only adolescents from the general population (n = 23). Six samples included help-seeking adolescents with non-psychotic mental health problems, one of which also included a separate general population group. Three samples included subgroups of help-seeking young people with early psychosis and adolescents from the general population. The remaining five study samples consisted of adolescents with additional clinical needs unrelated to mental health.

2.3.2. Overview of paranoia measures

Across the 38 unique datasets, 13 different self-report measures were used to evaluate paranoia. Four of the included measures were single paranoia items from broader psychotic experience questionnaires that had been designed for use in adolescents. The remaining nine measures were multiple-item paranoia questionnaires - three of these were designed for young people and six were designed for adults. Two studies used adapted versions of existing paranoia measures to assess state paranoia using experience sampling methodology (ESM). A summary of the evaluation of psychometric properties for each paranoia measure is shown in Table 3, the details of which are discussed in the following sections.

Table 3. Evaluation of measurement properties for each paranoia questionnaire. Properties rated as sufficient = ● partial = ● insufficient = ● or indeterminate = ●

	Measurement properties							
	Content validity	Age appropriate	Structural validity	Internal reliability	Measure invariance	Test retest	Construct validity	Validated in YP
Adolescent measures								
SMS	●	●	●	/	●	●	●	●
SPEQ	●	●	●	●	●	●	●	●
SPEQ state	●	●	●	●	●	●	●	●
APSS [A]	●	●	/	/	●	●	●	●
NCS-A [A]	●	●	/	/	●	●	●	●
PLEQ-C [A]	●	●	/	/	●	●	●	●
YSR [A]	●	●	/	/	●	●	●	●
Adult measures								
CAPE *(5-item)*	●	●	●	●	●	●	●	●
CAPE *(7-item)*	●	●	●	/	●	●	●	●
GPTS-A	●	●	●	/	●	●	●	●
GPTS-B	●	●	●	●	●	●	●	●
PC state	●	●	●	●	●	●	●	●
PS	●	●	●	/	●	●	●	●
SCL-90-R	●	●	●	/	●	●	●	●
BSI [B]	●	●	●	/	●	●	●	●

Note: A = Single item measures where structural validity and internal reliability do not apply. B = BSI presented out of alphabetical order as it is a shortened version of the SCL-90-R; Measure names: SMS = Social Mistrust Scale; SPEQ = Specific Psychotic Experiences Questionnaire; APSS = Adolescent Psychotic Symptom Screener; NCS-A = US National Comorbidity Survey Replication Adolescent Supplement; PLEQ-C = Psychotic-Like Experience Questionnaire for Children; YSR = Youth Self Report; CAPE = Community Assessment of Psychic Experiences' GPTS = Green et al. Paranoid Thoughts Scale (part A and B). PC = Paranoid Checklist; PS = Paranoia Scale; SCL-90-R = Symptom Checklist Revised. BSI = Brief Symptom Inventory.

2.3.3. Paranoia measures developed for young people

Seven of the identified measures were developed for young people. This included three multiple-item questionnaires and four single items taken from larger questionnaires. A summary of the characteristics of these questionnaires is shown in Table 4.

Table 4. Characteristics of paranoia measures developed for young people

Measure	Author	Construct	Target population	Items	Response format	List of studies
Questionnaires						
SMS	Wong (2014)	Suspiciousness	Children GP	12	Endorsement (0-2)	(Wong et al., 2014; Wong and Raine, 2018; Zhou et al., 2018)
SPEQ	Ronald (2014)	Paranoid ideation	Adolescents GP	15	Frequency (0-5)	LEAP study: (Barkhuizen et al., 2019; Havers et al., 2019; Ronald et al., 2014; Shakoor et al., 2016, 2018; Shakoor, McGuire, et al., 2015; Shakoor, Zavos, et al., 2015; Sieradzka et al., 2014, 2015; Singham et al., 2017; Taylor et al., 2016; Taylor, Gregory, et al., 2015; Taylor, Robinson, et al., 2015; Zavos et al., 2014, 2016) Other studies: (Catone et al., 2017, 2020; Pisano et al., 2016)
SPEQ (state)	Hennig (2018)	State paranoia	Adolescents GP	6	Endorsement on VAS scale (0-100)	(Hennig and Lincoln, 2018)
Single items						
APSS	Kelleher (2011)	Ideas of reference	Adolescents MH	1	Endorsement (0-2)	(Dolphin et al., 2015; Kelleher et al., 2011)
NCS-A	Kessler (2009)	Mild paranoia	Adolescents GP	1	Endorsement (0-1)	(Brown et al., 2020; Waite and Freeman, 2017)
PLEQ-C	Ruffell (2016)	Ideas of reference	Adolescents MH	1	Conviction (0-2), frequency, distress, & impact (0-3)	(Ruffell et al., 2016)
YSR	Achenbach (1994)	Paranoid ideation	Adolescents MH	1	Endorsement over the past year (0-3)	(Bechtold et al., 2016)

Note: GP = general population; MH = mental health; LEAP study = Longitudinal Experiences and Perception Study; Measures: SMS = Social Mistrust Scale; SPEQ = Specific Psychotic Experiences Questionnaire; APSS = Adolescent Psychotic Symptom Screener; NCS-A = US National Comorbidity Survey Replication Adolescent Supplement; PLEQ-C = Psychotic-Like Experience Questionnaire for Children; YSR = Youth Self Report.

2.3.3.1. Social Mistrust Scale (SMS)

Three papers identified in the review used the 12-item SMS (Wong et al., 2014). One paper reported a unique sample in China, whilst the other two reported the same dataset of 8-14-year-olds in the UK and Hong Kong (Wong et al., 2014; Wong and Raine, 2018).

Content validity

The SMS was designed to measure mild suspiciousness/mistrust in children from the general population (Wong et al., 2014). The content of SMS items therefore reflect the lower end of the paranoia spectrum. Although the language is age-appropriate, the relevance and comprehensiveness of the item content was rated as partial. Although some items are relevant indicators of suspiciousness (e.g. I worry too much about others trying to get at me at school"), others may struggle to distinguish paranoia from genuine harm (i.e. "Others try to harm me at home"). Four of the items were also reverse scored, asking whether young people have someone they trust at home/school, and if others trust them with things at home/school. A lack of endorsement on these positively worded items would not necessarily reflect mistrust/paranoia, and, so, their content validity for measuring paranoia is potentially limited.

Internal structure

Wong et al. (2014) provided evidence for a three-factor structure of the SMS in 8-14-year-olds with subscales for general mistrust, home mistrust, and school mistrust with good model fit. However, a single factor solution provided a poor fit to the data, and, so, the use of a total SMS score in all three papers was not well supported. Internal consistency was fair for the school mistrust scale (α = 0.74-0.75) and poor for the home (α = 0.66-0.68) and general mistrust scales (α = 0.54-0.63; Wong et al. 2014). Internal consistency of the total SMS score was reported as fair by the authors (α = 0.75-0.78); however, the estimate is not interpretable due to the multidimensionality of the scale. Across two studies, the SMS demonstrated configural invariance (i.e. equal factor structure) between children from the UK and Hong Kong (Wong et al. 2014), girls and boys, and younger (8-11 years) and older (12-14) children (Zhou et al., 2018). However, neither of these studies found support for the next level of metric invariance, indicating a different pattern of factor loadings between each of the group comparisons.

Scale properties

Test-retest reliability of the total SMS score over a 1-month period was good (ICC = 0.80). Criterion validity, however, was undetermined. In 32 adolescents with schizophrenia, Zhou et al. (2018) found the SMS total score was moderately correlated with positive psychotic symptoms (r = 0.32) and general psychopathology symptoms (r = 0.44), assessed using the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). However, neither the SMS total score nor the three subscales were correlated with the suspiciousness/persecutory ideation domain of the PANSS. The relationship between the SMS and other self-report measures of paranoia have not been assessed.

2.3.3.2. SPEQ Paranoia scale

Eighteen papers included in the review used the paranoia scale of the Specific Psychotic Experiences Scale (SPEQ; Ronald et al., 2014). However, fifteen of these papers reported on the same dataset from the Longitudinal Experiences and Perceptions (LEAP) study of 16-year-olds drawn from the Twins Early Development Study (TEDS) birth cohort (Haworth et al., 2013). Two of the other three papers using the SPEQ were based on the same dataset of patients attending child and adolescent mental health services (CAMHS) (Catone et al., 2017, 2020). The SPEQ includes six separate scales to measure different psychotic experiences in the adolescent general population. The SPEQ paranoia scale consists of 15 items derived from the Paranoia Checklist (PC), a measure originally developed for the adult general population (Freeman et al., 2005). For the SPEQ, the wording of seven of these PC items was adapted for an adolescent population.

Content validity

The scale has good content validity with many relevant items representing ideas of persecution. A small number of items, however, reflect broader non-persecutory ideas of reference (e.g. "I can detect coded messages about me in the press/TV/internet") and those where the intention of harm is unclear (e.g. "People are laughing at me"). Although the language of most items is comprehensible, several include words that may be difficult to understand for younger adolescents (i.e. "conspiring", "hostile", and "on my guard.")

Internal structure

Based on a principal components' analysis in 4,731 16-year olds, the structural validity of the paranoia items as a distinct scale from the five other psychotic experience domains was shown to be good (Ronald et al., 2014). However, the factor structure of the paranoia items alone has not been assessed, and, so, the appropriateness of treating these items as a unidimensional scale is unclear. In the validation study, internal consistency was high (α = 0.93; Ronald et al., 2014). Measurement invariance is undetermined.

Score properties

Ronald et al. (2014) report moderate test-retest reliability (r = 0.66) over an average period of 9 months (n = 1427–1437). This extended time period may provide a limited evaluation of test-retest reliability as genuine fluctuations in paranoia are likely. The paranoia scale demonstrates moderate correlations with other psychotic experiences (Ronald et al., 2014); however, criterion validity against other specific indicators of paranoia is undetermined.

2.3.3.3. SPEQ paranoia (state)

One study used a modified 6-item version of the SPEQ paranoia scale to assess state paranoia using experience sampling methodology (Hennig and Lincoln, 2018).

Content validity

The selected items focused on mild paranoid ideas of general suspiciousness, ideas of reference, and emotional harm. The language was age appropriate for all items.

Internal structure

No factor analytic methods were conducted to establish the dimensionality of the 6 items. Structural validity is therefore unclear. Internal consistency in 61 adolescents across 7 days was acceptable (α = 0.78-0.80; Hennig and Lincoln, 2018). Measurement invariance is undetermined.

Score properties

Neither test-retest reliability nor criterion validity have been assessed.

2.3.3.4. Single item measures

Six studies used four single items from broader measures designed for young people, including: the Adolescent Psychotic-Like Symptom Screener (APSS; Kelleher et al., 2011); the Psychotic-Like Experience Questionnaire for Children (PLEQ-C; Laurens et al., 2007); the US National

Comorbidity Survey Replication Adolescent Supplement (NCS-A; Kessler et al., 2009); and the Youth Self Report (YSL; Achenbach, 1994). The language for each item was age appropriate, but they all inherently lacked comprehensiveness in measuring a range of paranoid ideas. Structural validity and internal validity were not assessed for single items.

APSS and PLEQ-C

Two studies used a single item from the APSS, and one used a single item from the PLEQ-C. These questionnaires both assessed broadly defined psychotic experiences. The paranoia item from both these measures was the same and specifically captured ideas of reference ("Have you ever thought that people are following or spying on you"). For both measures, criterion validity was assessed using clinical interviews to verify the presence of psychotic symptoms. In a sample of 44 young people, Kelleher et al. (2011) reported a true positive rate (i.e. sensitivity) of 50% (95% CI = 19-81%) and a true negative rate (i.e. specificity) of 91% (95% CI = 80-97%). In a larger sample of 139 children, the sensitivity of this item for detecting any confirmed psychotic experience at interview was only 27% whilst the specificity was 91% (Gutteridge et al., 2020). These findings indicate a potentially high number of false positives in young people who endorse this item. Measurement invariance and test-retest reliability for this item were undetermined.

NCS-A

Two studies assessed the single paranoia item in NCS-A dataset, a national psychiatric epidemiological survey in the USA (Kessler et al., 2009). The item reflected the mild suspicious idea that "People often make fun of me behind my back." Although not assessed in adolescents, concurrent validity has been shown by Brown et al. (2020) in 857 adults from the general population with a strong correlation (r = 0.56) between this item and the Green Paranoid Thoughts Scale (GPTS) Part B (see section 2.3.4) which was significantly larger than the correlation with anxiety (r = 0.38, p < 0.001). Measurement invariance and test-retest reliability was undetermined.

YSR

One study in the USA used the paranoia item from the YSR, a measure assessing a wide range of psychopathology in young people. The single paranoia item on the YSR reflected general

persecutory thought ("You feel that others are out to get you"). Measurement invariance, test-retest reliability, and criterion validity of this single item were undetermined.

2.3.4. Paranoia measures developed for adults

Six measures were developed for adults, the characteristics of which are shown in Table 5.

Table 5. Characteristics of paranoia measures developed for adults

Measure	Author	Construct	Target population	Items	Response format	List of studies
CAPE	Konings (2006)	Paranoid ideation	Adults GP	5 or 7	Frequency (0-4) and distress (0-4) over the past 12 months	**Five-item:** (Armando et al., 2010; Eilbracht et al., 2015; Galbraith et al., 2014; Jack and Egan, 2016; Núñez et al., 2015; Wigman et al., 2011; Yung et al., 2006)**. Seven-item:** (Collip et al., 2013; Lu et al., 2020; Moriyama et al., 2019; Turley et al., 2019; Yung et al., 2009)
GPTS	Green (2008)	Ideas of reference (A) and persecution (B)	Adults MH and GP	A: 16 B: 16	Frequency (1-5) over past month	**Part A & B:** (Fett et al., 2015, 2016; Korver-Nieberg et al., 2013) **Part B only**: (Bird et al., 2017)
PC (state)	Schlier (2016)	State paranoia	Adults GP	5	Current endorsement (-5 to +5)	(Davidson et al., 2019)
PS	Fenigstein (1992)	Paranoid ideation	Adults GP	20	Endorsement (1-5)	(Campbell and Morrison, 2007; Raes and Van Gucht, 2009)
SCL-90-R	Derogatis (1983)	Paranoid ideation	Adults MH	6	Distress (0-4) over past week	(Kuzman et al., 2020; Talakoub et al., 2012; Thompson et al., 2019; Zhang et al., 2016)
BSI [A]	Derogatis (1992)	Paranoid ideation	Adults MH	5	Distress (0-4) over past week	(Albertella and Norberg, 2012; Fernández-Artamendi et al., 2013; Murphy et al., 2010; Tompsett et al., 2009)

Note: A = BSI presented out of alphabetical order as it is a shortened version of the SCL-90-R; GP = general population; MH = mental health. Measures: CAPE = Community Assessment of Psychic Experiences; GPTS = Green et al. Paranoid Thoughts Scale; PC = Paranoia Checklist; PS = Paranoia Scale; SCL-90-R = Symptom Checklist 90 Revised; BSI = Brief Symptom Inventory.

2.3.4.1. Community Assessment of Psychic Experiences (CAPE)

Twelve studies used a paranoia subscale derived from the CAPE (Konings et al., 2006). This measure was designed to assess subthreshold psychotic experiences in adults from the general population within three domains of positive, negative, and depressive symptoms. Multiple factor analytic studies in both adults and adolescents have been conducted on the 20-item positive symptom scale (CAPE-P), producing a variety of factor solutions from which subscales have been derived (Mark and Toulopoulou, 2016). Of the twelve studies in this review, seven used a 5-item paranoia scale from a 5-factor solution reported by Wigman et al. (2011); the remaining five used a 7-item paranoia scale from a 4-factor solution reported by Yung et al. (2009).

Content validity

The 5-item paranoia scale from the CAPE contains two items with clear persecutory content. However, the remaining three items refer to more general ideas of reference and ideas that people are not what they seem to be. Content validity was therefore partial. The 7-item version contained two additional items to the original five. These items referred to ideas of reference and the idea that a double has taken the place of someone they know. Overall, this scale therefore represents a mix of delusional ideas that are not specific to paranoia. With the addition of these extra items, content validity for the 7-item scale was rated insufficient. Both paranoia scales from the CAPE may also be unsuitable for adolescents due to the use of words such as "persecuted" and "conspiracy."

Internal structure

Factor analytic studies of the CAPE-P in adolescents show the 5-factor solution (with the 5-item paranoia scale) is more robust than the 4-factor solution (with the 7-item scale). The 4-factor EFA solution described by Yung et al. (2009) (the key citation for the 7-item version) shows the two additional paranoia items did not adequately load on the factor (<0.30) and had similar sized small loadings on the 'bizarre experiences' factor. Wigman et al. (2011) found the 5-factor model had significantly better fit than models with 1-4 factors in two separate samples of more than 5000 and 2000 adolescents. In the 5-factor model, loadings for all 5 paranoia items were acceptable (>0.56; Wigman et al. 2011). However, a recent meta-analysis of factor analytic studies of the CAPE-P across adults and adolescents concluded a 3-factor solution was superior, with all paranoia items contained within a broader 'delusional ideations' scale. Internal consistency of the 5-item paranoia scale is insufficient (α = 0.67; Wigman et al. 2011). Internal

reliability for the 7-item scale was not interpretable due to its lack of structural validity. Measurement invariance was undetermined for both versions of the paranoia scale.

Scale properties

For both versions of the scale, test-retest reliability and criterion validity are undetermined.

2.3.4.2. Green et al. Paranoid Thoughts Scale (GPTS)

Four studies (3 unique samples) used the GPTS (Green et al., 2008) - the most established measure of paranoid ideation in adults. The GPTS contains two distinct subscales to assess ideas of reference (Part A) and persecution (Part B). In the four studies using the GPTS identified in this review, three used both scales whilst the fourth used Part B only. The psychometric properties of the GPTS have not been examined in an adolescent population.

Content validity

The GPTS has good content validity as a measure of paranoia. The separate scales for social reference and persecution provides greater precision in the assessment of these related but distinct aspects of the paranoia hierarchy (Freeman et al., 2005). The primary focus of the GPTS is the persecution scale as it reflects the content of persecutory delusions (Freeman, Loe, et al., 2019). All items in this scale are clearly of a persecutory nature, and so, are highly relevant for assessing persecutory ideation (Freeman and Garety, 2000). It is also comprehensive, including a range of specific persecutory ideas (e.g. physical harm, upset, conspiracy). However, as the GPTS was developed for adults, several items include words that may be difficult for young people to understand such as "persecution", "conspiracy", "preoccupied", and "deliberately".

Internal structure

The GPTS scales were initially derived and validated in 353 university students and 50 patients with psychosis (Green et al., 2008). However, Freeman, Loe, et al. (2019) recently conducted a large-scale psychometric evaluation of the GPTS in over 10,000 adults, including over 2,000 patients with psychosis. The findings did not support the use of Part A as a stand-alone scale as four items loaded on both Parts A and B and two items loaded on Part B only. The unidimensionality of Part B was supported with evidence of a robust single factor structure for all 16 items. In the initial validation, Green et al. (2008) report high internal consistency for Part B ($\alpha = 0.92$). Using IRT analysis, Freeman, Loe, et al. (2019) showed Part B has high reliability across a wide spectrum of paranoia severity (equivalent $\alpha < 0.90$), and, so, has good precision

for non-clinical and clinical levels of paranoia. Internal consistency of Part A was not assessed by Freeman, Loe, et al. (2019) due to its lack of structural validity.

Using differential item functioning (DIF) analysis, Freeman, Loe, et al. (2019) found no evidence of measurement variance between men and women or between different age groups on the GPTS Part B. Six items of Part A, retained for a revised version of the GPTS (R-GPTS), also showed no evidence of DIF between these groups.

Scale properties

Green et al. (2008) reported good test-retest reliability over two weeks for Parts A (ICC = 0.88 and Part B (ICC = 0.81). The GPTS has good criterion validity. The GPTS Total score (Parts A and B combined) are shown to predict the occurrence of genuine persecutory ideation in controlled virtual reality scenarios (Freeman, Antley, et al., 2014; Freeman, Pugh, et al., 2010). Freeman, Loe, et al. (2019) also found 93% of patients with psychosis who have a confirmed persecutory delusion scored above the moderately severe range on Part B, compared to only 47% of patients with psychosis for whom persecutory delusions had not been assessed. The construct validity of Part A against other specific indicators of social reference have not been assessed.

2.3.4.3. Paranoia checklist (PC) - state version

One study used a 5-item state version of the PC (Freeman et al., 2005), originally validated by Schlier et al. (2016).

Content validity

The content of the 5 items reflect mild paranoia with a focus on mistrust, ideas of reference, and mild emotional harm. The language was broadly age-appropriate, except for one item containing "on my guard" which may be unclear for younger adolescents.

Internal structure

Schlier et al. (2016) provide evidence for a unidimensional factor structure for the state PC with good model fit. Internal consistency was also good (α = 0.83). Measurement invariance was undetermined.

Score properties

The state PC was moderately correlated with trait paranoia (r = 0.47), however, similar

associations were found with trait social anxiety (r = 0.42) which had been examined by the authors for divergent validity (Schlier et al., 2016). As a result, criterion validity of this scale as a specific measure of paranoia is unclear. Test re-rest reliability was undetermined.

2.3.4.4. Paranoia Scale (PS)

Two studies used the PS, a 20-item scale developed to assess paranoia in university students (Fenigstein and Vanable, 1992). The items were taken from the Minnesota Multiphasic Personality Inventory (Butcher et al., 1989), selected if they had been used in other studies to measure paranoia and were judged to reflect paranoid ideas of a moderate but non-clinical level (Fenigstein and Vanable, 1992). The measurement properties of the PS have not been examined in adolescents.

Content validity

Although once the most widely used measure of paranoia, Freeman et al. (2005) pointed out that many of the PS items do not reflect persecutory ideation (e.g. "Most people inwardly dislike putting themselves out to help other people", "People often disappoint me", "I have often found people jealous of my good ideas just because they had not thought of them first"). As a result, content validity was insufficient. The wording of several items could also be confusing for younger adolescents (e.g. "Most people will use somewhat unfair means to gain profit or advantage, rather than lose it").

Internal structure

In the initial validation, Fenigstein and Vanable (1992) suggested the PS had a unidimensional structure because all items loaded on the first unrotated factor. However, this factor only explained 25% of the variance amongst the items, suggesting other factors were likely unaccounted for. The structural validity of the PS is therefore insufficient. Consequently, although high internal consistency was reported by Fenigstein and Vanable (1992), the estimate is not interpretable. Measurement invariance of the PS is undetermined.

Score properties

Test-retest reliability after 6 months was r = 0.70 (Fenigstein and Vanable, 1992). However, this assessment of test-retest reliability may have been limited as genuine change may have occurred over a 6-month period. Regarding criterion validity, Green et al. (2008) showed large correlations between the PS and the GPTS reference (r = 0.69) and persecution (r = 0.62) scales

in adults from the general population. Notably, in 50 patients with persecutory delusions, the PS score showed a much larger correlation with the reference (r = 0.86) compared to the persecution (r = 0.68) scale (Green et al., 2008). This suggests the PS may more closely reflect milder paranoid ideas.

2.3.4.5. Symptom checklist revised (SCL-90-R)

Four studies used the SCL-90-R, a 90-item questionnaire assessing nine different psychological symptom domains, including a 6-item paranoia scale (Derogatis, 1983). The scale was originally developed for adults with psychiatric disorders, although the publishers' state that it is appropriate for those aged 13 years and older.

Content validity

Although all SCL-90-R paranoia items are age-appropriate for adolescents, their content validity is poor as most items do not reflect paranoia (e.g. "Having ideas or beliefs that others do not share", & "Others not giving you proper credit for your achievements").

Internal structure

The structural validity of the SCL-90-R as a whole is unclear, with numerous factor analytic studies in adults (Prinz et al., 2013; Vassend and Skrondal, 1999) and adolescents (Rytilä-Manninen et al., 2016) reporting inconsistencies from the original 9-factor structure. One study reported an overlap between the paranoia and the 'interpersonal sensitivity' scales, and, thus, recommended combining 3 items from each to form a new "distrust" scale (Paap et al., 2011). Internal reliability of the SCL-90-R paranoia scale is shown to be in the acceptable range (Paap et al., 2011; Preti et al., 2019); however, these estimates are invalid due to insufficient evidence that the scale is unidimensional. Alongside evidence of varying factor structures between studies, there is evidence of structural variance between men and women (Carpenter and Hittner, 1995). Measurement invariance was therefore insufficient.

Scale properties

Test-retest reliability after 1-2 weeks has been shown to be between r = 0.77-0.86 (Campbell et al., 1999; Vallejo et al., 2007). Criterion validity against other validated indicators of paranoia are undetermined.

2.3.4.6. Brief symptom inventory (BSI)

Four studies used the BSI, which was developed as a shortened version of the SCL-90-R by reducing the original 90-items to 53 across each of the nine psychological symptom domains. Five of the original six paranoia items from the SCL-90-R were retained for the BSI paranoia scale.

Content validity

Despite the removal of the addition item from the SCL-90-R ("Having ideas or beliefs that others do not share"), the content of the BSI items still provided a poor reflection of persecutory thought.

Internal structure

Similar to the SCL-90-R, issues with the structural validity of the BSI subscales as distinct factors have been reported in adults and adolescents (Piersma et al., 1994). In a study of 2,700 adults in Hungary, Urbán et al. (2014) tested a bifactor CFA model of the BSI with one single factor for all 53 items and 9 specific factors for each symptom domain. This showed that the specific factor loadings for 4/5 of the paranoia items were below 0.30 (the minimum threshold for a meaningful factor loading), and, overall, 94% of the variance in the paranoia factor was explained by the single 53-item factor. This suggests the BSI paranoia scale has insufficient structural validity as a unidimensional scale. Various estimates of internal reliability for the BSI paranoia scale have been reported; however, these are not interpretable given its lack of structural validity.

Score properties

The authors of the BSI reported a two-week test-retest reliability of $r = 0.79$ in a sample of 60 adults (Derogatis and Melisaratos, 1983). Criterion validity against other validated indicators of paranoia was undetermined.

2.4. Discussion

Efforts to advance the understanding of paranoia in adolescence will depend on valid and reliable measurement. Self-report questionnaires will be especially useful as they capture young peoples' own perspective on the occurrence of paranoia and can be used as a screening tool to improve its recognition in services. In this chapter, a systematic literature review was therefore conducted to identify and evaluate self-report measures that are currently used to assess paranoia in adolescence. Thirteen such measures of variable quality were identified.

The review highlighted several important issues affecting precision in self-report assessments of paranoia in adolescents. First, the use of measures created for adults was common with young people, but item content based on adults may not adequately capture adolescent paranoia. Age may also influence the way items are interpreted. Importantly, many of the measures designed for adults included items that may be difficult for young people to comprehend. This was especially notable for the GPTS which, despite being the most well-established measure of paranoia in adults, contains words that are not well understood by younger populations. Indeed, the thesis author has found in their experience that adolescents frequently ask for the GPTS items to be explained.

Second, the extent to which items in a measure reflect paranoid ideation could substantially vary. Of the thirteen measures assessed, only four contained items that sufficiently reflected paranoid ideation in terms of both relevance and comprehensiveness. This lack of content validity was often due to a broad conceptualisation of paranoia that resulted in few items with persecutory content (i.e. thoughts of intended harm from others). This was particularly problematic for older measures based on dated definitions of paranoia including the SCL-90-R (Derogatis, 1983), the BSI (Derogatis and Melisaratos, 1983), and the Paranoia Scale (Fenigstein and Vanable, 1992). Content validity was also a notable issue for the CAPE (Konings et al., 2006) paranoia scale which, as first highlighted in Chapter 1, consists of a mixture of broad delusional ideas with only two items that reflect persecutory ideation. These four measures were used in over half of the identified papers assessing paranoia in unique samples of adolescents, but the lack of content validity means the extent to which the reported estimates actually reflect paranoia may be limited.

Another issue was that items within a measure could vary substantially in the level of severity they represent, leading to items with potentially little clinical relevance being assigned the same

value as ones that strongly discriminate clinical symptomology. This, in turn, could lead to imprecise estimates. The variation in item content and severity was also reflected by problems with a measure's internal structure (i.e. the extent to which the items reflect the same construct). The internal structure of several measures was questionable, raising concerns about the interpretability of their total 'paranoia' scores. This was demonstrated by the presence of multiple factors through factor analysis that were nevertheless summed together, or simply a lack of adequate evidence of unidimensionality. Notably, there has also been limited evaluation of measurement invariance for the questionnaires identified in this review. Establishing measurement invariance between groups relating to various demographic factors (e.g. gender, age, and clinical vs non-clinical populations) is important to ensure that scores can be meaningfully collated and compared within these groups.

A final issue that is rarely acknowledged is that assessment tools often differ in the type and severity of paranoia they assess. As shown in Chapter 1, these differences can lead to variations in item endorsement that subsequently impact prevalence rates. This variation is likely to reduce the ability to meaningfully compare paranoia scores across different studies and could also impact precision across different populations. For example, a test reflecting mild paranoia may perform well in non-clinical populations but lack utility for assessing severe paranoia in young people accessing services (where a ceiling may instead occur). This was demonstrated in the SMS (Wong et al., 2014) which was designed to capture milder presentations of suspiciousness/mistrust in schoolchildren and thus lacked sensitivity as a clinical measure of paranoia in young patients with psychosis (Zhou et al., 2018).

Across all the measures evaluated in this review, the SPEQ paranoia scale (Ronald et al., 2014) had the most evidence as a valid and reliable measure of paranoia for adolescents. However, the SPEQ was derived from a measure developed for adults – the Paranoia Checklist (Freeman et al., 2005). The SPEQ was also designed for measuring paranoia in the general population, and, so, its utility for use in child and adolescent mental health services is unclear. Furthermore, although the overall content validity of the SPEQ paranoia scale was good, several items reflected broader non-persecutory ideas and contained words that may be inappropriate for younger adolescents. A new self-report measures of paranoia, specifically designed for adolescents and for use in a clinical setting, may be a beneficial addition to the literature.

2.4.1. Limitations

Several limitations of this review must be acknowledged. First, due to the reasons described at the start of this chapter, this review focused on self-report questionnaires only. However, an evaluation of clinician-rated interview tools would also be helpful to inform the interpretability of studies using these measures in the literature. A second limitation was the exclusion of studies with questionnaires solely administered in a language other than English. Such questionnaires were excluded as the thesis author would not be able to reliably evaluate their psychometric properties; however, this exclusion may have limited the ability to assess measurement invariance across young people from different countries. It must also be acknowledged that this review only partially followed the COSMIN guidance (Prinsen et al., 2018; Terwee et al., 2018) - an additional literature search was not conducted to systematically identify all papers evaluating the psychometric properties of the measures reviewed, and the risk of bias in studies that informed the evaluation was not assessed. This extra level of rigour, however, was inappropriate given that paranoia in adolescents has, so far, lacked systematic study. Rather than provide a definitive judgement about the best outcome measure (i.e. the aim of COSMIN reviews), the intention was to identify the self-report tools that have previously been used and to identify key issues that may affect validity and reliability in measurement.

Despite these limitations, this chapter highlights the importance of evaluating the properties of questionnaires used to assess paranoia in adolescents, as the measurement issues raised will have significant implications for validity of studies that have used these measures. These issues can now be used to inform the development of improved assessment tools for paranoia in young people.

Chapter Three[1,2]

The Bird Checklist of Adolescent Paranoia (B-CAP): A new assessment of paranoia for young people

3.1. Introduction

As highlighted in Chapter 2, there are a lack of well-defined and age-appropriate measures for assessing paranoia in young people, especially in clinical populations. This chapter therefore describes the development and psychometric validation of a new dimensional measure of paranoia in adolescents: The Bird Checklist of Adolescent Paranoia (B-CAP). The aim was to create a psychometrically robust measure that would: be age-appropriate; include paranoid content relevant to adolescents (e.g. fears relating to friends, school, and social media); and have utility for measuring both non-clinical and clinical levels of paranoia in adolescents. Using a rigorous psychometric approach, this study also provides an exemplar for the application of item response theory (IRT) to improve precision in scale development.

The dominant model upon which measure development is based in psychology is classical test theory (CTT; Allen and Yen, 2002). Also known as 'true score theory', CTT arose from a recognition that some degree of error is inevitable in the measurement of unobservable (i.e. latent) psychological constructs. Consequently, the core assumption of CTT is that observed scores on a questionnaire are determined by a person's 'true' score reflecting the construct of interest plus unexplained measurement error. CTT assumes all items are 'strictly parallel', that is, they all measure the same construct equally (DeVellis, 2006). As a result, items are assigned the same value in the calculation of scale scores by summing item endorsement, which, as a result, is thought to minimise the errors associated with individual items. This approach, however, can lead to imprecise scores that mask potential differences in way individual items measure a construct – as highlighted by the paranoia questionnaires reviewed in Chapter 2. The parameter estimates within a CTT approach are also sample dependant.

[1] This chapter adapted from the following published paper, shown in Appendix B:

Bird JC, Loe BS, Kirkham M, Fergusson EC, Shearn C, Stratford HJ, Teale A-T, Waite F, & Freeman D. (2020). The assessment of paranoia in young people: Item and test properties of the Bird Checklist of Adolescent Paranoia. *Schizophrenia Research*, 220, 116-122

[2] An NIHR evidence alert published about the B-CAP is shown in Appendix C.

Item response theory (IRT) is an alternative psychometric model developed over the past forty years (Reise and Waller, 2009). Also known as latent trait theory, IRT examines the probabilistic relationship between the latent trait dimension and the way in which individual items measure that trait. Rather than relying on a count of item endorsement, IRT estimates severity on a continuum derived from the relationship between participant responses and differences in the ability of each item to measure the problem. IRT therefore produces more precise estimates than CTT, and, furthermore, the alignment of items and participants on the same scale results in parameters that are sample independent (Bortolotti et al, 2013). This alignment allows an examination of the level of trait severity each item typically measures, and, also, the reliability of the scale as a function of the severity spectrum. IRT can therefore be used to make inferences about which population a scale is most reliable for.

Another advantage of IRT is the ability use the item parameters to create computerised adaptive tests (CAT) that adapts according to the severity of a participants answers to select the next item. This dynamic process continues until enough information is gained to reliably estimate the participant's severity level for that trait (i.e. paranoia) (Gibbons et al., 2016). For example, if the respondent fully endorsed an item reflecting moderate paranoia, little information would be gained from a milder paranoia item; however, subsequent items of similar or greater severity would be informative in estimating the point on the paranoia spectrum that the participant lies. Fewer items are typically required to reach a similar level of precision as the full questionnaire, providing the opportunity to reduce patient burden in lengthy clinical and research assessments (Gibbons et al., 2016). This reduced burden may be especially important considering young people with mental health problems are likely to be experiencing high levels of distress and may have difficulties concentrating. Shorter assessments including only relevant items may therefore improve the patient experience and facilitate engagement.

3.1.1. This study

This study had four objectives. The first objective was to derive the B-CAP from a larger paranoid thought item pool and evaluate its factor structure. The second objective was then to use IRT analysis to evaluate the item and test properties of the B-CAP, including an assessment of measurement invariance between genders, older and younger adolescents, and the clinical and non-clinical groups. Based on the varying ways in which the presence of paranoia has been defined in previous questionnaires (see Chapter 1), a third objective was to specify severity

ranges to facilitate interpretation and provide validated categories for determining prevalence rates. Finally, the IRT model was used to evaluate the potential to administer the B-CAP as a computerised adaptive test (CAT) to limit the number of items required to reliably estimate paranoia and reduce patient burden.

3.2. Method

3.2.1. Participants

A general population sample included 801 adolescents recruited from a secondary school in Leicestershire. Using opt-out parental consent, every pupil (n = 947) in school years 7-10 (ages 11-15 years) was invited to take part. An information sheet and opt-out consent form was sent to all parents who were given a minimum of two weeks to return the opt-out form back to the school. All classes were approached over one week, and pupils providing written assent completed a questionnaire pack within a 60-minute lesson led by the thesis author or a teacher. Young people whose parents had opted out or who did not give informed assent completed alternative work set by the teacher. The final sample of 801 adolescents represented 85% of students enrolled at the school (mean age = 13.3, SD = 1.16). Participants were aged 11-15 years (mean age = 13.3, SD = 1.16) and included 410 girls (51%), 382 boys (48%), and 9 "other gender" (1%). Most participants were White British (n = 629, 79%). Ethical approval was obtained from the University of Oxford Medical Sciences Interdivisional Research Ethics Committee (R50453/RE001).

A clinical sample included 301 adolescents with mental health problems recruited during routine care at child and adolescent mental health services (CAMHS) in Oxfordshire. Over 15 months, adolescents aged 11-17 years were recruited during routine clinical appointments at a community outpatient CAMHS team and an adolescent inpatient unit in Oxford Health NHS Foundation Trust. Participants were invited to take part regardless of their reason for accessing CAMHS, clinical diagnosis, or current treatment. The only exclusions were a moderate/severe learning disability or inability to complete questionnaires in English. Informed parental consent and child assent (11-15 years) or consent (16-17 years) was obtained prior to taking part. Participants in the clinical sample were aged 11-17 years (mean age = 15.1 years, SD = 1.75) and included 184 girls (61%) and 117 boys (39%). Most participants were also White British (n = 240, 80%). To examine test-retest reliability, 28 patients from the clinical sample repeated the

paranoia scale after 2 weeks. The study received approval by an NHS Research Ethics Committee (Ref: 17/SC/0539).

3.2.2. Measures

3.2.2.1. Paranoid thoughts item pool

An item pool was designed to represent a spectrum of paranoid thoughts with content relevant to adolescents (e.g. friends, school, and social media). The content of items was informed by reviewing existing paranoia measures, the clinical experience of the research group, and comments from young people during interview assessments from a previous study (Bird et al., 2017). A frequency response scale was chosen to support the use of the final questionnaire as an outcome measure that can assess meaningful change over time (Krabbe and Forkmann, 2012).

Young person involvement was sought to review the initial item pool. In collaboration with a local youth worker, a focus group was conducted with eleven adolescents aged 12-16 from a secondary school in Oxfordshire. Individual meetings were also held with three adolescents aged 15-16 years receiving inpatient care in the NHS trust where the thesis author had an honorary clinical contract. The young people gave their perspective on important components of paranoia for adolescents and reviewed the content, wording, structure, and layout of an initial version of the questionnaire. This version included 45 items, a 4-point response scale (0=never, 1=sometimes, 2=often, 3=always), and a one-month time frame.

Based on feedback from the young people, 3 items were deleted, 6 new items were added, and minor changes were made to the wording of 21 items to improve clarity and readability. This produced an amended item pool of 48 items. Young people also suggested changing the response options to include a shorter time frame of 2 weeks and more specific time markers on a 6-point scale (0=not at all, 1=once, 2=couple of times, 3=few times a week, 4=every day, 5=all the time) where higher scores indicate higher levels of paranoia. The full 48 question item pool can be found in Appendix D.

3.2.2.2. Specific Psychotic Experiences Questionnaire (SPEQ)

The SPEQ Paranoia scale (Ronald et al., 2014) is a 15-item scale of paranoid thoughts, intended for adolescents in the general population. Participants rate how often they have had each

thought in the past 2 weeks on a 5-point Likert Scale (0 = not at all, 5 = daily). Higher scores indicate higher paranoia (see Chapter 2 for overview of psychometric properties).

3.2.2.3. Social Mistrust Scale (SMS)

The SMS (Wong et al., 2014) is a 12-item questionnaire of mistrust in school children. The measure contains three subscales for mistrust at home, at school, and in general. Each item is rated on a 0-3 scale (0 = no, 1 = sometimes, 2 = yes), with higher scores indicating higher levels of social mistrust (see Chapter 2 for evaluation of psychometric properties).

3.2.2.4. Trust visual analogue scales (VAS)

Three continuous visual analogue scales (0-100) were created to measure participant's subjective view of how easy they find it trust "someone I've just met" and "people I already know", and also to what extent they "feel more fearful of others than I should be".

3.2.2.5. Multidimensional Peer Victimisation Scale (MPVS)

The MPVS (Mynard and Joseph, 2000) is a 16-item self-report measure of peer bullying in adolescents. Participants rate the frequency of each experience in the past year on a 0-3 scale (0 = not at all, 1 = once, 2 = more than once), with higher scores indicating greater bullying. The MPVS is a well-established measure of bullying in young people that is shown to be reliable, valid, and psychometrically sound (Joseph and Stockton, 2018).

3.2.2.6. The Current View

The Current View (Jones et al., 2013) is a practitioner-completed tool assessing a wide range of clinical difficulties within four components: psychiatric problems, complexity factors, contextual problems, and educational problems. For the purpose of assessing concurrent validity, one item from the Current reflecting clinician-ratings of hallucinations and or delusions was examined, coded to indicate presence/absence of that problem.

3.2.4. Statistical analysis

All analyses were conducted in R, version 3.6.1. Individual packages used included "psych" (Revelle, 2020), GPArotation (Bernaards and Jennrich, 2005), lavaan (Rosseel, 2012) "mirt" (Chalmers, 2012), "mokken" (van der Ark, 2012), "lordif" (Choi et al., 2011), and "catR" (Magis and Raîche, 2012). Missing values below 20% on the final version of the B-CAP and additional

questionnaires were imputed using the 'mice' package (van Buuren and Groothuis-Oudshoorn, 2011).

3.2.4.1. Stage one: Initial validation

Deriving the B-CAP

Exploratory factor analysis (EFA) was conducted to assess the factor structure of the paranoid thought item pool in the general population sample. Only participants with no missing data on any of the paranoid thoughts item pool were included at this stage (n = 715). To evaluate whether the data was appropriate for factor analysis, Bartlett's test of Sphericity and the Kaiser-Meyer-Olkin (KMO) tests were conducted. Bartlett's test assesses whether the matrix of item correlations is significantly different from an identity matrix (i.e. where items are completely unrelated). A significant result therefore indicates that items have enough shared variance to perform factor analysis (Field, 2012). The KMO is a measure of sampling adequacy and is calculated both for individual items and the whole scale. KMO index values between 0.7-0.8 are 'good', between 0.8-0.9 are 'great', and above 0.9 are 'superb' (Hutcheson and Sofroniou, 1999). In this data set, Bartlett's test was significant (χ^2 = 20,838, df = 1128, p < 0.001) and the KMO of 0.96 was excellent.

Prior to conducting the EFA, pairwise item correlations were examined and items that were either a) poorly correlated with all other items; or b) had very high correlations (indicating multicollinearity) were deleted. To determine the number of factors to extract from the item pool, a parallel analysis was conducted, and the scree plot was examined. EFA was then conducted using principle axis factoring, chosen to account for the lack of multivariate normality. Oblique rotation was used due to the assumption that factors would be correlated. To derive the final questionnaire, items were deleted if they had a) weak theoretical content; b) low communalities (<0.30); c) did not load higher than 0.30 on any factor; or d) had loadings above 0.30 on more than one factor. Mokken scale analysis was used to further evaluate the dimensionality of the scale and the homogeneity of the items, with Loevinger's H coefficients ≥0.3 indicating unidimensionality (Stochl et al., 2012).

Model fit

To assess the model fit of the final solution, two confirmatory factor analyses were conducted in the non-clinical and clinical samples. The MLR robust maximum likelihood estimator was

used due to non-normality in the data. Although the chi square goodness-of-fit test is often used as an evaluation of model fit, it is well recognised that it has a high likelihood of type 1 error (Bentler and Bonett, 1980). This is because the test relies on an assumption of multivariate normality and deviations from this often result in trivial distributional misspecifications that reject good fitting models. As a test of statistical significance, the chi square is also highly sensitive to sample size and will almost always reject the model (i.e. provide significant result) when large sample sizes are used. The relative/normed chi square ratio (χ^2/df) was therefore used to minimise the impact of sample size on the test (Wheaton et al., 1977), with a threshold of < 3 indicating an acceptable model fit (Kline, 2015).

Both absolute and incremental fit indices were then used to provide a comprehensive evaluation of model fit (Bentler and Bonett, 1980). This included the Comparative Fit Index (CFI), the Tucker-Lewis index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). The recommended thresholds for good model fit on each of these indices is shown in Table 6 (Hu and Bentler, 1999).

Table 6. Recommended thresholds for good model fit

Fit index	Recommended thresholds
Relative/normed chi square ratio	< 3 = good
Comparative Fit Index (CFI)	> 0.9 = acceptable > 0.95 = good
Tucker-Lewis index (TLI)	> 0.9 = acceptable > 0.95 = good
Root Mean Square Error of Approximation (RMSEA)	< 0.10 = acceptable < 0.06 = good
Standardized Root Mean Square Residual (SRMR)	< 0.06 = good

3.2.4.2. Stage two: Item and test properties

Item properties

IRT analysis was conducted on the combined clinical and non-clinical data to assess the psychometric properties of the B-CAP across the full spectrum of paranoia severity. As the response options were polytomous (i.e. more than two options), a two-parameter graded response model (GRM; (Samejima, 1969) was fitted to the B-CAP items. To identify outliers with atypical response patterns, participants with extreme person fit statistic scores (±3) from the GRM were excluded (Felt et al., 2017).

The IRT parameters are expressed as a function of theta, representing the continuum of the latent trait (i.e. paranoia), with values denoting standard deviations from average trait paranoia (i.e. theta of 0). Higher theta values therefore indicate greater severity of paranoia. Unlike ability constructs often used in the IRT literature (e.g. intelligence), the population distribution of paranoia is expected to be negatively skewed with most people reporting minimal levels (Bebbington et al., 2013). As a result, average trait paranoia would represent the lower end of the severity spectrum. The discrimination parameter (a) describes how well an item discriminates different levels of theta, with higher values signifying small shifts in paranoia severity produce rapid increases in the probability of item endorsement. Discrimination values ≥1 are highly discriminative whilst those ≤0.5 are unacceptable (Baker and Kim, 2017). The difficulty parameters (b) indicate the severity level each item response typically represents, with higher values suggesting the item assesses more severe presentations. Five difficulty parameters are given for each item, representing the theta level where there is a 50% probability of responding between the threshold of each of the six response options (b_1 = 0-1, b_2 = 1-2, b_3 = 2-3, b_4 = 3-4, b_5 = 4-5).

To assess measurement invariance between groups, differential item functioning (DIF) analysis was conducted for gender, age, and sample population. Item variance, or DIF, indicates a bias in measurement whereby participants from different demographic groups with the same level of trait paranoia respond differently to the items (Holland and Wainer, 2012). A beta change above 10% and a pseudo R^2 above 0.13 were used as the criteria to identify items with DIF (Choi et al., 2011; Crane et al., 2007).

Test properties

The reliability of the B-CAP was primarily assessed using the test information (TI) function from the IRT analysis. This denotes the scale precision as a function of theta, showing the levels of severity the measure has high and low reliability. For interpretability, the formula $1/\sqrt{TI(\theta)}$ was used to convert TI values at specific theta (θ) levels to an equivalent alpha on a scale of 0-1 (O'Connor, 2018). Test-retest reliability over 1-2 weeks was examined in the sample of 28 adolescents with mental health problems using the intraclass correlation coefficient (ICC). A two-way mixed effects, absolute agreement, single measurement ICC was used in line with recommendations for test-retest studies (Koo and Li, 2016). The expected score function from

the IRT analysis was used to assess the likely scores for different levels of severity and establish interpretative score ranges.

The concurrent validity of the B-CAP was assessed by evaluating the correlations with other measures of paranoia and mistrust. To assess the extent to which the paranoia items were measuring unfounded fears rather than current victimisation, the correlation between paranoia scores and participants ratings concerning whether they were "more fearful of others than I should be" was assessed. The size of this correlation was then compared to the correlation between the VAS rating and bullying scores using a correlation difference test (Hittner et al., 2003; Zou, 2007).

3.2.4.3. Stage Three: Computerised Adaptive Test (CAT) simulation

To evaluate the functioning of the B-CAP as an adaptive test, a CAT simulation was conducted. Using the IRT parameters derived from the combined adolescent sample, 10,000 simulated responses were generated to assess the mean number of items needed to reliably estimate paranoia across the severity spectrum. Item selection in the simulation is determined by the maximum Fisher Information criterion. A Bayesian modal estimation that temporarily assumes a normal distribution is used to estimate theta at the start of the simulation, then, a non-Bayesian maximum likelihood estimation is employed to determine a participant's final theta (i.e. severity). The simulation stopping rule was a standard error (SE) of ≥0.32, equivalent to a reliability of ≥0.90. The accuracy of the theta scores derived from the CAT was assessed using the correlation with theta scores based on all 18 items.

3.3. Results

3.3.1. Deriving the questionnaire

Prior to conducting exploratory factor analysis (EFA), three items were deleted due to low correlations with most other items (items 8, 16, & 42; see Appendix D). A further three items were deleted as they had high correlations above 0.70 with other items (items 14, 45, & 48). During the EFA, eight items were deleted on theoretical grounds due to the content either not adequately representing persecutory ideation or overlapping with other items (items 1, 3, 5, 6, 11, 17, 23, 26, and 46). Twelve items were then deleted due to either low communalities below 0.3 (items 9, 10, 21, 32, 37, and 39) or cross-loading over multiple factors (items 33, 30, 43, 27, 41, and 31).

With the remaining 21 items, a clean three-factor structure was identified comprising thoughts of social harm (11 items), conspiracy ideas (5 items), and physical threat (5 items). However, three items from this social harm scale (items 2, 18, and 19) were deleted to balance the contribution of each factor to the overall scale. The factor loadings of the final 18-item, 3-factor solution are shown in Table 7. This factor model explained 52% of the variance and correlations between the factors were high (social harm & conspiracy $r = 0.77$; social harm & physical threat $r = 0.58$; conspiracy & physical threat $r = 0.65$). A formatted version of the final B-CAP is shown in Appendix E.

Table 7. EFA factor loadings for final B-CAP items with three factors for ideas of social harm, conspiracy, and physical threat.

Exploratory factor analysis		**Paranoia factors**		
Item		**Social**	**Conspiracy**	**Physical**
1.	People at school are trying to make me feel unwanted	0.82		
2.	I'm sure people are gossiping about me on social media	0.62		
3.	I am being pushed out of conversations on purpose	0.83		
4.	My friends or partner are ignoring my messages to upset me	0.51		
5.	People are trying to embarrass me in class on purpose	0.65		
6.	People are making sly comments to upset me	0.82		
7.	I think people are lying to me on purpose	0.64		
8.	People say things under their breath to wind me up	0.62		
9.	Nasty tricks are being played on me		0.45	
10.	People are trying to confuse me on purpose		0.38	
11.	Groups of people are planning against me		0.79	
12.	People are collecting my information or photos to use against me		0.44	
13.	I'm sure people are seeking revenge on me		0.73	
14.	I feel like I am being followed or stalked			0.42
15.	I am scared of what strangers will do to me			0.75
16.	People will try to kidnap me			0.78
17.	I could be attacked at any time			0.68
18.	I feel unsafe around people everywhere I go			0.36

3.3.2. Model fit

Mokken scale analysis showed that all 18 items conformed to a single dimension, with item coefficients above 0.3 and an overall homogeneity coefficient of 0.47 (SE=0.018). This suggested the three factors identified in the EFA could be better conceptualised as sub-domains of a single paranoia construct. A second-order CFA in the 769 participants from the school sample with complete data on the 18 items was therefore assessed (**Figure 5**).

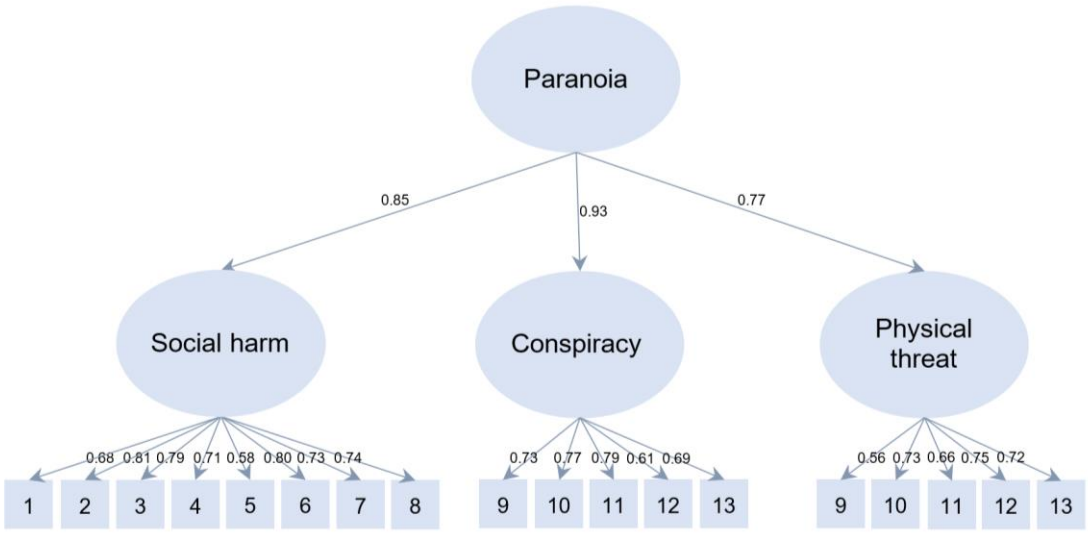

Figure 5. Second-order 3-factor model of paranoia items

The CFA found that a three-factor solution with an overarching second-order paranoia factor has a good fit to the data (Table 8). The three domains (i.e. social harm, conspiracy, and physical threat) were strongly predicted by the second-order paranoia factor with high standardised coefficients (0.77-0.93). With only three indicators the second order model was just identified (Kenny and Milan, 2012), and, so, fit indices were identical to first order model with only the three factors. As shown in Table 8, the model fit was also acceptable in the smaller clinical sample (n = 301) where the χ^2 value was almost identical to the non-clinical sample. The TLI and CFI values were slightly lower in the clinical sample, although still in the acceptable model fit range of > 0.90. Similarly, the RMSEA and SRMR were slightly higher but still within the acceptable range. The results of the Mokken scale analysis and the second-order CFA indicate that it is appropriate to treat to 18-item B-CAP as a unidimensional scale to derive a total paranoia score in addition to subscale scores for the three domains.

Table 8. Confirmatory factor analysis of second-order 3 factor model in general population (n = 769) and clinical (n = 301) samples.

Confirmatory Factor Analysis							
Model fit	**χ^2 (df)**	**p**	**χ^2/df**	**CFI**	**TLI**	**RMSEA**	**SRMR**
1. General population	279.9 (132)	0.00	2.12	0.956	0.949	0.053	0.047
2. CAMHS	278.6 (132)	0.00	2.11	0.936	0.926	0.073	0.062
Second order loadings	**Social harm**	**Conspiracy**		**Physical threat**			
1. General population	0.852	0.933		0.769			
2. CAMHS	0.989	0.892		0.651			

3.3.3. Item response theory analysis

Following removal of outlier participants with extreme person fit statistics (n = 10), unidimensional IRT analysis was conducted on the final sample of 1092 participants (clinical n = 296, non-clinical n = 796). The two parameter GRM provided an excellent fit to the data (CFI = 0.97, TLI = 0.96, RMSEA = 0.053, SRMSR = 0.075). The item parameters are displayed in Table 9, and item category response curves (CRCs) for all items are shown in Appendix F.

Table 9. IRT item parameters for discrimination (a) and difficulty (b). Standard errors are shown in parentheses

	IRT Parameters					
	a	***b*$_1$**	***b*$_2$**	***b*$_3$**	***b*$_4$**	***b*$_5$**
1.	2.41 (0.14)	0.10 (0.05)	0.58 (0.05)	1.23 (0.07)	1.77 (0.09)	2.36 (0.12)
2.	2.09 (0.12)	0.21 (0.05)	0.71 (0.06)	1.51 (0.08)	2.10 (0.11)	2.46 (0.13)
3.	2.40 (0.13)	0.09 (0.05)	0.70 (0.05)	1.40 (0.07)	1.94 (0.09)	2.57 (0.13)
4.	1.75 (0.12)	0.70 (0.06)	1.43 (0.09)	1.95 (0.11)	2.51 (0.15)	3.02 (0.19)
5.	1.99 (0.12)	0.24 (0.05)	0.96 (0.06)	1.58 (0.08)	2.16 (0.11)	2.63 (0.14)
6.	2.77 (0.16)	0.21 (0.04)	0.84 (0.05)	1.41 (0.07)	2.03 (0.09)	2.41 (0.12)
7.	2.44 (0.13)	-0.24 (0.05)	0.41 (0.05)	1.09 (0.06)	1.66 (0.08)	2.10 (0.10)
8.	2.24 (0.12)	0.08 (0.05)	0.69 (0.05)	1.30 (0.07)	1.92 (0.09)	2.34 (0.12)
9.	2.28 (0.15)	0.88 (0.06)	1.51 (0.08)	2.29 (0.12)	2.75 (0.15)	2.94 (0.17)
10.	1.89 (0.11)	0.41 (0.05)	1.08 (0.07)	1.79 (0.09)	2.29 (0.12)	2.73 (0.15)
11.	2.57 (0.17)	0.85 (0.05)	1.36 (0.07)	1.82 (0.09)	2.18 (0.11)	2.48 (0.12)
12.	1.85 (0.14)	1.23 (0.08)	1.83 (0.11)	2.45 (0.15)	2.78 (0.17)	3.21 (0.21)
13.	1.83 (0.12)	0.80 (0.06)	1.51 (0.09)	2.07 (0.11)	2.50 (0.14)	2.79 (0.16)
14.	1.51 (0.11)	0.96 (0.07)	1.63 (0.10)	2.34 (0.14)	2.94 (0.19)	3.36 (0.23)
15.	1.22 (0.08)	-0.29 (0.07)	0.61 (0.07)	1.33 (0.10)	2.00 (0.13)	2.53 (0.17)
16.	1.14 (0.09)	0.96 (0.09)	1.71 (0.13)	2.42 (0.18)	3.24 (0.25)	3.90 (0.32)
17.	1.49 (0.09)	0.11 (0.06)	0.90 (0.07)	1.49 (0.09)	1.97 (0.12)	2.35 (0.14)
18.	1.90 (0.12)	0.44 (0.05)	0.97 (0.06)	1.48 (0.08)	1.84 (0.10)	2.39 (0.13)

As shown in Table 9, discrimination parameters were high for all 18 items (a = 1.14-2.77), suggesting small shifts in paranoia severity increase the probability that items will be endorsed. The item "People are making sly comments to upset me" was the most discriminating item (a = 2.77). The difficulty parameters show all items measure a broad range of paranoia severity from average to severe across the response options (0-5). Full endorsement of all items (b_5, item response 4-5) represented a high severity of paranoia at 2.10-3.90 standard deviations above average. High difficulty parameters for b_1 (representing a response of 0-1) suggested any

endorsement of the following items were particularly indicative of heightened paranoia severity (>0.85 S.D. above average): "People are collecting my information or photos to use against me" (b_1 = 1.23), "People will try to kidnap me" (b_1 = 0.96), "I feel like I am being followed or stalked" (b_1 = 0.96), "Nasty tricks are being played on me" (b_1 = 0.88), and "Groups of people are planning against me" (b_1 = 0.85).

3.3.4. Differential item functioning

Figure 6 shows the density plots comparing the distribution of theta (θ) between younger (aged 11-13 years, n = 509) and older (aged 14-17, n = 583) adolescents, girls (n = 590) and boys (n = 494), and participants in the non-clinical (n = 796) and clinical (n = 296) samples. The DIF analysis found no evidence of significant DIF for each of these demographic factors, with none of the 18 items showing a pseudo R^2 change of more than 0.13 or a beta change of more than 10% between groups.

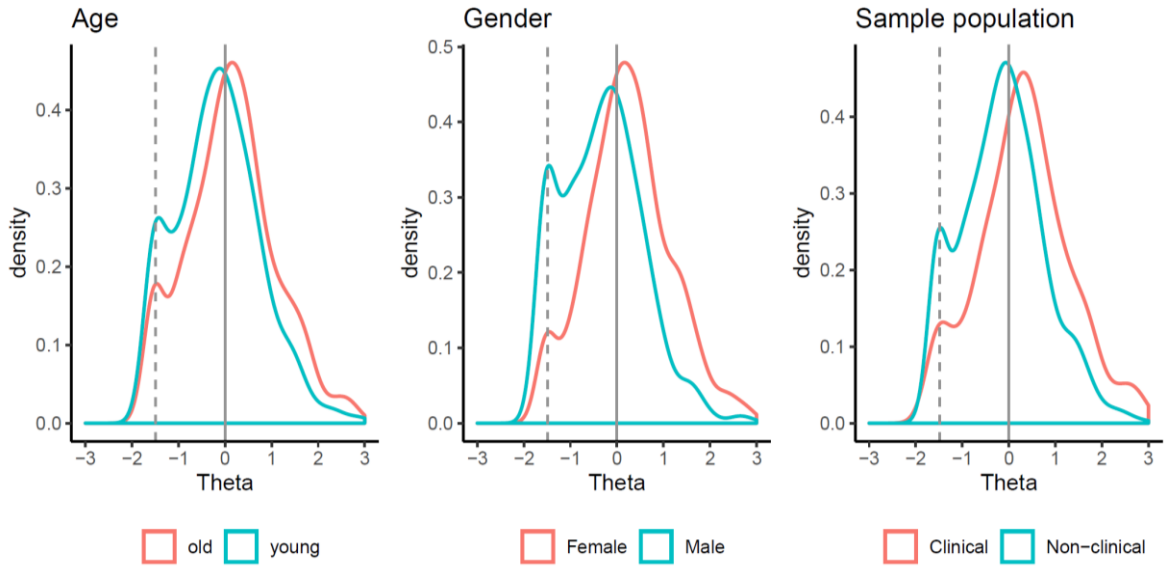

Figure 6. Density plots comparing distribution of theta (θ) between groups for Age, Gender; and Population group. Solid line at theta = 0 represents average trait paranoia. Dashed line at theta -1.49 represents an expected B-CAP score of 0

A stricter criterion of a beta change of more than 5% was then adopted to assess milder levels of DIF. With this stricter criterion, one item was flagged for DIF in the sample population analysis (item 5: "People are trying to embarrass me in class on purpose") and 4 items were flagged for DIF in the gender analysis (item 9: "Nasty tricks are being played on me"; item 13: "I'm sure people are seeking revenge on me"; item 15: "I am scared of what strangers will do to me"; and item 16: "People will try to kidnap me"). No items were flagged using the stricter criterion for the age analysis. The item characteristic plots and the test characteristic curves for

the items with mild DIF are shown in Appendix G. The items flagged for DIF under this stricter criterion did not have an impact on the total scores, with high correlations between theta scores from all 18 items and the DIF adjusted scores for both participant group (r = 0.997, item 5 omitted) and gender (r = 0.992, items 9, 13, 15, & 16 omitted). The mild DIF in these items could therefore be disregarded and differences between demographic groups meaningfully interpreted.

3.3.5. Test reliability

The test information (TI) function (Figure 7) represents the reliability of the B-CAP as a function of paranoia severity (i.e. theta) (see Appendix H for individual information functions). As shown in Figure 7. the B-CAP demonstrated excellent reliability and precision across a wide range of the paranoia spectrum. Equivalent alpha values were greater than 0.90 (TI = 10) between 0.46 SD below and 3.36 SD above average trait paranoia (SE = 0.21-0.31), representing total scores between 5 and 82 (maximum score = 90). The highest reliability was between 0.44 and 2.60 SD above average, representing total scores between 17 and 69, with equivalent alpha values ≥0.95 (TI = 20) and standard errors below 0.23 in this range. The maximum TI of 23.4, equivalent to α = 0.96, was at a theta of 1.73 (SE = 0.21). Reliability only fell into the acceptable range (α < 0.80) beyond 3.90 SDs above (expected scores of 87-90) and 0.94 SDs below (expected scores of 0-1) average. These findings suggest the B-CAP has high reliability for assessing both non-clinical and clinical levels of paranoia with the wide score range. Preliminary test-retest reliability after 1-2 weeks was also high in the small sample of 28 adolescents with mental health problems (ICC = 0.95, 95% CI = 0.90-0.98).

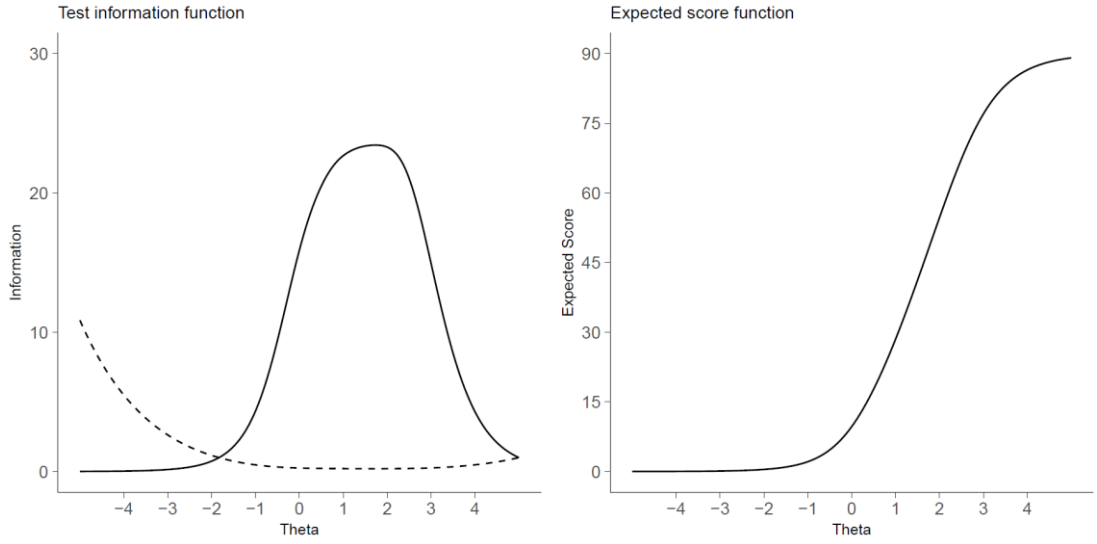

Figure 7. Test information (TI) function with standard errors (---) and expected score function

3.3.5. Expected scores

The B-CAP total score had high precision, with a correlation of 0.92 between scores derived from summing the 18 items and theta scores from the GRM. The expected score function in Figure 7 highlights the anticipated negative skew of paranoia where the average adolescent would be expected to endorse the items to a small degree, with expected scores of 9.68 out of 90 at the average level of trait paranoia (theta = 0) and 17.8 at 0.5 SDs above average (theta = 0.5). Higher scores reflect higher levels of paranoia severity, with expected scores of 28.5 at 1 SD above average, 41.2 at 1.5 SD, 54.7 at 2 SD, 67.3 at 2.5 SD, and 77.0 at 3 SD above average trait paranoia. From this expected score function, descriptive score categories are provided in Table 10 to facilitate interpretation of the B-CAP total score.

Table 10. Interpretive severity ranges for B-CAP total score.

Category	Score	Theta	Description
Average	0-22	≤ 0.70	Scores in this range represent normal levels of suspicious thinking at less than 0.70 SDs above average for adolescents
Mildly elevated	23-39	0.75-1.40	Scores in this range represent slightly elevated suspiciousness at 0.75-1.40 SDs above average for adolescents.
Moderate	40-53	1.45- .95	Scores in this range represent moderate paranoia at 1.45-1.95 SDs above average for adolescents.
High	54-70	2.00-2.60	Scores in this range represent high levels of paranoia at 2.00-2.60 SDs above average for adolescents.
Severe	71-90	≥ 2.65	Scores in this range represent severe levels of paranoia at greater than 2.65 SDs above average for adolescents

3.3.7. Construct validity

As shown in Table 11, the total score of the 18 item B-CAP demonstrated convergent validity with strong correlations with the paranoia subscale of the SPEQ and the social mistrust scale (SMS) in the school pupils. There was also a strong relationship between paranoia and the presence (vs absence) of clinician-rated psychotic symptoms (i.e. delusions and/or hallucinations) in the CAMHS patients. However, this was not statistically significant, most likely due to limited power with only 17 patients rated as having these symptoms; notably, 9 of these 17 adolescents (53%) had at least mildly elevated paranoia.

Table 11 also shows the school pupils reported low levels of trust in new people, with an average rating of 16.3 on a VAS scale where 0 = 'not at all' and 100 = 'very trusting'. Conversely, the

pupils generally reported higher levels of trust in people they already know, with an average VAS rating of 64.7 out of 100. Higher paranoia in the pupils showed a small association with lower trust in people they already know; however, paranoia was only minimally associated with trust in new people.

Paranoia in the school pupils showed a strong positive correlation with peer bullying in the past year (Table 11). Importantly, however, paranoia was moderately correlated with pupils' ratings that they were "more fearful of others than they should be", with this rating becoming gradually higher across the B-CAP score ranges. Pupils with average paranoia (n = 667) rated the excessiveness of their fear of others as 30/100 (SD = 26) on a VAS scale where 0 = 'no more than I should' and 100 = 'much more than I should'. This rating increased to 50/100 (SD= 27, n = 82) for those with mildly elevated paranoia, 55/100 (SD = 31, n = 36) for those with moderate paranoia, 64/100 (SD = 30, n = 12) for those with high paranoia, and 85/100 (SD = 30, n = 4) for those with severe paranoia. The correlation of 0.41 between participant's VAS ratings of the excessiveness of their fears was significantly larger than the correlation of 0.25 between the same VAS rating and peer bullying scores ($\tilde{\chi}$ = 5.35, p < 0.001). These findings provide confidence that the B-CAP is a valid tool for identifying excessive concerns about others that are distinct from recent experiences of victimisation.

Table 11. Associations between B-CAP score and other measures. Standardised Beta shown for linear regression of clinician-rated presence (vs absence) of psychotic symptoms and paranoia.

	Sample	*n*	Mean (SD)	*r*	*p*
SPEQ paranoia	School	801	13.0 (14.6)	0.84	<0.001
Social mistrust scale	School	801	2.98 (3.32)	0.68	<0.001
Trust new people (0-100)	School	797	16.3 (17.6)	-0.09	0.0086
Trust people I know (0-100)	School	799	64.7 (22.7)	-0.22	<0.001
Excessive fear of others (0-100)	School	766	33.6 (27.8)	0.41	<0.001
Peer bullying	School	757	6.82 (7.29)	0.61	<0.001
Psychotic symptoms	CAMHS	17 (254)[a]	/	0.47	0.061

Note: a) Number of participants with clinician-rated psychotic symptoms; participants without clinician rated psychotic symptoms shown in parenthesis.

3.3.8. CAT simulation

The results of the CAT simulation are shown in Table 12. The 10,000 simulated responses are split into 10 equal decile (D) ranks along the theta spectrum. The average test length was 10.9 items (SD = 5.14) with a mean Root Mean Square Error (RMSE) of 0.36 and a mean bias of 0.0014. The number of items administered decreased incrementally across each decile rank of

the theta spectrum, indicating a smaller number of items are sufficient to derive an accurate estimate of paranoia as severity increases. Only 5-6 items were administered on average from D8 to D10 (mean theta = 0.66-1.75). This pattern is consistent with the test information values that showed the B-CAP has the greatest reliability at the higher end of the severity spectrum. The CAT scores had high accuracy with a correlation of 0.93 between theta scores derived from all 18 items and the CAT estimated scores.

Table 12. CAT simulation of 10,000 respondents showing average test length across 10 decile (D) ranks of the theta spectrum

	Decile ranks									
	D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
Mean Theta	-1.76	-1.04	-0.67	-0.38	-0.12	0.13	0.39	0.66	1.02	1.75
Mean length	18.0	17.7	16.3	13.4	10.7	8.01	6.80	6.20	5.68	5.71
RMSE	0.61	0.35	0.39	0.35	0.31	0.29	0.29	0.30	0.31	0.31
Mean SE	0.52	0.44	0.38	0.33	0.31	0.31	0.30	0.30	0.30	0.30
Mean bias	0.42	0.01	-0.05	-0.01	-0.03	-0.02	-0.04	-0.06	-0.09	-0.15
Stop rule satisfied	0.00	0.05	0.25	0.61	0.85	0.98	1.00	1.00	1.00	1.00

3.4. Discussion

The 18-item B-CAP consists of an overarching paranoia construct with three subdomains of paranoia: social threat, conspiracy concerns, and physical harm. IRT analyses showed the items are highly discriminative of shifts in adolescent paranoia across the spectrum of severity, with higher scores representing more severe presentations. Reliability was excellent across a wide range of paranoia severity, from the average levels expected in most adolescents to the more severe presentations likely in clinical populations. Importantly, reliability was highest for elevated levels of paranoia and remained high even at the extreme end of the spectrum. Furthermore, all items functioned similarly between boys and girls, between older and younger adolescents, and between young people from the general population and those seeking help from mental health services. This measurement invariance indicates that differences in B-CAP scores between the demographic groups are unlikely to be caused by bias within the questionnaire. Preliminary test-retest reliability was high in a small group of young people with mental health problems, although this would need to be confirmed in a larger sample. Overall, the findings suggest the B-CAP is a reliable and sensitive tool to assess both non-clinical and clinical levels of paranoia in young people.

The B-CAP should have utility as a clinical measure in CAMHS. The broad similarity of items, both in their ability to discriminate shifts in paranoia and in the level of severity each item response represents, suggest the total score can be meaningfully interpreted. A high correlation with theta scores suggest the total score has good precision for routine clinical use. However, computerised administration to calculate theta scores would lead to even higher precision in estimating paranoia severity, whilst also allowing the possibility of adaptive testing to reduce the number of items administered. Our CAT simulation showed that, when administered as an adaptive test, only 5-6 items on average were required at the higher end of the severity spectrum to reliably estimate paranoia. Although an 18-item scale is already relatively short, when administered alongside many other measures in assessments this item reduction may decrease patient burden.

3.4.1. Limitations

There are notable limitations of this study. Although the combination of participants from the general population and patients attending mental health services allowed a range of the paranoia

spectrum to be assessed, only a small minority of our sample had psychosis and we did not include data from young people with diagnosed persecutory delusions. As a result, the analysis and resultant IRT parameters may have underrepresented the extreme end of the paranoia spectrum. If a large sample of adolescents with psychosis were included, it is also possible that more extreme paranoia items rarely endorsed by people without psychosis (e.g. "people are trying to poison me") would have been retained in the final model. Obtaining normative scores for the B-CAP from young people with persecutory delusions will be beneficial. However, the IRT model was used to create score ranges from the expected scores at different levels of severity to aid clinical interpretation. It is also notable that the categorical response curves shown in Appendix F suggest fewer response options could be adequate in sampling paranoia severity from the B-CAP items. However, collapsing response categories would likely reduce the scale's sensitivity to detect individual fluctuations in paranoia in clinical practice. As the B-CAP is designed to be a clinical tool, sensitivity to individual change is vital. This is also consistent with service user input in the design phase where young people fed back that an initially proposed four-point scale was not specific enough and it was expanded to six at their suggestion.

As discussed in Chapter 2, there is likely an unavoidable level of measurement error in self-report paranoia questionnaires from genuine experiences of hostility. Although the B-CAP was moderately associated with participant ratings that their suspicions were excessive and distinct from bullying scores, future validation of the B-CAP with clinician-rated assessments and experimental procedures such as virtual reality (Freeman et al. 2010) would be beneficial. Another limitation is the small number of items used in the CAT analysis, since reliability can be improved with a broader range of items to choose from when matching items to participants. Yet even with only 18 items, our CAT simulation was still able to substantially reduce the number of items without a loss of precision. However, as the whole sample was used to calibrate the item bank, it was only possible to use simulated responses to conduct the CAT simulation. Assessing the functioning of the adaptive B-CAP in a separate validation sample will now be required. Adopting a multidimensional IRT approach would also be beneficial to assess the capacity of the CAT to sample from each of the three sub-domains of paranoia in the B-CAP. Nonetheless, the B-CAP provides a valid, reliable, and age-appropriate tool to advance the study of paranoia in adolescents.

Chapter Four [2]

Paranoia in adolescents attending a secondary school

4.1. Introduction

There are arguably few places that provoke greater feelings of social vulnerability than secondary school. This is the key social setting where challenging adolescent peer interactions, characterised by turbulent friendships, fickle social hierarchies, and widespread peer aggression (see Chapter 1), typically unfold. In this social landscape, judgments about the intentions of others may become skewed towards the negative; for some adolescents, paranoid thoughts that others intend harm may follow. Secondary schools therefore provide an appropriate starting point to understand paranoia in adolescents. In this chapter, the newly developed B-CAP was used to examine the prevalence and potential correlates of paranoia in a secondary school cohort of adolescents.

Previous studies suggest paranoid thoughts may be relatively common in the adolescent general population, but limitations in measurement have prevented reliable prevalence estimates (see Chapter 1). As occurs in adults, it is likely that paranoia in adolescents will be continuously distributed and hierarchically arranged, with severe ideas of threat building on more common concerns (Bebbington et al., 2013; Freeman et al., 2005). There is also evidence that paranoia at this age may be higher in girls compared to boys (Ronald et al., 2014; Wong et al., 2014). As described in Chapter 1, preliminary studies with adolescents suggest paranoia is likely associated with greater psychopathology, negative interpersonal experiences, and several psychological factors (e.g. negative affective, worry, low self-esteem, and sleep disturbance) identified in the cognitive model of paranoia (Freeman, 2016).

Young people's suspicions will likely be shaped by their social context, which for many adolescents also occurs online to variable degrees (Kelly et al., 2018). This raises a little-addressed question: does social media make young people paranoid? There are several potential routes by which social media use may interact with emerging paranoia in adolescence. First, social media may trigger social comparison processes that intensify feelings of vulnerability and

[2] This chapter has been adapted from the following paper, shown in Appendix I:

Bird JC, Evans R., Waite F, Loe BS, & Freeman D. (2019). Adolescent paranoia: Prevalence, structure, and causal mechanisms. *Schizophrenia Bulletin,* 45(5), 1134-1142.

inferiority (Singleton et al., 2016). Second, social media could provide a constant source of ambiguous social information to be misinterpreted as threatening – as well as opportunity for genuine online victimisation (Kowalski et al., 2014). In line with this, previous evidence suggests heightened emotional reactivity to social media and cybervictimisation predict the persistence of paranoia in adolescents (Bird et al., 2017). Third, threat-based safety behaviours on social media (e.g. censoring posts, checking for threat, or avoiding interactions) may increase preoccupation with threat and prevent access to disconfirmatory evidence. Evidence has shown that online safety-seeking behaviours are often used by young adults with social anxiety (Carruthers et al., 2019). Finally, excessive social media use at night could impair young people's sleep (Carter et al., 2016), which, in turn, may contribute to paranoia via increased negative affect (Freeman, 2016). The interaction between paranoia, psychological processes, and social factors (both on and offline) during adolescence will likely be complex.

4.1.1. Network modelling

Statistical advances in network modelling provide new opportunities to evaluate complex systems of interaction between multiple variables within observational data (Borsboom and Cramer, 2013). As introduced in Chapter 1, a network model consists of a group of variables, each represented as a "node", with pairs of nodes connected by an "edge". Statistically, these edges encode direct relationships between pairs of variables, implying they are directly related once other variables in the network have been conditioned upon. The absence of an edge thus indicates two variables are conditionally independent once other variables are controlled. The most commonly used methods for estimating these conditional dependence relationships involve *undirected* network models. In an undirected network, edges are weighted to represent the size of the conditional relationship but undirected, making no assumptions on the direction of this relationship. Undirected networks are therefore easily parameterized to provide a reliable estimate of the underlying causal skeleton connecting a set of variables.

In recent years, however, the use of Bayesian methods to discover *directed* causal effects in a network have started to be used within psychiatry (Kuipers et al., 2019; Moffa et al., 2017). Bayesian networks are probabilistic graphical models, visualised in a directed acyclic graph (DAG) where all edges are directed (→) and feedback loops, that is, a circular sequence of edges leading from a node back to itself, are not allowed (i.e. they are acyclic). If there is an edge from A→B, it is said that A is a parent of B; this implies that after controlling for other parents, B

remains dependent on A. If the graph is causally interpreted, then A is a direct cause of B. Conversely, the absence of an edge represents independence once earlier variables in the causal chain are considered (Pearl, 2009). Importantly, a DAG assumes the joint probability distribution of the variables factorises according to the structure of the graph - in words, each variable only depends upon its parents. As this factorisation places restrictions on the joint probability distribution, it is possible to differentiate the distribution for a given set of variables and learn, using Bayesian inference, the underlying causal model (i.e. DAG) from patterns in the data (Pearl, 2009).

Although Bayesian DAGs provide innovative opportunities for examining causal pathways in cross-sectional data, it is important to acknowledge several restrictions. First, the acyclic nature of a DAG fails to acknowledge that interactions between most psychological variables are likely to be at least somewhat reciprocal. It is also not possible to uncover the true direction of all causal effects in a DAG as different causal models are often represented by the same conditional independencies. This typically occurs when two graphs have the same adjacent pairs of nodes, and the same v-structures - these are pairs of edges of the form $X \rightarrow Z \leftarrow Y$, where X and Y are not joined by an edge directly. Such graphs form a Markov equivalence class and cannot be distinguished from patterns in the data (Pearl, 2009).

As undirected networks are highly identifiable, they provide an efficient starting point to examine the causal structure between a set of variables without problems of acyclity or Markov equivalence. But whilst recognising the limitations of DAGs, Bayesian methods also improve the reliability of an identified network by quantifying the uncertainty in both the model selection procedure and estimation of parameters. These parameters then allow inferences about the *probability* of each possible directed causal pathway in a given dataset. A cautious approach can then be used where the degree of certainty for each directed path is described, providing nuanced insights into causal pathways located in complex systems.

4.1.2. This chapter

This study of paranoia in a secondary school context had three objectives. The first objective was to describe the prevalence of paranoia in the adolescent cohort and the potential differences between genders and age groups. The second objective was to evaluate the differences in paranoia between young people scoring above and below the clinical range for psychiatric

symptoms (i.e. anxiety, depression, and insomnia), and between different intensities of social media use. The third objective was to examine - using network models - the patterns of interaction between paranoia and theoretically important psychological factors (i.e. negative affect, body image concerns, and sleep dysfunction) and social factors pertinent to adolescents (peer difficulties, bullying, and social media use). To provide a comprehensive insight into these interactions, an undirected network model was first estimated to identify the broad causal structure, and then, a Bayesian approach with DAGs examined the probabilistic directed causal pathways between paranoia and other variables.

4.2. Method

4.2.1. Participants

Participants were 801 adolescents aged 11-15 years (mean age = 13.3, SD = 1.16) from a secondary school in Leicestershire, as initially described in Chapter 2. The sample consisted of 85% of students enrolled at the school, equally distributed across years 7-10. Participants included 410 girls (51%), 382 boys (48%), and 9 "other gender" (1.1%). A total of 629 participants were White British (78.5%), 56 were South Asian (7.0%), 38 were mixed ethnicity, 21 were Black (African, Caribbean, or other Black), 25 were other White, 12 were Chinese, 4 were other Asian, 2 were Arab, and 14 did not provide ethnicity data.

4.2.2. Measures

4.2.2.1. Paranoia

Participants completed the full item pool used to develop the B-CAP in Chapter 2. However, for this study only the final 18-item scale was used. Participants rated the frequency of each paranoid thought in the last 2 weeks on a 6-point scale (0=not at all, 5=all the time). Higher scores indicate higher levels of paranoia.

4.2.2.2. Negative affect (anxiety and depression)

The 25-item Revised Anxiety and Depression Scale (RCADS) – Short version is a measure of anxiety and depression for children and adolescents (Ebesutani et al., 2012). The RCADS-short is a briefer version of the original 47-item RCADS. Items are rated on a 4-point scale (0=never, 4=always), with higher scores indicating higher negative affect. Alongside a total anxiety and depression (i.e. negative affect) score, two subscales for anxiety (15 items) and depression (10 items) are also obtained. T-scores, standardised by age and gender, of 70+ indicate clinical levels of anxiety and depression.

4.2.2.3. Worry

The 14-item Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita et al., 1997) was used to measure worry. Items are rated on a 0-3 scale (0=never, 3=always), with higher scores indicating a greater tendency to worry.

4.2.2.4. Body image concerns

The Body Esteem Scale for Adolescents and Adults (BESAA; Mendelson et al., 2001) is a 23-item Likert-scale designed to assess body satisfaction. Items are rated on a 5-point scale (0=never, 1=rarely, 2=sometimes, 3=often, 4=always), with lower scores indicating greater body image concerns.

4.2.2.5. Sleep difficulties

The Adolescent Sleep Wake Scale – short version (ASWQ; Essner et al., 2015) was used to measure sleep difficulties. The ASWQ is a 10-item questionnaire assessing sleep quality in adolescents. Items are rated over the previous two weeks on a six-point scale (1=always, 6=never), with higher scores indicating better sleep quality. The Insomnia Severity Index (ISI; (Bastien et al., 2001) was also used to measure the likely presence of insomnia. The ISI is a 7-item self-report questionnaire assessing insomnia symptoms over the past two weeks. Items are rated on a 5-point scale (0=not at all, 4=very much), with higher scores indicating greater insomnia severity. A score of 10+ on the ISI is the validated cut-off score for detecting insomnia in the adult general population (Morin et al., 2011); however, one study in China found a score of 9+ was optimal for detecting insomnia in adolescents (Chung et al., 2011).

4.2.2.6. Peer difficulties

The 5-item peer problems subscale of the Strengths and Difficulties Questionnaire (SDQ; (Goodman, 2001) was used to assess peer difficulties. The SDQ is a 25-item mental health screening questionnaire for young people. Each item is rated on a 3-point scale (0=not true, 1=somewhat true, 2=certainly true), with higher scores indicating greater difficulties.

4.2.2.7. Bullying

The 16-item Multidimensional Peer Victimisation Scale (MPVS; Mynard and Joseph, 2000) was used to assess peer bullying. The MPVS is specifically designed to assess peer bullying in adolescents. Participants rate the frequency of each bullying experience in the past year on a 3-point scale (0=not at all, 1=once, 2=more than once), with higher scores indicating greater bullying.

4.2.2.8. Social media dependence

The Bergen Social Media Addiction Scale (Andreassen et al., 2017) is a 6-item self-report questionnaire designed to assess social media dependence. Participants were asked to rate the

frequency of each experience in the last 2 weeks. Items are rated on a 5-point scale (1=never, 5=always), with higher scores indicating greater dependence on social media.

4.2.2.9. Novel social media use measures

Four novel social media measures were created and validated for this study (see Appendix J). All four questionnaires examined the frequency of items within the last two weeks.

Night use

Social media use at night was assessed using six items relating to frequency (e.g. "How long do you usually spend on social media when you are in bed before sleeping?") and impact (e.g. "It is hard to stop using social media when I need to sleep"). Items were rated on a 6-point scale, with higher scores indicating greater social media use at night.

Emotional reactivity

To assess emotional reactivity to social media, participants rated the frequency of seven negative emotions (e.g. "scared", "sad") whilst using social media. Items were rated on a 6-point scale (0=never, 5=all the time), with higher scores indicating greater levels of negative emotion in response to social media.

Safety-seeking behaviours

Ten items assessed online threat-based safety-seeking behaviours - that is, actions to avoid harm from others whilst using social media (e.g. "be careful what I post so it can't be used against me"). Items were rated on a 6-point scale (0=never, 5=all the time), with higher scores indicating higher use of safety-seeking behaviours on social media.

Negative self-comparison

Seven items assessed how often participants compared themselves negatively to others on social media (e.g. "I'm not as attractive as other people I see on social media"). Items were rated on a 6-point scale (0=never, 5=all the time), with higher scores indicating greater levels of negative self-comparison on social media.

4.2.3. Statistical analysis

Analyses were conducted using R, version 3.6.1.

Missing data

Missing data on the B-CAP were rare: 28 participants had 1 item missing and 4 participants had 2 items missing. Across all questionnaires, only 3.1% of values were missing. Missing values on each questionnaire were imputed using multiple imputation (MI) with predictive mean matching (van Buuren and Groothuis-Oudshoorn, 2011) for those with missing data for less than 20% of items on that questionnaire. This MI procedure produced five imputed datasets. Only one of these datasets was used for the analysis of prevalence, simple associations, and the undirected network analysis. However, all five imputed datasets were pooled for the Bayesian DAGs analysis to better account for the uncertainty of missing values in the posterior probability distribution (Sterne et al., 2009).

Prevalence and associations

The prevalence of paranoia was assessed by examining individual item endorsement (score of 2+, i.e. at least weekly), and the proportions of adolescents scoring above the validated score ranges described in Chapter 3. The frequency distribution of the total number of items endorsed was examined against an exponential model. The hierarchical structure of items was then examined using the correlation between endorsement rates for each item and the number of additional items endorsed, corrected for the contribution of that item (Sturt, 1981). One-way analysis of variance (ANOVA) was used to examine the differences in paranoia scores between girls, boys, and those who selected other gender. Pearson's correlation was used to examine the continuous relationship between paranoia and age, and a one-way ANOVA was conducted to examine the differences in paranoia between the four school year groups.

A one-way ANOVA was used to examine the difference in paranoia scores between those in the average, borderline, and clinical ranges for anxiety and depression (i.e. negative affect) on the RCADS. Notably, this analysis did not include the 9 participants who selected 'other gender' as the T-scores are calculated based on gender. The difference in paranoia scores between those above and below clinical thresholds for insomnia on the ISI were then examined using a t-test. A two-way ANOVA examined the differences in paranoia between light (< 1-hour p/day), moderate (1-4 hours p/day), and heavy (4+ hours p/day) social media users, and the interaction between social media use and gender.

Network analyses

For the network analyses, participants who had one or more entirely missing questionnaires were excluded (n = 59), providing a final sample of 742 adolescents. Prior to conducting both network analyses, the variables were matched to the quantiles of a normal distribution to provide a Gaussian dataset.

Undirected network

To examine the undirected network structure, a Gaussian Graphical Model (GGM) was estimated using neighbourhood regression in the 'mgm' package (Haslbeck and Waldorp, 2020). This neighbourhood regression approach was used to allow the predictability of each node to be calculated via the proportion of variance (R^2) explained by connecting nodes (Haslbeck and Waldorp, 2018). To overcome potential sampling variation and limit the estimation of spurious edges, regularisation with the Least Absolute Shrinkage and Selection Operator (LASSO) was used (Tibshirani, 1996). The LASSO regularisation employs a penalty by limiting the sum of the partial correlation coefficients, leading to a shrinking of estimates with some becoming exactly zero (Epskamp and Fried, 2018). The degree of regularisation is controlled by the tuning parameter λ, selected using the Extended Bayesian Information Criterion (EBIC). The EBIC hyperparameter is set between 0-0.5 to determine the extent to which a parsimonious model is preferred (Foygel and Drton, 2010), with higher values producing more cautious estimations. An EBIC hyperparameter of 0.3 was used in this analysis. A non-parametric bootstrap with 1000 iterations was then conducted to calculate 95% confidence intervals of the edge weights using the package 'bootnet' (Epskamp et al., 2018). The bootstrap difference test was used to compare edge weights.

Once estimated, the package 'qgraph' (Epskamp et al., 2012) was used to visualise the unique relations among the variables in a weighted network model where the thickness and saturation of the edge colour represents the size of the relationship. Blue edges represent positive conditional dependence associations whilst red edges represent negative associations. To ease interpretation, the body image variable was transformed in line with the other variables so that a higher score indicates a worse presentation. The node predictability values (R^2) are visualised by a shaded ring around each node. The layout of the undirected network is set by the Fruchterman and Reingold algorithm (Fruchterman and Reingold, 1991) where strongly connected nodes are positioned closer together and the most widely connected nodes are placed

in the centre of the network. Where edges overlapped, minor manual adjustments to the layout were made to ensure a clear visualisation of the relationships.

In a separate graph, the shortest paths between paranoia and every other variable were computed to highlight potential mediation pathways in the network. Calculated using Dijkstra's algorithm (Dijkstra, 1959), the shortest path represents the fastest route for an interaction to occur between two variables, taking the strength of edge weights along different possible routes into account. So, if a direct path between two variables (i.e. A—B) is available, this may be the fastest path to take; if the connection is weak, however, an indirect path consisting of stronger connections (i.e. A—C—B) may be the most efficient route. Edges not required for the shortest paths are suppressed, allowing a clear visualisation of the direct and indirect pathways between selected variables.

Directed Acyclic Graphs (DAGs)

To determine which causal DAG structures were compatible with the data, Bayesian analysis was used to obtain a posterior probability distribution over the set of possible graphs. Following the method of (Moffa et al., 2017), the Partition Markov Chain Monte Carlo (MCMC) algorithm (Kuipers and Moffa, 2017) was used to sample from this distribution in proportion to the probability for each possible graph. In other words, graphs with a better fit to the data (after accounting for model complexity) were selected most often. Partition MCMC is a search and score method that samples DAG structures using the Bayesian Gaussian equivalent (BGe) score, representing the marginal likelihood of each DAG model. For a fair comparison between graphs with different structures, graphs were fitted using a multivariate normal distribution with an inverse Wishart prior distribution on the covariance matrix. The BiDAG package (Sutur and Kuipers, 2018) was used to run partition MCMC for 10 million iterations on all five imputed datasets, thinned by a factor of 1000 to obtain 50,000 sample DAGs from the posterior distribution. The posterior probability of each edge was then estimated by averaging over the 50,000 samples and visualised in a DAG.

In the DAG visualisation, the edge colour intensity represents the proportion of sampled graphs in which that edge was present. For clarity, however, only edges present in over 50% of graphs are displayed. Blue directed edges (→) represent significant direct causal effects where that orientation occurred in over 90% of cases in which an edge was present. Conversely, black undirected edges depict relationships where this threshold for a consistent causal direction was

not met. In these cases, the edge between two variables occurred frequently, indicating high certainty of a direct causal dependence between them, but either direction was plausible from patterns in the data.

For each sampled graph, a sample was then drawn from the posterior distribution of the covariance matrix. These were used, in conjunction with the graphs, to estimate the total causal effect of each variable on every other variable. The total effects comprise both direct effects (with other variables constrained) and indirect paths via other variables. Causal effects are expressed as z-scores with 90% credible intervals (CI). Notably, these credible intervals only include the sampled graphs in which the relevant causal pathway was present. Hence, they should be interpreted conditionally on the existence of such a pathway.

4.3. Results

4.3.1. Prevalence

Paranoid thoughts were endorsed by a substantial minority of adolescents, with weekly occurrence by item ranging from 7-32% (Table 13). The mean number of paranoid thoughts endorsed was 3.25 (SD = 4.07) and the total items endorsed followed a single, continuous distribution that closely fitted an exponential curve ($r = 0.97$; Figure 8).

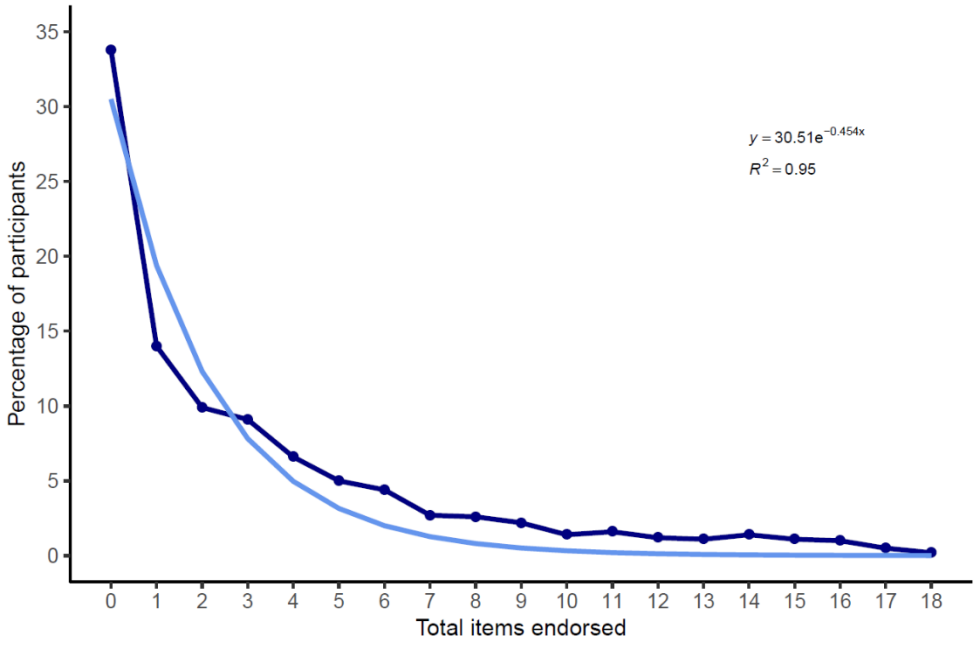

Figure 8. Distribution of paranoia endorsement fitted against an exponential curve

The most commonly endorsed items were "I am scared of what strangers will do to me" (32%) and "I think people are lying to me on purpose" (30%). The least commonly endorsed items were "People are collecting my information or photos to use against me" (7%), "Groups of people are planning against me" (9%) and "Nasty tricks are being played on me" (9%). Endorsement of individual paranoia items was associated with endorsing between 3.72–7.65 additional paranoia items (mean = 5.66, SD = 0.91). There was a non-reflexive relationship between the items, with a strong correlation between endorsement frequency and the number of additional items endorsed ($r = -0.75, p < 0.001$). The scale scores in Table 14 show that 17% ($n = 134$) of adolescents reported at least mildly elevated levels of paranoia; however, a much smaller proportion of young people scored above moderate, high, and severe score ranges.

Table 13. Item response frequencies and percentage endorsed (score of 2+) in secondary school sample. The mean number of additional items endorsed when each item is endorsed is also shown.

Item	0	1	2	3	4	5	Endorsed (2+)	Excess items
1. Feel unwanted	461	136	97	48	33	26	25%	5.30
2. Gossip on social media	511	122	96	40	15	17	21%	5.50
3. Out of conversations	463	158	98	43	22	17	22%	5.45
4. Ignoring messages	596	114	41	26	12	12	11%	6.03
5. Embarrass in class	458	177	87	40	20	19	21%	5.58
6. Sly comments	520	151	65	40	12	13	16%	6.52
7. Lying on purpose	370	192	124	54	29	32	30%	4.92
8. Under breath	441	158	99	59	18	26	25%	5.50
9. Nasty tricks	630	101	48	9	4	9	9%	7.19
10. Confuse me	525	142	73	31	13	17	17%	5.64
11. Groups planning	646	81	32	14	5	23	9%	7.67
12. Collecting photos	668	78	30	9	9	7	7%	6.20
13. Seeking revenge	600	116	40	15	7	23	11%	6.15
14. Followed or stalked	602	105	56	21	7	10	12%	5.50
15. Scared strangers	354	185	107	65	31	59	33%	3.71
16. Kidnap me	591	93	58	31	12	16	15%	4.74
17. Attacked anytime	455	160	76	46	14	50	23%	4.58
18. Unsafe everywhere	547	105	68	32	26	23	19%	5.73

Note: 0 = Never, 1 = Once, 2 = Couple of times, 3 = Few times a week, 4 = Every day, 5 = All the time.

4.3.1. Relationship with gender and age

There was a significant effect of gender on paranoia scores, with girls scoring significantly higher ($p < 0.001$) than boys on both the total score and each of the three subscales (Table 14). This difference was also shown across the score ranges with 23% of girls reporting at least mildly elevated paranoia levels compared to only 8% of boys. Notably, the few participants who identified as "other gender" reported significantly higher paranoia than both girls and boys on the total score and all subscales, with 7/9 of these young people reporting at least mildly elevated levels (Table 14).

Table 14. Mean paranoia scores split by gender and proportion scoring above the score ranges

	Full sample	Gender groups			ANOVA	
		Girls	Boys	Other	F	*p*
n	801	410	382	9	/	/
B-CAP total	12.5 (14.0)	15.8 (15.0)	8.2 (10.8)	37.7 (19.0)	49.4	<0.001
Social harm	6.40 (7.50)	8.23 (8.13)	4.2 (5.8)	16.4 (10.2)	40.5	<0.001
Conspiracy	2.18 (3.71)	2.53 (3.94)	1.6 (3.1)	10.7 (5.6)	32.6	<0.001
Physical threat	3.89 (4.82)	5.08 (5.31)	2.5 (3.6)	10.6 (7.6)	41.9	<0.001
Score ranges						
Average: <23	667 (83%)	314 (77%)	351 (92%)	2 (22%)	/	/
Mildly Elevated +	134 (17%)	96 (23%)	31 (8.1%)	7 (78%)	/	/
Moderate +	52 (6.5%)	40 (9.8%)	8 (2.1%)	4 (44%)	/	/
High +	16 (2.0%)	11 (2.7%)	3 (0.8%)	2 (22%)	/	/
Severe+	4 (0.5%)	2 (0.5%)	2 (0.5%)	0 (0%)	/	/

Note: Score ranges for BCAP total = 0-90, Social harm = 0-40, Conspiracy = 0-25, Physical threat = 0-25. Degrees of freedom for ANOVA = 2,790.

There was no significant correlation between total paranoia severity and age (r = 0.065, p = 0.068) and the main effect for school year group on paranoia was non-significant (Table 15). Notably, a year group effect was observed for the social harm subscale, driven by lower scores for participants in year 7 (age 11-12 years) compared with the other year groups. A small effect at the threshold for significance was observed for the conspiracy subscale, driven by slightly lower scores in year 7 compared to year 9 (13-14 years).

Table 15. Mean paranoia scores split by year group and proportion scoring above the score ranges.

	School year groups				ANOVA	
	Year 7	**Year 8**	**Year 9**	**Year 10**	***F***	***p***
n	156	213	225	207		
B-CAP total	10.2 (13.2)	13.6 (15.1)	12.6 (12.7)	12.8 (14.4)	1.87	0.13
Social harm	4.99 (7.05)	7.1 (8.28)	6.10 (6.66)	7.10 (7.71)	3.14	0.02
Conspiracy	1.45 (3.39)	2.3 (3.86)	2.44 (3.73)	2.28 (3.71)	2.59	0.05
Physical threat	3.80 (4.81)	4.2 (5.03)	4.03 (4.52)	3.43 (4.92)	1.09	0.35
Score ranges						
Average	140 (90%)	171 (80%)	184 (82%)	172 (83%)	/	/
Mildly Elevated +	16 (10%)	42 (20%)	41 (18%)	35 (17%)	/	/
Moderate +	9 (5.8%)	18 (8.5%)	9 (4%)	16 (7.7%)	/	/
High +	4 (2.6%)	4 (1.9%)	3 (1.3%)	5 (2.4%)	/	/
Severe +	1 (0.6%)	2 (0.9%)	1 (0.4%)	0 (0%)	/	/

Note: Score ranges for BCAP total = 0-90, Social harm = 0-40, Conspiracy = 0-25, Physical threat = 0-25. Degrees of freedom for ANOVA = 3,790.

4.3.2. Relationship with mental health symptoms

Eleven percent of pupils (n = 91) scored in the clinical range for anxiety and depression symptoms on the RCADS (mean age = 13.5, SD = 1.05, female: n = 65, male: n = 26); an additional 4% (n = 33) were in the borderline range. Adolescents in the clinical range for anxiety and depression had significantly higher paranoia scores (mean = 31.3, SD = 18.6) than young people in both the borderline (mean = 22.4, SD = 15.3) and average ranges (mean = 9.00, SD = 9.85; F (2,784) = 175.1, p < 0.001). Notably, 60% (n = 55) of adolescents scoring in the clinical range for anxiety and depression also had elevated paranoia, and 47% (n = 63) of those with elevated paranoia reported clinical levels of anxiety and depression.

Sleep problems were notably high in the sample, with 43% (n = 342) scoring in the adolescent range for insomnia of 9+ on the ISI (mean age= 13.3, SD = 1.11; girls n = 202; boys n = 133; other gender n = 7). This proportion dropped slightly to 37% (n = 293) with the stricter ISI cut-off score of 10 from the adult literature. Using the adolescent threshold, young people in the clinical insomnia range had significantly higher levels of paranoia (mean = 19.1, SD = 16.7) than those in the average range (mean = 7.35, SD = 8.42; t = 11.8, df = 473.9, p < 0.001). Notably, 30% (n = 103) of adolescents in the insomnia range reported at least elevated paranoia scores; however, 79% (n = 104) of those with elevated paranoia were in the clinical insomnia range.

4.3.3. Relationship with social media use

Of the participants who responded (n = 779), 94% (n = 736) reported using social media, with 81% (n = 629) using it every day. Of those who used social media, 22% (n = 164) used it for less than 1 hour per day (light users), 34% (n = 252) used it for between 1-4 hours a day (moderate users), and 42% (n = 310) used it for more than 4 hours per day (heavy users). There was a significant effect of the intensity of daily social media use on paranoia (F (2,717) = 13.9, $p < 0.001$), with heavy users reporting significantly higher scores (mean = 15.7, SD = 15.4) than both moderate (mean = 11.2, SD = 12.6, $p < 0.001$) and light users (mean = 9.8, SD = 13.3, $p < 0.001$). A significant interaction between the social media use groups and gender (F (4,717) = 2.60, $p = 0.01$) showed this effect was specific to girls, with no difference in paranoia between boys with heavy, moderate, and light social media use ($p > 0.99$).

4.3.4. Network analysis

Simple correlations between the variables were examined prior to conducting network analyses. Paranoia demonstrated medium-large simple correlations with all variables (Table 16). Notably, the anxiety and depression subscales on the RCADS were highly related ($r = 0.79$, $p < 0.001$), indicating multicollinearity. As a result, the total RCADS score was used in the network analyses as a general measure of negative affect. Similarly, the worry variable had a high overlap with the RCADS ($r = 0.76$), and, so, was not included in the networks (see Appendix K for correlation between all variables).

Table 16. Mean scores and simple correlations with paranoia in the full sample (n = 801), and, for the network sample (n = 742), edge weights with paranoia and variance explained by connecting nodes (R^2).

		Descriptives			Undirected network		
Network variables	***n***	**Mean**	**SD**	***r*** [1]	**Edge weight**	**95% CI**	**R^2**
Paranoia	801	12.5	13.9	/	/	/	0.63
Negative affect	799	19.2	14.1	0.70	0.29	0.20, 0.37	0.66
Body image	790	47.7	18.7	-0.48	0.04	-0.03, 0.10	0.43
Sleep problems	792	34.6	10.7	0.45	0.05	-0.02, 0.12	0.42
Peers difficulties	759	2.14	1.77	0.49	0.13	0.03, 0.23	0.26
Bullying	757	6.82	7.29	0.61	0.23	0.15, 0.31	0.51
SM night use	778	10.1	5.86	0.33	0.00	-0.01, 0.01	0.47
SM dependence	773	12.2	5.47	0.41	0.04	-0.02, 0.10	0.49
SM safety behaviours	763	8.46	9.46	0.65	0.16	0.08, 0.25	0.58
SM negative comparison	753	10.7	10.6	0.59	0.05	-0.02, 0.11	0.64
SM emotion reactivity	749	6.54	7.54	0.62	0.07	-0.01, 0.15	0.55
Not included in network	***n***	**Mean**	**SD**	***r***			
Anxiety (RCADS)	799	11.31	8.52	0.67	/	/	/
Depression (RCADS)	799	7.86	6.3	0.66	/	/	/
Insomnia	783	8.55	5.95	0.49	/	/	/
Worry	800	19.05	10.85	0.56	/	/	/

Note: All simple correlations are significant ($p < 0.001$)

Undirected network structure

The undirected network is shown in Figure 9 and the edge weights with 95% CIs for edges with paranoia are shown in Table 16. Once the contribution of other variables was controlled, paranoia demonstrated positive associations with all variables except for social media night-time use. The largest edges were with negative affect, bullying, and safety behaviours, which were not significantly different in size ($p > 0.05$). These three edges were significantly larger than all other edges with paranoia ($p > 0.05$), except for the edges with social media safety behaviours and emotional reactivity to social media which were not significantly different in size ($p > 0.05$; Appendix L). Sixty three percent of the variance in paranoia was explained by the nodes it shared an edge with ($R^2 = 0.63$).

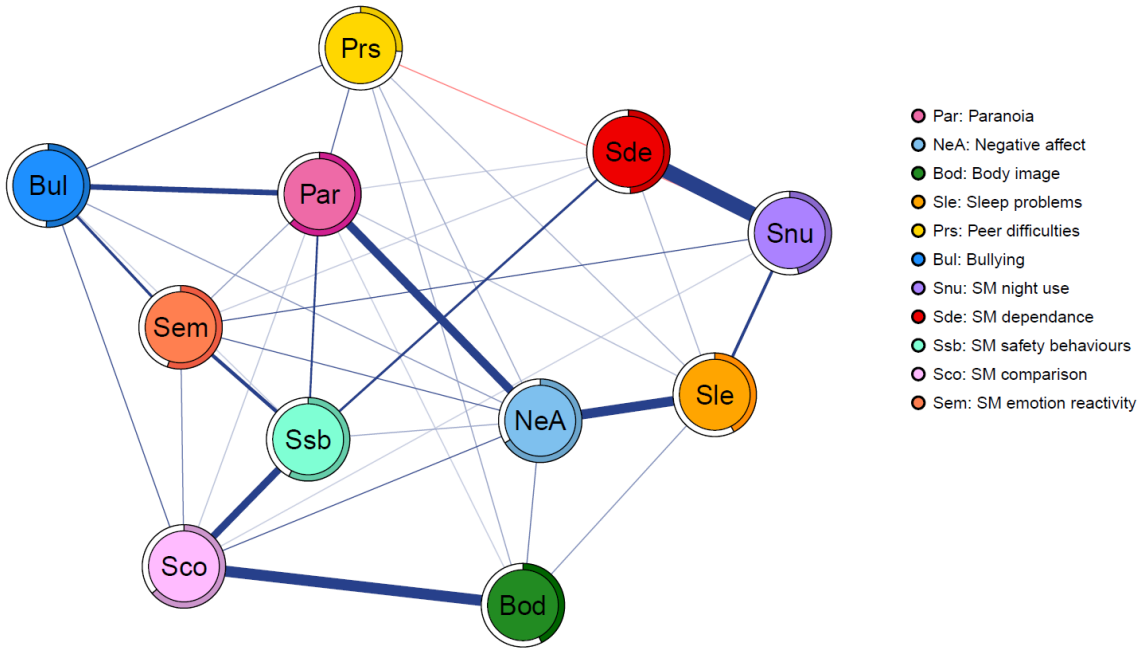

Figure 9. Undirected network of relationships between paranoia and other variables. Blue edges indicate positive associations and red edges indicate negative associations. Shaded rings represent the variance explained (R^2) by connected nodes.

Although paranoia had edges with nine variables, the shortest path network in Figure 10 showed that the direct relationship was the dominant route of interaction for negative affect, bullying, social media safety behaviours, and peer difficulties only. The most efficient route from paranoia to sleep problems, social media night use, and body image issues all occurred via negative affect, indicating a possible mediating role of negative affect in these relationships. The shortest path network also highlighted potential mediation pathways from paranoia to social media emotional reactivity via bullying, and to both social media dependence and negative self-comparison on social media via the use of online safety behaviours Figure 10.

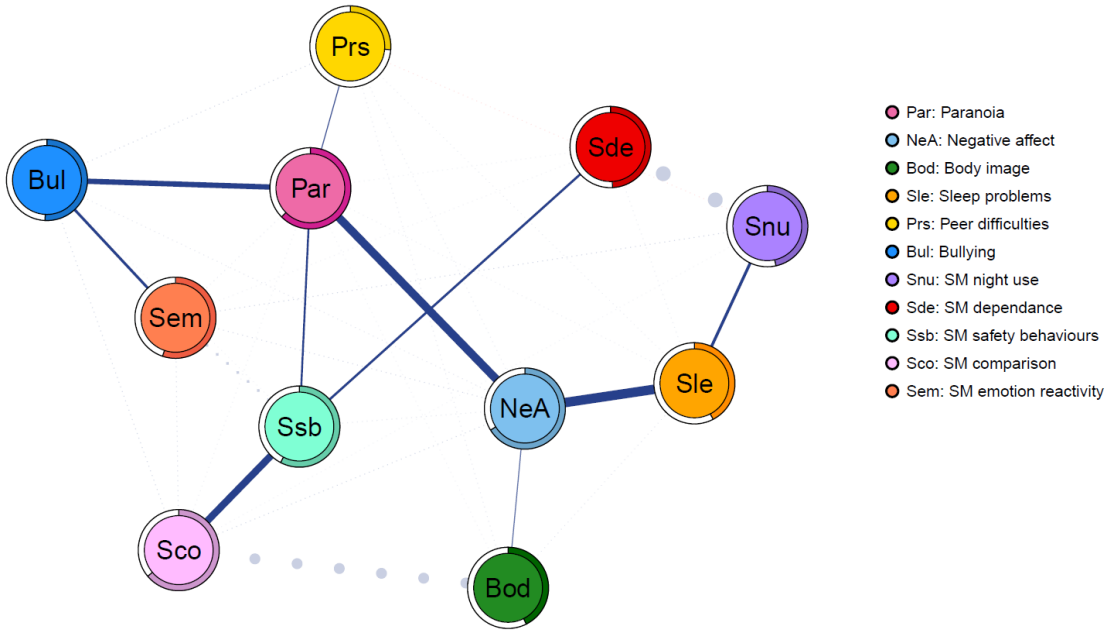

Figure 10. Shortest paths from paranoia to other variables. Dashed lines represent suppressed edges.

DAGs analysis

The average of the 50,000 DAGs sampled from the posterior probability distribution is shown in Figure 11. The proportion of DAGs containing a causal pathway from each variable to paranoia and vice versa, and the average size of each causal effect (z_{total}) when present, is shown in Table 17. The proportion of DAGs where the causal effect was direct, and the average size of this effect (z_{direct}), is also shown for each orientation (see Appendix M for causal plots of all pathways).

The total causal pathways (i.e. incorporating direct and indirect routes) show that, regardless of direction, causal interactions between paranoia and negative affect, body image issues, sleep problems, peer difficulties, bullying, and cognitive-affective responses to social media were highly likely. However, examination of the direct effects showed the causal relationships with body image issues and sleep problems were primarily indirect through other variables. These two variables were therefore conditionally independent from paranoia, represented by the lack of an edge in Figure 11.

Table 17. Causal pathways between paranoia and other variables in both directions, including the proportions of DAGs sampled where 1) the causal pathway occurred, and 2) where a direct edge occurred, and the average size of these causal effects when present.

Causal pathway	**% of DAGs**		**Total effect**		**Direct effect**	
Variable → Paranoia	Pathway	Direct	$\tilde{z}$	90% CI	$\tilde{z}$	90% CI
Negative affect	70%	100%	0.57	0.39, 0.72	0.43	0.32, 0.63
Body image	46%	44%	-0.21	-0.49, -0.01	-0.05	-0.15, 0.00
Sleep problems	23%	38%	0.19	0.00, 0.46	0.03	0.00, 0.10
Peers difficulties	18%	99%	0.21	0.07, 0.49	0.15	0.06, 0.44
Bullying	46%	100%	0.40	0.22, 0.68	0.29	0.20, 0.57
SM night use	1%	3%	0.03	-0.01, 0.10	0.00	0.00, 0.00
SM dependence	1%	54%	0.07	0.00, 0.41	0.03	0.00, 0.09
SM safety behaviours	40%	100%	0.39	0.19, 0.67	0.26	0.16, 0.44
SM self-comparison	62%	73%	0.38	0.10, 0.67	0.16	0.00, 0.40
SM emotion reactivity	47%	80%	0.27	0.06, 0.64	0.15	0.00, 0.38
Paranoia → Variable	Pathway	Direct	$\tilde{z}$	90% CI	$\tilde{z}$	90% CI
Negative affect	30%	100%	0.59	0.41, 0.76	0.48	0.36, 0.72
Body image	45%	24%	-0.26	-0.51, -0.02	-0.04	-0.23, 0.00
Sleep problems	47%	21%	0.25	0.00, 0.48	0.02	0.00, 0.13
Peers difficulties	82%	99%	0.28	0.15, 0.44	0.22	0.12, 0.32
Bullying	54%	100%	0.42	0.28, 0.64	0.35	0.25, 0.54
SM night use	94%	1%	0.10	-0.04, 0.38	0.00	0.00, 0.00
SM dependence	92%	14%	0.14	-0.02, 0.43	0.01	0.00, 0.11
SM safety behaviours	60%	100%	0.37	0.19, 0.63	0.26	0.17, 0.41
SM self-comparison	37%	72%	0.36	0.07, 0.61	0.17	0.00, 0.45
SM emotion reactivity	51%	79%	0.30	0.06, 0.59	0.16	0.00, 0.37

Note: CI = credible intervals

There was a high certainty that causal relationships between paranoia and negative affect, bullying, social media safety behaviours, and peer relationships all included a dominant direct interaction. These direct effects occurred in almost 100% of samples and constituted over two thirds of the total causal effect for each variable Table 17. This finding is consistent with the shortest paths of the undirected network in Figure 9. DAGs analysis further highlighted direct relationships between paranoia and both social media emotional reactivity and negative self-comparison. These direct effects comprised approximately half of the total causal effects; notably, however, there was some uncertainty where the effect was completely indirect in 20-28% of sampled graphs.

As shown by the undirected edges in Figure 11, the direction of the causal interactions with paranoia were not well identified as none met the threshold for a significant directed effect (90%

of non-zero effects in one direction). Although the probability of each direction was approximately equal for many variables, there were two exceptions. First, paranoia was more likely to contribute to peer difficulties than vice versa, with this orientation occurring in 82% of sampled DAGs and the reverse occurring in 18%. Second, a causal relationship from negative affect to paranoia occurred in 70% of graphs, suggesting this orientation was somewhat more likely than the reverse which occurred in the remaining 30% (Figure 11).

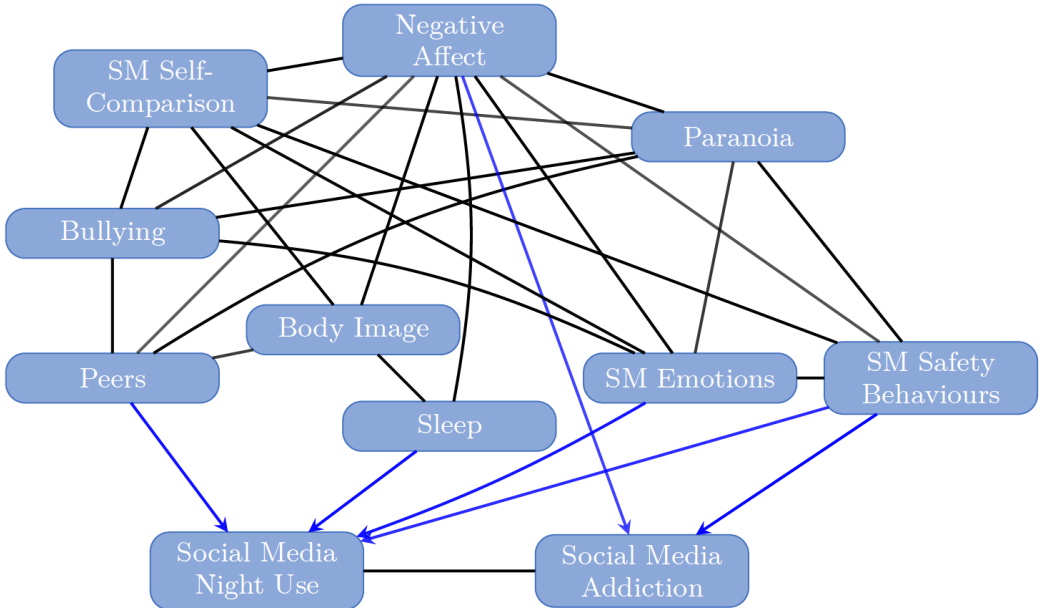

Figure 11. Directed Acyclic Graph (DAG) of relationships between paranoia and other variables, representing the average of 50,000 DAGs sampled from the posterior probability distribution. Blue directed edges indicate significant directed causal effect.

Despite moderate correlations with social media dependence and night use (Table 16), causal pathways from these measures to paranoia occurred in only 1% of sampled DAGs with negligible total causal effects ($\bar{\kappa}_{total} < 0.1$; Table 17). This indicates with high certainty that excessive social media use had a zero-causal effect on paranoia. Although a causal pathway in the reverse direction occurred in 92% and 94% of samples for social media dependence and night use respectively, these were primarily indirect with negligible direct effects ($\bar{\kappa}_{direct} < 0.01$). Notably, these social media use variables were significantly caused by several factors, including negative affect, peer difficulties, sleep problems, social media emotional reactivity, and safety-seeking behaviours - represented by blue directed edges in Figure 11.

4.4. Discussion

The findings are consistent with the view that adolescence can be a socially challenging time, highlighting that mistrust of others may be part-and-parcel of daily life for a significant minority of adolescents. The overall incidence of paranoia followed a single, continuous distribution and many paranoid thoughts occurred at least weekly for 20-30% of pupils. Thoughts of physical threat were common - almost a fifth felt unsafe everywhere around people and a third feared what strangers would do to them. There were also concerns about peers deliberately excluding them, making sly comments to wind them up, and lying to them on purpose. Conspiracy concerns were less frequent, with 10% thinking groups of people were plotting against them. Rarer paranoid ideas occurred alongside more common items, replicating a hierarchical structure of paranoia seen in adults whereby extreme fears about others build upon normal social concerns (Freeman et al., 2005). Overall, 17% of the school pupils reported at least elevated paranoia levels. Consistent with previous findings from adolescent samples (e.g. Ronald et al., 2014), paranoia occurred at significantly higher levels in girls compared with boys. Levels of paranoia were also higher in young people reporting clinical levels of psychopathology (compared to those in the average ranges).

This study used innovative network approaches - including a Bayesian method with DAGs - to examine the patterns of interaction between paranoia and key psychological and social factors. The variables included in the network predicted over 60% of the variance in paranoia. Once the contribution of other variables was controlled, the networks showed that paranoia was most closely related to negative affect, bullying experiences, the use of threat-focused safety behaviours on social media, and peer difficulties. Direct relationships were also observed for negative self-comparison on social media and emotional reactivity to social media. While the direction of these effects was uncertain, examination of the undirected network structure and the probability of each orientation in the DAG allowed a tentative understanding of potential causal patterns.

4.4.1. Psychological factors

There was a robust interaction between negative affect and paranoia in adolescents. Affective symptoms had the strongest relationship with paranoia and showed high certainty for a direct causal effect. Although both directions were plausible, negative affect was more likely to causally

contribute to paranoia than vice versa. The uncertainty in the directions may be expected given evidence of a reciprocal interaction between negative affect and paranoia over time (Kuipers et al., 2019). However, the likely contribution of negative affect to paranoia is consistent with the threat-anticipation model (Freeman, 2016) and previous findings that anxiety, depression, and worry predict paranoia persistence in a clinical sample of adolescents (Bird et al., 2017).

DAGs analysis showed that although a causal interaction between paranoia and both sleep problems and body image concerns was likely, these effects were primarily indirect via other variables. This was despite a clear bivariate relationship where young people with clinical levels of insomnia reported higher paranoia. Although multiple routes through the network will contribute, the relationships between paranoia and both sleep problems and body image were primarily mediated by negative affect. These indirect routes are consistent with the predictions of the threat anticipation model (Freeman, 2016) and empirical evidence that the impact of impaired sleep on paranoia is almost fully mediated by negative affect (Reeve et al., 2018). Although mechanisms linking body image concerns and paranoia have not been tested, qualitative accounts from adults with persecutory delusions suggest body image concerns do increase feelings of vulnerability and low mood (Marshall et al., 2019).

4.4.2. Social factors

There was a direct interaction between paranoia and certain social factors in the adolescents. Although the relationship between paranoia and peer difficulties was bidirectional to a degree, DAGs showed that paranoia was far more likely to causally impact peer relationships than vice versa. This pathway is plausible, as the ability to trust is necessary for relationships, whereas fear of others will make it difficult to socialise and make friends. For bullying, however, either causal direction was equally probable. This is consistent with the DAGs analysis of (Moffa et al., 2017) which could not determine directionality without a prior assumption that bullying was antecedent to paranoia. Our findings suggest this assumption may not hold for cross-sectional associations. Rather than a direct causal relationship, a shared genetic propensity that increases one's vulnerability to both bullying and paranoid ideation may be partly responsible for the association (Shakoor, McGuire, et al., 2015). Another possibility is due to biased perceptions of threat, people experiencing paranoia may be more likely to incorrectly perceive hostility (Gromann et al., 2013).

Social media was a frequent part of daily life for most of the adolescents. Heavy social media use was associated with greater paranoia, as were indicators of problematic social use (social media dependence and higher use at night). DAGs analysis, however, revealed that problematic social media use was highly unlikely to have any causal influence on paranoia. Multiple intermediate variables accounted for the correlations between paranoia and social media dependence and excessive night-time use. Contrary to concerns of a detrimental causal role of social media on mental health (e.g. Crone and Konijn, 2018; Kelly et al., 2018), problematic social media use was instead a consequence of existing psychological and social difficulties.

Although social media use did not contribute to paranoia, the findings did suggest the way young people respond to online social content may be important. Paranoia was closely related to the use of threat-focused online safety-behaviours, consistent with the theoretical importance of defence behaviours in maintaining paranoia (Freeman, 2016). These online safety-behaviours were also shown to have a potential mediating role in the relationship between paranoia and social media dependence. Paranoia further demonstrated causal interactions (half of which were from indirect routes) with negative self-comparison and emotional reactivity to social media - consistent with previous literature (Bird et al., 2017). As occurs in real-life, a reciprocal relationship is likely where a young person's suspicions trigger threat-related cognitive processes that in turn bias appraisals of online social content, increase feelings of vulnerability, and prevent processing of disconfirmatory evidence.

4.4.3. Limitations

There are clear study limitations. First, although the whole classroom approach to data collection was efficient in obtaining a representative sample, it is also possible that young people's responses to the questionnaires were influenced by the presence of their peers. A further limitation is that the worry questionnaire did not provide a distinct measure of worry, showing multicollinearity with general negative affect. It was therefore not possible to examine the interactions between paranoia and worry in the network.

The need for caution when drawing causal inferences from cross-sectional data must be emphasised. DAGs analysis estimates the probabilistic causal relationships between a set of variables; however, causality using DAGs can only be inferred under strict assumptions. This includes an assumption of causal sufficiency where the variables measured are sufficient to

control for confounding relationships. There is also an assumption of faithfulness: that is, a complicated causal mechanism does not lead to an observationally simpler model 'by chance' (Pearl, 2009). The acyclic assumption within a DAG of 'one true' causal direction may also obscure the complexity of the relationships. Dynamic network approaches with longitudinal data will be needed to decode reciprocal relationships that occur over time (Kuipers et al., 2019). Despite these limitations, the use of Bayesian DAGs alongside undirected network models provided novel opportunities to generate robust causal hypotheses and identify testable intervention targets for paranoia in adolescents. The clinical significance of paranoia at this age, however, still must be determined.

Chapter Five [3]

Paranoia in patients attending child and adolescent mental health services

5.1. Introduction

Paranoia may be particularly prevalent during adolescence, building on the heightened social vulnerabilities at this age. But as described in Chapter 1, very little is known about its occurrence in patients attending child and adolescent mental health services (CAMHS). This oversight may be due, in part, to a commonly held view that paranoia in youth is a symptom of emerging psychosis, and, so, the principal concern of early intervention in psychosis services. It is increasingly clear, however, that paranoia is unlikely to be specific to psychotic disorders in adolescence. In Chapter 4, paranoia was relatively common and continuously distributed in secondary school pupils, consistent with a dimensional view that paranoia exists on a spectrum in the general population (Freeman et al., 2005). Further, elevated paranoia in the school pupils often co-occurred with clinically elevated scores for anxiety/depression and insomnia. Building on these findings, the aim of this chapter was to determine the extent to which paranoia may be a clinical problem in CAMHS patients.

As described in Chapter 1, emerging mental health problems in adolescents are often characterised by a fluid and heterogenous mix of subthreshold symptoms that cut across traditional diagnostic boundaries. It is therefore likely that paranoia in young people attending CAMHS will occur in a range of different clinical presentations. Indeed, there is initial evidence from studies of CAMHS patients that paranoia is associated with symptoms such as anxiety, depression, suicidality, and borderline personality disorder (see Chapter 1). Evidence from the adolescent general population also suggests the relationship between paranoia and other difficulties may persist over time (Havers et al., 2019). From a network perspective, causal interactions between emerging symptoms in young people may create self-sustaining feedback loops that drive a worsening trajectory of paranoia and other difficulties throughout adolescence (Borsboom, 2017). Consequently, identifying interactions between paranoia and other

[3] This chapter has been adapted from the following published paper, shown in Appendix N.
Bird JC., Fergusson EC, Kirkham M, Shearn C, Teale A-L, Carr L, Stratford HJ, James AC, Waite F, & Freeman D. (2021). Paranoia in patients attending child and adolescent mental health services. *Australian and New Zealand Journal of Psychiatry.* https://doi.org/10.1177%2F0004867420981416

symptoms in adolescent patients may highlight key treatment targets that, if reduced, have the potential to alleviate paranoia.

5.1.1 This chapter

The aim in this study was to assess paranoia and its potential correlates systematically in a cohort of adolescent patients accessing CAMHS. There were three objectives. The first objective was to describe the prevalence of paranoia in this cohort using the B-CAP and compare these rates to those reported in the general population from Chapter 4. The second objective was to examine the patterns of association between paranoia, psychiatric symptoms, and social functioning. To do this, the bivariate associations between paranoia and the presence of clinician-rated symptoms were first examined; then, network analysis was used to examine the unique relations with self-report and selected clinician-rated symptoms. Deviating from the approach taken in Chapter 4, only undirected network models were used in this study due to a smaller sample size that prevented the reliable estimation of directed causal effects. The final objective was to examine the persistence of paranoia in a subgroup of the cohort and its relationship with other difficulties over time.

5.2. Method

5.2.1. Participants

Participants were 301 adolescent patients with mental health problems recruited during routine appointments in CAMHS, as first described in Chapter 3. The patients were aged 11-17 years (mean age = 15.1, SD = 1.75), included a higher proportion of girls (*n* = 184, 61%) than boys (*n* = 117, 39%) and were mostly White British (*n* = 240, 80%). Participants included 271 community CAMHS patients (mean age = 15.0, SD = 1.80, girls *n* = 164, boys *n* = 107) and 30 inpatients at an adolescent unit (mean age = 16.0, SD = 0.81, girls: *n* = 20, boys: *n* = 10).

5.2.2. Measures

5.2.2.1. Bird Checklist of Adolescent Paranoia (B-CAP)

The 18-item B-CAP (Chapter 3) was used to assess the frequency of paranoid thoughts in the past fortnight. Items are rated on a 6-point scale (0=never, 5=all the time) with higher scores indicating higher paranoia.

5.2.2.2. Revised Child Anxiety and Depression Scale (RCADS)

The RCADS (Chorpita et al., 2000) is a 47-item self-report questionnaire examining anxiety and depression in 8-17-year-olds. Items are rated on a 4-point scale (0=never, 3=always) with higher scores indicating higher severity. Six subscales are produced: depression, panic, obsessive compulsiveness, generalised anxiety, social anxiety, and separation anxiety.

5.2.2.3. Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, 2001) is a 25-item mental health screening questionnaire for adolescents aged 11-17 years. Items are rated on a 3-point scale (0=not true, 2=certainly true), with higher scores indicating greater difficulties. Four problem subscales are derived comprising emotional symptoms, conduct problems, hyperactivity/inattention, and peer difficulties. An additional 'impact' score is derived from items concerning overall distress and social impairment (Goodman, 1999). For this study, the emotional symptoms domain was not included in the analysis due to the conceptual overlap with the RCADS.

5.2.2.4. Current View

The Current View (Jones et al., 2013) is a practitioner-completed tool assessing a wide range of clinical difficulties. For this study, clinician-ratings of the following psychiatric symptoms and

indicators of social functioning were examined: anxiety (separation, social, generalised, obsessive-compulsive disorder (OCD), panic, and agoraphobia), depression, deliberate self-harm, fluctuations in mood (bipolar), hallucinations/delusions (psychosis), post-traumatic stress disorder symptoms, substance abuse, conduct problems, emerging personality disorder, attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), history of abuse/neglect, peer relationship problems, persistent family relationship problems, and current educational problems. All items were coded to indicate presence/absence of that problem, except for educational difficulties where the sum of two items rating severity of attendance and attainment problems on a 3-point scale was used.

5.2.3. Procedure

Participants completed the paranoia questionnaire alongside the routinely administered RCADS and SDQ. Clinicians involved in each participant's care (i.e. a care coordinator or psychiatrist) completed a routine measure of current difficulties (i.e. Current View). All three routine measures were completed as part of participants' standard care. Case note diagnoses/presenting problems were obtained from the diagnosis section of participants' electronic records, recent clinical assessment/review letters, and discussion with care coordinators. The study involved an optional follow up where the self-report questionnaires were repeated after at least three months for a subsample of participants who were contactable and agreed to do so. Follow up questionnaires were completed at the clinic or online via a Qualtrics survey.

5.2.4. Statistical analysis

All analyses were conducted in R, version 3.6.1 (R Core Team, 2013).

5.2.4.1. Missing data

Missing data on the B-CAP were rare: 3 participants had 1 item missing and 4 participants had 2 items missing. However, at least one of the three routine outcome measures had not been completed for approximately 10% of patients. A total of 275 participants completed either the RCADS or the SDQ (mean age = 15.1, SD = 1.75, girls: n = 171, boys: n = 104, outpatient: n = 250, inpatient: n = 25). Paranoia was slightly higher in those that completed either measure (mean = 20.3, SD = 18.5) than those who did neither (mean = 15.7, SD = 14.7), although this difference was not significant (t = 1.60, df = 41.5, p = 0.12). The clinician-rated Current View was completed for 272 participants (mean age = 15.0, SD = 1.77, girls: n = 166, boys: n = 106,

outpatient: n = 248, inpatient: n = 24). Paranoia did not differ between those with and without Current View ratings (t = 0.20, df = 35.3, p = 0.84). Out of the completed measures, 0.3% of values were missing. For all four questionnaires, missing values were imputed using predictive mean matching for individuals with missing data for less than 20% of items, providing a single imputed dataset. As the Current View items were examined individually as distinct variables, missing values were not imputed.

5.2.4.2. Prevalence

The prevalence of paranoia was assessed with mean scores, item endorsement (2+, i.e. at least weekly), and the proportion scoring above the validated score thresholds. Prevalence rates in the patients were presented alongside mean scores and item endorsements from the secondary school cohort in Chapter 4. Difference in paranoia between genders was examined using a t-test and the correlation between paranoia and age was computed.

5.2.4.3. Clinical associations

The bivariate relationships between paranoia and the presence of clinician-rated difficulties were assessed using a series of linear regressions. No corrections were made for non-normality in the residuals as linear regression models without normally distributed errors produce valid estimates in large samples (Schmidt and Finan, 2018). For eight variables, however, weighted least squares (WLS) regression was used to account for heteroscedasticity in the residuals (Romano and Wolf, 2017). Standardized beta (β) estimates are presented with 95% confidence intervals.

5.2.4.4. Network analysis

Undirected network analysis was used to estimate the unique patterns of association between paranoia, self-report psychological problems, and the clinician-rated presence of two distinct symptoms with clinical relevance to paranoia: deliberate self-harm and post-traumatic stress. Due to the mixture of continuous and binary variables in this dataset, a Mixed Graphical Model (MGM) was estimated using the package 'mgm' (Haslbeck and Waldorp, 2020). Participants with incomplete data on any variable were deleted (n = 83), resulting in a sample of 218 patients for the network analysis. As with the network analysis described in Chapter 4, a LASSO regularisation (Tibshirani, 1996) with an EBIC hyperparameter of 0.3 was used to limit the estimation of spurious edges in the network.

Node predictability was also estimated to show the extent to which each node is predicted by its neighbouring nodes (i.e. those it shares an edge with). As described in Chapter 4, the node predictability of continuous variables was assessed with the proportion of variance explained (R^2). For binary variables, however, predictability was assessed with the proportion of correct classification (CC_{total}), or accuracy, and normalised accuracy (nCC). The nCC values break down the total accuracy of a given variable to represent the additional contribution of connected nodes beyond what can be trivially predicted from the marginal intercept model (CC_{marg}) (Haslbeck and Waldorp, 2018).

Once estimated, the unique relations between the variables were visualised in a weighted network model in the same format as the undirected network in Chapter 4. The node predictability values are visualised by a shaded ring around each node - for the binary variables, however, the shaded area is split to represent the accuracy of the intercept model and the additional contribution of connected nodes. Shortest paths between paranoia and every other variable were also computed to visualise potential mediation pathways in the network. For all edges, 95% confidence intervals were constructed using a non-parametric bootstrap with 1000 iterations in the package 'bootnet' (Epskamp et al., 2018). Edge weights with paranoia were compared with the bootstrap difference test. As explained in Chapter 4, the edge weights were biased towards zero due to the regularisation and thus confidence intervals do not reflect a significance test against zero (Epskamp and Fried, 2018)).

5.2.4.5. Paranoia persistence

Follow up data were collected for paranoia and the two other self-report measures in a subgroup of participants. Change in paranoia over time was examined using the effect size (M_{pre}-M_{post}/SD_{pre}) and a Wilcoxon signed-rank test. Individual change in paranoia was examined using the reliable change index (RCI; Jacobson and Truax, 1991) where an RCI of +/- 1.96 indicates significant change. For the RCI calculation, the B-CAP Cronbach's α of 0.94 from the current sample was used. To examine the relationship between paranoia persistence and symptoms over time, participants were split into a persistent/increasing paranoia group (≥23 at both times, or ≥23 at either time point with non-significant RCI) and a low/transient paranoia group (≤22 at both times, or significant decreases to ≤22 at follow up). Using the package 'lme4' (Bates et al., 2015), linear mixed-effects models were conducted for each symptom domain with fixed effects for paranoia group, time, and a group by time interaction, and a random effect for participants.

5.3. Results

5.3.1. Participant characteristics

Adolescents were accessing services with a range of problems, although the most common were affective disturbances and neurodevelopmental conditions (Table 18). Seven participants had suspected psychosis and an additional four were noted to experience hallucinations alongside other difficulties. Other than those who had suspected psychosis, paranoia was recorded as a presenting problem in the clinical records of only one participant.

Table 18. Primary presenting problem(s) for accessing CAMHS as recorded by participant's care team and mean paranoia scores for each problem.

	n	Percentage	Paranoia (SD)
Anxiety / depression	195	65%	22.0 (19.8)
Emotion dysregulation, self-harm, & suicidality	82	27%	27.4 (19.5)
Autism Spectrum Disorder	79	26%	21.4 (21.2)
Attention Deficit Hyperactivity Disorder	41	14%	12.7 (13.2)
Anger / conduct problems	30	10%	17.3 (16.7)
Disordered eating	24	8%	21.2 (18.6)
Trauma	23	8%	25.5 (19.7)
Sleep problems	20	7%	21.6 (16.3)
Gender identity issues	8	3%	19.2 (18.7)
Family relationship issues	8	3%	17.8 (13.5)
Psychosis	7	2%	26.1 (23.9)
Substance misuse	7	2%	23.9 (17.4)
Tic disorders	5	2%	19.8 (30.1)
Hallucinations [1]	4	1%	23.8 (22.6)
Paranoia [1]	1	0.3%	32.0 (NA)

Note: 1 = Occurring alongside other difficulties in participants without suspected psychosis

5.3.2. Prevalence

Paranoid thoughts were common in this clinical sample, with item endorsement ranging from 14%-54% (Table 19). The mean number of suspicions endorsed was 5.85 (SD = 5.17). Out of the 301 patients, 35% (n = 104) had at least mildly elevated paranoia, 15% (n = 46) had at least moderate paranoia, 6% (n = 18) had at least high paranoia, and 3% (n = 10) had severe levels of paranoia (Table 20). As shown in Table 19 and Table 20, prevalence rates in the CAMHS patients were approximately double those reported in the secondary school cohort from Chapter 4.

Table 19. Item endorsement in CAMHS patients (n = 301) and at least weekly endorsement rates from secondary school cohort (n = 801) described in Chapter 4.

	CAMHS							School
Item	**0**	**1**	**2**	**3**	**4**	**5**	**Weekly+**	**Weekly+**
1. Feel unwanted	135	33	68	37	17	11	44%	25%
2. Gossip on social media	120	39	76	31	12	23	47%	21%
3. Out of conversations	124	54	63	28	22	10	41%	22%
4. Ignoring messages	177	49	32	21	12	10	25%	10%
5. Embarrass in class	185	39	31	24	9	13	26%	20%
6. Sly comments	118	58	60	36	14	15	42%	16%
7. Lying on purpose	93	44	74	47	19	24	54%	30%
8. Under breath	143	43	48	33	18	16	38%	24%
9. Nasty tricks	216	32	30	14	1	8	18%	8%
10. Confuse me	164	40	48	19	15	15	32%	17%
11. Groups planning	197	35	31	17	11	10	23%	10%
12. Collecting photos	237	21	23	7	4	9	14%	7%
13. Seeking revenge	201	36	30	17	8	9	21%	11%
14. Followed or stalked	212	23	26	18	9	13	22%	12%
15. Scared strangers	124	50	45	35	22	25	42%	32%
16. Kidnap me	193	42	26	22	11	7	22%	14%
17. Attacked anytime	132	54	43	21	25	26	38%	23%
18. Unsafe everywhere	149	46	37	20	23	26	35%	19%

5.3.3. Relationship with demographic factors

The 30 inpatients had somewhat higher paranoia scores overall (mean = 27.1, SD = 21.5) than the 271 community patients (mean = 19.2, SD = 17.7), but this was not statistically significant (t = 1.93, df = 33.5, p = 0.062). There was no significant relationship between age and paranoia (r = 0.08, p = 0.16).

A shown in Table 20, girls reported significantly higher levels of paranoia than boys, with 41% of girls experiencing at least mildly elevated paranoia compared to 24% of boys. At the subscale level, girls scored significantly higher than boys on both the social harm and physical threat scales (p < 0.001). Girls also scored slightly higher than boys on the conspiracy subscale, but this difference did not reach statistical significance (p = 0.068; Table 20).

Table 20. Mean paranoia scores and differences between girls and boys. Proportions of CAMHS patients scoring above validated score thresholds compared to the secondary school pupils described in Chapter 4.

	Mean scores			**Gender comparison**		
Paranoia scores	All	Girls	Boys	*t*	*df*	*p*
B-CAP total	20.0 (18.2)	23.1 (19.4)	15.0 (14.9)	4.08	288.2	<0.001
Social harm	10.4 (9.2)	11.8 (9.7)	8.3 (7.9)	3.46	280.0	<0.001
Conspiracy	3.7 (5.3)	4.1 (5.6)	3.1 (4.6)	1.83	281.6	0.068
Physical threat	5.9 (6.3)	7.2 (6.7)	3.7 (4.9)	5.19	294.4	<0.001
	CAMHS patients			**School pupils**		
Severity ranges	All	Girls	Boys	All [1]	Girls	Boys
n	301	184	117	801	410	382
Average: <23	197 (65%)	108 (59%)	89 (76%)	667 (83%)	314 (77%)	351 (92%)
Mildly Elevated +	104 (35%)	76 (41%)	28 (24%)	134 (17%)	96 (23%)	31 (8%)
Moderate +	46 (15%)	34 (18%)	12 (10%)	52 (7%)	40 (10%)	8 (2.)
High +	18 (6%)	15 (8%)	3 (3%)	16 (20%)	11 (3%)	3 (0.8%)
Severe+	10 (3%)	9 (5%)	1 (0.9%)	4 (0.5%)	2 (0.5%)	2 (0.5%)

Note. 1 = Participants from school sample who identified as 'other gender' (n = 9) not presented as no equivalent comparison group in CAMHS sample.

5.3.3. Associations with clinician-rated problems

Bivariate associations between paranoia and the presence of each clinician-rated problem are shown in **Table 21**. The presence of peer relationship problems had the strongest association with paranoia ($\beta = 0.64$, $p < 0.001$) and explained 11% of the variance in paranoia scores. The second largest association was for self-harm ($\beta = 0.55$, $p < 0.001$) which accounted for 7% of the variance in paranoia. Similar sized medium associations were also observed for post-traumatic stress symptoms ($\beta = 0.54$, $p = 0.001$) and a history of abuse/neglect ($\beta = 0.50$, $p = 0.013$), although only 4% and 2% of the variance in paranoia was explained by these factors, respectively. It was notable that of the 104 patients with at least elevated paranoia, 38 (37%) had clinician-rated trauma (post-traumatic stress or history of abuse/neglect). Depression and social anxiety showed small but significant associations with paranoia that each explained 6% of the variance. Small significant associations accounting for only 4% and 2% of the variance in paranoia were observed for educational difficulties and generalised anxiety, respectively. The presence of ADHD symptoms showed a small negative association that explained 2% of the variance in paranoia scores.

Table 21. Associations between paranoia severity and the presence of clinician-rated problems. Mean paranoia scores shown with standard deviations in parentheses for those with and without each problem. Significant results highlighted in bold.

Problem type	Clinician rating				Linear regressions			
	Absent		Present		β	95% CI	p	R^2
	n	Mean	*n*	Mean				
Social anxiety [a]	79	14.2 (13.7)	189	22.5 (19.4)	**0.45**	0.23, 0.67	**<0.001**	**0.06**
Separation anxiety	172	18.5 (17.0)	97	23.1 (20.5)	0.25	0.00, 0.50	0.050	0.01
Generalised anxiety	97	16.8 (17.4)	171	21.6 (18.7)	**0.26**	0.01, 0.51	**0.042**	**0.02**
OCD	220	20.8 (19.1)	49	17.1 (14.9)	-0.20	-0.51, 0.11	0.21	0.01
Panic	187	18.7 (18.2)	84	23.0 (18.7)	0.23	-0.03, 0.49	0.078	0.01
Agoraphobia	217	19.6 (18.1)	52	21.8 (19.3)	0.12	-0.18, 0.43	0.43	0.00
Depression [a]	75	13.9 (13.2)	197	22.4 (19.5)	**0.46**	0.25, 0.68	**<0.001**	**0.06**
Self-harm [a]	143	15.3 (14.3)	129	25.4 (20.8)	**0.55**	0.31, 0.79	**<0.001**	**0.07**
Eating problems	222	19.4 (18.6)	50	23.0 (17.3)	0.19	-0.11, 0.50	0.21	0.01
Psychosis	254	19.6 (18.1)	17	28.2 (21.6)	0.47	-0.02, 0.96	0.061	0.01
Bipolar	246	19.8 (18.6)	26	22.5 (16.4)	0.15	-0.26, 0.55	0.48	0.00
PTSD [a]	199	17.7 (16.9)	63	27.5 (20.6)	**0.54**	0.22, 0.85	**0.001**	**0.04**
Abuse or neglect [a]	221	18.6 (17.6)	43	27.9 (21.2)	**0.50**	0.11, 0.89	**0.013**	**0.02**
Conduct problems	218	19.3 (18.7)	52	23.2 (16.9)	0.22	-0.09, 0.52	0.16	0.01
Substance abuse	242	19.4 (18.5)	30	25.4 (16.4)	0.33	-0.05, 0.71	0.089	0.01
Emerging PD	208	18.9 (17.8)	62	23.6 (19.5)	0.25	-0.03, 0.54	0.080	0.01
Peer difficulties [a]	98	12.5 (13.3)	173	24.2 (19.5)	**0.64**	0.42, 0.85	**<0.001**	**0.11**
Family difficulties	111	17.6 (18.4)	157	22.0 (18.3)	0.24	0.00, 0.48	0.054	0.01
ADHD [a]	196	21.6 (19.2)	74	15.9 (15.4)	**-0.31**	-0.55, -0.07	**0.010**	**0.02**
ASD	172	19.6 (17.6)	93	21.0 (20.2)	0.08	-0.18, 0.33	0.56	0.00
Education problems [a]	/	/	/	/	**0.22**	0.08, 0.36	**0.002**	**0.04**

Note: a = Weighted least squares regression used due to heteroscedasticity in residuals; PD = personality disorder. β = Standardized beta

As first reported in Chapter 3, there was a small-medium association between the presence of clinician-rated psychosis (hallucinations/delusions) and higher paranoia ($\beta = 0.47$, $p = 0.061$, $R^2 = 0.01$) that was not statistically significant due to limited power. Small associations that were not significant ($p > 0.05$) and each accounted for only 1% of the variance in paranoia were also observed for substance abuse, emerging personality disorder, separation anxiety, family relationship problems, panic, conduct problems, and OCD (Table 21). The associations between paranoia and agoraphobia, extremes of mood, eating problems, and ASD were of a negligible size ($\beta < 0.20$) and non-significant ($p > 0.05$).

5.3.4. Network analysis

Simple correlations between paranoia and the self-report variables were examined prior to conducting the network analyses. As shown in Table 22, paranoia demonstrated medium to large correlations with all self-report variables except for hyperactivity and conduct problems for which there were small correlations. See Appendix O for correlations between all variables.

Table 22. Simple correlations between paranoia and self-report problems in full sample (n = 301), and, for the network sample (n = 218), edge weights and node predictability values.

	Descriptives				Network analysis				
	n	**Mean**	**SD**	***r***	**Edge**	**95% CI**	**R^2**	**CC**	**nCC**
Self-report									
Peer difficulties	268	3.70	2.29	0.51	0.35	0.22, 0.47	0.28	/	/
Conduct problems	271	3.42	2.31	0.27	0.17	0.02, 0.31	0.29	/	/
Panic	269	10.7	7.11	0.55	0.14	-0.01, 0.28	0.63	/	/
OCD	269	6.57	4.16	0.44	0.11	-0.03, 0.26	0.35	/	/
Separation anxiety	269	6.67	4.50	0.50	0.08	-0.05, 0.21	0.58	/	/
Social anxiety	267	15.9	7.08	0.46	0.00	-0.10, 0.10	0.47	/	/
Generalised anxiety	270	9.54	4.45	0.49	0.00	-0.03, 0.03	0.63	/	/
Depression	271	16.6	7.01	0.43	0.00	0.00, 0.00	0.57	/	/
Hyperactivity	268	6.32	2.47	0.21	0.00	-0.01, 0.01	0.31	/	/
Distress/impairment	261	8.85	3.46	0.38	0.00	0.00, 0.00	0.48	/	/
Clinician-report									
Self-harm	/	/	/	/	0.17	-0.05, 0.38	/	0.62	0.22
Post-traumatic	/	/	/	/	0.14	-0.07, 0.36	/	0.75	0.00

Note: All simple correlations are significant ($p < 0.001$). Predictability of (binary) clinician-report variables measured by proportion of correct classification (CC). Normalised CC (nCC) indicates contribution of connected nodes beyond marginal intercept model.

The fully estimated network between paranoia, self-report psychological problems, and selected clinician-rated symptoms is shown in Figure 12. This showed that, once the contribution of all other variables was controlled, paranoia demonstrated the largest unique relationship with peer difficulties (edge weight = 0.35, 95% CI = 0.22, 0.47). Notably, paranoia also had a key role in connecting peer difficulties with the rest of the network, with the paths from peer difficulties to four of the anxiety domains, behavioural problems, self-harm, and post-traumatic stress all occurring via paranoia.

Paranoia also demonstrated direct edges with self-harm, conduct problems, panic, post-traumatic stress, obsessive compulsiveness, and separation anxiety (Figure 12). The edge with peer difficulties was significantly larger than the edges with conduct problems, panic, obsessive-compulsiveness, and separation anxiety ($p < 0.05$), but not self-harm or post-traumatic stress. None of the other edges with paranoia were significantly different in size ($p > 0.05$; Appendix P). A total of 56% of the variance in paranoia was explained by the direct edges with these seven variables (Table 22).

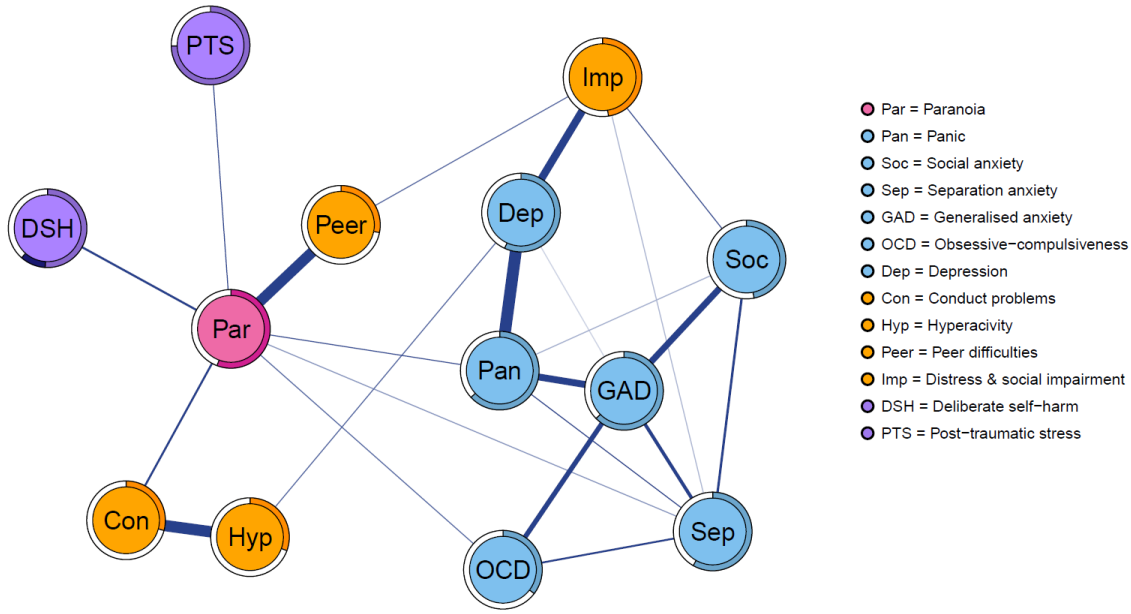

Figure 12. Network analysis of paranoia and other symptoms in CAMHS patients. Rings represent node predictability based on neighbouring nodes. Pink, blue, and orange rings (i.e. continuous variables) indicate R^2 values. For binary (i.e. purple) variables, the shaded rings represent the proportion of correct classification, split into the accuracy of the intercept model (purple section) and the contribution of connected nodes (dark blue section).

The shortest paths from paranoia to all other variables in Figure 13 show that the direct relationship was the dominant pathway between paranoia and all seven variables for which an edge was present. As illustrated by the absence of an edge in Figure 12, paranoia was conditionally independent from depression, distress/social impairment, hyperactivity, generalised anxiety, and social anxiety, highlighting primarily indirect relationships through other variables in the network. Figure 13 shows the shortest route from paranoia to distress/social impairment was via peer difficulties, indicating a mediating role of peer difficulties in this relationship. The shortest path network also highlights mediation pathways

from paranoia to hyperactivity via conduct problems, and to depression, generalised anxiety, and social anxiety via panic.

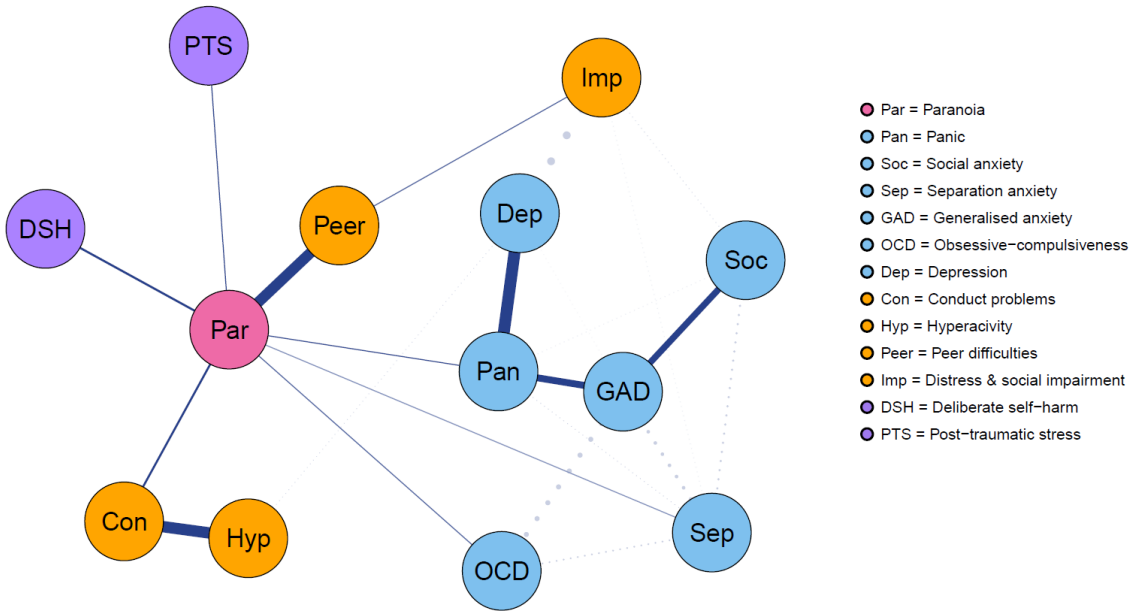

Figure 13. Shortest paths from paranoia to all other variables in CAMHS patients. Dashed lines represent suppressed edges.

Notably, paranoia was the only variable that both self-harm and post-traumatic stress had a unique association with once all other variables were controlled (Figure 12). For these two binary variables, the normalised accuracy (i.e. predictability) values suggested the single edge with paranoia accounted for 22% of the remaining accuracy of self-harm beyond what was predicted by the intercept model (nCC = 0.22, CC_{marg} = 0.51). For post-traumatic stress, however, the edge with paranoia did not lead to any increase in accuracy beyond the intercept model (nCC = 0.00; CC_{marg} = 0.75).

5.3.4. Paranoia persistence

A total of 105 participants (mean age = 15.1, SD = 1.71, girls: n = 75, boys: n = 30) agreed to repeat the questionnaires several months later (mean = 21.3 weeks, SD = 6.52). The difference in baseline paranoia between those with follow-up data (mean = 22.6, SD = 19.6) and those without (mean = 18.6, SD = 17.3) was small and not significant (t = 1.78, df = 190.9, p = 0.077).

Table 23. Descriptive statistics for follow up data. Standard deviations in parentheses

Measure	Time 1		Time 2				
	n	**Score**	***n***	**Score**	**F**	***p***	**ES**
Paranoia	105	22.6 (19.6)	105	23.7 (19.4)	1.10 (16.6)	0.73 [1]	0.06
Depression	94	17.1 (6.78)	101	15.4 (6.78)	-1.56 (5.63)	0.014 [1]	0.26
Panic	93	11.6 (7.33)	100	10.6 (7.02)	-0.75 (5.25)	0.21 [1]	0.14
Social anxiety	92	17.5 (6.76)	100	15.9 (7.06)	-1.43 (5.55)	0.019	0.24
Separation anxiety	92	7.58 (4.84)	100	7.03 (4.70)	-0.43 (3.33)	0.15 [1]	0.11
OCD	92	6.91 (4.37)	100	5.73 (4.46)	-0.99 (3.93)	0.018 [1]	0.27
GAD	93	10.1 (4.63)	100	9.27 (4.72)	-0.72 (4.12)	0.24 [1]	0.19
Peer difficulties	93	3.78 (2.21)	99	3.80 (2.09)	0.02 (1.66)	0.69 [1]	0.01
Conduct	94	3.21 (2.14)	99	3.05 (2.12)	-0.03 (1.67)	0.40 [1]	0.08
Hyperactivity	93	6.18 (2.35)	99	6.22 (2.53)	0.22 (1.92)	0.302	0.02
Distress/impairment	90	9.11 (3.33)	99	7.97 (4.20)	-0.83 (3.63)	0.052 [1]	0.34

Note: 1 = Non-parametric Wilcoxon test used as the difference scores were not normally distributed (p<0.05)

As shown in Table 23, there was no overall difference in paranoia between baseline and follow-up. On an individual basis, however, 18/105 participants had significant increases (RCI > 1.96) in paranoia and 16/105 had significant decreases (RCI < -1.96). Of the 46 participants with at least mildly elevated baseline paranoia, 30 had consistently elevated or increasing scores, 5 showed significant reductions that remained in the elevated range, and 11 had significant reductions into the average range.

Linear mixed effects models of the relationship between paranoia trajectory group and symptoms over time are displayed in Table 24. Compared to those with low/transient paranoia (n = 55), across the two time points, participants with persistent/increasing paranoia (n = 50) had consistently higher levels of depression, panic, social anxiety, generalised anxiety, separation anxiety, peer difficulties, conduct problems, hyperactivity, and distress/social impairment, but not OCD. As shown in Table 24, there were small paranoia group by time interactions at the threshold for significance for generalised anxiety and social anxiety, indicating those with persistent paranoia had somewhat less improvement in these symptoms compared to those with low/transient paranoia. Group by time interactions were negligible and non-significant for all other domains (p > 0.05).

Table 24. Mixed-effects models of the relationship between paranoia trajectory group and symptom domains over time. Mean paranoia scores are shown with standard deviation in parentheses, and standardised beta coefficients are shown with 95% confidence intervals.

Measure	Paranoia scores		Group effect		Group*Time effect	
	Low	Persistent	*β*	*p*	*β*	*p*
Depression						
Time 1:	14.5 (6.06)	20.0 (6.42)	0.81 (0.45,1.18)	<0.001	0.12 (-0.22,0.47)	0.49
Time 2:	12.1 (5.77)	18.9 (6.00)				
Panic						
Time 1	9.10 (6.76)	14.5 (6.96)	0.75 (0.38,1.12)	<0.001	0.22 (-0.08,0.52)	0.16
Time 2	7.17 (5.70)	14.4 (6.40)				
Social anxiety						
Time 1	15.1 (7.20)	20.2 (5.03)	0.75 (0.38,1.11)	<0.001	0.34 (0.00,0.68)	0.052
Time 2	12.0 (6.22)	20.0 (5.40)				
Separation anxiety						
Time 1	6.14 (4.82)	9.21 (4.37)	0.64 (0.26,1.02)	0.001	0.25 (-0.04,0.54)	0.092
Time 2	4.85 (3.85)	9.40 (4.41)				
OCD						
Time 1	6.45 (4.57)	7.44 (4.11)	0.22 (-0.18,0.63)	0.28	0.23 (-0.14,0.60)	0.22
Time 2	4.69 (4.51)	6.85 (4.17)				
Generalised anxiety						
Time 1	8.51 (4.85)	12.0 (3.62)	0.74 (0.38,1.10)	<0.001	0.38 (0.02,0.74)	0.043
Time 2	6.56 (4.13)	12.2 (3.40)				
Peer difficulties						
Time 1	3.13 (1.87)	4.46 (2.34)	0.63 (0.24,1.01)	0.002	0.10 (-0.23,0.42)	0.57
Time 2	2.96 (1.60)	4.69 (2.20)				
Conduct problems						
Time 1	2.69 (1.81)	3.76 (2.33)	0.50 (0.11,0.90)	0.014	0.08 (-0.25,0.40)	0.65
Time 2	2.45 (1.94)	3.69 (2.14)				
Hyperactivity						
Time 1	5.66 (2.29)	6.72 (2.33)	0.44 (0.04,0.84)	0.032	-0.01 (-0.35,0.33)	0.96
Time 2	5.75 (2.77)	6.73 (2.15)				
Distress/impairment						
Time 1	8.00 (3.64)	10.3 (2.46)	0.62 (0.23-1.01)	0.002	0.09 (-0.32-0.50)	0.67
Time 2	6.45 (4.09)	9.58 (3.71)				

5.4. Discussion

In this study, the adolescents attending CAMHS were primarily doing so because they had emotional disorders such as anxiety and depression. This was to be expected. However, paranoia was common in these young patients, with several suspicious thoughts occurring in one-third to one-half of the clinical cohort. Over half of patients regularly thought people were lying to them on purpose, over forty percent felt scared of what strangers would do to them, and thirty five percent felt unsafe everywhere around people. Overall, thirty five percent reported at least mildly elevated paranoia and fifteen percent reported at least moderate paranoia. Rates of paranoia were approximately double those observed in the general population sample from Chapter 4. The finding that adolescent girls, compared to boys, are especially likely to report suspicious thinking was also replicated. Although traditionally conceptualised as a symptom of psychotic disorders, paranoia in this adolescent sample primarily occurred alongside common mental health problems and only a minority had suspected psychosis. Although limited in size, the available follow-up data indicated that the paranoia was often persistent. Yet paranoia may well be overlooked: only one participant had the presence of paranoia recorded in their clinical notes.

Paranoid thinking in the adolescent patients was associated with a wide range of clinician-rated problems including anxiety, depression, trauma, self-harm, peer relationship issues, and educational difficulties. Paranoia in CAMHS patients may therefore be expected to present in the context of emotional problems, adverse life experiences, and impaired social functioning. It may also be particularly common in young people who self-harm: elevated paranoia was present in almost half of patients for whom emotion dysregulation, self-harm, or suicidality was a primary reason for accessing services. Network analysis also showed that once all other variables were controlled, the presence of self-harm was solely associated with paranoia, with this edge contributing 22% to the predictability of self-harm (beyond the intercept model). This relationship is consistent with findings from the adult literature (Freeman, Bold, et al., 2019; Freeman, Loe, et al., 2019) and evidence that self-harm is associated with psychotic experiences in general in adolescents (Hielscher et al., 2019; Martin et al., 2015). The co-occurrence of paranoia with so many different psychiatric symptoms could also be an indicator of more severe presentations, with adolescents reporting persistent paranoia having greater levels of symptoms and social impairments over time.

Consistent with the findings from Chapter 4, network analyses in the patient sample showed paranoia had unique associations with anxiety symptoms, especially panic. The network analysis further demonstrated a close relationship between paranoia and post-traumatic stress symptoms. Once all other variables were controlled, the presence of post-traumatic stress symptoms was solely related to paranoia. This relationship is consistent with evidence that negative interpersonal experiences contribute to the development of paranoia (Freeman et al., 2013; Sitko et al., 2014). But the findings also show paranoia was certainly not confined to traumatised youth: the trauma variables only accounted for a small amount of the variance in paranoia and almost two thirds of patients with paranoia did not have a (clinician-rated) history of trauma.

Another important finding was the close relationship between paranoia and peer relationship difficulties. This association was the strongest of all those assessed from both clinicians and patients, even after controlling for the influence of all other variables in the network. Although the relationship will be bidirectional to a degree, evidence from the general population suggests adolescent peer difficulties are more likely to be influenced by paranoia than vice versa (Chapter 4). The strength of the relationship between paranoia and peer difficulties was substantially larger in the patients compared to the school pupils from Chapter 4, likely reflecting a greater impact of paranoia in adolescents with mental health problems that require clinical care. The pathways connecting peer difficulties with many other symptoms also occurred via paranoia, suggesting paranoia could be a common route to impairments in adolescent peer relationships. At an age when peer acceptance is most highly valued (Somerville, 2013), the potential impact on friendships could be a cause of distress for adolescents. In line with this, peer difficulties were the mediating link connecting paranoia and the distress / functional impairment caused by young people's problems.

5.4.1. Limitations

The study has several limitations. First, the sample was not a fully representative cohort. It was not possible to invite all patients accessing the participating services to take part, since services could not be covered all the time for recruitment. However, attempts were made to minimise sampling bias by inviting patients to take part regardless of their reason for accessing services or clinical diagnosis. This provided an element of randomness that increased the likelihood that the sample would be representative of the wider CAMHS population. The cohort also included

a higher proportion of girls than boys, although this may be representative of CAMHS given the higher rates of common mental health problems in adolescent girls (NHS Digital, 2018). Nevertheless, the pattern of associations between paranoia and other variables could be influenced by gender, and, as a result, the network structure may have biased understanding towards girls. There is a lack of clear evidence, however, showing that the relationships between paranoia and causal factors differ by gender. Another notable source of sampling bias was the primarily affluent catchment areas for the services included with a local demographic of mostly White British individuals. Given evidence that the development of paranoia is likely to be influenced by factors such as racial discrimination, poverty, and neighbourhood crime (see Chapter 1), clinical levels of paranoia in youth are likely to differ by locality.

A strength of this study was the ability to compare, using the same validated measure, the prevalence of paranoia in CAMHS patients with observed rates from the secondary school cohort from Chapter 4. This was not a perfect comparison, however, as the school pupils were slightly younger than the patients in this study. But as age was not associated with paranoia in either sample, the effect of this difference on the comparison is likely to be minimal. Another limitation was that aside from the B-CAP, the other measures were missing for approximately 10% of participants. This reflected the reality of routine measurement in CAMHS where clinical pressures could prevent clinicians from completing the Current View and patients sometimes left before completing all questionnaires. It is also acknowledged that the follow up questionnaires were collected as an optional part of the study, so only a third of the sample provided longitudinal data. Planned prospective studies examining paranoia in clinical samples will be needed to understand fully the relationship over time with other problems. It is also the case that the depth of clinical understanding is likely to be improved by qualitative research with adolescent patients experiencing paranoia; this is the approach taken in the next chapter.

Chapter Six

The journey of adolescent paranoia: A qualitative study with young patients with mental health problems

6.1. Introduction

Paranoia may be a common and clinically important problem in adolescents who are accessing mental health services. However, detailed insight into the lived experience of paranoia for these young patients is lacking. There has been no qualitative study of paranoia in adolescents with mental health problems. A detailed examination of young people's lived experience may increase the depth of understanding provided by the quantitative observations and potentially provide new insights to be explored further. Qualitative methods can also give voice to young people's priorities and concerns. Therefore, in this chapter, the lived experience of paranoia in adolescents with common mental health problems attending CAMHS is explored using qualitative methods.

There were two aspects of lived experience focussed upon. The first aspect was the content of young patients' paranoia, the clinical context in which it presented, and experiences of help-seeking in CAMHS. The second aspect was adolescents' understanding of the development, experience, and impact of paranoia in their daily lives. This focus on meaning-making was guided by an overarching interest in developing cognitive behavioural therapies for paranoia, as the way individuals make sense of their experiences is a central feature of the cognitive approach (Beck and Beck, 1995). This was therefore addressed using interpretative phenomenological analysis (IPA; Smith, 1996), a qualitative approach specifically designed for understanding how individuals make sense of lived experience.

6.2. Method

6.2.1. Design

This qualitative IPA study used semi-structured interviews to explore adolescent patients' experiences of paranoia. IPA draws upon three underlying principles of phenomenology, hermeneutics, and idiography. Phenomenology is concerned with the exploration of experience, attempting to understand a specific phenomenon (i.e. paranoia) and the components that make it unique. Second, hermeneutics describes a focus on the interpretation and meaning of these

experiences for participants. The researcher is an active part of this interpretation, reflecting a *double hermeneutic* where the researcher seeks to make sense of the participants sense making (Smith and Osborn, 2015). Importantly, IPA recognises that the researcher's background, pre-conceptions, and biases will influence the interpretation. Finally, idiography refers to the commitment to individual participants through an in-depth analysis of each case, ensuring the nuances of each person's experience are captured within the final report. The study received approval by the South Central - Oxford B National Health Service Research Ethics Committee (Ref: 17/SC/0539).

6.2.2. Reflexive position

In line with the principles of IPA, there was a commitment to reflexive practice at every stage of this study (see section 6.2.5). It is acknowledged that the findings will have been shaped by the professional perspective of the thesis author and the two supervisors (FW and DF) as clinical psychologists from a research team who develop cognitive-behavioural approaches to paranoia. As a clinical psychologist with extensive experience supporting adolescents in CAMHS, the thesis author's commitment to this topic was motivated by desire, as a clinician, to improve treatments for young people with paranoia. The thesis author was also influenced by personal experiences of mild paranoia as a teenager that gave a degree of insight that inevitably influenced the interpretation of young people's accounts.

6.2.3. Participants

Purposive sampling was used to recruit adolescent patients who were homogenous in their experiences of current paranoia but representative of the full age range (11-17 years) and both genders. A target sample size of twelve was chosen to provide a breadth of personal experience from adolescents whilst still allowing sufficient depth in the exploration of individual perspectives. Inclusion criteria were adolescents who, at the time of participation, were 1) aged 11-17 years; 2) attending child and adolescent mental health services (CAMHS) in Oxford Health NHS Foundation Trust; and 3) reporting elevated paranoia, defined as a score of 23+ on the B-CAP. Exclusion criteria were 1) a diagnosis of psychosis or suspected psychosis, 2) a moderate/severe learning disability, or 3) an inability to participate in an interview in English.

Participants were identified following their participation in the study described in Chapter 5. Potentially eligible adolescents and their parents were contacted, and, if interested, offered a

screening assessment. During this assessment, participants were provided information about the study and the presence of current paranoia was assessed using the B-CAP and a brief clinical interview. Of the 17 adolescents screened, 3 declined to participate and 2 were unsuitable as they were not currently experiencing paranoia. The remaining 12 adolescents were eligible and agreed to take part. Informed parental consent and child assent (11-15 years) or consent (16-17 years) was obtained, and a separate meeting arranged to conduct the interview. Adolescents and parents consented to the use of verbatim quotes under a pseudonym. The interviewer did not have pre-existing relationships with any participant.

6.2.4. Procedure

The consolidated criteria for reporting qualitative research (COREQ) checklist (Tong et al., 2007) was followed throughout the study.

6.2.4.1. Interview schedule development

A primary consideration in the development of the interview schedule was ensuring the interview would facilitate young people's ability to talk freely about their experiences. Informed by clinical experience working in CAMHS, it was thought that adolescent patients could struggle to open up in an interview setting due to shyness, anxiety, mistrust, or a limited capacity for introspection. The interview schedule was therefore designed to include more questions and possible prompts than a typical adult IPA study (Smith et al., 2009), and close attention was given to ensure the language was clear and age appropriate. Importantly, the interview questions (and the study information provided in recruitment) did not refer to 'paranoia' due to the associated stigma of this word, with more relatable phrases such as 'mistrust' and 'worries about people' used instead.

The core interview questions reflected the study aim: exploring participants' understanding of the development, experience, and impact of paranoia. The interview started with the positively framed topic of trust to help adolescents feel at ease, before the more challenging content of paranoid concerns was explored. To consider the clinical context of participants' experiences, participants were also asked about whether paranoia was related to their other mental health problems and experiences of help-seeking. A full copy of the interview schedule is shown in Appendix Q.

The interview schedule was designed to be used flexibly to follow the young person's narrative, incorporate their own vocabulary, and provide verbal prompts to encourage elaboration (e.g. "can you tell me more?", "how do you mean?"). Particular attention was given to ensure the interview questions were consistent with IPA methodology in exploring how participants understand their experiences. Based on this, general prompts were used throughout to encourage reflection on the meaning of participants' responses to the questions (e.g. "what do you think about that?", "why is that?"). The interview was piloted with the first participant: although no changes to the content of the interview schedule were necessary, this first interview highlighted the need to use more follow up prompts to encourage deeper reflection from participants on the meaning of experiences.

6.2.4.2. Interview

Individual interviews were conducted by the thesis author with participants in either a mental health clinic (n = 9), their home (n = 2), or a university building (n = 1). Interviews, which lasted 30.3-84.5 minutes (mean = 64.5, SD = 14.6), were audio-recorded and transcribed verbatim. Transcripts were anonymised and participants assigned pseudonyms. No repeat interviews were conducted. Participants completed a written form with questions about their demographic details, their view of why they attended CAMHS, whether they were receiving support for paranoia, and if not, if they wanted help for it. Participants received £15 reimbursement for their time.

Throughout the interview, attention was given to any potential distress that the topics may elicit. Participants were reminded they did not have to share anything they did not feel comfortable with. The clinical skill of the interviewer was used to attend to signs of distress and respond appropriately. At the end of the interview, participants were asked for feedback on the overall process, if they had found anything difficult, and if they had any questions. Although some participants described certain topics were difficult to discuss (i.e. traumatic events), all reflected positively on the interview with most stating that they found it actively helpful. Due to feasibility issues, adolescents were not invited to provide feedback on the transcripts. However, one participant requested a copy of their transcript and did not raise any concerns about the content.

6.2.5. Analysis

The IPA analysis followed the procedure by Smith et al. (2009). First, each transcript was read and re-read to familiarise and immerse the self within the data. At this stage, exploratory notes including descriptive, linguistic, and conceptual comments were made, with a focus on the things that mattered to the participant and the meaning of their experiences. Next, emergent themes were drawn from the exploratory comments to capture "the psychological essence" of what was said, synergising idiosyncratic features with conceptual interpretations. For each participant, connections between emergent themes were explored in relation to the research questions and clustered into an individual hierarchical structure. This process was repeated for all twelve accounts, bracketing ideas from the previous interview to ensure an idiographic understanding of each participant's lived experience. Patterns of similarity and difference across the individual analyses were then identified and organised into an overall structure of superordinate and subordinate themes. These overarching themes were then refined by re-examining each participant's interview to explore nuances in meaning and ensure the final interpretation was grounded in young people's words.

6.2.6. Demonstrating validity

Yardley's (2008) four criteria for demonstrating credibility (i.e. validity) in qualitative research were used throughout the study. First, 'sensitivity to context' includes a sensitivity to relevant theory/research, the sociocultural setting, participant perspectives, and ethical issues in the study design and analysis. Second, 'commitment and rigour' includes thorough data collection, rigorous analysis with sufficient breadth and/or depth, methodological competence, and prolonged engagement with the topic. Third, 'coherence and transparency' refers to consistency between the chosen qualitative framework (e.g. IPA) and the methods used, the clarity of the findings, transparency in the methods and findings, and the use of reflexivity. Finally, impact and importance refers to a consideration of the practical, theoretical, and socio-cultural implications of the study. Full details of how each of these four criteria were demonstrated in this study are shown in Table 25.

6.2.6.1. Reflexivity

Reflexivity was used at every stage of the study to consider how the thesis author's personal experiences, assumptions, and biases were influencing the findings. In the spirit of IPA, the aim

of reflexivity was not to completely 'bracket' from these assumptions, but to curiously engage with them (LeVasseur, 2003). Prior to data collection a bracketing interview was conducted to reflect on these assumptions, although it was also recognised that one cannot fully predict how biases will arise until faced with the data (Smith et al., 2009). In the analysis, a curious stance was adopted involving an assumption that the thesis author did not understand the participants' experiences and active reflection on reactions to what participants said. These reflections were recorded in a reflexive journal alongside the analysis and elicited during reflexive conversations in supervision.

Table 25. Strategies undertaken to address Yardley (2008) criteria for ensuring validity in qualitative research

Criterion	Strategy employed
Sensitivity to context	• In-depth review of the literature on adolescent development, models of paranoia, and previous qualitative reports of paranoia. • Consideration of the age and clinical context of participants in the study design to facilitate engagement and their ability to open up. • Consideration of ethical issues in study design. • Contextualisation of the analysis within participant demographics and the clinical context in which paranoia presented. • Use of verbatim quotes to support claims. • Use of reflexivity to consider influence of researcher on emerging analysis within supervision and a reflexive log. • Bracketing interview prior to data collection.
Commitment & rigour	• Prolonged engagement with the topic of adolescent paranoia. • Purposive sampling of adolescents with experience of paranoia. • Rigorous analytic process closely following recommended steps within IPA. • Ensuring balanced representation of all 12 participants in the analysis and selection of quotes. • Use of supervision to triangulate perspectives and perform credibility checks of emerging analysis. • Independent rating of sections of transcript.
Transparency & coherence	• Detailed description of the method. • Ensuring method and results consistent with IPA. • Rationale for content of interview schedule provided. • Audit trial of decision making and analytic process. • Examples of analysis included in independence. • Exploration of contradictions in findings. • Regular supervision to develop coherent interpretation. • Reflexive statement.
Impact & importance	• Focus on clinical presentations of paranoia in a patient sample. • Consideration of clinical implications of findings for CAMHS services and the treatment of paranoia in young people.

6.2.6.2. Supervision

Regular supervision was used throughout the analysis to triangulate perspectives, perform credibility checks, and collaboratively refine the emerging interpretation (Yardley, 2008). At the idiographic level, preliminary versions of each participant's theme structure were reviewed and refined in supervision with FW, alongside the annotated transcripts, to ensure they provided a credible and coherent narrative of the young person's experience. The theme structures therefore went through numerous iterations and were only finalised upon consensus agreement in supervision. Supervision with FW was further used to ensure the analysis adhered to the principles of IPA and was sufficiently interpretative, prompting a move beyond the descriptive to consider higher levels of interpretation (Smith, 2004). This was particularly important with early participants for whom the interpretations were generally more cautious. As a result, after the final interview had been analysed, the first three were re-analysed in full to produce stronger interpretative accounts that matched the depth of subsequent interviews.

The development of themes across participants was collaboratively refined in supervision with FW and DF, over seven one-hour meetings, to enrich the interpretation and ensure it was theoretically coherent. During these meetings, each member of the research team offered unique perspectives - both from individual areas of expertise and involvement at different stages of the analysis - that enhanced the credibility of the final account. To ensure transparency, an audit trail of the analytic process was maintained including a record of decision making and evolving versions of the idiographic and overarching analyses. Examples of the analysis are provided in the appendix, including an extract of an annotated transcript with initial notes and emergent themes (Appendix R), and an idiographic theme structure for one participant (Appendix S).

6.2.6.3. Independent rating

IPA recognises that different analysts bring unique interpretations to a transcript (Smith et al., 2009). Therefore, to further enhance the rigour of the analysis, a clinical psychologist external to the study independently analysed clean sections of transcript to the level of identifying emergent themes. In line with the principles of IPA, the objective of this independent rating was not to assess inter-rater reliability. Instead, the goal was to consider the coherence of the emerging analysis and how it was being shaped by the thesis author's particular perspective (Yardley, 2008). Despite this, comparison of the independent and original sections of analysis in supervision revealed a high level of consistency. The specific phrasing was often different,

but the content of independently coded themes could be matched to those in the original analysis. No new themes were identified. Notably, the original analysis included greater detail and interpretation than the independent coding which was more descriptive. This reflected a commitment to the topic through prolonged engagement and familiarity with the research area and client group (Yardley, 2008).

6.3. Results

6.3.1. Contextualising the findings

Participants included 3 boys and 9 girls (mean age = 14.7, SD = 1.97), and all were White British. Eleven participants were attending outpatient CAMHS and one participant (Lucy) was at an adolescent inpatient unit. Participants were presenting to services primarily with affective symptoms, self-harm/suicidality, reactions to trauma, and eating difficulties (Table 26).

Table 26. Participant characteristics and self-report paranoia scores including subscales for social harm (S), conspiracy ideas (C), and physical threat (P).

Name[1]	Age	Gender	Presenting problems	S	C	P	Total
Katie	16	Female	Depression, self-harm, suicidality, emotion dysregulation	22	18	23	63
Megan	16	Female	Depression and anxiety	15	6	20	41
Jack	11	Male	Generalised anxiety	25	13	19	57
Ashley	12	Female	Autism, anxiety, low mood, self-harm, poor sleep	33	11	25	69
Nathan	15	Male	Anxiety, depression, suicidality, emotion dysregulation	29	16	14	59
Chloe	14	Female	Self-harm, low mood, anxiety, emotion dysregulation	16	1	12	29
Emily	16	Female	PTSD symptoms, anxiety	24	10	13	47
Sophie	16	Female	Self-harm, suicidality, mild eating disorder	17	3	18	38
Holly	15	Female	Low mood, emotion dysregulation, self-harm, suicidality	25	11	23	59
Sam	12	Male	Autism, emotion dysregulation, anger	27	17	14	58
Olivia	16	Female	Depression, emotion dysregulation, suicidality, anxiety	27	12	16	55
Lucy	17	Female	Anorexia nervosa, anxiety, self-harm, suicidality	24	8	25	57

Note: [1] Pseudonyms used to maintain anonymity

As shown in Table 26, eight participants scored in the high paranoia range on the B-CAP (i.e. 54-70), two scored in the moderate range (i.e. 40-53) and two scored in the mildly elevated range (i.e. 23-39). Within the interviews, participants described a variety of paranoid concerns spanning ideas of reference (e.g. being followed) and persecutory fears of deliberate social (e.g.

being secretly made fun of), emotional (e.g. being upset on purpose), sexual (e.g. being raped), and physical harm (e.g. being beaten up or killed). All twelve participants described fears of physical harm from others, which predominantly focused on strangers, and, for ten participants, included a fear of kidnap. Five of the nine female participants explicitly described fears of sexual assault from men. Six adolescents also described excessive mistrust of their peers, with concerns of social and emotional harm in situations where this was unlikely. This included, for example, an uncertain feeling that peers were deliberately excluding them or were only being nice to ridicule them. Four of these participants described suspiciousness of peers as their primary paranoid concern with fears of physical harm viewed as secondary. Only three participants reported paranoia on social media, which included threatening interpretations of ambiguous posts and worries they were being ridiculed in secret. Example quotes of a paranoid concern for each participant are shown in Figure 14.

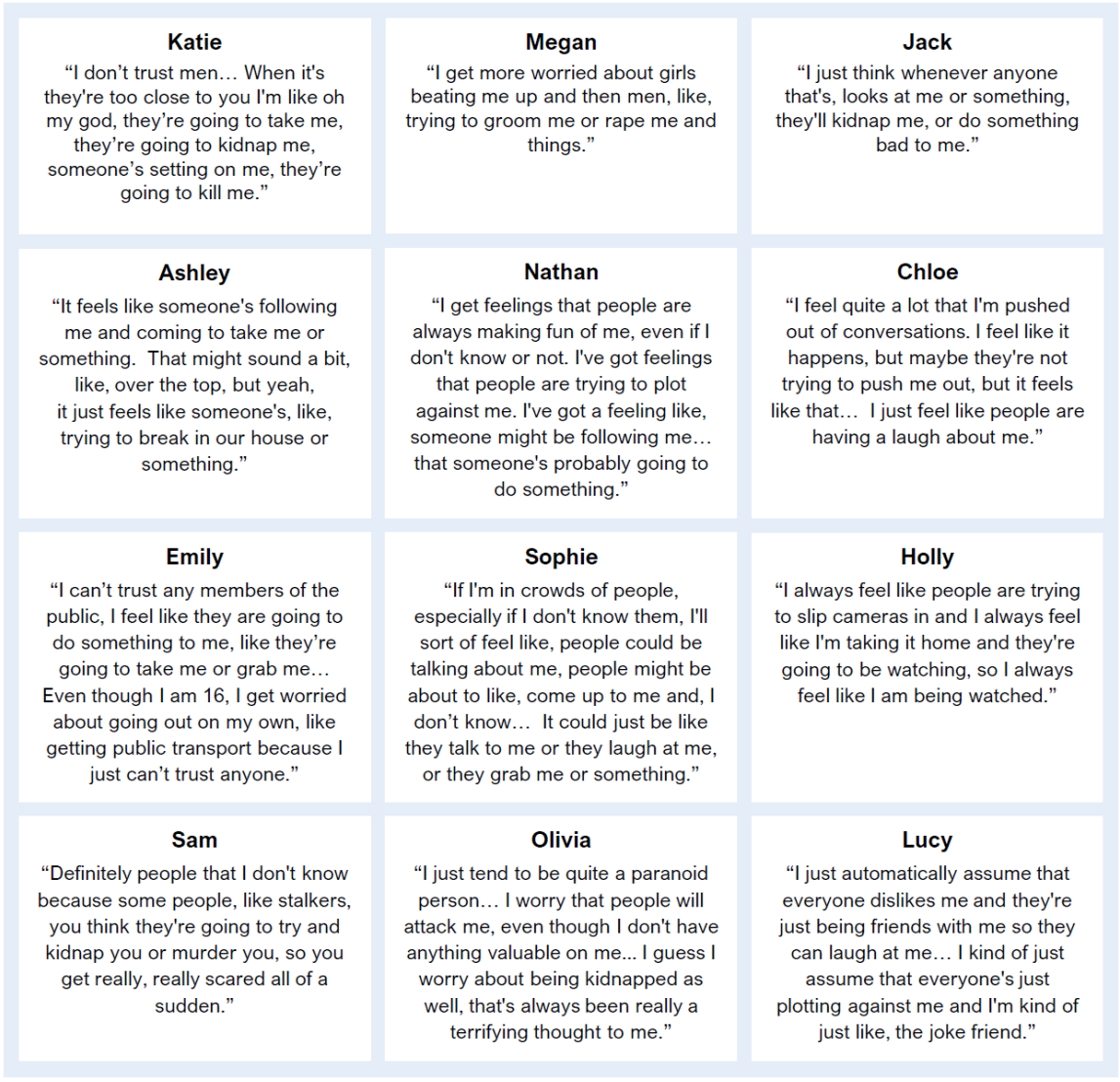

Figure 14. Example of young peoples' paranoid concerns

The prominence of paranoia within the adolescents' broader clinical presentations varied, but none had paranoia recorded as a presenting problem in their clinical notes. Five participants understood mistrust/paranoia as central to the reasons they attended CAMHS, even if they had framed it differently. For example, Ashley described how fears of harm and kidnap drove her anxiety about going outside, poor sleep, and checking behaviours she had conceptualised as obsessive compulsiveness:

Ashley: "My OCD, I have to keep checking the doors, windows…"

Interviewer: "So what happens if you don't check?"

Ashley: "I just don't go to sleep, I keep hearing things, so I always have to check."

Interviewer: "Right. So what's the kind of, the worst image that goes through your mind when you haven't checked?

Ashley: "I don't know, just someone at the door trying to get in."

The remaining seven participants understood paranoia as an additional problem to the focus of their CAMHS interventions, although all viewed it as a source of distress. Of these seven participants, only one - Sophie - had discussed their paranoia with a CAMHS professional. Even then, Sophie recalled only speaking about it briefly "a few times", but not in-depth as she felt "scared of what they'll say." The remaining participants explained that paranoia had not come up in their sessions which prioritised other issues. Notably, Nathan described his paranoia as a major issue that he wanted help for, but he had not told anyone at CAMHS (or in his personal life) because "I can't really trust anyone." Eight participants said they had not been offered treatment for paranoia, and the remaining four were unsure. When asked if they wanted help for paranoia, nine young people said that they did and three were unsure.

6.3.2. The journey of adolescent paranoia

The IPA analysis described a three-stage journey of adolescent paranoia, each represented by a super-ordinate theme. First, 'Discovering threat and vulnerability' described adolescents' understanding of how paranoia developed. Second, 'The paranoia experience' described the core features of their paranoia. Finally, 'Adjusting to paranoia' described the ongoing attempts to make sense of the experience, its impact, and responses to it. Super-ordinate and sub-ordinate themes are visualised in Figure 15. A summary of the participant contributions to each theme is shown in Appendix T.

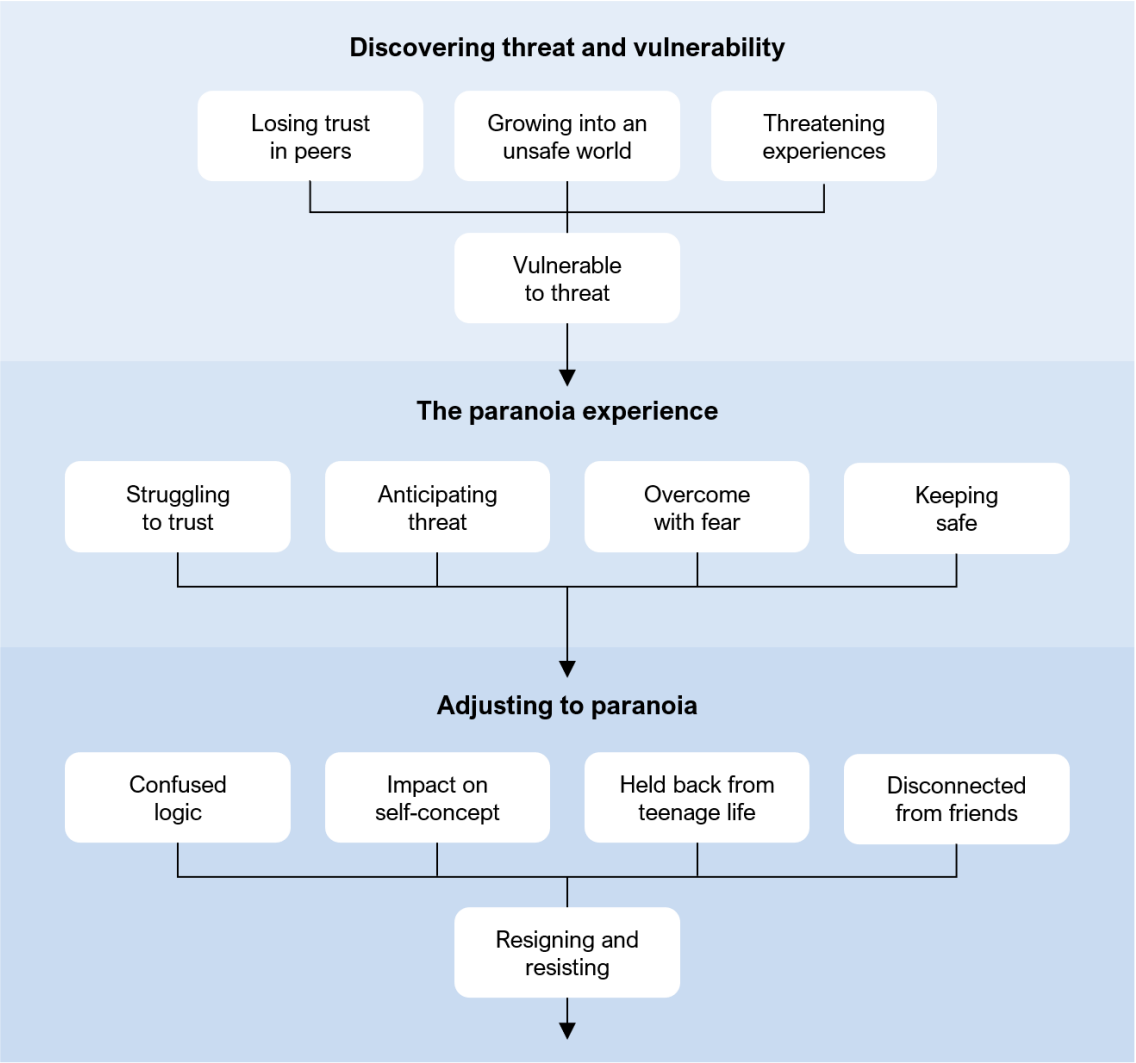

Figure 15. Visual representation of the journey of adolescent paranoia

6.3.2.1. Discovering threat and vulnerability

Central to the onset of paranoia was a process of discovering threat and vulnerability. First, all participants described learning more about the possibility of threat from others via one or a combination of three experiences: 'losing trust in peers', 'growing into an unsafe world', and 'threatening experiences.' The discovery of threat through these experiences contributed to a core sense of personal vulnerability to interpersonal harm, from which paranoia emerged. Additional example quotes for each subtheme are shown in Table 27.

Losing trust in peers

> "I had a best friend who, like, I definitely can't trust now, and we were really close, and she just turned on me and turned all my other friends against me for no reason… it was horrible and that made me not really want to trust anyone else." - *Emily, 16*

Most participants described how challenging peer interactions contributed to a shift in assumptions about trust. This included changeable friendships, gossip, rumours, subtle exclusion, and, in some instances, bullying. Experiences with peers contributed to an emerging realisation that other people, and especially teenagers, were untrustworthy. Notably, many participants described how paranoia emerged from significant experiences of broken trust and betrayal within peer relationships: "I've been turned on by so many people that now I can't trust anyone" (Nathan). The process of losing trust in peers was gradual for most, with general mistrustfulness emerging from multiple encounters. However, some recalled specific incidents of falling out with peers that, although typical for adolescence, substantially altered their beliefs about others and played a prominent role in paranoia onset.

Growing into an unsafe world

> "When you always hear things on the news and there's so much of it going on nowadays, and your mother's always warning you and your grandparents are always warning you, it's just so difficult to not have those thoughts. Especially as I'm female, I'm not being sexist, but they're more targeted for assault and stuff. It's just got worse over the years." – *Chloe, 14*

Six participants described how paranoia emerged in the context of growing up: they were becoming more aware of danger in the world whilst also becoming more exposed to these dangers. This often occurred as they started to go out alone, with four participants identifying this as the time their paranoia began. The reality of interpersonal dangers such as murder, rape, and terrorism were highlighted to adolescents from the news, warnings from adults, and anecdotes from friends/family. Becoming more aware of danger often led adolescents to re-evaluate their childhood assumptions of safety, contributing to an increasing view that the world was not a safe place. Gender was important in the awareness of threat, with several describing a realisation that sexual assault is a risk that girls face in society. Yet as participants were becoming more aware and exposed to potential danger, they didn't yet know how to protect themselves. The prospect of facing these dangers alone therefore seemed frightening:

> "You're kind of like, I've got the world to grow into, but it's not something safe. It's something I've got to always be careful of because I'm not going to be able to protect myself… It's a lot more scary because you know you're growing up and you're going to be facing things more independently, [but] you don't really know how to deal with it" - *Sophie, 16*

Threatening experiences

> "Probably after I got groomed, things started to come; and then when I got cheated on, I just thought everyone - and then after I got beat up, I just think all strangers… even though the police said, you were just in the wrong place at the wrong time, I always think, no, it's everyone now" – *Megan, 16*

Eight participants identified threatening experiences that contributed to the onset of paranoia. Four participants described direct trauma, including sexual assault, physical attack, and being mugged. However, five participants also described subjectively unsettling and frightening experiences such as being approached or 'cat-called' by strangers, and, for three participants there were unsettling anomalous experiences. The latter was prominent for Ashley who described an experience of a disappearing figure (two years earlier when she was aged 10) that triggered her fears of harm from strangers (see Table 27).

Throughout the accounts, participants described how their concerns had generalised from these frightening experiences. This process was gradual for a number, with an accumulation of experiences generalising their sense of threat over time. Other participants described how individual incidents led to a dramatic shift in perspective, including a realisation that dangers could happen to them. This generalisation was also influenced by 'close calls' that drew attention to the harm that they could have faced: "because I've come close to situations like that, it's become more of an option that, like, I never thought would happen to me" (Lucy).

Table 27. Additional quotes for first level of theme "Discovering vulnerability and threat."

Discovering vulnerability and threat	
Losing trust in peers	
Chloe, 14	"I guess it's really easy to break trust, because I've told people things before and they've gone behind my back and told other people things. . . After your trust has been broken once, you don't really know how to, like if you should talk to anyone else, as you don't know what people are like?"
Olivia, 16	"When I was younger, I used to sort of, tumble into people quite easily. I'd sort of go, oh, do you want to be friends, so talking to them loads and I'd tell people things and then that sort of backfired… but now I've had experiences with people and I've had that prior knowledge of what people are like, I tend to be more wary"
Growing into an unsafe world	
Holly, 15	"I've always been aware of what can happen with strangers, or anyone, it doesn't need to be strangers, it can be someone you trust dearly and they can still do horrible things to you… As I've got older and matured, and with social media where you hear everything on the news and everything gets passed round, you hear about it so much more and it's just like, this seems to be happening a lot, I'm not going outside because if there's everything happening a lot more, why should I risk myself? I can just stay home."
Sophie, 16	"I started feeling less and less prepared as I learnt more about the reality of [danger], and then because I was less prepared, I'd keep thinking through all the possibilities. So I'd over-think things and also feel unprepared. And then it just made me start feeling overwhelmed around other people. "
Threatening experiences	
Lucy, 17	"[The paranoia] kind of started when I was about 14-15, because that's when the comments started being given to me and people started honking their horn and whistling, that's when I started to feel like unsafe outside, and then I got mugged and then this weird guy started talking to me as well."
Ashley, 12	"There was someone in a black coat, all black, behind me, and then next thing I looked back, he had disappeared, which, it was quite creepy… When I saw that man in black, I think that's when it completely started, that's when I, that's when people followed me… that's when I started to mainly think about it."

Vulnerable to threat

The sense of vulnerability underpinning the participants' paranoia included three subthemes: 'uncertainty about others', 'self as a target', and 'defenceless and unprotected'. Additional example quotes for each of these subthemes are shown in Table 28.

Uncertainty about others

> "You just don't know when it's going to happen and that always scared me, because a lot of things in my life, when I got mugged, I never thought that would happen to me ever, and then it did… So it makes me think, what else? Obviously, anything can happen, so it's just made it more of a worry in my head." – *Lucy, 17*

Through their experiences, participants described becoming increasingly aware that people are not always as they seem, and that misplaced trust can have harmful consequences. Experiences of broken trust and direct harm had brought significant doubt into their judgements about others, including close friends, and, as a result, many described feeling uncertain in decisions about trust. There was significant concern that threat from others was unpredictable and could happen at any time, with this uncertainty contributing to the generalisation of paranoia from

threatening experiences. The uncertain nature of threat left adolescents feeling more at risk, and, as a result, prompted a perceived need for constant vigilance.

Self as a target

> "I sort of feel like people will look at me like they know; they know I'm a bit weird and they know that I'm a bit different and it feels like people will pick up on that, and sort of find me an easier target." – *Olivia, 16*

Participants described how paranoia often emerged from a view of themselves as a target, informed both by past experiences and low self-esteem. This was often linked to negative perceptions of the self in relation to others. For example, participants' beliefs that they were different or unlikeable made it seem more likely that others would want to harm them and created doubt about whether friendliness from others was genuine. Nathan gave a particularly insightful account of this link: "I think the reason I get them ideas is not just because of my confidence, but the way I look at myself and the way I think other people think of me." Feeling like a target was also linked to appraisals that harm is deserved and, as a result, likely to be an ongoing threat. Gender was an important factor in girls' view of themselves as a target, and notably, both Megan and Lucy described how unwanted male attention had made their physical appearance as 'pretty' girls a source of threat.

Defenceless and unprotected

> "I think it can be the fact I'm very weak. I really am not strong… So I think that can make me feel a lot worse because it's like, if something did happen I'm not strong enough to defend myself or get away, and I can easily be overpowered." – *Holly, 15*

Paranoia was also rooted in the adolescents' views of themselves as defenceless and unprotected, and, as a result, more likely to face severe consequences if harmed (Raihani & Bell, 2019). For ideas of physical harm this was often linked to a view of the self as weak or a lack of trust in others to protect them. For example, Katie described feeling unsafe in public with friends as "if someone, like, touched me or took me, I don't think I trust [my friends] to get me back." Feeling unprotected could also be influenced by insecurity within parental relationships (Bowlby, 1969), with Ashley reflecting that abandonment fears made kidnap more frightening as she worried her "parents would never look for me". For social concerns, participants' defencelessness was linked to broader social vulnerabilities where difficulties fitting in meant the risk of friends turning on them was high. This was evident for Sam who described: "I've only got two or three friends, so I'm really scared of my friends because at one point I might be at zero so I will be alone."

Table 28. Additional quotes for the second layer of superordinate theme "discovering threat and vulnerability", representing the three subthemes of "vulnerable to threat"

Vulnerable to threat	
Uncertainty about others	
Holly, 15	"You don't know what people are capable of, and that's very scary and kind of links to don't judge a book by its cover, because someone could look really petite, innocent, really kind, but really they could be very strong and they could have a record or something, you don't know. So that also leads to like, not trusting very well because obviously looks can be deceiving"
Sam, 12	"But no matter what, you can't be too safe… Even with your friends, you can't trust them sometimes, because still they're your friends, you think you can trust them, but they still can spread the words… so you can pretty much never be too safe because people can double-cross you or triple-cross you and you just can't trust people that you don't know, even your friends."
Self as a target	
Nathan, 15	"I think a lot of people despise me, and if lots of people despise me, a couple of people are probably going to do something about it."
Megan, 16	"Because everyone says I'm a pretty girl… Sometimes it makes me feel dirty, because all the men come up to me, and I feel like I look like a slag and stuff."
Jack, 11	"The way I look or, the way I look… I just think that I look weird and people might, like, talk about me or something."
Defenseless and unprotected	
Sophie, 16	"I used to be confident that I'd be able to defend myself, and then I guess I got, when I started feeling less confident about myself, I also was like, well, I'm pathetic, I'm not going to be able to protect myself from anything, so yeah, I got more anxious about what other people could do and say."
Ashley, 12	"I think also what I feel like I'm going to get kidnapped or someone's following me, I also think it's because, like, I might be, like, left, I might be abandoned. I think it's because if I ever do, which I might not but it's like, you never know, that my parents would never look for me or anything."

6.3.2.2. The paranoia experience

The adolescents' experiences of paranoia comprised four core components: 'struggling to trust', 'anticipating threat', 'overcome with fear', and 'keeping safe.' Additional example quotes for each of the subthemes are shown in Table 29.

Struggling to trust

> "When you do have trust for someone, well, really it's just one of the best things you can have; it's just trust. But the opposite, when you don't have trust for someone, especially if you're close to them… is just a horrible feeling, because you've known them for so long, and you feel like you can't talk to them about stuff you should be able to." – Nathan, 15

Participants described finding it incredibly hard to trust, with many explaining it took a long time, and, even then, several could not "ever really trust anyone 100 percent" (Emily). Trust was typically viewed as fragile with an assumption that others will ultimately prove untrustworthy, and a result, trusting made them vulnerable to getting hurt. Decisions about trust were therefore not to be taken lightly, and, as Olivia explained, "having true trust in someone is a big commitment". The majority of participants described trust as highly important, with a number explaining that they took it more seriously than their peers. It was also viewed as

necessary and something participants explicitly longed for in friendships, as having trust in others was said to bring a sense of happiness and allowed young people to relax, be themselves, and feel safe. Yet despite their desire for trust, adolescents described a tendency towards mistrust in their relationships, remaining wary of others and frequently doubting people's intentions.

Anticipating threat

> "Even at home where everything you think is safe, you still have to look out for people, because people can, like, get through your keyhole. They might like, know your number for your spare key lock or they can pick locks, so you can still get really, really scared. So when you see somebody out near your path, looking straight at you through your windows, you automatically think 'hide'." – *Sam, 12*

All participants described a dominant cognitive mode of anticipating threat from others (Freeman, 2016). Adolescents described being on the lookout for danger when in social situations, excessively focusing on the actions of others, picking up subtle social cues, and over-analysing what people might do. These processes contributed to self-consciousness in social situations, with several participants over-thinking both how they come across and how others react to them. Young people frequently felt on edge around others, with paranoid concerns often described as a felt sense of threat. Participants also described a tendency to interpret ambiguous interactions as hostile and jump to threatening conclusions. Worry was common, with adolescents repetitively thinking through the worst-case possibilities of what could happen, described by Megan as thinking: "what if, what if, what if?" The anticipation of threat was frequently experienced as something always present in young peoples' minds, which for a number was described as "a constant state of worry" (Holly).

Overcome with fear

> "It makes my anxiety really bad, and, like, panic attacks, because I don't know who to trust. I panic, then I panic even more and that ends up in a panic attack, especially when I'm out, because men, and then people might jump me; then when I'm at home, like with my friends, I just end up crying if my friends leave me, and then after I think, 'why am I being so stupid?'" – Megan, 16

Many adolescents described strong emotional responses to paranoid thoughts. These responses, which included panic, terror, and anger, were often experienced as sudden, intense, and overwhelming. For three participants the fear made it difficult to sleep. Some reflected on how these emotions could take over, with Nathan describing it as "like an instant change, like Jekyll and Hyde." Intense emotions often made it difficult for adolescents to objectively evaluate paranoid thoughts, with several recalling increased conviction in their suspicions in moments of panic. The strong emotions often led to a feeling of being out of control, and two participants

recalled deliberate self-harm or making suicidal threats in response to paranoia. Several participants expressed feeling powerless to the emotions evoked and struggling to use coping strategies to calm down. A number of participants reflected how mood could influence the intensity of fear, with existing low mood, anxiety, and stress making strong reactions to paranoid thoughts more likely. Conversely, two participants discussed how pre-existing suicidality and low mood could reduce initial panic, because as Sophie explained, "if they do attack me, what do I care, really?"

Keeping safe

> "I prefer being inside or where I live, because no-one knows where I live… I don't let anyone know, apart from my really close mates… It's like there's no way that someone can get me from outside or from inside if they don't know where I live" – Katie, 16

In response to paranoid concerns participants used a range of defensive strategies to keep themselves safe (Freeman et al., 2007). To protect against physical harm, participants described avoiding certain situations, particularly those involving many people, or not staying out for too long. Indeed, several adolescents preferred staying at home where they felt shielded from outside dangers. When they were outside, participants tried to minimise risk by keeping a low profile, for example avoiding eye contact, putting their head down, not talking to strangers, and keeping a distance from crowds. For Lucy, this included wearing baggy clothes to avoid sexual attention from men. Participants took further precautions in public including keeping their back to a wall, having a clear view of the room, planning escape routes, and being ready to defend themselves. Many also described attempts to escape, either by walking faster or running to a place of safety. Several participants also relied on others to protect them, for example by only going out with trusted people. Six adolescents also described defences against social threats, such as keeping others at a distance, not sharing personal details that could be used against them, and generally withdrawing from social interactions.

Table 29. Additional quotes for superordinate themes of "The paranoia experience"

The paranoia experience	
Struggling to trust	
Megan, 16	"I think trust is a bigger thing [to me] than a lot of other people my age… Probably because a lot of bad things have happened to me, so I just think it's like the one thing that I've got, like, left… I take it really seriously."
Lucy, 17	"If I meet someone new and I become friends with them, immediately I'm like, 'oh my gosh, this is someone that likes me and they're friends with me', so I trust them straightaway… then my brain's like, 'oh, but literally everybody in your life before has messed with your trust', so I start to doubt myself and I stop telling them things and I cut myself off from them. So it's kind of, because I'm so desperate to trust someone, I let it happen really quickly, then I over-think it all and stop myself."
Anticipating threat	
Olivia, 16	"When I'm walking I usually look behind me a lot, I tend to look straight at the ground, I don't like looking at people just in case they'll do something… It sort of feels like my brain makes me listen to every conversation that everyone is having, so it's like I'm getting an overload of sound and it's like a sensory overload."
Emily, 16	I take notice of their body language and just little things they say, I think maybe that's a sign that someone's going to be, like, I don't know, mean to me or, I don't know. It's really weird.
Overcome with fear	
Jack, 11	"Sometimes I can take my mind off of it, if my Mum, like, speaks with me, but then sometimes it just doesn't work. Sometimes I get, like, proper anxious, I try and breathe, but I just get, I just get so anxious of people staring at me."
Ashley, 12	"When I get anxious, it's not just anxious, it's, like, angry at the same time… So like I said, I get scared, so I feel so unsafe when I don't have my phone, and my Mum was trying to take my phone for the night, because I hadn't cleaned up something… so when she tried to take my phone I literally had this big breakdown, my Mum had to call [crisis team]"
Keeping safe	
Sophie, 16	"I'll be a lot more cautious about who's around me and where I am and trying to fit in to not draw attention to myself. And I'll try and get out of the situation as quickly as possible"
Holly, 15	"If I'm in a room, I always try and identify everything in the room, because if something bad happened, I would be able to make a plan with that. So when I'm out in a public place, I'm always kind of ready for anything. Like if I'm standing still, I always stand in a stance where if someone tried to push me over, they wouldn't be able to do it very easily."

6.3.2.3. Adjusting to paranoia

The adolescents described an ongoing process of adjusting to the experience and impact of paranoia. There were five subordinate themes: 'conflicting logic', 'impact on identity', 'held back from teenage life', 'disconnected from friends', and, finally, 'resigning and resisting'. Additional example quotes for the first four subthemes are shown in Table 30 and additional quotes for the final subtheme are shown in Table 31.

Confused logic

> "That feeling of absolute terror, like all logic will fly out the window. It's like, 'oh, random person on the street – murderer'. It's crazy how your mind can just sort of flip things… I just go, oh, come on, you're being stupid. And then my mind's like, no, no, absolutely not." – Olivia, 16

Most adolescents described a sense of confused logic about paranoid thoughts, which arose from an awareness their concerns were most likely unfounded and excessive. A number of participants explicitly referred to paranoid thoughts as 'irrational' or 'delusional', and several described their mistrustfulness as 'unhealthy'. This was less apparent for the youngest participants (11-12 years old), although all three still described questioning to some extent the accuracy of their fears. For example, Ashley (12y) described knowing her fears would be seen by others as "over the top" as they did not "sound real." The awareness that fears were unfounded often created a sense of dissonance, confusion, and distress, with several adolescents expressing difficulty understanding why they felt and acted this way.

Impact on self-concept

> "I don't like myself because I'm afraid all the time of other people and I don't want to be… I guess it's my ideals of who I am; I'd rather be someone who's not afraid… so when I start freaking out about stupid things that probably aren't going to happen, like someone attacking me, that makes me feel sort of pathetic" – Sophie, 16

The paranoia experience often affected the adolescents' self-concept, with most describing negative self-appraisals in relation to paranoia. For many these included appraisals of feeling persecuted, with paranoid thoughts triggering rumination about what makes them a target and also a sense of worthlessness. However, the appraisals also included self-critical judgements about paranoia. Nine participants described how unfounded suspicions made them feel "crazy", "weird", "stupid", and, importantly, different from their peers. A few participants further described shame and guilt over mistrusting others without good reason. The impact of paranoia on self-concept left several adolescents with a desire to be different from how they were, and a number described paranoid behaviour becoming part of their identity. Paranoia could also prevent adolescents from expressing their personalities, experienced as a loss of self. This was notable for Emily who struggled to understand her mistrustful demeanour as she used to be sociable and confident, reflecting that: "it's not me."

Held back from teenage life

> "I should be able to go out with my friends and enjoy my time, I shouldn't have to worry about being kidnapped or murdered or anything else, because I'm only 15, I'm still very young and I shouldn't have to grow up with these worries. I should be able to enjoy my life while I can." – *Holly, 15*

The adolescents described how paranoia could hold them back from doing things that they enjoyed and engaging with normal teenage life. It was often at odds with their expectations of how teenagers should be, with several describing sadness at feeling unable to simply go out and have fun like their peers. Multiple areas of daily life were affected, including problems

concentrating on schoolwork, struggling with everyday tasks, and an amplifying effect of paranoia on other difficulties (e.g. depression). However, the most prominent concern was a feeling of social restriction. Patterns of avoidance and withdrawal limited participants' options for socialising, and several expressed sadness at spending most of their time indoors or alone.

When young people did go out, intrusive paranoia and an attentional focus on threat typically interfered with their enjoyment, as described by Megan: "I'm focusing more on, 'don't get beat up', than actually having fun." The social restrictions of paranoia often made it hard to fit in with peers, further contributing to adolescents' views of themselves as outsiders. A number of participants reflected on a direct conflict between paranoia and the social pressure to fit in, struggling to weigh up the 'social risk' (Blakemore, 2018) of not going out against the risk of harm if they do. This included the possibility of being judged for their paranoia and, as a result, disguising it around friends:

> "I don't want to tell too many people and they turn round and, [say] like, 'you're crazy; sorry, see you later, bye'… You've got to kind of disguise looking around funny at people and when you get the feeling there's someone out to get you, you've just kind of got to put it past you. You've just got to be like, if that happens, it happens, because if my friends find out, they're just going to tell me I'm crazy." – *Katie, 16*

Disconnected from friends

> "It stopped me from talking to a lot of people that I'd like… I'm too scared to talk to them, I've always been too anxious, so it's stopped me from potentially making really good friendships… and a lot of my relationships, I've lost a lot of friends because I've distanced myself from them and they've just kind of given up and stopped talking to me, that happens a lot." – Lucy, 17

An important consequence of paranoia was a sense of disconnection from friends, typically resulting in loneliness and isolation. For a number of adolescents, this was partly linked to feeling alone with paranoid concerns that others could not understand. However, most often it was due to mistrust making it hard to connect with others and form close friendships. This was pertinent for Nathan who described mistrust as a "big red cross [that] represents a barrier between me and everyone else." Alongside giving little of themselves away, several participants described how quietness in social situations made them unapproachable or stopped them from initiating conversations with potential friends. Social avoidance also left adolescents with limited opportunity to meet new friends, and the tendency to decline invites and push people away made it hard to maintain friendships. Difficulties making and keeping close friends was often a source of sadness and frustration for adolescents, with several describing it as the most challenging part of paranoia.

Table 30. Additional quotes for first layer of superordinate theme "adjusting to paranoia."

Adjusting to paranoia	
Conflicting logic	
Lucy, 17	"I'm convinced they're following me, and I'm like, oh my god oh my god. So I always go into different shops to try and get away from them, but no-one is ever following me, like no-one, nothing ever happens to me. I'm just really convinced that people do, I don't know, it's kind of like a delusion that I have"
Jack, 11	"It's never happened before. But at the time, I say it now, but at the time when someone is staring at me, I kind of just forget about everything that I've said before… but nothing's ever happened, that someone's, like, a stranger's hurt me or anything."
Impact on self-concept	
Nathan, 15	"I just want to be like everyone else, and [paranoia] stops me from being like everyone else… I just want to be sort of a functioning member of society; one that is liked, and one that's understood, but that's not going to be happening any time soon… because these thoughts aren't going away."
Katie, 16	"I kind of see myself as crazy. Like, everyone else just goes out and has fun, and then I go out and I'm all panicky and I'm like 'oh, there's some randomer there', or 'this is happening', so I do kind of see myself as, you know, a bit loony."
Held back from teenage life	
Ashley, 12	"I'm just in my room; I don't even open my curtains, I don't even know what light is any more. Which is annoying, because I'm a really out-doors-ey person… I hardly ever leave my room anymore."
Emily, 16	"It's not really that nice because I can see people on social media going out to their friends' parties and things like that, or just spending time together and I just don't have trust in people to do that… I get really sad at home, and I'm like, oh, I want to get out, but when I do I just get really panicky so I just don't bother."
Disconnected from friends	
Chloe, 14	"[The most challenging part is] lack of friends. Because I had a best friend, and then we just drifted apart. Sometimes it can feel really lonely. I just can't be close to people."
Sophie, 16	"My old friendship group, they sort of, I don't see them much, but if I do see them, they'll be like, 'oh my God she's here', and joke about it. They've sort of gotten used to the fact that I'm not around anymore."

Resigning and resisting

The final theme represented an ongoing tension for the adolescents in their adjustment to paranoia between "reluctantly resigning" to the experience and "trying to resist" its impact. Additional example quotes for each of these subthemes are shown in Table 31.

Reluctantly resigning

> "I just sort of get on with life and I live, like, day by day as it is. I don't really understand everything about why it happens, but, I've come to terms that it's not going to get any better, so I just have to live with it." - *Nathan, 15*

Many adolescents described reluctantly resigning to paranoia due to a belief it could not be controlled, and, as a result, had to be endured. Several described this as a process of getting used to paranoia, with the first onset of paranoia experienced as most worrying, before it became a more normal part of life. Alongside coming to terms with the paranoia experience, a number also described a broader acceptance of the social consequences, including isolation and a lack of close friendships. Reluctant resignation was most present for the six adolescents who described their paranoia as persistent, unchanging, or getting worse, and was typically associated with feelings of sadness and frustration. However, several other participants described an uncertain view of the future, involving partial acceptance that paranoia will always be there alongside hope that in some way it improves. A few participants also expressed weighing up the negative impact of paranoia against its protective function, leading to ambivalence about change:

> "It's kind of good to have these thoughts of worry because if something did happen you'd be aware, you'd be able to do something, but at the same time it does put you down" – *Holly, 15*

Trying to resist

> "I think I just kind of, not got used to it, but just realised what was happening. Like, maybe people aren't out to get me, but then again I've always got that slight suspicion maybe somebody is. But I think, you know, you've just kind of got to push forward and get on with it, because if not you're just going to be stuck, like panicking all the time and not leaving the house." – *Katie, 16*

Despite the reluctant resignation that several adolescents described, most participants conveyed attempts to resist the experience and impact of paranoia. This included attempts to cope with paranoid thoughts, often through distraction or strategies to manage anxiety. This was evident for Jack, where learning anxiety reduction strategies meant he was now "controlling it a bit more." A number of adolescents were trying to let their guard down in order to rebuild trust in others, realising "I have to trust more people to get through life" (Holly), or trying to maintain a social life despite their fears. For several participants this was aided by re-evaluating the likelihood of harm and reassuring themselves that they were safe. A few participants had

started to directly challenge avoidance and face their fears, which, although difficult, helped them feel safer and learn that they could cope.

Table 31. Additional quotes for second layer of superordinate theme "adjusting to paranoia", representing "Resigning and resisting."

Resigning and resisting	
Reluctantly resigning	
Katie, 16	"There's nothing you can really do to stop it, if that makes sense. You've just got to kind of get used to it."
Emily, 16	"I still struggle with trusting people. I think I kind of always will now. I don't think it'll change because obviously you can't go back and change things, so that's probably going to stick with me forever really now."
Trying to resist	
Holly, 15	"Sometimes I just refuse. I'll just sit there and in my head I'll just go, 'I'm not going to do it, I'm not going to ruin my own time.' Yeah, there are still worries and I'll occasionally look around and be very skitty, but sometimes if I'm out with the family or a family meal, I'm just like, I'm not going to ruin this because I don't know if this will happen again"
Sam 12	"You just try and persevere sometimes. So pretty much just, confidence is when you get a bit braver. So being brave is pretty much just saying, like, I'm not scared of you."

6.4. Discussion

The aim of this study was to understand the experience of paranoia in adolescent patients with common mental health problems. All twelve of the young people interviewed had at least some paranoid worries of physical harm from others, although concerns of deliberate social, emotional, and sexual harms were also described. This paranoia was often intertwined with other mental health difficulties as part of a broader clinical picture, and almost half of patients viewed paranoia as central to the reasons they were seeking care. The clinical impact was clear: paranoia caused high distress, worsened other mental health problems, and was corrosive for social relationships. Yet despite regular contact with services, paranoia had not been identified by clinicians as a presenting problem for any of the patients interviewed. For many adolescents, the interview was the first time they had spoken in detail their about paranoia. When asked, almost all participants said they wanted help for their paranoia. These accounts therefore vividly illustrate what was suspected in Chapter 5: paranoia in adolescents with mental health problems is a clinically important but often overlooked issue in CAMHS.

A journey emerged from the accounts, which started with the discovery of threat and vulnerability, led to a paranoid experience of mistrust and fear of others, and, finally, an adjustment to the impact of paranoia in daily life. This journey involved navigating multiple

tensions, with young people trying to balance independence with vulnerability; trust with mistrust; and a desire to socialise with a fear of what people might do. But young people also knew that their paranoid concerns were excessive and, as a result, were still trying to make sense of them and decide how to respond. This reflected a key decision point for young people: reluctantly accept the paranoia experience as a part of life or resist its impact and overcome it. The next stage of a young person's journey is likely to depend on the outcome of this decision.

6.4.3. Limitations

Several limitations must be acknowledged. First, the participant group included a greater proportion of girls than boys. Although attempts were made to represent gender equally in recruitment, the sampling bias reflected the higher rates of paranoia in adolescent girls compared to boys in CAMHS (Chapter 5). A deeper understanding of paranoia in adolescent boys will be required. Second, all participants were White British and lived in a relatively affluent area of the UK. Understanding the experience of paranoia in young people from different backgrounds will be important, particularly those with higher levels of adversity and social disadvantage which are known risk factors for paranoia (see Chapter 1). A further limitation is that there was a lack of service user involvement and (personal and professional) diversity within the research team; a broader range of perspectives would have enriched the analysis.

Despite these limitations, the findings in this study provide valuable first-person insights and a novel developmental framework for understanding clinical presentations of paranoia in adolescents with mental health problems. The journey of paranoia, outlined in Figure 6.2, could be used by clinicians to frame discussions about paranoia with adolescents, supporting them to better understand their own journey and decide next steps.

Chapter Seven

Discussion

"[There is] a striking paucity of clinical reports specifically describing paranoid symptomatology in children. In many standard textbooks such reactions are hardly mentioned. The impression gained is that significant paranoid syndromes simply do not occur in children or, if they do, that they are extremely rare."
– Harrison et al. (1963)

In this thesis, it is argued that rather than a rare phenomenon, paranoia is an overlooked clinical problem in youth. A systematic programme of research examining the assessment, prevalence, and clinical understanding of paranoia in adolescence was therefore conducted. In this discussion chapter, a summary of the findings from the thesis will be presented and the clinical and theoretical implications for the assessment and treatment of paranoia in adolescents will be considered. The limitations of the thesis beyond those already described in each chapter will then be examined and future directions for research on the topic will be set out.

7.1. Overview of findings

A key starting point to advance the study of paranoia in adolescence is precise measurement. In Chapter 2, a systematic review was therefore conducted to identify and evaluate the measures that have previously been used to assess paranoia in adolescents. Although there are multiple ways in which paranoia could be assessed, this review focused primarily on self-report questionnaires as the most precise and clinically useful method of detecting paranoia. The findings highlighted several key issues affecting precision in existing self-report measures used with young people, including a lack of age-appropriateness, poor content validity for assessing paranoia, questionable internal structure, and differences in the severity range of paranoia each measure assesses. Crucially, measures designed to assess severe presentations of paranoia in clinical populations of young people were lacking.

To address this gap, Chapter 3 described the development of a new self-report measure: The Bird Checklist of Adolescent Paranoia (B-CAP). Using rigorous psychometric methods and a combination of classical test theory and item response theory (IRT) approaches, the B-CAP was shown to be a valid and reliable tool for assessing a wide range of paranoia severity in youth. Importantly, the B-CAP demonstrated the greatest precision at higher levels of severity and the psychometric properties indicated it should have utility as a clinical measure in CAMHS. Validated score ranges were also provided to aid interpretation and facilitate its clinical use. The

use of IRT also allowed an examination of the functioning of the B-CAP as a computerised adaptive test (CAT) that dynamically selects items matched to a participants' level of paranoia. Using a simulation of 10,000 responses, the findings showed that an adaptive B-CAP could be effective in clinical populations to precisely estimate higher levels of paranoia with fewer items, and, so, reduce potential patient burden.

The development of the B-CAP allowed a systematic examination of paranoia in two cohorts of adolescents from a secondary school population (Chapter 4) and patients with common mental health problems accessing CAMHS (Chapter 5). In the secondary school pupils, paranoid thoughts were common, followed a continuous distribution, and were hierarchically structured. Using a combination of undirected and directed network analyses, paranoia was shown to have a robust causal interaction with negative affect. Although both directions were plausible, negative affect was somewhat more likely to contribute to paranoia than vice versa. There was also a close reciprocal interaction between paranoia and peer bullying, and, although bidirectional to a degree, paranoia was far more likely to causally impact peer difficulties than vice versa. A notable finding from the networks was that paranoia did not have a causal relationship with indicators of problematic social media use, with multiple intermediate variables accounting for the correlations with these variables. Paranoia was, however, related to the way young people respond to online social contact, with reciprocal causal interactions occurring between paranoia and threat-focused online safety-seeking behaviours, negative self-comparison, and emotional reactivity to social media.

In Chapter 5, paranoia was shown to be especially common in CAMHS patients, occurring at approximately double the rates observed in the school pupils. This paranoia occurred across a range of clinical presentations but was also overlooked, with only one patient having paranoia listed as a presenting problem in their clinical notes. Associations with clinician-rated symptoms suggested paranoia is likely to occur in the context of affective symptoms, self-harm, adverse life experiences, and impaired social functioning. Follow up data from one third of the cohort also suggested this paranoia is often persistent and associated with more severe psychological and social difficulties over time. Undirected network analysis then showed that, once other variables were controlled, paranoia had direct associations with anxiety symptoms, especially panic. Both self-harm and post-traumatic stress symptoms were only related to paranoia in the network, indicating that paths to all other symptoms in the network occurred via paranoia. A

particularly notable finding, however, was the close interaction between paranoia and peer difficulties. This association was the strongest of all those assessed by both clinicians and patients, even after controlling for other variables in the network. Peer difficulties played a mediating role in the relationship between paranoia and problem distress and functional impairment, and paranoia was a common route connecting peer difficulties with other symptoms in the network.

To enhance the depth of understanding provided by the quantitative findings, qualitative accounts from young patients with paranoia and non-psychotic mental health problems were explored in Chapter 6. The young patients described a range of distressing paranoid concerns that were typically overlooked by clinicians and untreated, despite regular contact with services. A journey emerged from the accounts, starting with adolescents' awareness of paranoia beginning to a paranoid experience of mistrust and fear of others, and, subsequently, their adjustments to paranoia in daily life. Paranoia onset was rooted in the discovery of interpersonal threat and personal vulnerability, shaped by challenging peer interactions, becoming aware of danger in the world, and personal adverse experience. The paranoia experience included a struggle to trust friends, a state of threat anticipation, intense fear, and defensive strategies to keep safe. The patients described how the paranoia experience was confusing, negatively impacted self-concept, held them back from normal teenage life, and caused a disconnection from friends. Longer term responses to paranoia reflected a tension between reluctantly resigning to paranoia and trying to resist the impact.

7.1. An overlooked clinical problem?

This thesis has shown that paranoia in adolescents is common, clinically important, and potentially overlooked in those accessing child and adolescent mental health services. Greater awareness of paranoia in patients attending CAMHS may be required. The use of validated tools such as the B-CAP may help clinicians to identify paranoia within young people's broader clinical presentation and monitor change. But beyond a potential lack of measurement, why is paranoia so often overlooked in young people accessing CAMHS?

One possibility is that many clinically relevant suspicions are not recognised as paranoia in young people due to a narrow conceptualisation based on the severest forms of paranoia in adults with psychosis (i.e. persecutory delusions). The view that paranoia is a symptom of emerging

psychosis also means that, when identified, the clinical focus is usually on assessing the presence of psychotic disorder. When psychosis has been ruled out, the reality is that a young person's suspicions are often disregarded. But as shown in this thesis, paranoid thoughts across the spectrum of severity are associated with a wide range of psychiatric symptoms and social impairments in adolescents attending CAMHS. Consequently, there is a clear need for clinicians to recognise paranoia in adolescents, not simply as a marker of psychosis, but as a clinically important problem in its own right.

A second issue is that, across the spectrum of severity, presentations of paranoia may be relatively subtle or ambiguous. This is especially the case in adolescence when paranoia will typically be in the early stages of symptom development. Without careful assessment, milder presentations of paranoia could easily be missed or mistaken for other difficulties such as panic or social anxiety. In these cases, clinicians may recognise that a young person is anxious around others but not realise the depth of their fears. This ambiguity was evident in the qualitative accounts from Chapter 6 where the paranoid nature of young people's concerns was often only revealed with targeted questioning and exploration. Indeed, the accounts also highlighted that many young people may not voluntarily share their paranoid concerns with professionals for reasons that included mistrust and fear of judgement. As a result, clinicians will need to hold paranoia in mind during assessments with young people to explore the possible presence of mistrust and unfounded ideas of harm.

Another consideration is that the socially challenging environment of adolescence could make it somewhat difficult to distinguish paranoid ideas at this age from 'normal' teenage concerns, ongoing difficulties with peers, or legitimate bullying. There is an important distinction between paranoia and genuine instances of victimisation in terms of treatment planning, but they are not mutually exclusive. Even adolescents with unfounded suspicions are likely to also experience negative social interactions, especially within their peer group, and it is also possible that paranoia was triggered by recent negative experiences such as social exclusion, bullying, or trauma. It is well established that early interpersonal adversity is a risk factor for later paranoia (see Chapter 1); in adolescence, however, the generalisation of threat from these experiences is still ongoing. As was the case for several adolescents in the qualitative study, the recency of such experiences could result in an overlapping presentation of valid attributions of threat, post-traumatic stress, and newly generalised (and thus unfounded) ideas of persecution. As a result,

careful clinical assessment and formulation may often be needed to identify paranoia within young peoples' broader clinical picture and determine priorities for treatment.

7.2 Conceptualising adolescent paranoia

This thesis has provided a reliable clinical tool for assessing paranoia in adolescents and greater clarity about its prevalence at this age. But how do the findings enhance the clinical and theoretical understanding of paranoia in adolescence?

First, it must be recognised that many components of paranoia at this age are consistent with existing knowledge from the adult literature. The findings support a dimensional view, described in Chapter 1, that paranoia exists on a continuum in the population and builds upon adaptive concerns of trust and social vulnerability (Bebbington et al. 2013; Freeman et al. 2005). The adolescent findings also support key ideas from the threat-anticipation model of persecutory delusions that paranoia, as an unfounded threat belief, activates feelings of fear and anxiety-related processes concerned with anticipating danger (Freeman, 2016). This was evident from the close interactions between paranoia and anxiety symptoms and processes in the adolescent cohorts and in the patient accounts where the anticipation of threat, overwhelming fear, and defensive strategies were central to the paranoia experience. Yet despite these core phenomenological similarities, the theoretical understanding of paranoia in adolescence must also be tailored to consider the developmental and social context in which young people's suspicions arise.

7.1.1. Pathways to paranoia in adolescence

Across the lifespan, paranoia is likely to build upon feelings of vulnerability and threat-based beliefs about the self and others, which, for many people, are learned through negative experiences in life (Freeman, 2016). This route to paranoia was supported by evidence in adolescents of a robust empirical relationship with adverse interpersonal experiences, and further validated with qualitative accounts where several young people described paranoia generalising from experiences of objective (e.g. trauma and bullying) or subjective (e.g. anomalous perceptions) threat. In adolescence, however, it is proposed that several normative changes could influence these emerging beliefs and tilt some young people towards paranoia.

First, the cognitive capacity for paranoid thought may increase in adolescence due to the developmental changes in social cognition first described in Chapter 1. Alongside a

hypersensitivity to social threat, these changes provide adolescents with a greater ability to consider the intentions of others, and, consequently, to better understand that people are not always as they seem. Compared to children, this improved perspective-taking fosters greater trust and co-operation with others as young people get older; however, it also results in a greater *loss* of trust when they are treated unfairly (Fett et al., 2014). Adolescents therefore start to make more sophisticated and selective decisions about who to trust at this age (Güroğlu et al., 2009).

Alongside these developmental changes, however, qualitative accounts in this thesis also highlighted how changes in the social world may play an especially important role in paranoia onset at this age. These changes started in secondary school where challenging peer interactions typical of adolescence (Chapter 1) provided new reasons to be mistrustful – especially of other teenagers. This finding supports evolutionary theories that paranoia could emerge in adolescence as an adaptive response to a socially competitive peer group where targeted social threat is more likely (Raihani and Bell, 2019). Another important consideration, however, is that the growing complexity of relationships in adolescence will result in many people having their first experiences of deceit and disloyalty at this age. For some young people, navigating these new social challenges could result in greater uncertainty about others that leaves them on edge. This was evident in the qualitative accounts where several adolescents described how the onset of their paranoia was influenced by incidents of unexpected betrayal within friendships that drastically altered their expectations of trust.

Social changes in adolescence, however, extend far beyond the peer group. An especially novel insight from the qualitative study was that the need to be wary of others may amplify as adolescents grow up in a world that is not always safe. Increasing freedom and independence at this age facilitates young people's development into an autonomous adult, but an inevitable consequence of this freedom is less protection from harm. As described by the adolescents interviewed, this newfound independence - paired with a maturing awareness of danger - may result in a transitional state of vulnerability where they are more exposed to potential harm but feel unprepared to manage the risks. This vulnerability may result in an adaptive shift towards paranoia in adolescence, prompting young people to be more cautious as they start to navigate the dangers that exist in the world. For most adolescents, it is expected that this caution will lessen over time as they become more confident in their autonomy and re-adjust their perception of how often these dangers occur. But whilst suspicions may fade for many young

people as they get older, if feelings of vulnerability persist, a worsening trajectory of paranoia throughout adolescence is likely to ensue.

"So many girls are going through this"[4] -- The realities of sexual harm.

An especially important insight from the qualitative accounts was that girls may feel especially vulnerable in adolescence as they discover the realities of sexual harm - potentially contributing, at least partly, to the consistently higher rates of paranoia in girls at this age (see Chapters 4 and 5). Sexual harm is a threat that, although it affects a minority of boys, permeates the daily lives of girls and women in society. As participants in the qualitative study described, this reality is repeatedly emphasised to girls through the media, warnings from adults, and even their friends – surveys have found that 30% of adolescent girls know other girls their age who have been sexually assaulted (Girlguiding, 2018). Too often teenage girls are also made aware of their vulnerability to sexual harm through harassment by men in public, including 'catcalling' (i.e. wolf whistling and sexualised comments) and unwanted touching (Southgate and Russell, 2018). Street harassment is often targeted at young girls, with 85% of women having these experiences before the age of 17 (Hollaback!, 2014). These experiences can erode girls' sense of safety in public; indeed, one in three adolescent girls in the UK are reluctant to go out in their local area because they do not feel safe (The Children's Society, 2017). Although undeniably important for girls to be mindful of risk, the persistent message in adolescence that they are vulnerable and must be cautious is likely to shape a worldview on which - for some girls - excessive mistrust and paranoia can thrive.

7.1.2. What do young people get paranoid about?

Once developed, the content of young people's paranoid concerns is also likely to be shaped by the social context in which they occur. Compared to adults, it may be expected that adolescents will have more concerns of deliberate social harm from their peers due to the challenging nature of adolescent peer groups and their hypersensitivity to social rejection at this age (Chapter 1). Concerns about deliberate physical harm, however, could be especially prevalent: these fears were reported by 33-42% of young people across the two cohorts and in all 12 qualitative accounts. These rates are somewhat at odds with the adult literature where paranoid ideas of physical harm are far less common and often considered a sign of severity (Freeman et al. 2005). For example, epidemiological evidence shows that less than 10% of adults have thoughts about

[4] Quote from participant in Chapter 6 with pseudonym 'Lucy' (17 years)

others deliberately harming them (Bebbington et al. 2013; Freeman et al. 2005). A notably unique theme in young people's paranoia was also a fear of kidnap, reported by 15-22% of adolescents in the two cohorts and 10/12 qualitative accounts. Concerns about being kidnapped are rarely described by adults, and, consequently, are not reflected in any adult measures of paranoia. Their pertinence in youth, however, could be understood from the developmental perspective outlined above, as many children are taught to fear kidnap, and, so, starting to go out alone as a teenager would leave them more exposed and defenceless to this possible threat.

7.1.2. The struggle to socialise.

Across the studies in this thesis, a key finding was that paranoia is likely to be associated with peer relationship problems in young people. This was demonstrated through direct relationships between paranoia and peer difficulties in both adolescent cohorts, even after controlling for the contribution of other variables in the network. Although the relationship will be bidirectional to a degree, causal modelling in the general population cohort suggested adolescent peer difficulties are more likely to be influenced by paranoia than vice versa. These empirical findings were then validated by young people's lived experiences, with descriptions of how paranoia made it difficult to go out and socialise, left them disconnected from friends, and, ultimately, could lead to withdrawal and isolation.

This social impact of paranoia is to be expected at any age, as thinking that people want to cause harm inevitably makes it hard to be around others. But compared to adults with persecutory delusions who often experience chronic social isolation, in adolescence, young people still have a strong desire to socialise and connect with their peers. In Chapter 6, adolescents with paranoia described a longing to be close to others in the face of mistrust and a struggle to weigh up the 'social risk' (Blakemore, 2018) of not going out - that this, being judged or losing friends - against the risk of harm if they do. This tension between paranoid fears and the normative drive to fit in may be a unique feature of paranoia in adolescence that could also intensify young people's distress. This was evident in Chapter 6 where the negative effects on young people's friendships and social life was often described as the most challenging part of paranoia and was a key priority motivating many of the patients' want to change. Helping adolescents with paranoia to overcome this social impact and get back to normal teenage life may therefore be an important focus for interventions at this age.

7.3. Limitations

Alongside specific limitations addressed in each chapter, there are several broader limitations of the thesis to be acknowledged. First, as was highlighted in Chapters 4-6, the generalisability of the findings could be somewhat limited beyond the participant cohorts, especially in the CAMHS patients which was not a fully representative sample. Studies examining paranoia in larger, representative samples of adolescents are certainly needed, especially in clinical services and in young people from different social and minority backgrounds who may have greater exposure to risk factors such as social adversity and discrimination.

Beyond the issue of generalisability, an important methodological limitation was that the measurement of paranoia in the quantitative studies was entirely reliant on self-report assessment. Although the B-CAP was shown to be psychometrically robust measure of paranoia for young people, it is likely that some degree of measurement error exists within the reported estimates. This potential error must be acknowledged when interpreting the findings regarding the prevalence and associations of paranoia in Chapters 4 and 5. As described in Chapter 2, one pertinent source of measurement error is from genuine experiences of victimisation as it is almost impossible to determine via self-report whether thoughts of harm are always completely unfounded. This may be especially the case in an adolescent population where both overt and more subtle forms of peer aggression are commonplace (Troop-Gordon, 2017). But as described in Chapter 3, the B-CAP was shown to be distinct from bullying scores and correlated with young people's ratings that their fears of others are excessive.

It is also important to consider whether the B-CAP was primarily measuring the related construct of social anxiety, or, indeed, peer relationship difficulties. Although some overlap is probable, the content of the B-CAP was distinct in its focus on intentional harm from others, rather than broader concerns of negative evaluation or general peer difficulties. The data from Chapters 4 and 5 also demonstrate that the patterns of correlations between paranoia and other variables were substantially different than equivalent correlations for peer difficulties and social anxiety (see Appendix K and O for correlation matrices). These differences were then reflected in the differing patterns of unique association between paranoia, peer difficulties, and social anxiety in the networks. Notably, the findings in Chapter 5 showed that there was only a small correlation between paranoia and social anxiety which disappeared once other variables were

controlled for in the network. These findings provide confidence that the B-CAP is conceptually distinct from both social anxiety and peer difficulties.

Despite the initial evidence for the validity of the B-CAP as a measure of paranoia, further validation via clinical interview and experimental procedures such as virtual reality (Freeman et al. 2010) are needed. Although this additional validation was lacking from the two adolescent cohorts, it is worth noting that the patients in Chapter 6 – all of whom had genuine and clinically relevant paranoid concerns – were identified exclusively from their B-CAP scores in the CAMHS cohort. Of the seventeen participants from this cohort with elevated B-CAP scores who attended a screening for the qualitative study, only two were judged to not have current paranoia at the screening. However, in both cases this lack of paranoia was demonstrated by low B-CAP scores at the time of screening, reflecting a change since their initial participation in the cohort study. This added additional confidence that even if some measurement error is likely, the B-CAP is likely to be a clinically effective screening tool for detecting genuine paranoia in adolescents.

Another important consideration is that the studies in thesis did not include any young people with early psychosis. This population is where the severest form of paranoia - persecutory delusions – will be experienced, as delusions are one of the main diagnostic criteria for psychosis. However, it must also be noted that many people with psychosis do not have paranoia – for example, Freeman, Loe, et al. (2019) found that in a sample of over 2000 patients with psychosis, clinical levels of paranoia were reported by less than half. Nevertheless, as first mentioned in Chapter 3, not including adolescents with psychosis could mean that the reported paranoia estimates underrepresent the extreme end of the severity spectrum. It is also possible that the patterns of interaction between paranoia and other symptoms described in Chapters 4 and 5 may differ in adolescents with psychosis, likely due, in part, to the stronger activation and network spread that will arise with severer symptoms (Borsboom, 2017), alongside the potential influence of other full threshold psychotic symptoms.

Although the relationship between various psychological, social, and clinical variables were assessed in this thesis, there are some clear omissions. Further assessment of specific anxiety processes theorised to maintain paranoia in adults would have been helpful. Threat-focused safety-seeking behaviours were measured in Chapter 4, but only in relation to social media. These online safety behaviours demonstrated one of the strongest direct relationships with

paranoia in this study; examining their wider use in other areas of life will surely be important. Indeed, the use of safety-seeking behaviours was a core feature of the paranoia experience in the qualitative accounts. Although worry was also measured in this study, it was not analysed due to high multicollinearity with general affective symptoms. Future studies of paranoia in youth may benefit from examining worry and other anxiety processes (e.g. hypervigilance, threat-focused imagery, and self-focused attention) that, although not examined in this thesis, were present in young people's accounts.

It is also noteworthy that anomalous experiences – a key causal factor identified in the cognitive model of persecutory delusions - were not assessed in this thesis. As outlined in Chapter 1, hallucinations and other anomalous experiences are dominant symptoms of psychotic disorders, and, when present, commonly provoke increases in paranoia. But evidence shows that in patients without psychosis, paranoia most often arises independently of perceptual anomalies (Hermans et al., 2020). Furthermore, a previous longitudinal study by the thesis author showed that although hallucinations are highly correlated with paranoia in CAMHS patients, they do not predict its persistence over time (Bird et al., 2017). However, the potential influence of other anomalous experiences such as dissociation, subtle perceptual disturbances, and unexplained arousal, is unclear. Further research examining the role of the broader range of anomalous experiences in young people is needed.

Another important causal factor from the cognitive model that was not examined in this thesis was reasoning biases. However, the reasoning biases implicated in the cognitive model (i.e. belief inflexibility and jumping to conclusions) are thought to reflect a general liability for delusions that likely drives the conviction in paranoid thoughts rather than their content (Henquet et al., 2020). As described in Chapter 1, these reasoning biases are therefore thought to be specific to those with delusions and psychotic disorders more broadly. In line with this, the adolescent study by the thesis author found no association between paranoia and the tendency to jump to conclusions in 34 adolescent patients with paranoia attending CAMHS (Bird et al., 2017). Consequently, it was expected that reasoning biases especially associated with delusions, at least as commonly measured, may play a limited role in non-delusional paranoia in young people. Other reasoning processes, however, are likely to be important, especially in adolescence when key cognitive abilities underlying social reasoning are developing (Kilford et al. 2016). Future

research examining the relationship between reasoning processes and paranoia in adolescents will be beneficial.

Finally, it is acknowledged that there would have been benefits to starting this program of research with the qualitative study. This study was carried out last due to the practical order in which the research developed – starting with the need to develop an assessment tool, which was then used to collect data in CAMHS from where participants could be identified for the interviews. However, qualitative research is inherently hypothesis generating, and, so, beginning with this line of inquiry would have shaped the questions explored in the rest of the thesis. On reflection, the peripheral role of social media in the adolescent accounts may have tempered the thesis authors initial hypotheses about its potential influence on paranoia at this age. The qualitative accounts also gave novel insights about the importance of physical (rather than social) vulnerability in adolescence that had not previously considered, and, so, would have been valuable to explore further.

7.4. Future directions

The findings of this thesis provide an empirical and clinical foundation to advance the study of paranoia in adolescence. Several areas would now benefit further examination. First, although the findings indicate paranoia is common in youth, the way it develops over time and its long-term impact are yet to be established. Indeed, an important question is whether the relationship between paranoia and peer relationship problems observed in this thesis translate into greater social impairment over time. An investigation of other areas of impairment beyond peer difficulties will also be important. Consequently, planned prospective studies examining the trajectories and associated outcomes of paranoia are required. This work will be especially important in cohorts of CAMHS patients to strengthen the case for greater investment in clinical approaches to paranoia for adolescents.

Another important question to be examined is the extent to which paranoia may be a barrier to young people's engagement with mental health services. As highlighted in the patient accounts (Chapter 6), mistrust, negative self-appraisals, and internalised stigma about paranoia could prevent young people from opening up about the experience for fear of judgement. But it is also important to consider that patients may inherently feel vulnerable when seeking care about any mental health difficulty, and adolescents can find it especially hard to open up to

professionals due to a reduced alliance with adults at this age (Rickwood et al. 2007). In this context, the addition of excessive mistrust could make young people overly guarded in their encounters with services and reluctant to engage; this in turn, could limit their ability to access treatment for other mental health difficulties (Brown et al. 2009).

Further empirical research is also needed to examine the mechanisms driving the emergence and persistence of paranoia in adolescence. Based on the preliminary findings of this thesis, anxiety mechanisms, self-esteem, and safety-seeking behaviours may be especially promising targets for investigation. The causal role of these factors could be assessed experimentally using an interventionist-causal approach where each factor is manipulated through intervention and the subsequent effect on paranoia examined. Longitudinal studies using dynamic network modelling (Kuipers et al. 2018) would also be useful to evaluate the likely complex pattens of causal interaction between paranoia and other factors over time. Similarly, prospective momentary assessment studies using experience sampling methodology could be used to examine the causal dynamics of paranoia as it occurs in young people's daily life.

Beyond putative mechanisms identified from the adult literature, exploration of a broader range of factors pertinent to adolescents is also needed. For example, little is known about the role of parent factors on the development of paranoia at this age, which may have important implications for interventions. Alongside issues in the parent-child relationship (e.g. neglect, insecure attachment), it is also possible that parental mistrust and paranoia could lead to parenting behaviours that promote suspiciousness in the young person (Murray et al. 2009). Developmental research to examine how normative changes in social cognition and behaviour during adolescence (Chapter 1) contribute to emerging paranoia at this age would also be beneficial.

The programme of research in this thesis is considered to provide a starting point to advance the study of paranoia in adolescence. With increased clinical understanding, the next stage will be to develop targeted early interventions for paranoia at this age. Indeed, adolescence could be a window of opportunity for treating paranoia successfully due to the flexibility with which paranoid thoughts are likely to be held and potentially high motivation to change because of the social benefits. Treating paranoia at this age therefore has the potential to prevent paranoid concerns and their consequences becoming firmly established. However, interventions also need to be created within a developmental framework to ensure they are both engaging and

address the particular challenges that young people with paranoia may face. The delivery of effective, trans-diagnostic treatments for paranoia in youth will enable adolescents struggling with paranoia to be supported to develop greater trust in others and feel safer in their daily lives. However, at this stage, investment is needed in work to develop, alongside adolescents, these treatments and test their efficacy.

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Appendix A

Sample characteristics of papers included in review (Chapter 2)

Table A1. Sample characteristics of papers included in the review (part 1)

Measure	Paper	Country	N	Age	Female	Population
APSS item	Dolphin (2015)	Ireland	5910	12-19	52%	General population
	Kelleher (2011)	Ireland	334	11-13	?	General population
BSI	Albertella (2012)	Australia	132	13-17	23%	Substance use
	Fernández-Artamendi (2013)	Spain	772	16-21	51%	General population
	Murphy (2010)	USA	67	14-20	14%	Physical injury
	Tompsett (2009)	USA	363	13-17	67%	Homeless
CAPE (5 item)	Armando (2010)	Australia	848	15-18	53%	General population
	Eilbracht (2015)	Netherlands	4375	10-18	50%	General population
	Galbraith (2014)	UK	392	11-16	80%	General population
	Jack (2018)	UK	230	11-14	47%	General population
	Núñez (2015)	Spain	727	13-18	51%	General population
	Wigman (2011)	Netherlands	7652	12-17	51%	General population
	Yung (2006)	Australia	150	15-24	58%	CAMHS
CAPE (7 item)	Collip (2013)	Australia	881	13-18	51%	General population
	Lu (2020)	China	4580	11-16	47%	General population
	Moriyama (2019)	Brazil	2241	6-12	47%	General population
	Turley (2019)	Australia	655	15-16	?	General population
	Yung (2009)	Australia	875	13-17	53%	General population
GPTS	Fett (2016)	UK	139	13-19	47%	Psychosis + NC
	Fett (2015) [a]	/	/	/	/	/
	Korver-Nieberg (2013)	UK	110	13-18	56%	Psychosis + NC
	Bird (2017)	UK	34	11-16	82%	CAMHS
NCS-A	(Waite and Freeman, 2017)	USA	10,148	13-17	51%	General population
	Brown (2020) [b]	/	/	/	/	/
Paranoia Scale	Campbell (2007)	UK	373	14-16	56%	General population
	Raes (2009)	Netherlands	131	15-19	70%	General population
PC (state)	Davidson (2019)	USA	28	13-18	39%	General population
PLEQ-C item	Ruffell (2016)	UK	72	8-14	33%	CAMHS
SCL-90-R	Kuzman (2020)	B&H	200	13-19	57%	Epilepsy + GP
	Talakoub (2015)	Iran	64	14-20	100%	Diabetes
	Thompson (2019)	Australia	171	15-18	68%	CAMHS
	Zhang (2016)	China	3,957	11-20	53%	General population
SMS	Wong (2014)	UK & HK	2498	8-14	?	General population
	Wong (2019) [c]	/	/	/	/	/
	Zhou (2018)	China	2160	8-16	49%	Psychosis + GP

Table A1. Sample characteristics of papers included in the review (part 2)

Measure	Paper	Country	N	Age	Female	Population
SPEQ	Ronald (2014)	UK	4,743	16	55%	General population
	Barkhuizen (2019) [d]	/	/	/	/	/
	Havers (2019) [d]	/	/	/	/	/
	Shakoor (2016) [d]	/	/	/	/	/
	Shakoor (2018) [d]	/	/	/	/	/
	Shakoor (2015a) [d]	/	/	/	/	/
	Shakoor (2015b) [d]	/	/	/	/	/
	Sieradzka (2014) [d]	/	/	/	/	/
	Sieradzka (2015) [d]	/	/	/	/	/
	Singham (2017) [d]	/	/	/	/	/
	Taylor (2015a) [d]	/	/	/	/	/
	Taylor (2015b) [d]	/	/	/	/	/
	Taylor (2016) [d]	/	/	/	/	/
	Zavos (2014a) [d]	/	/	/	/	/
	Zavos (2016b) [d]	/	/	/	/	/
	Catone (2017)	Italy	50	12-18	52%	CAMHS
	Catone (2020) [e]	Italy	/	/	/	/
	Pisano (2016)	Italy	56	14-18	41%	CAMHS + GP
SPEQ (state)	Hennig (2018)	Germany	61	14-17	49%	General population
YSR item	Bechtold (2016)	USA	1,009	13-18	0%	General population

Note: a) Same sample as Fett et al. (2016); b) Same sample as Waite et al. (2017); c) Same sample as Wong et al. (2014); d) Same sample of Ronald et al. (2014); e) Sample as Catone et al. (2017); ? = not reported in paper; Country abbreviations: B&H = Bosnia & Herzegovina; HK = Hong Kong

Appendix B

Published paper in Schizophrenia Research (Chapter 3)

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The assessment of paranoia in young people: Item and test properties of the Bird Checklist of Adolescent Paranoia

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ABSTRACT

Background: Precise assessment tools for psychotic experiences in young people may help identify symptoms early and facilitate advances in treatment. In this study we provide an exemplar - with a paranoia scale for youth – for improving measurement precision for psychotic experiences using item response theory (IRT). We evaluate the psychometric properties of the new measure, test for measurement invariance, and assess its potential for computerised adaptive testing (CAT).

Method: The 18-item Bird Checklist of Adolescent Paranoia (B-CAP) was completed by 1102 adolescents including 301 patients with mental health problems and 801 from the general population. After excluding outliers ($n = 10$), IRT was used to examine item properties, test reliability, and measurement invariance. The properties of an adaptive B-CAP were assessed using a simulation of 10,000 responses.

Results: All B-CAP items were highly discriminative ($a = 1.14–2.77$), whereby small shifts in paranoia led to a higher probability of item endorsement. Test reliability was high ($a > 0.90$) across a wide range of paranoia severity ($\theta = -0.45–3.36$), with the greatest precision at elevated levels. All items were invariant for gender, age, and population groups. The simulated adaptive B-CAP performed with high accuracy and required only 5–6 items at higher levels of paranoia severity.

Conclusions: The B-CAP is a reliable assessment tool with excellent psychometric properties to assess both non-clinical and clinical levels of paranoia in young people, with potential as an efficient adaptive test. In future, these approaches could be used to develop a multidimensional CAT to assess the full range of psychotic experiences in youth.

1. Introduction

For many young people psychotic experiences such as hallucinations and delusional ideas are a transitory part of normal development (Kelleher et al., 2012a; Wigman et al., 2011). Yet for others, persistent psychotic experiences throughout adolescence may indicate a pluripotent risk for a range of mental health problems including schizophrenia, depression, and anxiety disorders (Kelleher et al., 2012b; Linscott and Van Os, 2013; McGorry and Mei, 2018). Reliable assessment of psychotic experiences in young people accessing services is therefore important. Although clinician-rated tools indicating the presence of psychotic symptoms and/or disorder have been well established (Yung et al., 2009), the reliability and clinical utility of self-report measures have not (Kelleher et al., 2011; Lee et al., 2016). In this study we evaluate the measurement of one of the most common psychotic experiences in young people: paranoia (the unfounded idea that other people are intending you harm) (Freeman and Garety, 2000). Despite its association with a range of psychopathology in youth (Ronald et al., 2014; Wigman et al., 2011), a lack of well-defined and age appropriate measures has perhaps been a barrier to the recognition of paranoia in young people. Most existing measures are primarily designed for adult populations with language that may be less appropriate for adolescents. We recently presented an initial validation of a new dimensional measure of paranoid thoughts specifically for youth: The Bird Checklist of Adolescent Paranoia (B-CAP; Bird et al., 2019). We now extend this initial validation to evaluate the item and test properties of the B-CAP using item response theory (IRT), whilst also arguing for the wider application of IRT to the measurement of psychotic experiences in youth.

There are several key issues potentially affecting the validity and reliability of measures of psychotic experiences in young people. First, using measures created for adults is a common practice with young people. However, it is possible that item content based on adult descriptions

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do not adequately capture adolescent psychotic experiences. Further, age may influence the way items are interpreted. The rates of false positives in self-report measures of psychotic experiences are thought to be high in young people, with certain items producing more false positives than others (Kelleher et al., 2011). Second, assessment tools vary in the overall severity of psychotic experiences they measure, potentially impacting precision across different populations. For example, a test consisting of items representing mildly elevated presentations may perform well in non-clinical populations but have low reliability in those with a diagnosis of schizophrenia (where a ceiling effect may instead occur). Third, measures of psychotic experiences frequently include a broad range of symptoms in a single scale, summed together to provide a total score. Yet individual psychotic experiences such as paranoia, hearing voices, and cognitive disorganisation are qualitatively distinct phenomenon, with numerous studies demonstrating they form separate factors and differ in underlying aetiology (Zavos et al., 2014). These differences are lost in tools that sum together multiple psychotic experiences, often including an unequal balance of items for individual domains. Further, items within a scale often vary in the level of severity they represent, leading to items with potentially little clinical relevance being assigned the same value as ones that strongly discriminate clinical symptomology. This can lead to imprecise estimates of psychotic experiences whilst reducing the ability to meaningfully interpret and compare summed scores (Gibbons et al., 2016).

Modern psychometric methods such as item response theory (IRT) provide innovative opportunities to improve measurement precision. Rather than relying on a count of item endorsement, IRT estimates severity on a continuum derived from the relationship between participant responses and differences in the ability of each item to measure the problem. Thus, IRT produces more precise estimates. The approach also evaluates the level of severity each item typically measures, allowing inferences to be made about which population the test may be most reliable for. IRT can also be used to examine differential item functioning between demographic groups to prevent bias within a scale. Another advantage of IRT is the ability to create computerised adaptive tests (CAT) that dynamically select items matched to a person's severity. Fewer items are typically required to reach a similar level of precision as the full questionnaire, providing the opportunity to reduce patient burden in lengthy clinical and research assessments (Gibbons et al., 2016). CAT presents a novel solution to ensure the reliable measurement of individual psychotic experiences whilst also minimising assessment burden.

In this study we offer an exemplar for using IRT to develop precise assessments for psychotic experiences in young people. With a combined sample of adolescent patients attending mental health services and adolescents from the general population, we use IRT to evaluate the item properties and test reliability of the B-CAP across the continuum of paranoia severity. Next, we test for differential item functioning (DIF) between genders, older and younger adolescents, and between the clinical and non-clinical groups. Finally, using a CAT simulation we evaluate the potential to administer the B-CAP adaptively to limit the number of items required to estimate paranoia reliably.

2. Method

2.1. Participants

Participants were 1102 adolescents aged 11–17 years including 301 help-seeking patients attending child and adolescent mental health services (mean age = 15.1, SD = 1.75, female $n = 184$, male $n = 117$, White British $n = 240$) and 801 adolescents from the general population (mean age = 13.3, SD = 1.16, female $n = 410$, male $n = 382$, other gender $n = 9$, White British $n = 629$). Participants in the clinical sample were seeking help for a range of presenting problems, most commonly affective disorders and neurodevelopmental disorders (see supplementary materials). Seven participants had a diagnosis of psychosis (2.0%).

Participants from the clinical sample were recruited during routine appointments at a community outpatient child and adolescent mental health service ($n = 271$) and an adolescent inpatient unit ($n = 30$) in Oxfordshire (Bird et al., in review). Patients aged 11–17 years accessing these services were invited to take part, regardless of diagnosis. Exclusion criteria were a moderate/severe learning disability or inability to complete questionnaires in English. Informed parental consent and child assent was obtained for young people prior to completing the questionnaire in the clinic. Participants from the general population were recruited from a secondary school in Leicestershire, United Kingdom, as reported in Bird et al. (2019). All pupils aged 11–15 years were invited to take part using opt-out parental consent and pupils who provided written assent completed the questionnaire as part of the larger study pack within a 60-minute lesson.

2.2. Assessments

The B-CAP is an 18-item scale, developed by our research team (Bird et al., 2019), assessing the frequency of paranoid thoughts in the last two weeks on a 6-point scale (0 = *Never*, 5 = *All the time*). Higher scores indicate higher paranoia. The full scale is provided in the appendix at the end of this paper. Items were generated from the clinical expertise of the research team, consideration of existing paranoia measures, and comments made by young people. Eleven adolescents aged 12–16 from a secondary school in Oxfordshire and three adolescents aged 15–16 years receiving inpatient mental health care met with JB and provided their perspective on important components of paranoia for young people and gave suggestions for the content, wording, response format, and layout of questionnaire. The final 18 items were selected from a broader item pool following exploratory and confirmatory factor analysis. The final hierarchical model of a second-order paranoia factor and three sub-factors of social harm, conspiracy ideas, and physical threat showed excellent fit statistics (Bird et al., 2019).

The B-CAP has concurrent validity with other measures of paranoia, with data from Bird et al. (2019) showing a correlation of $r = 0.84$ ($p < 0.001$) with the paranoia subscale of the Specific Psychotic Experiences Questionnaire (SPEQ; Ronald et al., 2014) and $r = 0.68$ ($p < 0.001$) with the Social Mistrust Scale (SMS; Wong et al., 2014). Although all paranoia measures are limited in their ability to determine whether thoughts are truly unfounded, we have shown that B-CAP scores are moderate correlated ($r = 0.41$, $p < 0.001$) with participant ratings on a visual analogue scale (VAS) that they are 'more fearful of others than they should be' (Bird et al., 2019). This was significantly larger than the small correlation of $r = 0.25$ between the same VAS rating and bullying scores ($z = 5.35$, $p < 0.001$). This provides additional confidence that the B-CAP is a valid tool to identify likely excessive concerns about others that are distinct from genuine victimisation.

2.3. Statistical analysis

All analyses were conducted in R, version 3.6.1 (R Core Team, 2013). Individual packages used included "psych" (Revelle, 2019), "mirt" (Chalmers, 2012), "mokken" (Van der Ark, 2015), "lordif" (Choi et al., 2011), and "catR" (Magis and Raîche, 2011). To assess the full spectrum of paranoia severity, the analysis was conducted on the combined clinical and non-clinical data. Rates of missing data were very low (<2%) and missing values were imputed using the mice package (Van Buuren and Groothuis-oudshoorn, 2011).

Although the B-CAP has been shown to consist of three subtypes of paranoia (Bird et al., 2019), the single overarching paranoia factor that explained these sub-factors in a hierarchical model indicates the scale can be considered unidimensional for the purpose of IRT. A confirmatory factor analysis in the combined clinical and non-clinical sample confirmed that this hierarchical model had a good fit to the data

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(supplementary materials). We used Mokken analysis to further evaluate item homogeneity, with Loevinger's H coefficients ≥0.3 indicating unidimensionality (Stochl et al., 2012). This showed all 18 items conformed to a single dimension with item coefficients above 0.3 and an overall homogeneity coefficient of 0.474 (SE = 0.018).

As the response options were polytomous, a two-parameter graded response model (GRM; Samejima, 1969) was fitted to the B-CAP items. To identify outliers with atypical response patterns, participants with extreme person fit statistic scores (±3) were excluded (Felt et al., 2017). The IRT parameters are expressed as a function of theta, representing the continuum of the latent trait (i.e. paranoia), with values denoting standard deviations from average trait paranoia (i.e. theta of 0). Higher theta values therefore indicate greater severity of paranoia. Unlike ability constructs often used in the IRT literature (e.g. intelligence), the population distribution of paranoia is expected to be positively skewed with most people reporting minimal levels (Bebbington et al., 2013). As a result, average trait paranoia would represent the lower end of the severity spectrum. The discrimination parameters (a) describe how well each item discriminates different levels of theta, with higher values signifying small shifts in paranoia severity produce rapid increases in the probability of item endorsement. Discrimination values ≥1 are highly discriminative whilst those ≤0.5 are unacceptable (Baker and Kim, 2017). The difficulty parameters indicates the severity level each item response typically represents, with higher values suggesting the item assesses more severe presentations. Five difficulty parameters are given for each item, representing the theta level where there is a 50% probability of responding between the threshold of each of the six response options ($b1$ = 0–1, $b2$ = 1–2, $b3$ = 2–3, $b4$ = 3–4, $b5$ = 4–5).

To assess measurement invariance between groups, differential item functioning (DIF) analysis was conducted for gender, age, and sample population. Item variance, or DIF, indicates a bias in measurement whereby participants from different demographic groups with the same level of trait paranoia respond differently to the items (Holland and Wainer, 2012). A beta change above 10% and a pseudo R-square above 0.13 were used as the criteria to identify items with DIF (Crane et al., 2007; Choi et al., 2011).

The overall reliability of the B-CAP was primarily assessed using the test information (TI) function. This denotes the scale precision as a function of theta, showing at which levels of severity the scale has high and low reliability. For interpretability, the formula $1/\sqrt{TI(\theta)}$ was used to convert TI values at specific theta levels to an equivalent alpha on a scale of 0–1 (O'Connor, 2018). The expected score function based on the GRM was used to assess the likely score for individuals at different points of the severity spectrum and establish interpretative score ranges.

Using the IRT parameters derived from the current sample, we conducted a CAT simulation with 10,000 simulated responses to evaluate the mean number of items required at different levels of paranoia severity. Item selection is determined using the maximum Fisher Information criterion. A Bayesian modal estimation that temporally assumes a normal distribution is used to estimate theta at the start of the simulation. A non-Bayesian maximum likelihood estimation is employed to determine a participant's final theta (i.e. severity). The simulation stopping rule was a standard error (SE) of ≥0.32, equivalent to a reliability of ≥0.90. The correlation between theta scores derived from the CAT and those obtained from all 18 items were then computed.

3. Results

Following removal of the 10 participants with extreme person fit statistics (non-clinical n = 5, clinical n = 5), IRT analysis was conducted on the final sample of 1092 participants (non-clinical n = 796, clinical n = 296). The two parameter GRM provided a good fit to the data (CFI = 0.97, TLI = 0.96, RMSEA = 0.053, SRMSR = 0.076). The item parameters are displayed in Table 1, and the item category response curves (CRCs) for all items are shown in the supplementary materials.

3.1. Item properties

Discrimination parameters were high for all 18 items (a = 1.14–2.77), suggesting small shifts in paranoia severity lead to an increased probability that items will be endorsed. The item "*People are making sly comments to upset me*" was the most discriminating item (a = 2.77). The difficulty parameters show all items measure a broad range of paranoia severity from average to severe across the response options (0–5). For every item, full endorsement ($b5$, item response 4–5) represented a high severity of paranoia at 2.10–3.90 standard deviations above the average level. High difficulty parameters for $b1$, representing a response of 0–1, suggested that any endorsement of the following items were particularly indicative of heightened paranoia severity (>0.85 S.D. above average): "*people are collecting my information or photos to use against me*" ($b1$ = 1.23), "*people will try to kidnap me*" ($b1$ = 0.96), "*I feel like I am being followed or stalked*" ($b1$ = 0.96), "*Nasty tricks are being played on me*" ($b1$ = 0.88), and "*Groups of people are planning against me*" ($b1$ = 0.85).

3.2. Differential Item functioning (DIF)

There was no evidence of significant DIF between younger (aged 11–13 years, n = 509) and older (aged 14–17, n = 583) adolescents, girls (n = 590) and boys (n = 494), or participants in the non-clinical

Table 1
IRT parameters for B-CAP items with combined non-clinical and clinical sample (n = 1091). Standard errors are shown in parentheses.

Items	a	b_1	b_2	b_3	b_4	b_5
1.	2.41 (0.13)	0.10 (0.05)	0.58 (0.05)	1.23 (0.06)	1.77 (0.08)	2.36 (0.12)
2.	2.09 (0.12)	0.21 (0.05)	0.71 (0.05)	1.51 (0.08)	2.10 (0.10)	2.46 (0.13)
3.	2.40 (0.13)	0.09 (0.05)	0.70 (0.05)	1.40 (0.07)	1.94 (0.09)	2.57 (0.13)
4.	1.75 (0.11)	0.70 (0.06)	1.43 (0.08)	1.95 (0.11)	2.51 (0.15)	3.02 (0.19)
5.	1.99 (0.12)	0.24 (0.05)	0.96 (0.06)	1.58 (0.08)	2.16 (0.11)	2.63 (0.14)
6.	2.77 (0.16)	0.21 (0.04)	0.83 (0.05)	1.41 (0.07)	2.03 (0.09)	2.41 (0.12)
7.	2.44 (0.13)	−0.24 (0.05)	0.41 (0.05)	1.09 (0.06)	1.66 (0.08)	2.10 (0.10)
8.	2.24 (0.12)	0.08 (0.05)	0.69 (0.05)	1.30 (0.07)	1.92 (0.09)	2.34 (0.12)
9.	2.27 (0.15)	0.88 (0.06)	1.51 (0.08)	2.29 (0.12)	2.75 (0.15)	2.94 (0.17)
10.	1.88 (0.11)	0.41 (0.05)	1.08 (0.07)	1.79 (0.09)	2.29 (0.12)	2.73 (0.15)
11.	2.57 (0.17)	0.85 (0.05)	1.36 (0.07)	1.82 (0.09)	2.18 (0.11)	2.48 (0.12)
12.	1.85 (0.14)	1.23 (0.08)	1.83 (0.11)	2.45 (0.15)	2.78 (0.17)	3.20 (0.21)
13.	1.83 (0.12)	0.80 (0.06)	1.51 (0.09)	2.06 (0.11)	2.50 (0.14)	2.79 (0.16)
14.	1.51 (0.11)	0.96 (0.07)	1.63 (0.10)	2.34 (0.14)	2.94 (0.19)	3.36 (0.23)
15.	1.22 (0.08)	−0.29 (0.07)	0.61 (0.07)	1.33 (0.10)	2.00 (0.13)	2.53 (0.17)
16.	1.14 (0.09)	0.96 (0.09)	1.71 (0.13)	2.42 (0.18)	3.24 (0.25)	3.90 (0.32)
17.	1.49 (0.09)	0.11 (0.06)	0.89 (0.07)	1.49 (0.09)	1.97 (0.12)	2.35 (0.14)
18.	1.90 (0.12)	0.44 (0.05)	0.97 (0.06)	1.47 (0.08)	1.84 (0.10)	2.39 (0.13)

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($n = 796$) and clinical ($n = 296$) samples. In each of these three DIF analyses, none of the 18 items showed a pseudo R^2 change of >0.13 or a beta change of >10%.

We then adopted a stricter criterion of a beta change of >5% to assess milder levels of DIF. With this stricter criterion, one item was flagged for DIF in the participant group analysis (item 5: *"People are trying to embarrass me in class on purpose"*) and 4 items were flagged for DIF in the gender analysis (item 9: *"Nasty tricks are being played on me"*; item 13: *"I'm sure people are seeking revenge on me"*; item 15: *"I am scared of what strangers will do to me"*; and item 16: *"People will try to kidnap me"*). No items were flagged using the stricter criterion for the age analysis. The item characteristic plots and the test characteristic curves for the items with mild DIF are shown in the supplementary materials. The items flagged for DIF under the stricter criterion did not have an impact on the total scores, with high correlations between theta scores from all 18 items and the DIF adjusted scores for both participant group ($r = 0.997$, item 5 omitted) and gender ($r = 0.992$, items 9, 13, 15, & 16 omitted). The mild DIF in these items can therefore be disregarded and differences between demographic groups can be meaningfully interpreted.

Paranoia scores were significantly higher in the clinical sample (mean = 20.0, SD = 18.2) compared to the general population sample (mean = 12.5, SD = 14.0; $t = 6.50$, $df = 439.3$, $p < 0.001$), and in girls (mean = 18.1, SD = 16.8) compared to boys (mean = 9.84, SD = 12.2; $t = 9.39$, $df = 1069.1$, $p < 0.001$). Older adolescents also had significantly higher paranoia scores (mean = 16.4, SD = 16.5) than younger adolescents (mean = 12.3, SD = 14.2; $t = 4.40$, $df = 1099.9$, $p < 0.001$), although the magnitude of this difference was smaller.

3.3. Expected scores

The B-CAP total score had high precision, with a correlation of 0.92 between scores derived from summing the 18 items and theta scores from the GRM. The expected score function in Fig. 1 highlights the anticipated positive skew of paranoia where the average adolescent would be expected to endorse the paranoid thought items to a small degree, with expected scores of 9.68 out of 90 at the average level of trait paranoia (theta = 0) and 17.8 at 0.5 SDs above average (i.e. theta = 0.5). Higher scores reflect higher levels of paranoia severity, with expected scores of 28.5 at 1 SD above average, 41.2 at 1.5 SD, 54.7 at 2 SD, 67.3 at 2.5 SD, and 77.0 at 3 SD above average trait paranoia. Using the expected score function, we provide descriptive score categories to facilitate interpretation of the total B-CAP score (Table 2).

3.4. Test reliability

The test information (TI) function (Fig. 1) represents the reliability of the B-CAP as a function of paranoia severity (i.e. theta) (see supplementary materials for individual information functions). As shown in Fig. 1, the B-CAP demonstrated excellent reliability and precision across a wide range of the paranoia spectrum. Equivalent alpha values were >0.90 (TI = 10) between 0.45 SD below and 3.36 SD above average trait paranoia (SE = 0.21–0.31), representing expected total scores between 5 and 82 (maximum score = 90). The highest reliability was between 0.44 and 2.60 SD above average, representing expected total scores between 17 and 69, with equivalent alpha values ≥0.95 (TI = 20) and standard errors below 0.22 in this range. The maximum TI of 23.4, equivalent to $a = 0.96$, was at a theta of 1.73 (SE = 0.21). Reliability only fell into the acceptable range ($\alpha < 0.80$) beyond 3.90 SDs above (expected scores of 86–90) and 0.94 below (expected scores of 0–2) average. These findings suggest the B-CAP has high reliability for assessing both non-clinical and clinical levels of paranoia.

3.5. Computer adaptive testing simulation

The results of the CAT simulation are shown in Table 3. The sample of 10,000 simulated participants are split into 10 equal decile (D) ranks representing the theta spectrum. The average test length was 10.9 items (SD = 5.14) with a mean Root Mean Square Error (RMSE) of 0.364 and a mean bias of 0.0014. The number of items administered decreased incrementally across each decile rank of the theta spectrum, indicating a smaller number of items are sufficient to get an accurate estimate of paranoia as severity increases. Only 5–6 items were administered on average from D8-D10 (mean theta = 0.68–1.75). This pattern is consistent with the TI showing the B-CAP has the greatest reliability across the higher end of the severity spectrum (i.e. D8-D10). The CAT demonstrated high accuracy with a correlation of 0.93 between theta scores derived from all 18 items and the CAT estimated scores.

4. Discussion

Paranoia and excessive mistrust may be an overlooked issue in youth with potentially detrimental effects on social functioning (Bird et al., 2019). Determining its true impact will depend on precise measurement. Here we use IRT to extensively evaluate the psychometric properties and precision of a new measure of paranoia specifically designed for young people. The IRT analyses show the B-CAP items are highly discriminative of shifts in adolescent paranoia across the spectrum of severity, with higher scores representing more severe

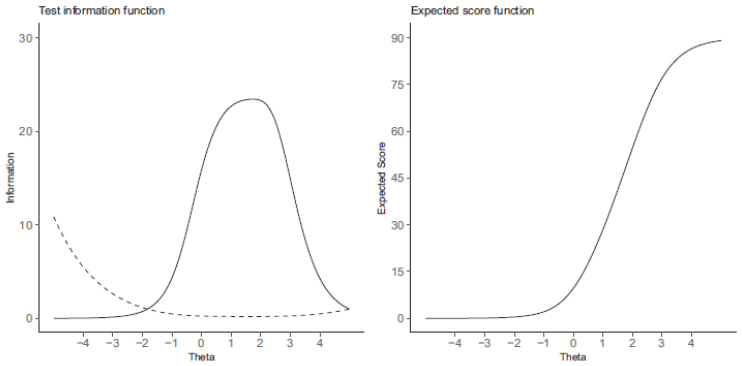

Fig. 1. B-CAP test information (TI) with standard errors (----) and expected score across the theta distribution.

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Table 2
Interpretive ranges for B-CAP total score.

Category	Score range	Theta range	Comment
Average	0–22	≤0.70	Scores in this range represent normal levels of suspicious thinking at <0.70 SDs above average for adolescents
Mildly elevated	23–39	0.75 to 1.40	Scores in this range represent mildly elevated suspiciousness at 0.75–1.40 SDs above average for adolescents.
Moderate	40–53	1.45 to 1.95	Scores in this range represent moderate paranoia at 1.45–1.95 SDs above average for adolescents.
High	54–70	2.00 to 2.60	Scores in this range represent high levels of paranoia at 2.00–2.60 SDs above average for adolescents.
Severe	71–90	≥2.65	Scores in this range represent severe levels of paranoia at >2.65 SDs above average for adolescents

presentations. Reliability was excellent across a wide range of paranoia severity, from the average levels expected in most adolescents to the more severe presentations likely in clinical populations. Importantly, reliability was highest for elevated levels of paranoia and remained high even at the extreme end of the severity spectrum. Furthermore, all items functioned similarly between boys and girls, between older and younger adolescents, and between young people from the general population and those seeking help from mental health services. This measurement invariance indicates that differences in total score between these demographic groups are unlikely due to bias within the questionnaire. Overall, these findings suggest the B-CAP is a reliable and sensitive tool to assess both non-clinical and clinical levels of paranoia in young people.

The B-CAP should have utility as a clinical measure in adolescent mental health services. The broad similarity of items, both in their ability to discriminate shifts in paranoia and in the level of severity each item response represents, suggest that total summed scores can be meaningfully interpreted. Indeed, the high correlation between the summed scores and the IRT derived theta scores suggest the total score has good precision for routine clinical use. However, computerised administration to calculate theta scores would lead to even higher precision in estimating paranoia severity, whilst also allowing the possibility of adaptive testing to reduce the number of items administered. Our CAT simulation showed that only 5–6 items on average were required at the higher end of the severity spectrum to reliably estimate paranoia. Although an 18-item scale is already relatively short, when administered alongside many other measures within clinical and research assessments this item reduction may help decrease patient burden. This is especially important considering help-seeking young people with higher levels of paranoia severity will more likely be distressed, experience emotional dysregulation, and have difficulties concentrating. Shorter assessments including only relevant items may therefore improve the patient experience and facilitate engagement.

Improvements in technology within health care settings mean computerised assessments are becoming feasible in routine clinical practice. Yet only a few studies have so far used IRT and CAT to evaluate assessments for psychosis (Batterham et al., 2016; Kim et al., 2013; Laurens et al., 2012; van Bebber et al., 2017), most of which have included measures that combine a range of separable psychotic experience within the same scale. This study is the first to evaluate the item properties and application of CAT to an individual psychotic experience, and we are working to make the adaptive B-CAP freely available online. However, the extension of our findings to calibrate multiple item banks to each assess different psychotic experiences will now be an important task. Using IRT to assess individual item properties within each bank will ensure items can reliably discriminate psychotic experiences at clinically relevant levels of severity, whilst adaptive testing will allow multiple domains to be administered in a shorter time to reduce patient burden. This would offer more precise estimates of an individual's current level of different psychotic experiences, providing reliable information about which domains may be the most pertinent for treatment.

4.1. Limitations

There are notable limitations of this study. Although the combination of participants from the general population and patients attending mental health services allowed a range of the paranoia spectrum to be assessed, only a small minority of our sample had psychosis and we did not include data from young people with diagnosed persecutory delusions. As a result, it is possible our analysis underrepresented the extreme end of the spectrum. Obtaining normative scores for the B-CAP from young people with persecutory delusions will now be helpful. However, we were able to use the IRT model to derive expected scores at different levels of paranoia with score ranges to aid clinical interpretation. Notably, the item category response curves (supplementary materials) suggest fewer response options would likely be adequate to sample paranoia severity from the B-CAP items. However, our view was that collapsing response categories would reduce the scale's sensitivity to detect individual fluctuations in paranoia in clinical practice. This is in line with service user input in the design phase where young people said a proposed four point scale was not specific enough and it was expanded to six at their suggestion.

Importantly, there is always an unavoidable level of measurement error in self-report paranoia questionnaires from genuine experiences of hostility. Although we recently showed B-CAP scores are moderately associated with participant ratings that their fears of others are excessive and distinct from bullying (Bird et al., 2019), validation of the B-CAP with clinician-rated assessment tools or experimental procedures such as virtual reality (Freeman et al., 2010) would be beneficial. It will also be necessary to determine the test-retest reliability of the B-CAP in future studies. Another limitation is the use of a small number of items within the CAT analysis, since a broader range of items to choose from when matching items to participants can improve reliability. Yet even with only 18 items our CAT simulation was still able to substantially reduce the number of items without a loss of precision. However, as our whole sample was used to calibrate the item bank, we were only able to use simulated responses in the CAT analysis. Assessing the functioning of the adaptive version of the B-CAP in a

Table 3
CAT simulation of 10,000 respondents showing average test length across 10 decile (D) ranks of the theta spectrum.

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Mean Theta	−1.78	−1.07	−0.69	−0.38	−0.11	0.14	0.40	0.68	1.04	1.75
Mean test length	18.0	17.8	16.4	13.7	10.2	8.10	6.70	6.15	5.67	5.68
RMSE	0.62	0.35	0.38	0.36	0.30	0.28	0.29	0.29	0.31	0.31
Mean standard error	0.52	0.44	0.38	0.33	0.31	0.31	0.30	0.30	0.30	0.30
Mean bias	0.44	0.03	−0.03	−0.02	0.00	−0.04	−0.03	−0.06	−0.10	−0.16
Stop rule satisfied	0.00	0.05	0.25	0.59	0.88	0.97	1.00	1.00	1.00	1.00
Number of simulees	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Note: RMSE = Root mean square error.

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separate validation sample will now be required. Adopting a multidimensional IRT approach would also be beneficial to assess the capacity of the CAT to sample from each of the three sub-domains of paranoia in the B-CAP. Overall, the study potentially provides an exemplar of how to address common issues in the measurement of psychotic experiences in young people. Precise assessment tools are essential to facilitate advances in research and treatment.

Contributors

JCB, BSL, FW, and DF designed the study concept. Data collection was conducted by JB, MK, ECF, HS, and AT. The analysis was conducted by JCB and BSL. JCB drafted the manuscript and all authors contributed to and approved the version prior to submission.

Declaration of competing interest

All authors declare that they have no conflicts of interest.

Acknowledgement

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Appendix A. Appendix

The Bird Checklist of Adolescent Paranoia

This form is about worries you may have about other people. Please circle how often you have had each thought over the last *2 weeks*.

	Never	Once	Couple of times	Few times a week	Every day	All the time
. People at school are trying to make me feel unwanted	0	1	2	3	4	5
2. I'm sure people are gossiping about me on social media	0	1	2	3	4	5
3. I am being pushed out of conversations on purpose	0	1	2	3	4	5
4. My friends or partner are ignoring my messages to upset me	0	1	2	3	4	5
5. People are trying to embarrass me in class on purpose	0	1	2	3	4	5
6. People are making sly comments to upset me	0	1	2	3	4	5
7. I think people are lying to me on purpose	0	1	2	3	4	5
8. People say things under their breath to wind me up	0	1	2	3	4	5
9. Nasty tricks are being played on me	0	1	2	3	4	5
0. People are trying to confuse me on purpose	0	1	2	3	4	5
1. Groups of people are planning against me	0	1	2	3	4	5
2. People are collecting my information or photos to use against me	0	1	2	3	4	5
3. I'm sure people are seeking revenge on me	0	1	2	3	4	5
4. I feel like I am being followed or stalked	0	1	2	3	4	5
5. I am scared of what strangers will do to me	0	1	2	3	4	5
6. People will try to kidnap me	0	1	2	3	4	5
7. I could be attacked at any time	0	1	2	3	4	5
8. I feel unsafe around people everywhere I go	0	1	2	3	4	5

Scoring instructions:

Add together responses for all 18 items to obtain the total paranoia score. To obtain subscale scores, add together responses for items 1–8 (social harm), 9–13 (conspiracy), and 14–18 (physical threat).

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2020.03.046.

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Appendix C

NIHR Evidence Alert about the B-CAP (Chapter 3)

https://doi.org/10.3310/alert_44284

A simple checklist reliably identified paranoia in adolescents with mental health problems, research shows

Published on 5 February 2021

doi: 10.3310/alert_44284

A new 18-item checklist provides the first reliable clinical tool for assessing paranoid thinking in young people. Research found the Bird Checklist of Adolescent Paranoia (B-CAP) gave precise estimates of the severity of paranoia. It was most reliable for moderate to severe levels.

Paranoia is a neglected problem in young people. Before this research, there was no widely-accepted way of detecting paranoid thoughts in adolescents.

The researchers say the B-CAP could help identify paranoia in young people and monitor their response to treatment. It could be routinely used by mental health services such as child and adolescent mental health services (CAMHS) and early intervention in psychosis services (EIS). Further evaluation of the B-CAP in clinical practice and in adolescents from different social and ethnic backgrounds will be helpful.

The B-CAP also has promise as a so-called adaptive test that adjusts itself to the severity of paranoia. The research found that an adaptive B-CAP reliably estimated severe paranoia with fewer questions. This could make the checklist easier for young people to complete.

What's the issue?

Paranoia is the unfounded idea that others want to harm you. It is relatively common in adolescents, with up to one in three (20% to 30%) experiencing suspicious thoughts at least weekly. At extreme levels, paranoia may be a symptom of a psychotic disorder, but it also likely to occur alongside many mental health problems in youth.

Thinking that others are out to get you can leave young people feeling scared when going outside and mistrustful in relationships. This social impact could worsen outcomes for young people with paranoia.

To ensure young people get help and treatment quickly, clinicians need to accurately detect paranoid thinking. But to date, there has been a lack of valid, reliable, and age-appropriate measures of paranoia for adolescents, especially among those with mental health problems.

The researchers therefore developed the B-CAP as a new test for paranoia in adolescents. In this study, they wanted to see if the checklist was reliable at different levels of paranoia and in different populations. They also wanted to see if the B-CAP could be used as a computer-based adaptive test. The number of questions on an adaptive test can change and may be reduced in response to early answers. This makes the assessment itself easier for young people to go through.

What's new?

This study analysed B-CAP data from 801 pupils (11–15 years) from a secondary school in Leicestershire and 301 patients (11-17 years) attending CAMHS in Oxfordshire.

The researchers used a technique called item response theory (IRT) to evaluate the B-CAP. IRT takes into account the differences in how each question measures paranoia. It gives a more precise score compared with traditional methods.

Young people in the study were asked to respond to questions such as '*people are making sly comments to upset me*' on a scale of 0 to 5, with 0 meaning they never thought it and 5 meaning they thought it all the time.

The results showed that:

- all questions detected small differences in the severity of paranoia
- none of the questions were biased by demographic factors such as age or gender
- a score of 4 or 5 on any question indicated severe paranoia
- certain questions such as *'I feel like I am being followed or stalked'* and *'people will try to kidnap me'* were linked to severe paranoia even if scored only as 1 or 2
- the checklist was most reliable for moderate paranoia and remained high at extreme levels
- a score of 34+ was an indicator of mildly elevated paranoia, 40+ of moderate paranoia, 56+ of high paranoia, and 71+ of severe paranoia
- a computerised model - based on the responses from all 1,102 adolescents - showed that the B-CAP performed well as an adaptive test and 5-6 items was usually sufficient to accurately estimate severe paranoia.

Why is this important?

Paranoia tends to emerge in adolescence but may be a neglected problem, the researchers say. Little is known about the key signs, it is not routinely measured in youth services, nor is its assessment included in any NICE guidance for young people.

The B-CAP provides a reliable measure to detect paranoia across the spectrum of severity. It detected paranoia at the average levels expected in most adolescents, and at more severe levels in those with mental health problems. This means it could be used in a range of services.

In child and adolescent mental health services (CAMHS), the B-CAP could be used to screen young people for paranoia. It could also be used to monitor change over time and their response to interventions. This would allow more young people to access support to overcome paranoia and to feel safer around others.

What's next?

The B-CAP is already being used by the researchers and their colleagues in local services. They say the checklist is ready to use by clinicians and researchers wanting to assess paranoia in teenagers. However, further evaluation of the B-CAP in clinical services and in adolescents from different social and ethnic backgrounds is needed to determine its true potential.

This study is part of larger programme of research that aims to improve the assessment and clinical understanding of paranoia in adolescence. This next step is to develop and test interventions to help young people with paranoia develop trust in others and feel safer in their daily lives.

You may be interested to read

The full study: Bird JC, and others. The assessment of paranoia in young people: Item and test properties of the Bird Checklist of Adolescent Paranoia. *Schiz Res.* 2020;220:116-122

Assessment tools, including the B-CAP, are available to download on the Oxford Cognitive Approaches to Psychosis (O-CAP) research group website

Related work on paranoia in adolescents by the same group: Bird JC, and others. Paranoia in patients attending child and adolescent mental health services. *Australian and New Zealand Journal of Psychiatry.* 2021. doi: 10.1177/0004867420981416

Appendix D

Full paranoid thought item pool (Chapter 3)

1. People are laughing at me behind my back.
2. Bad rumours are being spread about me.
3. I'm sure everyone is talking about me.
4. I feel like I am being followed or stalked.
5. I'm sure comments on social media are targeted at me.
6. When people make jokes I know they are secretly about me
7. I'm sure people are gossiping about me on social media.
8. I'm sure cameras are watching me.
9. I spot hidden messages for me (e.g. on the internet or on TV).
10. People are secretly watching my online activity.
11. Others are looking at me in an unfriendly way.
12. People at school are trying to make me feel unwanted.
13. I am being pushed out of conversations on purpose.
14. People are trying to turn everyone at school against me.
15. People are trying to embarrass me in class on purpose.
16. My teachers are out to make me fail.
17. People upload pictures on social media just to wind me up.
18. People ignore my posts on social media to put me down.
19. People are setting me up to be humiliated.
20. My friends or partner are ignoring my messages to upset me.
21. My family are trying to ruin my life on purpose.
22. People are making sly comments to upset me.
23. People are doing things to just to make me jealous.
24. I think people are lying to me on purpose.
25. People say things under their breath to wind me up.
26. I spot hidden insults about me from what people say.
27. People are trying to mess with my mind.
28. Nasty tricks are being played on me.
29. People are trying to confuse me on purpose.
30. People are trying to annoy me on purpose.
31. People are trying to set me up for things I haven't done.
32. Certain people are trying to control me on the internet.
33. People are only being nice to me to set me up.
34. Groups of people are planning against me.
35. People are collecting my information or photos to use against me.
36. I'm sure people are seeking revenge on me.
37. My friends or family are in on a plan to harm me.
38. I am scared of what strangers will do to me.
39. Something (e.g. spirits or creatures) is trying to harm me.
40. People will try to kidnap me.
41. People are trying to physically hurt me.
42. People are trying to poison me.
43. People may touch my body to humiliate or scare me.
44. I could be attacked at any time.
45. Everyone is out to get me.
46. I don't know who to trust.
47. I feel unsafe around people everywhere I go.
48. I think people are against me everywhere I go.

Appendix E

The Bird Checklist of Adolescent Paranoia (B-CAP) (Chapter 3)

This form is about worries you may have about other people. Please circle how often you have had each thought over the last **2 weeks.**

	Never	Once	Couple of times	Few times a week	Every day	All the time
1. People at school are trying to make me feel unwanted	0	1	2	3	4	5
2. I'm sure people are gossiping about me on social media	0	1	2	3	4	5
3. I am being pushed out of conversations on purpose	0	1	2	3	4	5
4. My friends or partner are ignoring my messages to upset me	0	1	2	3	4	5
5. People are trying to embarrass me in class on purpose	0	1	2	3	4	5
6. People are making sly comments to upset me	0	1	2	3	4	5
7. I think people are lying to me on purpose	0	1	2	3	4	5
8. People say things under their breath to wind me up	0	1	2	3	4	5
9. Nasty tricks are being played on me	0	1	2	3	4	5
10. People are trying to confuse me on purpose	0	1	2	3	4	5
11. Groups of people are planning against me	0	1	2	3	4	5
12. People are collecting my information or photos to use against me	0	1	2	3	4	5
13. I'm sure people are seeking revenge on me	0	1	2	3	4	5
14. I feel like I am being followed or stalked	0	1	2	3	4	5
15. I am scared of what strangers will do to me	0	1	2	3	4	5
16. People will try to kidnap me	0	1	2	3	4	5
17. I could be attacked at any time	0	1	2	3	4	5
18. I feel unsafe around people everywhere I go	0	1	2	3	4	5

Appendix F

Category Response Curves (Chapter 3)

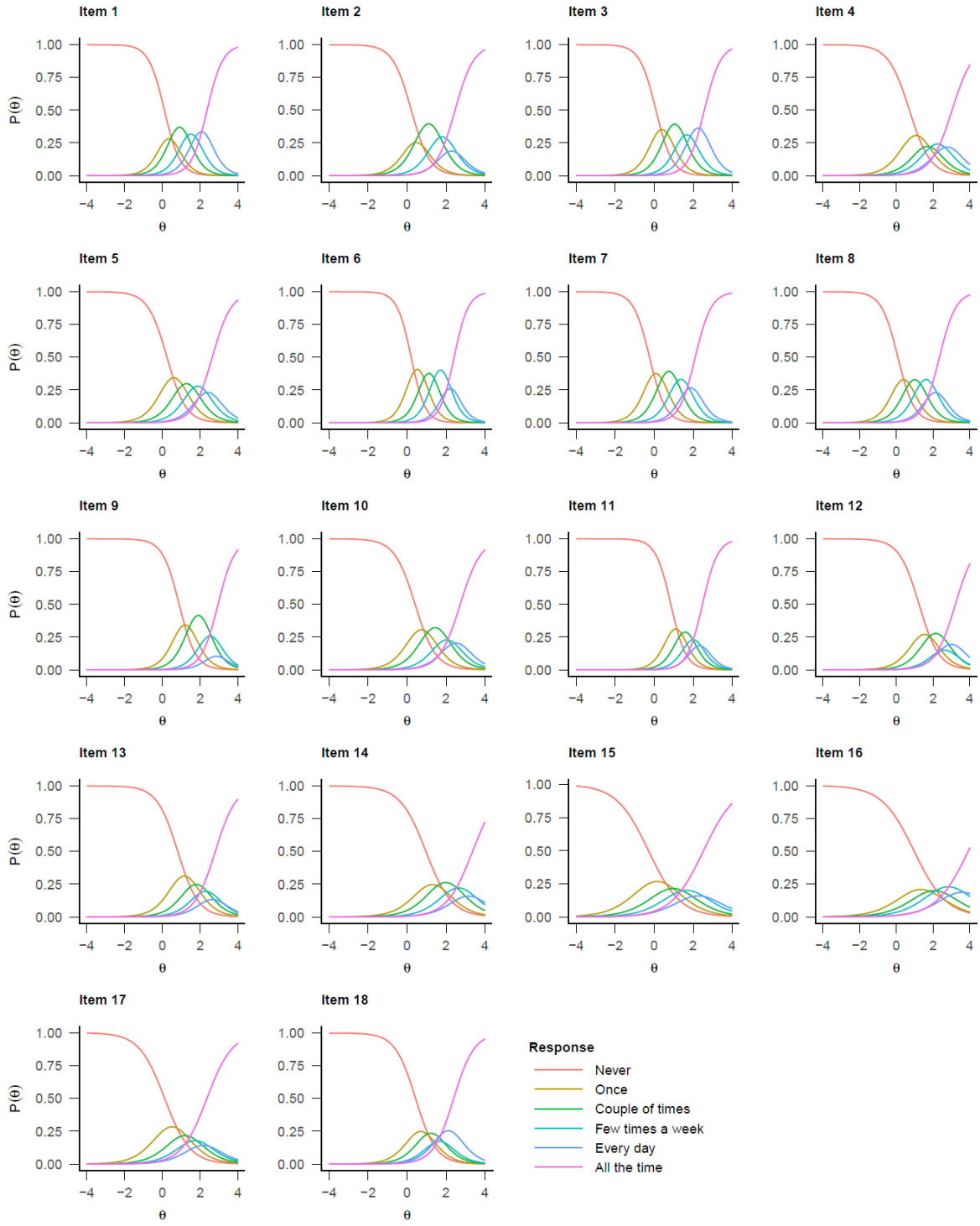

Figure A1. Category response curves (CRCs) for all 18 items. The lines represent the probability (y axis) of responding to each Likert scale option (0-5) across the distribution of theta (x axis) for each item.

Appendix G

Differential Item Functioning (DIF) plots (Chapter 3)

Gender DIF analysis: Test characteristic curve

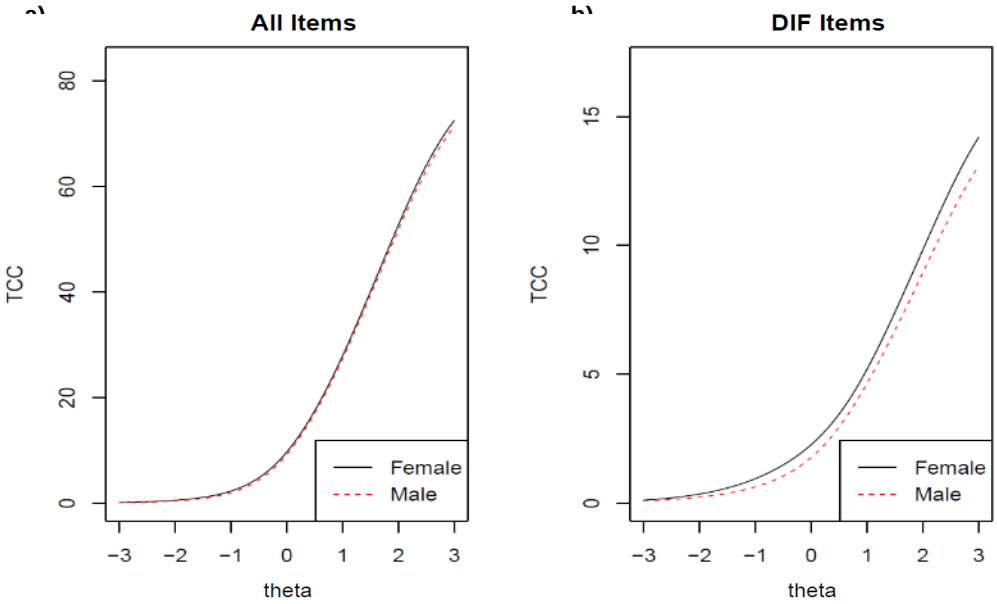

Figure A2. Impact of DIF items on the test characteristic curves (TCC). **a)** TCCs of all items (both items with and without DIF) for males and females. **b)** TCCs for the subset of items found to have DIF between males and females. At the overall test level, these curves suggest a minimal difference in the total expected score across the paranoia (theta) spectrum between males and females.

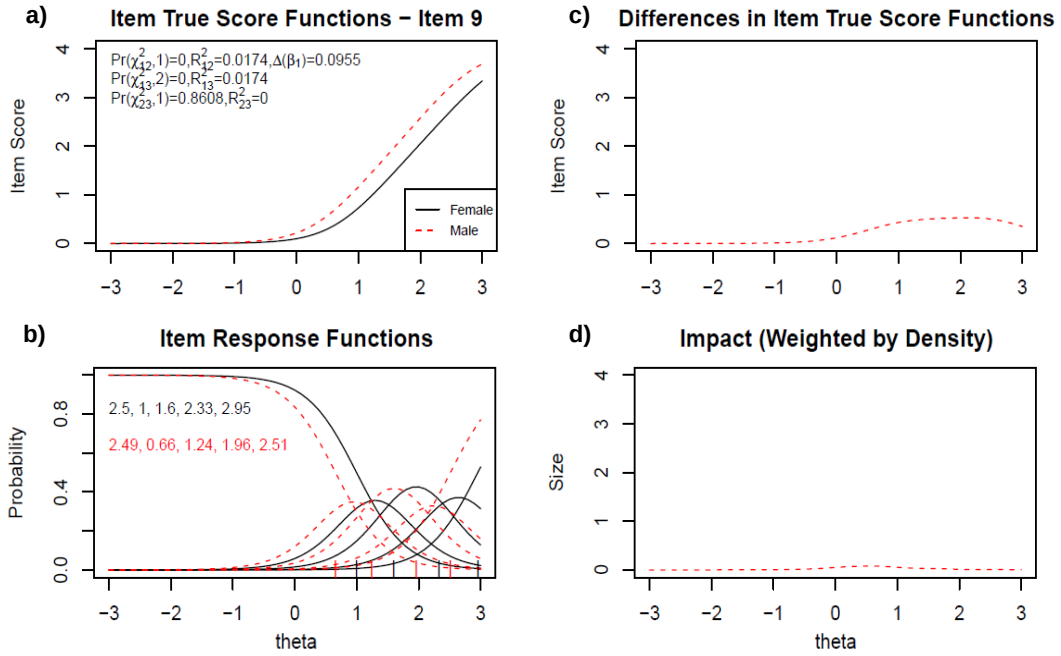

Figure A3. Display of the item *'Nasty tricks are being played on me'* showing a uniform DIF relating to gender. **a)** Item characteristic curves (ICCs) for both genders **b)** Item response functions based on gender-specific item parameter estimates. **c)** Absolute difference between the ICCs of both groups, indicating the difference is at higher levels of paranoia (theta). **d)** Absolute difference between the ICCs weighted by the score distribution of the focal group (i.e. males), indicating minimal impact.

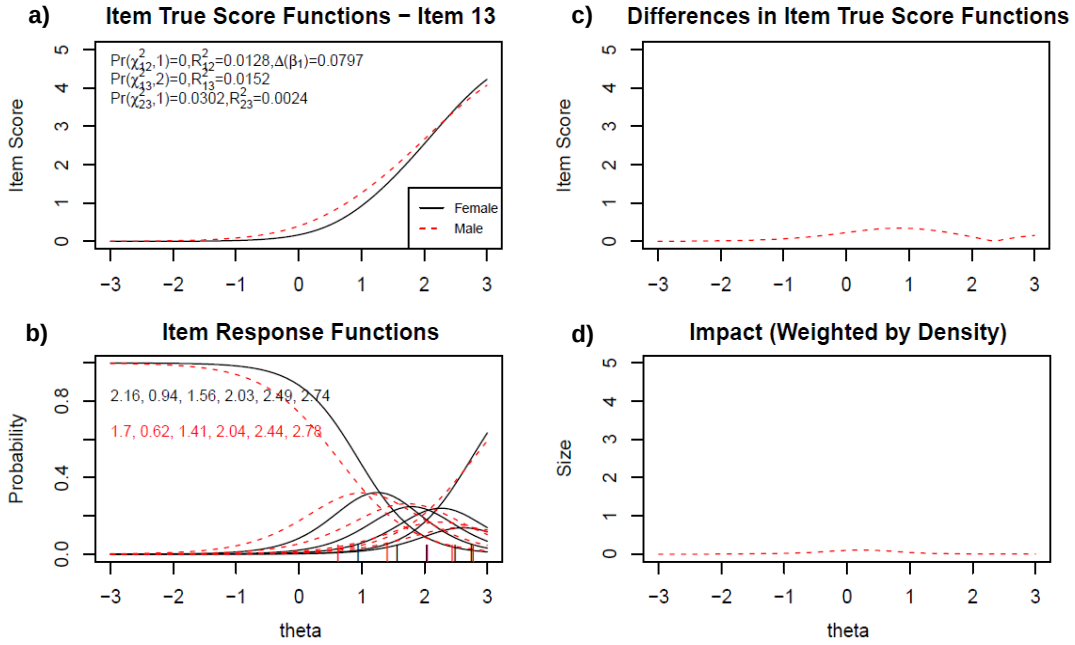

Figure A4. Display of the item *'I'm sure people are seeking revenge on me'* which shows a uniform DIF with respect to gender. **a)** ICCs for both genders; **b)** Item response functions based on gender-specific item parameters; **c)** Absolute difference between the ICCs for both groups, indicating the difference is at moderate to higher levels of paranoia (theta); **d)** Absolute difference between the ICCs weighted by the score distribution for the focal group (i.e. males), indicating minimal impact.

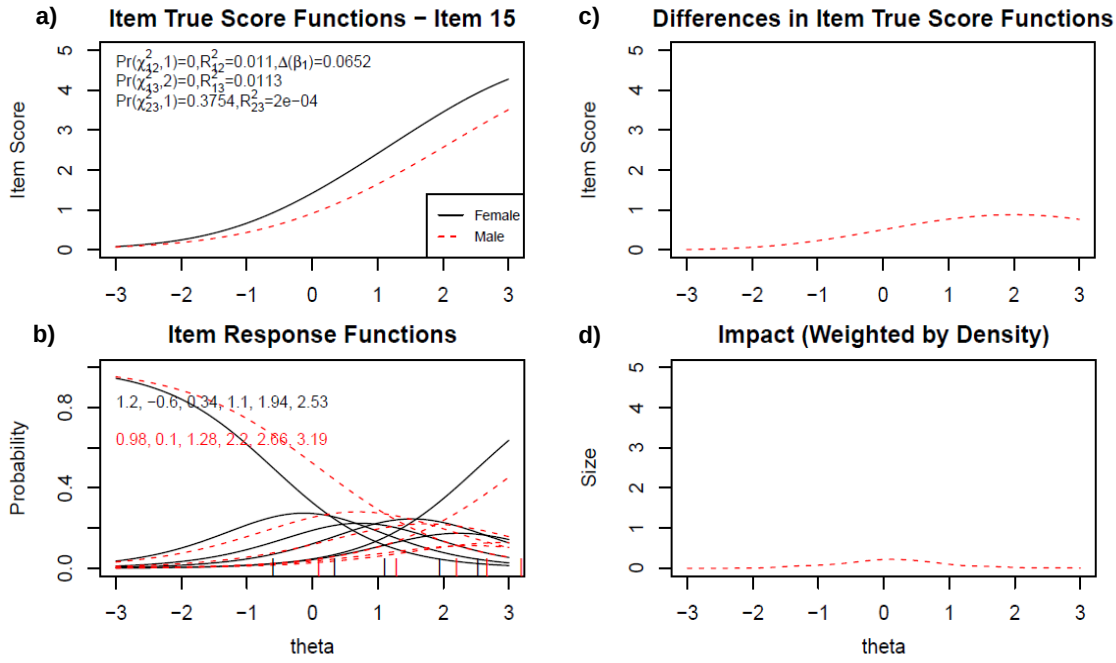

Figure A5. Display of the item *'I am scared of what strangers will do to me'* which shows a uniform DIF with respect to gender. **a)** ICCs for both genders; **b)** Item response functions based on gender-specific item parameters; **c)** Absolute difference between the ICCs for both groups, indicating the difference is at moderate to higher levels of paranoia (theta); **d)** Absolute difference between the ICCs weighted by the score distribution for the focal group (i.e. males), indicating minimal impact.

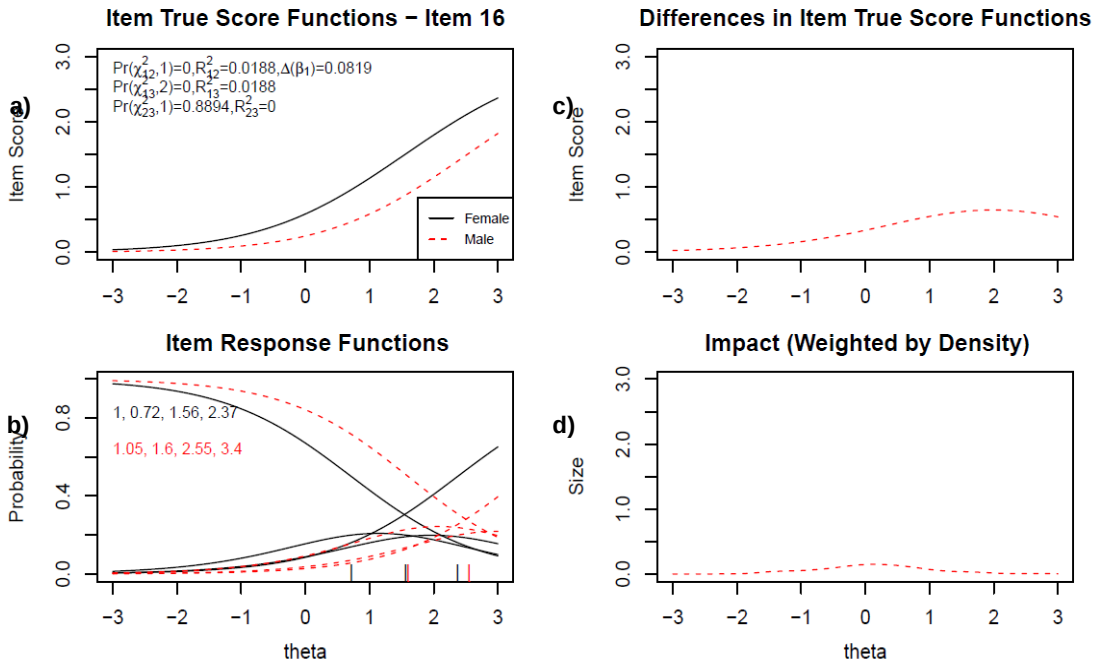

Figure A6. Graphical display of the item *'People will try to kidnap me'* which shows a uniform DIF with respect to gender. **a)** ICCs for both genders; **b)** Item response functions based on gender-specific item parameters; **c)** Absolute difference between the ICCs for both groups, indicating the difference is at moderate to higher levels of paranoia (theta); **d)** Absolute difference between the ICCs weighted by the score distribution for the focal group (i.e. males), indicating minimal impact.

Population DIF analysis: Test characteristic curves

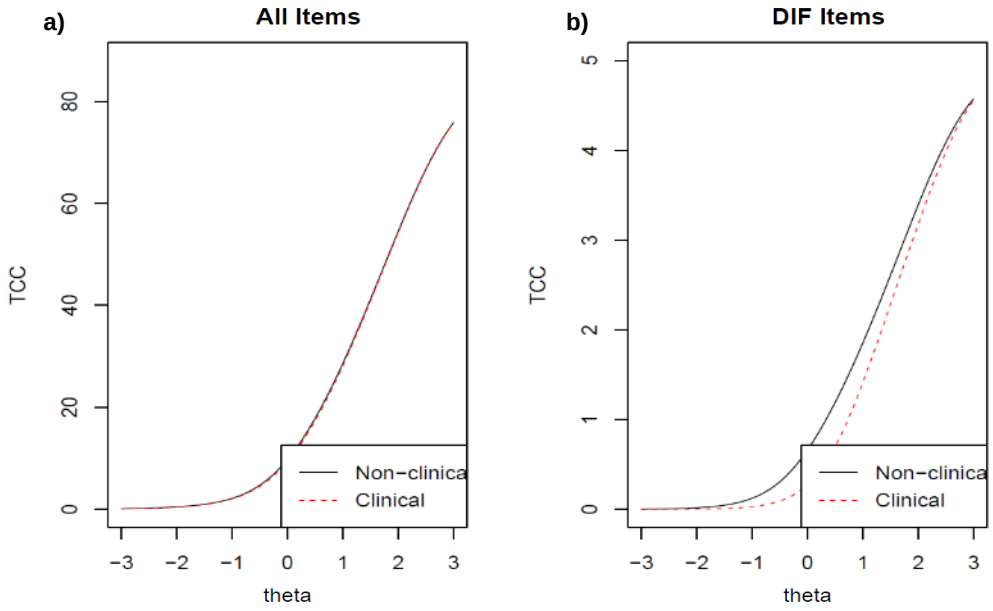

Figure A7. Impact of DIF item on the TCCs. **a)** TCCs of all items for the non-clinical and clinical groups; **b)** TCCs for the subset of items found to have DIF between the two population groups. At the overall test level, these curves suggest a minimal difference in the total expected score across the paranoia (theta) spectrum between the non-clinical and clinical groups.

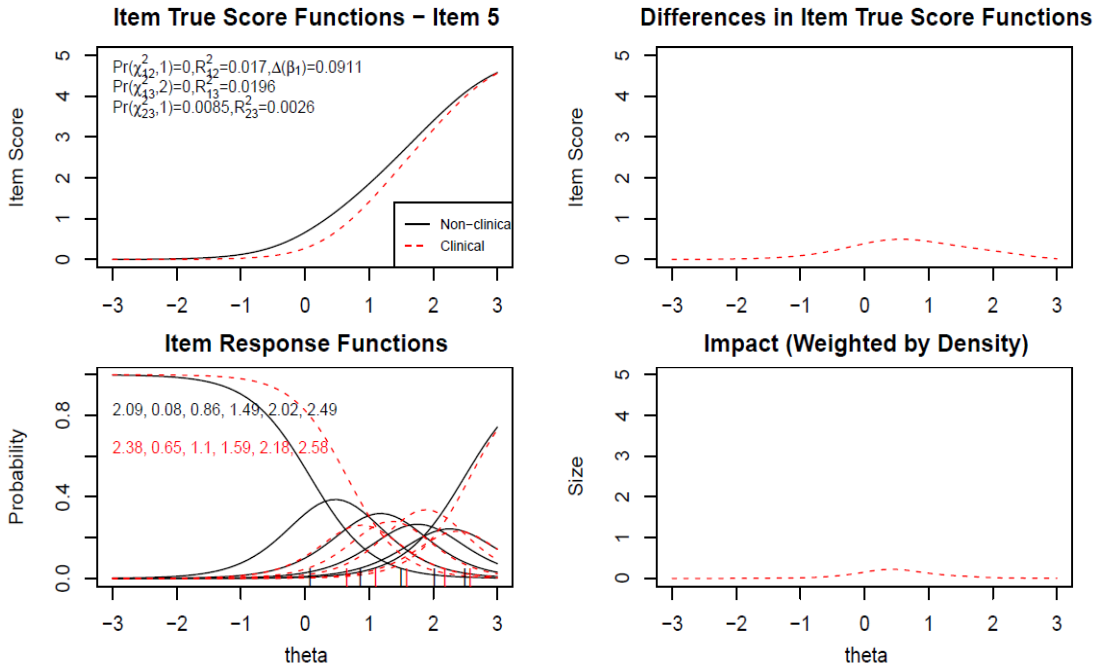

Figure A8. Display of the item '*People are trying to embarrass me in class on purpose*' showing a uniform DIF with respect the population group. **a)** ICCs for both population groups; **b)** Item response functions based on population-specific item parameters; **c)** Absolute difference between the ICCs for both groups, indicating the difference is at moderate levels of paranoia (theta); **d)** Absolute difference between the ICCs weighted by the score distribution for the focal group (i.e. clinical sample), indicating minimal impact.

Appendix H

Item Information Plots (Chapter 3)

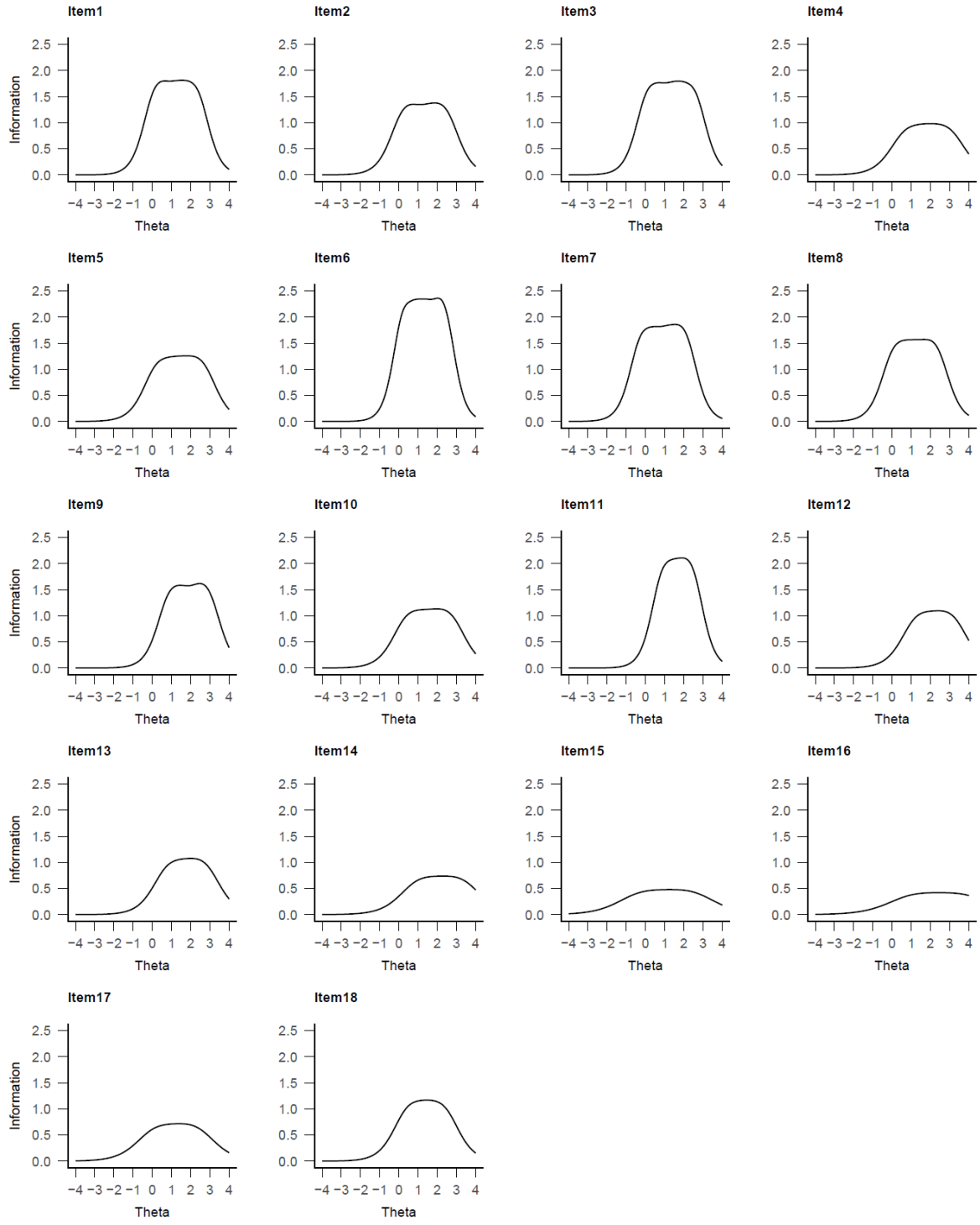

Figure A9. Item information curves for all 18 items.

Appendix I

Published paper in Schizophrenia Bulletin (Chapter 4)

Schizophrenia Bulletin
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Adolescent Paranoia: Prevalence, Structure, and Causal Mechanisms

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Background: **Adolescence can be a challenging time, characterized by self-consciousness, heightened regard for peer acceptance, and fear of rejection. Interpersonal concerns are amplified by unpredictable social interactions, both online and offline. This developmental and social context is potentially conducive to the emergence of paranoia. However, research on paranoia during adolescence is scarce.** ***Method:*** **Our aim was to examine the prevalence, structure, and probabilistic causal mechanisms of adolescent paranoia. A representative school cohort of 801 adolescents (11–15 y) completed measures of paranoia and a range of affective, cognitive, and social factors. A Bayesian approach with Directed Acyclic Graphs (DAGs) was used to assess the causal interactions with paranoia.** ***Results:*** **Paranoid thoughts were very common, followed a continuous distribution, and were hierarchically structured. There was an overall paranoia factor, with sub-factors of social fears, physical threat fears, and conspiracy concerns. With all other variables controlled, DAG analysis identified paranoia had dependent relationships with negative affect, peer difficulties, bullying, and cognitive-affective responses to social media. The causal directions could not be fully determined, but it was more likely that negative affect contributed to paranoia and paranoia impacted peer relationships. Problematic social media use did not causally influence paranoia.** ***Conclusions:*** **There is a continuum of paranoia in adolescence and occasional suspicions are common at this age. Anxiety and depression are closely connected with paranoia and may causally contribute to its development. Paranoia may negatively impact adolescent peer relationships. The clinical significance of paranoia in adolescents accessing mental health services must now be established.**

Key words: directed acyclic graphs/persecutory ideation/psychosis/affective symptoms/youth mental health

Introduction

There is no age of greater feelings of social vulnerability than adolescence. Friendships are often transient, bullying is all-too-common, and online social media provides a source of social comparison, ambiguous interactions with others, and opportunity for criticism.[1,2] During this period of developmental change adolescents become more attuned to the intentions of others, aware of how others perceive them, and hypersensitive to potential rejection.[3] Peer relationships seem unpredictable and avoiding social rejection becomes a primary motivator of behavior.[4] The social world may feel increasingly uncertain and to some adolescents potentially hostile. In this context, judgments about the intentions of other people may become skewed towards the negative. Paranoid thoughts that others are deliberately trying to harm you may follow.[5]

We set out to examine the prevalence, structure, and causal mechanisms of paranoia at this key developmental stage. A small number of previous studies indicate paranoid thoughts are common and continuously distributed in adolescents, with approximately a quarter reporting frequent suspicions.[6,7] As shown in adults a hierarchy of paranoia is likely to occur where severe ideas of threat build upon common social concerns.[8,9] Yet little is known about the content of paranoid thoughts during adolescence. Even less is known about causal factors. Contributory causal mechanisms identified in a theoretical model of paranoia in adults include negative affect, worry, negative self-beliefs, sleep dysfunction, and safety-seeking behaviors.[5] Negative social experiences further influence the likelihood that persecutory ideas will take hold.[10] These suspicions will likely reflect the social context of adolescence, which for many young people occurs online to variable degrees. Preliminary research suggests addictive internet use[11,12] and emotional reactivity to social media is associated with higher paranoia in young people.[13] Engaging with social information online in ways

0.06, and a Standardized Root Mean Square Residual (SRMR) of < 0.08.[33]

For DAGs analysis participants who did not finish the questionnaires, or had 1 or more entirely missing questionnaires, were excluded (n = 59). With a missing at random[34] assumption for remaining participants, multiple imputation was conducted for each questionnaire using the mice package.[35] Five imputed datasets were created. The analysis was conducted using the total scores for every variable within each of these 5 datasets and the results combined.

To examine the causal interactions with paranoia, we use a Bayesian method of causal discovery with DAGs. A DAG is a probabilistic graphical model representing conditional dependence relationships between sets of variables. Each variable is represented by a node, and pairs of nodes may be joined by a directed edge (→). A directed cycle, that is, a circular sequence of edges leading from a node back to itself, is not allowed. If there is an edge from A→B, we say A is a parent of B; this implies that after controlling for other parents, B remains dependent on A. If the graph is causally interpreted then A is a direct cause of B.[14] Conversely, the absence of an edge represents independence once earlier variables in the network are considered. Using Bayesian inference, it is possible to discover the most likely causal structure between variables from patterns observed in a given dataset. However, as distinct causal models can lead to the same patterns, it is not possible to learn all the causal links from observational data (see supplementary material 2 for details).

To determine which causal DAG structures were compatible with our data, we use Bayesian analysis to obtain a posterior probability distribution over the set of possible graphs. Following the method of Moffa et al,[10] we use the Partition Markov Chain Monte Carlo (MCMC) algorithm[36] to sample from this distribution in proportion to the probability for each possible graph. In other words, graphs with a better fit to the data (after accounting for model complexity) were selected most often. For a fair comparison between graphs with different structures, graphs were fitted using a multivariate normal distribution with an inverse Wishart prior distribution on the covariance matrix.[37] All variables were matched to the quantiles of a normal distribution. On this transformed dataset, we used the BiDAG package[38] to run partition MCMC for 10 million iterations on the 5 imputed datasets, thinned by a factor of 1000 to obtain 50 000 sample DAGs from the posterior distribution. We averaged over this sample to estimate the posterior probability of each edge in the network.

For each sampled graph, we also drew a sample from the posterior distribution of the covariance matrix. These were used, in conjunction with the graphs, to estimate the total causal effect of each variable on every other variable (supplementary material 2). The total effects comprise both direct effects (with other variables constrained) and indirect paths via other variables. Causal effects are expressed as z-scores with 90% credible intervals (CIs). For a significant causal effect to occur, a causal pathway must be present in one direction in at least 95% of non-zero sampled effects.

Results

Prevalence

Paranoid thoughts were commonly endorsed by adolescents, with weekly occurrence by item ranging from 7% to 32% (table 1). The mean number of paranoid thoughts endorsed was 3.26 (SD = 4.07). The total items endorsed followed a single, continuous distribution that closely fitted an exponential curve (r = .97; figure 1). The mean score for all 18 paranoia items was 12.5 (SD = 14.0). Girls reported significantly higher paranoia (mean = 15.8, SD = 15.0) than boys (mean = 8.25, SD = 10.9; $F(2,790) = 49.7$, $P < .001$). Paranoia was similar across age year groups with no interaction between age and gender ($F(5,790) = 1.07$, $P = .38$).

Sleep problems were notably prevalent with 42% (n = 334) in the clinical range for insomnia. Average levels of anxiety and depression were consistent with normative data,[20] although 11% (n = 91) scored above the RCADS clinical threshold. Adolescents in this clinically elevated subgroup (mean age = 13.5, SD = 1.05) were predominantly female (n = 65, 71%) and had substantially higher paranoia scores (mean = 31.2, SD = 18.7). Of those who responded (n = 779), 95% of participants (n = 736) reported using social media, with 81% (n = 629) using it every day. Of those who used social media, 41% used it for more than 4 hours per day (see supplementary material 1 for descriptive statistics).

Structure

Individual paranoia items were associated with endorsing 3.72–7.65 additional paranoia items (mean = 5.66, SD = 0.91). For each item, endorsement frequency was significantly correlated with the number of additional items endorsed (r = −.75, $P < .001$). In other words, those who endorsed rarer items reported more paranoid thoughts in total.

EFA identified a 3-factor structure of paranoia items explaining 51% of the variance. These factors were labeled social harm (8 items), conspiracy (5 items), and physical threat (5 items). Factor correlations were high (social harm and conspiracy r = .80; social harm and physical threat r = .66; conspiracy and physical threat r = .72). A 3-factor CFA model demonstrated excellent model fit with no modifications (χ^2 = 279.9, df = 132, $P < .001$, χ^2/df = 2.12, CFI = 0.96, TLI = 0.95, RMSEA = 0.053, SRMR = 0.045) (supplementary material 1). As shown in figure 2, a hierarchical factor model with identical fit

Table 1. Percentage Endorsement of Individual Paranoia Items in Last 2 Weeks

Item		0 (%)	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	At least Weekly (2+) (%)
Social harm								
1	I'm sure people are gossiping about me on social media	64	15	12	5	2	2	21
2	People at school are trying to make me feel unwanted	57	17	12	6	4	3	25
3	I am being pushed out of conversations on purpose	57	20	12	5	3	2	22
4	People are trying to embarrass me in class on purpose	57	22	11	5	2	2	20
5	My friends or partner are ignoring my messages to upset me	74	14	5	3	1	1	10
6	People are making sly comments to upset me	65	19	8	5	1	2	16
7	I think people are lying to me on purpose	46	24	15	7	4	4	30
8	People say things under their breath to wind me up	55	20	12	7	2	3	24
Conspiracy								
9	Nasty tricks are being played on me	79	13	6	1	0	1	8
10	People are trying to confuse me on purpose	66	18	9	4	2	2	17
11	Groups of people are planning against me	81	10	4	2	1	3	10
12	People are collecting my information or photos to use against me	83	10	4	1	1	1	7
13	I'm sure people are seeking revenge on me	75	14	5	2	1	3	11
Physical threat								
14	I feel like I am being followed or stalked	75	13	7	3	1	1	12
15	I am scared of what strangers will do to me	44	23	13	8	4	7	32
16	People will try to kidnap me	74	11	7	4	1	2	14
17	I could be attacked at any time	57	20	9	6	2	6	23
18	I feel unsafe around people everywhere I go	68	13	8	4	3	3	19

Note: 0 = never; 1 = once, 2 = couple of times; 3 = few times a week, 4 = everyday; 5 = all the time. At least weekly endorsement is a score of 2 ("couple of times") or above.

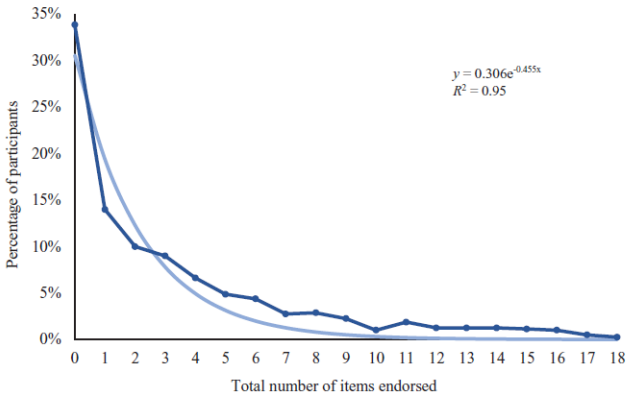

Fig. 1. Distribution of total paranoia items endorsed in adolescents fitted against an exponential curve.

indices included a general paranoia factor that strongly predicted the 3 subordinate factors (0.77–0.93).

Causal Mechanisms

Figure 3 shows the average of the 50 000 sampled DAGs. The edge color intensity represents the proportion of sampled graphs in which that edge was present. For clarity, only edges present in over 50% of graphs are displayed. Directed edges (→) represent significant direct causal effects where that orientation occurred in over 90% of cases in which an edge was present. Undirected edges depict relationships where this threshold for a consistent causal direction was not met. In these cases, an edge between 2 variables occurred frequently, indicating high certainty that there is a direct causal dependence between them, but that either direction could be plausible from the data.

All affective, cognitive, and social variables were significantly correlated with paranoia (supplementary material 1). However, the DAG analysis identified a complex network of interactions. Once the contribution of other variables was controlled, there was high certainty paranoia

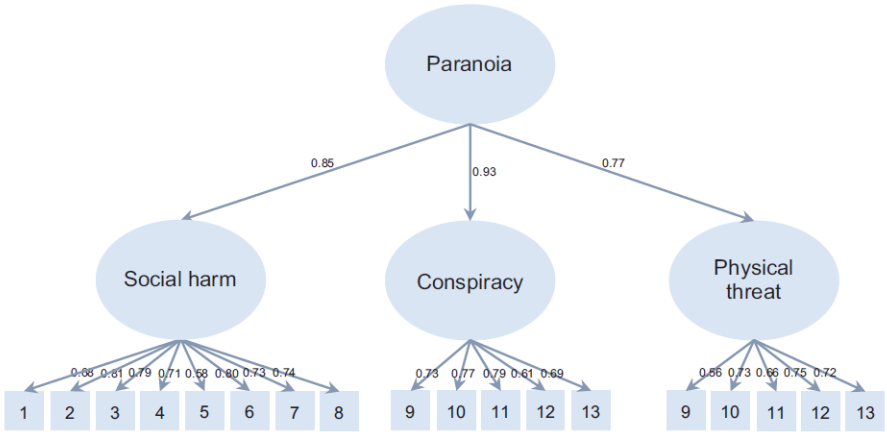

Fig. 2. Second-order 3-factor model of paranoia items.

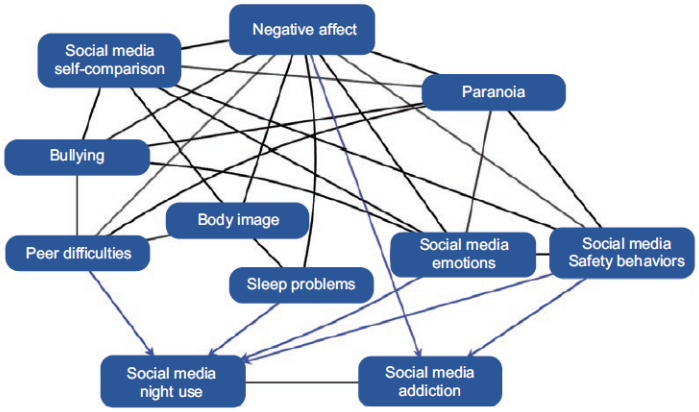

Fig. 3. Directed Acyclic Graph (DAG) of relationships between paranoia and emotional, cognitive, and social variables. Directed edges (→) indicate significant causal effect.

had direct causal relationships with negative affect, peer difficulties, bullying, social media safety-seeking behaviors, negative comparison on social media, and emotional reactivity to social media (figure 3). However, the direction of these relationships was not well identified, as represented by the undirected edges. The proportion of sampled DAGs containing a causal pathway from each variable to paranoia and vice versa, with the average total causal effects (z_t), is shown in table 2. The proportion of cases where the observed effect is direct (as opposed to indirect through other variables), and the size of the direct effect (z_d), is shown for each orientation.

A direct effect between paranoia and negative affect was present in all samples, indicating a causal relationship was highly likely. Although the direction was uncertain, a pathway from negative affect → paranoia occurred in 70% of graphs, suggesting a likely causal contribution of negative affect. However, the reverse direction was also plausible with this orientation occurring in the remaining 30% of graphs. Regardless of direction, the size of the causal effects for negative affect were the largest of all the variables in the network.

Body image concerns and sleep difficulties were conditionally independent of paranoia, represented by the lack of an edge in figure 2. Although pathways were often identified between paranoia and both body image and sleep difficulties, direct causal effects were small and infrequent (table 2). A zero causal effect was observed between paranoia and body image and sleep difficulties in 9% and 30% of graphs respectively, highlighting greater uncertainty in

Table 2. Average Causal Effects Between Paranoia and all Other Variables

Causal Effects	Pathway Present	Total *z*	90% CI	Direct Present	Direct *z*	90% CI
Variable to paranoia						
Negative affect	70%	0.57	0.39–0.72	100%	0.43	0.32–0.63
Body image	46%	−0.21	−0.49 to −0.01	44%	−0.05	−0.15–0.00
Sleep	23%	0.19	0.00–0.46	38%	0.03	0.00–0.10
Peer difficulties	18%	0.21	0.07–0.49	99%	0.15	0.06–0.44
Bullying	46%	0.40	0.22–0.68	100%	0.29	0.20–0.57
SM night use	1%	0.03	−0.01–0.10	3%	0.00	0.00–0.00
SM addiction	1%	0.07	0.00–0.41	54%	0.03	0.00–0.09
SM safety behaviors	40%	0.39	0.19–0.67	100%	0.26	0.16–0.44
SM self-comparison	62%	0.38	0.10–0.67	73%	0.16	0.00–0.40
SM emotion reactivity	47%	0.27	0.06–0.64	80%	0.15	0.00–0.38
Paranoia to variable						
Negative affect	30%	0.59	0.41–0.76	100%	0.48	0.36–0.72
Body image	45%	−0.26	−0.51 to −0.02	24%	−0.04	−0.23–0.00
Sleep	47%	0.25	0.00–0.48	21%	0.02	0.00–0.13
Peer difficulties	82%	0.28	0.15–0.44	99%	0.22	0.12–0.32
Bullying	54%	0.42	0.28–0.64	100%	0.35	0.25–0.54
SM night use	94%	0.10	−0.04–0.38	1%	0.00	0.00–0.00
SM addiction	92%	0.14	−0.02–0.43	14%	0.01	0.00–0.11
SM safety behaviors	60%	0.37	0.19–0.63	100%	0.26	0.17–0.41
SM self-comparison	37%	0.36	0.07–0.61	72%	0.17	0.00–0.45
SM emotion reactivity	51%	0.30	0.06–0.59	79%	0.16	0.00–0.37

Note: "Pathway present" = the proportion of DAGs sampled where that pathway occurred; "Total *z*" = average total causal effect when that pathway was present; "Direct present" = when that pathway occurred, the proportion of cases where the effect was direct; "Direct z" = the average size of the direct effect; CI = credible interval. SM = social media.

their direct relationship. Notably, young people scoring above the cutoff for insomnia (n = 334) had significantly higher paranoia (mean = 18.4, SD = 16.6) compared to the rest of the sample (mean = 7.24, SD = 8.36; $t(442.2) = 11.0$, $P < .001$). Although this highlights the clear relationship between sleep problems and paranoia ($r = .45$, $P < .001$), their independence in the DAGs indicates the association was sufficiently explained by other variables, most notably negative affect (figure 3).

Paranoia and peer difficulties were dependent on each other in 100% of cases and a direct effect was nearly always present (99%). The direction was not certain; however, paranoia was more likely to contribute to peer difficulties with this orientation occurring in 82% of sampled DAGs. Although a direct relationship between paranoia and bullying was always present, the direction was very uncertain: a pathway from paranoia → bullying occurred in 54% of graphs and the reverse direction occurred in the other 46%.

Despite moderate correlations with social media addiction ($r = .42$, $P < .001$) and night use ($r = .34$, $P < .01$), causal pathways from these measures to paranoia occurred in only 1% of sampled DAGs with negligible total causal effects ($z_t < 0.1$). This suggests high certainty that problematic social media use did not have a causal effect on paranoia. Although a causal pathway in the reverse direction occurred in 92% and 94% of samples for social media addiction and night use, these were primarily indirect with negligible direct effects ($z_d < 0.01$). Notably, these social media use variables were significantly caused by several factors, including negative affect, peer difficulties, sleep problems, social media emotional reactivity, and social media safety-seeking behaviors, represented by the directed edges in figure 2.

The DAGs analysis identified dependant relationships between paranoia and cognitive-affective responses to social media, although the directions were uncertain. The strongest effect was for threat-focused safety-seeking behaviors where both an edge and a direct causal effect were always present. Paranoia contributed to online safety-seeking behaviors (60%) more often than the reverse orientation (40%). In almost all cases there was a pathway in either direction between paranoia and both negative self-comparison (99%) and emotion reactivity to social media (98%). However, there was a larger indirect contribution to these relationships with less certainty in the direct effects, represented by the CIs including zero and an increased proportion of cases where the causal effect was indirect.

Discussion

Prevalence and Structure

Our findings are consistent with the view that adolescence can be a socially challenging time, highlighting mistrust of others may be part-and-parcel of daily life for a significant minority of adolescents. Many paranoid thoughts were occurring at least weekly for 20%–30% of the

adolescents. Thoughts of physical threat were common—almost a fifth felt unsafe everywhere around people and a third feared what strangers would do to them. There were also concerns about peers deliberately excluding them, making sly comments to wind them up, and lying to them on purpose. Conspiracy concerns were less frequent, with 10% thinking groups of people were plotting against them. Rarer paranoid ideas occurred alongside more common items, replicating a hierarchical structure of paranoia seen in adults whereby extreme fears about others build upon normal social concerns.[8,9] Girls reported significantly higher levels of paranoia than boys in this sample; this gender difference is consistent with evidence that adolescent girls can be less trusting,[39] more sensitive to potential social exclusion,[40] and more socially anxious than boys.[41] Like experiences such as anxiety and depression, the overall incidence of paranoia followed a single, continuous distribution. Clinical paranoia would likely represent a quantitative shift along this continuum, characterized by more frequent and persistent suspicions that impair functioning. Such paranoid thoughts in adolescents are likely antecedents of persecutory delusions.[5]

Causal Mechanisms

We used an innovative Bayesian approach using DAGs to examine the causal mechanisms of paranoia during adolescence. In our analysis, we found likely direct causal relationships between paranoia and negative affect, peer difficulties, bullying, and cognitive-affective responses to social media. While the direction of these effects was uncertain, examining the probability of each direction within our data allowed a tentative understanding of causal patterns.

There was a robust interaction between negative affect and paranoia in adolescents. Affective symptoms had the strongest relationship with paranoia and showed high certainty for a direct causal effect. Although both directions were plausible, negative affect was more likely to causally contribute to paranoia than vice versa. The uncertainty in the direction may be expected given evidence of a reciprocal interaction between negative affect and paranoia over time.[42] Yet the likely causal contribution of negative affect is consistent with evidence from adults[15,43] and previous findings that anxiety, worry, and depression predict paranoia persistence in a clinical sample of adolescents.[13] This suggests affective processes may be particularly promising intervention targets for adolescent paranoia.

Paranoia was highly correlated with both body image concerns and sleep problems, but they were conditionally independent once other variables were controlled. Examination of the total causal effects (including both direct and indirect pathways) showed paranoia and body image concerns likely causally influenced each other, but mostly indirectly through other variables such as negative affect and negative self-comparison on social media. Similarly, a causal pathway between paranoia and sleep difficulties was probable, but this occurred primarily via a shared contribution of negative affect. This is in line with experimental evidence that the impact of impaired sleep on paranoia is almost fully mediated by negative affect.[44] Treating disrupted sleep is a method of reducing paranoia,[17] which may largely be explained via the mechanism of improving mood.

There was a direct interaction between paranoia and certain social factors in the adolescents. Although paranoia had a strong direct relationship with bullying, either causal direction was equally plausible. This is consistent with the DAGs analysis of Moffa et al[10] which could not determine directionality without the prior assumption that bullying was antecedent to paranoia. Our findings suggest this assumption may not hold for cross-sectional associations. Rather than a direct causal relationship, a shared genetic propensity that increases an individual's vulnerability to both being victimized and endorsing unfounded paranoid ideas may be partly responsible for the association.[18] Another possibility is due to biased perceptions of threat, people experiencing paranoia may be more likely to incorrectly perceive hostility.[45] Our model found a stronger probability that paranoia causally contributed to peer difficulties than the other way around, with this direction occurring 82% of the time. As a sensitive period for social development,[3] the likely impact on peer relationships suggests recognizing and treating paranoia may be especially important during adolescence.

Social media was a frequent part of daily life for most of the adolescents. Although problematic social media use was moderately associated with paranoia, it did not causally contribute to paranoia or any other variable. Multiple intermediate variables accounted for the correlations between paranoia and social media addiction and excessive night use. Contrary to concerns of a detrimental causal role of social media on mental health,[46,47] problematic social media use was instead a consequence of existing psychological and social difficulties. However, our findings did suggest how young people respond to social content online may be important. Paranoia interacted with social media emotional reactivity, negative comparisons to others, and online safety-seeking behaviors. This is consistent with causal mechanisms highlighted in a cognitive model of paranoia,[5] and longitudinal evidence that emotional reactivity to social media maintains paranoia in adolescents.[13] A reciprocal causal relationship is likely, whereby paranoid fears activate these threat-focused cognitive processes that in turn bias threatening appraisals of social content, both online and offline, and maintain ongoing mistrust.[5]

As a time of heightened social processing and hypersensitivity to peer rejection,[3,48] adolescence may provide the psychological conditions upon which paranoia may

flourish. Yet the clinical significance of paranoia at this age is currently unclear. The prevalence of paranoid thoughts in this school cohort and close interaction with affective symptoms suggests paranoia will likely occur alongside common mental health problems in youth. Research assessing the clinical presentation of paranoia in adolescents accessing mental health services is now needed.

Limitations

There are clear limitations to our study. The use of a single school may limit the generalizability of our findings, and it is possible young people's responses were influenced by the presence of their peers. A potential concern with self-report paranoia questionnaires is whether they measure unfounded suspicions as opposed to genuine instances of hostility. Although a degree of measurement error is likely, experimental studies in adults show self-report measures are associated with unfounded paranoia in controlled virtual reality scenarios.[49] Furthermore, our measure was associated with participants' ratings that their fears of others are excessive.

Bayesian methods using DAGs are a significant progression upon commonly used statistical techniques for observational data. Within a network of variables, DAGs can obtain robust information about which variables are independent and which are causally related, with details of both the strength and likely direction of effects. Bayesian methods also improve the reliability of the identified network by quantifying the uncertainty in both the model selection procedure and estimation of parameters. As such, replication of the analysis in a similar dataset is likely to give consistent results. However, we must be cautious in drawing causal inferences from cross-sectional data. Indeed, causality using DAGs can only be inferred under strict assumptions. This includes an assumption of causal sufficiency where the variables measured are sufficient to control for confounding relationships. We must also assume faithfulness: that is, a complicated causal mechanism does not lead to an observationally simpler model "by chance."[14] A limitation of DAGs is they are unable to model the reciprocal relationships likely to occur within psychological and social constructs. The assumption within a DAG of "one true" causal direction may therefore obscure the complexity of these relationships. Dynamic network approaches with longitudinal data may be needed to decode reciprocal relationships that occur over time.[42] Despite these limitations, DAGs provide novel opportunities to generate robust causal hypotheses from observational data and identify testable intervention targets to reduce paranoia in adolescents.

Supplementary Material

Supplementary material is available at https://academic.oup.com/schizophreniabulletin/.

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The authors have declared that there are no conflicts of interest in relation to the subject of this study.

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Appendix J

Novel social media measures (Chapter 4)

Four novel social media measures were created for this study. This included: 1) night-time use of social media, 2) emotional reactivity to social media, 3) threat-focused online safety-seeking behaviours, and 4) negative self-comparison on social media. Items were generated for each measure via examination of the social media literature. Exploratory factor analysis (EFA) was then conducted to obtain a coherent set of items. The EFA was conducted as described in the method of Chapter 2. Only participants who reported using social media at least once a month were included in this analysis (n = 758).

Social media night use

The initial social media night use item pool consisted of 10 items. EFA was conducted on the 702 participants with no missing data on these 10 items. Confirming the appropriateness of factor analysis, Bartlett's test was significant (χ^2 = 1531.45, df = 15, p < 0.001) and the sampling adequacy was good (KMO= 0.79). The EFA identified a clean two-factor structure with 6 items that explained 55% of the variance. The two factors reflected frequency (3 items) and impact (3 items). Cronbach's alpha for the total score was 0.81.

"Over the past 2 weeks…"

1. How often have you used social media in the 2 hours before you get into bed?				
Never	*Once*	*Couple of times*	*Few times a week*	*Every night*
2. How often have you used social media whilst in bed before you go to sleep?				
Never	*Once*	*Couple of times*	*Few times a week*	*Every night*
3. How long do you usually spend on social media when you are in bed before sleeping?				
0-15 mins	*15-30 mins*	*30-60 mins*	*1-2 hours*	*3+ hours*
4. It is hard to stop using social media when I need to sleep				
Never	*Once*	*Couple of times*	*Few times a week*	*Every day*
5. Things on social media (e.g. posts, comments, photos, conversations) play on my mind when I'm trying to sleep				
Never	*Once*	*Couple of times*	*Few times a week*	*Every day*
6. Social media alerts wake me up when I'm sleeping				
Never	*Once*	*Couple of times*	*Few times a week*	*Every day*

Emotional reactivity to social media

The initial emotional reactivity to social media item pool consisted of 8 items. EFA was conducted on the 699 participants with no missing data on these 8 items. Confirming the appropriateness of factor analysis, Bartlett's test was significant ($\chi^2 = 3536.52$, $df = 28$, $p < 0.001$) and the sampling adequacy was excellent (KMO= 0.91). The EFA identified a single factor solution that explained 58% of the variance. Cronbach's alpha for the total score was 0.89.

"How often have you felt these emotions whilst using social media in the last 2 weeks?"

		Never	Once	Couple of times	Few times a week	Every day	All the time
Sad	=	0	1	2	3	4	5
Angry	=	0	1	2	3	4	5
Scared	=	0	1	2	3	4	5
Embarrassed	=	0	1	2	3	4	5
Guilty	=	0	1	2	3	4	5
Worried	=	0	1	2	3	4	5

Negative self-comparison on social media

The initial negative self-comparison on social media item pool consisted of 9 items. EFA was conducted on the 694 participants with no missing data on these 9 items. Confirming the appropriateness of factor analysis, Bartlett's test was significant ($\chi^2 = 6839.1$, $df = 36$, $p < 0.001$) and the sampling adequacy was excellent (KMO= 0.93). Two items were deleted due to theoretical content. EFA with the remaining 7 items identified a two-factor solution that explained 83% of the variance. The two factors reflected attractiveness and likeability. Cronbach's alpha for the total score was 0.96.

"When using social media in the past 2 weeks, how often have you had each of these thoughts?"

	Never	Once	Couple of times	Few times a week	Every day	All the time
I don't look as good as other people on social media	0	1	2	3	4	5
My body shape isn't as nice as other people on social media	0	1	2	3	4	5
I am not as attractive as other people I see on social media	0	1	2	3	4	5
Other people on social media have better social lives than me	0	1	2	3	4	5
I can't be as popular as other people I see on social media	0	1	2	3	4	5
I am not as likeable as other people I see on social media	0	1	2	3	4	5
I'm not as funny as other people I see on social media	0	1	2	3	4	5

Social media safety-seeking behaviours

The initial social media safety-seeking behaviours item pool consisted of 21 items. EFA was conducted on the 680 participants with no missing data on these 21 items. Confirming the appropriateness of factor analysis, Bartlett's test was significant (χ^2 = 7102.57, *df* = 210, $p <$ 0.001) and the sampling adequacy was excellent (KMO= 0.95). Six items were deleted due to low communalities < 0.3 and five items were deleted due to theoretical content. EFA with the remaining 10 items identified a single factor solution that explained 47% of the variance. Cronbach's alpha for the total score was 0.89.

"In the last 2 weeks whilst using social media, how often do you…"

	Never	Once	Couple of times	Few times a week	Every day	All the time
Watch closely how people react to my posts	0	1	2	3	4	5
Avoid posting anything in case people are nasty to me	0	1	2	3	4	5
Look for signs that friends have been lying to me	0	1	2	3	4	5
Be careful what I post so it can't be used against me	0	1	2	3	4	5
Check people's activity to work out if they are ignoring me	0	1	2	3	4	5
Avoid looking at people's profiles in case they find out	0	1	2	3	4	5
Look for signs that people are talking about me	0	1	2	3	4	5
Put smileys in my comments just so people don't get mad	0	1	2	3	4	5
Try to find out who has been looking at my profile	0	1	2	3	4	5
Avoid talking to other people in case they are mean to me	0	1	2	3	4	5

Appendix K

Correlation matrix between all variables (Chapter 4)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Paranoia	1													
2. Negative Affect (RCADS Total)	0.70	1												
3. Depression (RCADS)	0.66	0.93	1											
4. Anxiety (RCADS)	0.67	0.96	0.79	1										
5. Worry	0.56	0.76	0.68	0.75	1									
6. Body image	-0.48	-0.55	-0.60	-0.50	-0.50	1								
7. Sleep problems	0.45	0.60	0.63	0.53	0.45	-0.40	1							
8. Insomnia	0.49	0.65	0.67	0.58	0.47	-0.40	0.71	1						
9. SM Dependence	0.41	0.47	0.45	0.45	0.37	-0.30	0.41	0.43	1					
10. SM Safety behaviours	0.65	0.61	0.55	0.60	0.50	-0.40	0.38	0.39	0.49	1				
11. SM Negative comparison	0.59	0.64	0.62	0.60	0.56	-0.60	0.44	0.43	0.43	0.66	1			
12. SM Emotional reactivity	0.62	0.64	0.60	0.61	0.53	-0.40	0.40	0.45	0.48	0.65	0.59	1		
13. Peers difficulties	0.49	0.45	0.46	0.40	0.33	-0.40	0.33	0.34	0.25	0.37	0.39	0.38	1	
14. Bullying	0.61	0.56	0.52	0.53	0.47	-0.40	0.37	0.40	0.37	0.53	0.54	0.58	0.47	1

Appendix L

Bootstrap difference test (Chapter 4)

Table A6. Bootstrap edge difference test comparing the size of edges with paranoia

Node 1	Node 2	Lower CI	Upper CI	$p < 0.05$
Negative affect	Bullying	-0.18	0.05	FALSE
	SM Safety behaviours	-0.28	0.00	FALSE
	Peer difficulties	-0.33	-0.06	TRUE
	SM Emotional reactivity	-0.34	-0.09	TRUE
	Sleep problems	-0.37	-0.13	TRUE
	SM self-comparison	-0.36	-0.13	TRUE
	SM Dependence	-0.37	-0.15	TRUE
	Body image issues	-0.37	-0.14	TRUE
Bullying	SM Safety behaviours	-0.20	0.06	FALSE
	Peer difficulties	-0.25	-0.01	TRUE
	SM Emotional reactivity	-0.27	-0.04	TRUE
	Sleep problems	-0.29	-0.09	TRUE
	SM self-comparison	-0.28	-0.07	TRUE
	SM Dependence	-0.29	-0.10	TRUE
	Body image issues	-0.28	-0.10	TRUE
SM Safety behaviours	Peer difficulties	-0.18	0.07	FALSE
	SM Emotional reactivity	-0.21	0.04	FALSE
	Sleep problems	-0.22	-0.04	TRUE
	SM self-comparison	-0.22	0.00	TRUE
	SM Dependence	-0.23	-0.01	TRUE
	Body image issues	-0.22	-0.02	TRUE
Peer difficulties	SM Emotional reactivity	-0.16	0.10	FALSE
	Sleep problems	-0.18	0.03	FALSE
	SM self-comparison	-0.17	0.08	FALSE
	SM Dependence	-0.19	0.01	FALSE
	Body image issues	-0.18	0.05	FALSE
SM Emotional reactivity	Sleep problems	-0.14	0.07	FALSE
	SM self-comparison	-0.12	0.09	FALSE
	SM Dependence	-0.14	0.05	FALSE
	Body image issues	-0.14	0.07	FALSE
Sleep problems	SM self-comparison	-0.07	0.10	FALSE
	SM Dependence	-0.10	0.08	FALSE
	Body image issues	-0.09	0.09	FALSE
SM self-comparison	SM Dependence	-0.11	0.07	FALSE
	Body image issues	-0.11	0.08	FALSE
SM Dependence	SM Dependence	-0.08	0.09	FALSE

Appendix M

Causal effects from DAGS (Chapter 4)

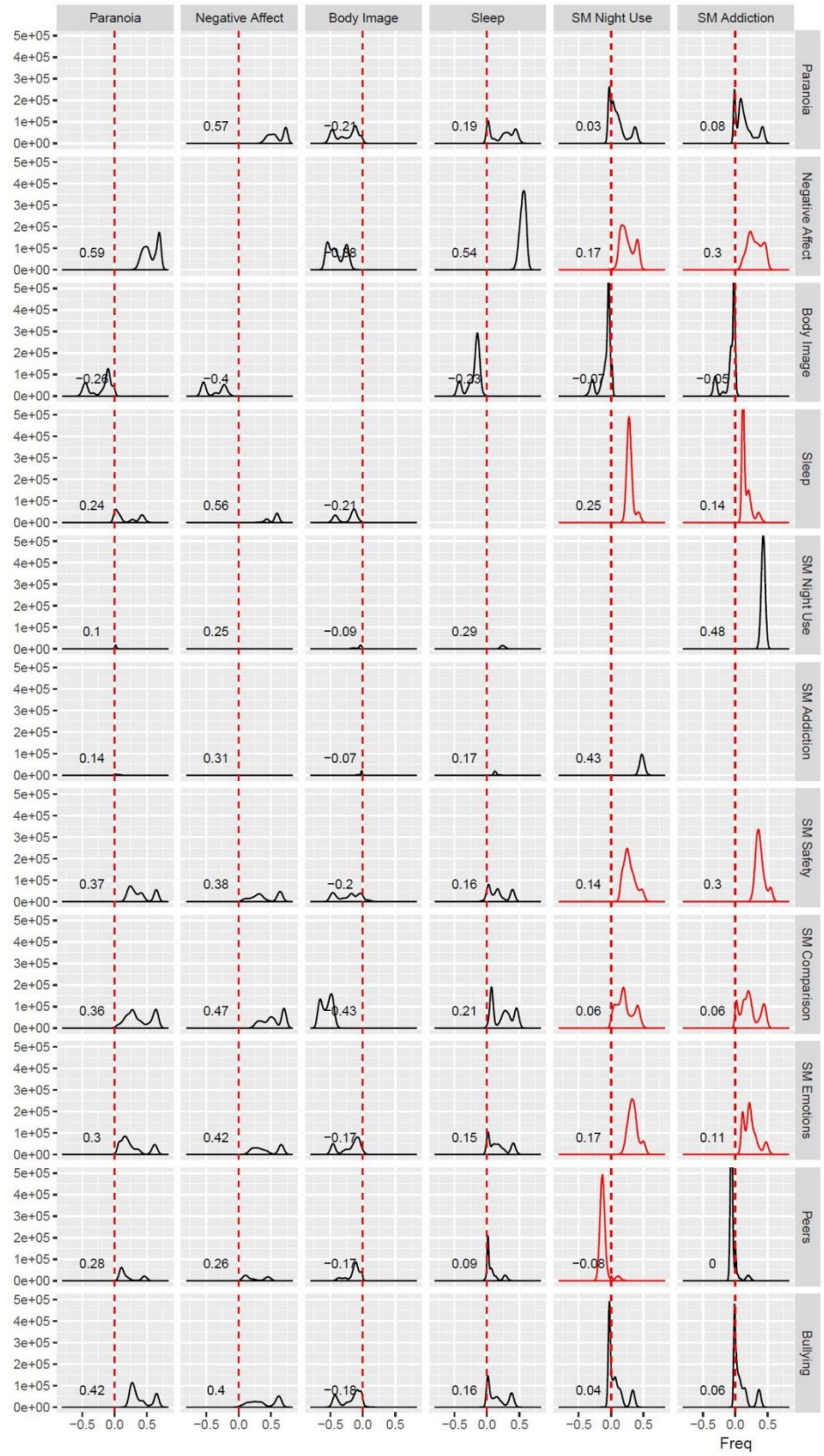

Fig A10. Plots of the average total causal effects for each variable on every other variable. z scores of the causal effect is shown on each plot. Red dotted line indicates zero causal effect. Red plots indicate a significant directed causal effect. (Part 1)

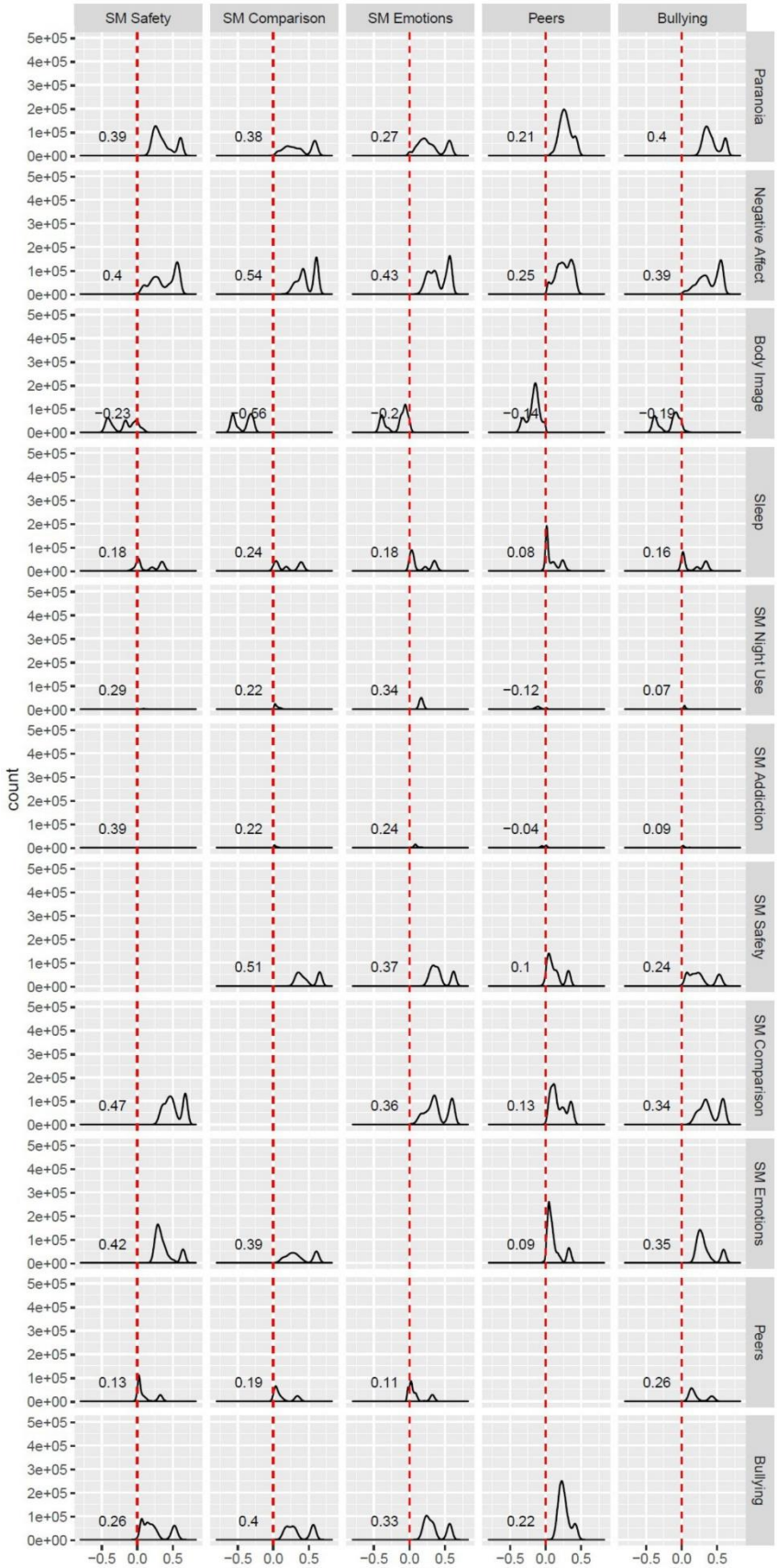

Fig A10. Plots of the average total causal effects for each variable on every other variable. z scores of the causal effect is shown on each plot. Red dotted line indicates zero causal effect. Red plots indicate a significant directed causal effect. (Part 2)

Appendix N

Published paper in Australian and New Zealand Journal of Psychiatry (Chapter 5)

Research

ANZJP

Australian & New Zealand Journal of Psychiatry
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Paranoia in patients attending child and adolescent mental health services

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Abstract

Objective: Paranoia may be particularly prevalent during adolescence, building on the heightened social vulnerabilities at this age. Excessive mistrust may be corrosive for adolescent social relationships, especially in the context of mental health disorders. We set out to examine the prevalence, symptom associations, and persistence of paranoia in a cohort of young people attending child and adolescent mental health services.

Method: A total of 301 patients (11–17 years old) completed measures of paranoia, affect, peer difficulties and behavioural problems. Clinicians also rated each participant's psychiatric symptoms. Patterns of association were examined using linear regressions and network analyses. In total, 105 patients repeated the measures several months later.

Results: Most of the adolescents had affective disorders ($n = 195$), self-harm/suicidality ($n = 82$), or neurodevelopmental conditions ($n = 125$). Few had suspected psychosis ($n = 7$). Rates of paranoia were approximately double compared with previous reports from the general population. In this patient sample, 35% had at least elevated paranoia, 15% had at least moderate paranoia, and 6% had high paranoia. Paranoia had moderate associations with clinician-rated peer difficulties, self-harm, and trauma, and small associations with clinician-rated social anxiety, depression, generalised anxiety, and educational problems. Network analyses showed paranoia had the strongest unique relationship with peer difficulties. Paths from peer difficulties to anxiety, self-harm, post-traumatic stress disorder symptoms, and behavioural problems were all via paranoia. Both self-harm and post-traumatic stress disorder were solely associated with paranoia in the network. Paranoia remained persistent for three-quarters and was associated with greater psychological problems over time.

Conclusion: Paranoia is relatively common and persistent across a range of clinical presentations in youth. When paranoia occurs alongside emotional problems, important peer interactions may be adversely affected. Wider consideration of paranoia in adolescent patients is needed.

Keywords

Youth mental health, psychotic experiences, delusions, emotional disorders, network analysis

Introduction

Paranoia – the unfounded idea that others deliberately intend harm – is one of the most prominent symptoms of psychotic disorders. Yet the clinical reality is that paranoia is rarely specific to psychosis, with evidence it occurs across a range of disorders (D'Agostino et al., 2019; Freeman et al., 2019a). Indeed, there is growing evidence that paranoia builds upon concerns about the self (e.g. social vulnerability, low self-esteem) and psychological processes (e.g. threat anticipation, worry) central to many emotional disorders (Freeman, 2016). In adolescence, an

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age when feelings of social vulnerability are typically heightened, paranoia may be especially prevalent (Bird et al., 2019; Ronald et al., 2014). Paranoia in adolescents is associated with a range of psychological difficulties including affective symptoms, peer difficulties, behavioural problems, and poor sleep (Bird et al., 2019; Taylor et al., 2015; Wigman et al., 2011; Zavos et al., 2014). Persistent paranoia has the potential to leave young people feeling unsafe in their daily lives, mistrustful in relationships, and isolated. The resulting effects on social relationships during this sensitive period for social interaction (Orben et al., 2020) could have far-reaching impact, with evidence that poor social functioning predicts the long-term persistence of psychiatric disorders in adolescence (Ford et al., 2017). To date, however, there has been extremely little detailed research on paranoia in clinical populations of youth.

There is a substantial literature showing psychotic experiences in general are common in adolescents accessing services, and, although transient for a number, the presence of such symptoms indicates a pluripotent risk for multiple psychiatric disorders and poor outcomes (Kelleher et al., 2012; McGorry et al., 2018). However, individual psychotic experiences such as paranoia, hallucinations, grandiosity, and cognitive disorganisation are separable phenomenon (found to be distinct in factor analytic studies) (e.g. Peralta and Cuesta, 1999; Ronald et al., 2014) that can occur independently of each other (e.g. Hermans et al., 2020) and that have a degree of aetiological difference (e.g. Garety et al., 2013; Zavos et al., 2014). Individual psychotic experiences will require a degree of difference in explanation and tailoring of treatment. The effects on day-to-day life may also vary – social relationships, for example, may be especially affected by paranoia due to the mistrust of others inherent in the cognitions.

In recent years, significant advances have been made in the treatment of persecutory delusions in adults by adopting a targeted focus on paranoia and its contributory causal factors (Freeman, 2016). Yet much of the adolescent literature has conceptualised psychotic experiences as a single construct, with individual symptoms primarily viewed as interchangeable indicators of psychosis risk. As a result, studies typically include measures that sum together a broad range of psychotic experiences into a total score, with individual domains often assessed to unequal degrees. Indeed, these measures typically include only one or two items for each psychotic experience, and, so, may have limited precision for detecting (and understanding) those symptoms. Much of the adolescent literature is also biased towards the assessment of hallucinations, which is often the only consistently defined construct across different measurement tools, and in many instances is used as a proxy for all psychotic experiences (e.g. Kelleher et al., 2017).

Here, we adopt a targeted approach: systematically assessing paranoia and potential correlates in a cohort of adolescents accessing UK Child and Adolescent Mental Health Services (CAMHS). We had three objectives. The first objective was to describe the prevalence of paranoia in this cohort using a measure specifically validated for adolescents and compare these rates to previous reports from the general population (Bird et al., 2019). The second objective was to examine the patterns of association between paranoia, psychiatric symptoms, and social functioning. To do this, the bivariate associations between paranoia and the presence of clinician-rated symptoms were first examined; then, network analysis was used to examine the unique relations with self-report and selected clinician-rated symptoms. Network approaches can statistically estimate complex systems of interaction (Borsboom and Cramer, 2013), therefore providing potential insights into the mechanisms linking paranoia with other difficulties. The final objective was to examine the persistence of paranoia in a subgroup of the cohort and its relationship with other difficulties over time.

Method

Participants

Over 15 months, adolescents (11–17 years) were recruited during routine clinical appointments at a Tier 3 outpatient CAMHS team and a Tier 4 adolescent inpatient unit based in Oxfordshire, UK. Both services were part of Oxford Health National Health Service (NHS) Foundation Trust. In the United Kingdom, Tier 3 CAMHS provide specialist multidisciplinary assessment and treatment for adolescents under 18 years with complex mental health problems and Tier 4 units provide highly specialist care for under 18s requiring admission for severe psychiatric problems and high levels of risk. Participants were invited to take part regardless of their reason for accessing services, clinical diagnosis, or current treatment. The only exclusions were a moderate/severe learning disability or inability to complete questionnaires in English. Informed parental consent and child assent (11–15 years) or consent (16–17 years) was obtained prior to taking part. The study received approval by an NHS Research Ethics Committee (Ref: 17/SC/0539).

Measures

The Bird Checklist of Adolescent Paranoia. The Bird Checklist of Adolescent Paranoia (B-CAP; Bird et al., 2019, 2020) is an 18-item self-report scale for adolescents that assesses the frequency of paranoid thoughts in the past fortnight. Items are rated on a 6-point scale (0=never, 5=all the time) with higher scores indicating higher paranoia. Three subtypes of paranoia are assessed within an overarching single construct: social harm, conspiracy ideas, and physical threat. The B-CAP has very good psychometric properties including strong reliability across the severity spectrum and measurement invariance for both age and gender in adolescents

(Bird et al., 2020). The B-CAP also demonstrates good concurrent validity with other measures of paranoia and adolescent's reports that their fears of others are excessive (Bird et al., 2019). We recently validated score ranges for the B-CAP where a score of 23+ indicates mildly elevated paranoia, 40+ indicates moderate paranoia, 54+ indicates high paranoia, and 71+ indicates severe paranoia (Bird et al., 2020).

The Revised Child Anxiety and Depression Scale. The Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) is a 47-item self-report questionnaire examining anxiety and depression in 8- to 17-year olds. Items are rated on a 4-point scale (0=never, 3=always) with higher scores indicating higher severity. Six subscales are produced: depression, panic, obsessive compulsiveness, generalised anxiety, social anxiety, and separation anxiety.

The Strengths and Difficulties Questionnaire. The Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001) is a 25-item mental health screening questionnaire for adolescents aged 11–17 years. Items are rated on a 3-point scale (0=not true, 2=certainly true), with higher scores indicating greater difficulties. Four problem subscales are derived comprising emotional symptoms, conduct problems, hyperactivity/inattention, and peer difficulties. An additional 'impact' score is derived from items concerning overall distress and social impairment (Goodman, 1999). The emotional symptoms domain was not included in the analysis due to the conceptual overlap with the RCADS.

The Current View. The Current View (Jones et al., 2013) is a practitioner-completed tool assessing a wide range of clinical difficulties. Here, we examined clinician ratings of the following psychiatric symptoms and indicators of social functioning: anxiety (separation, social, generalised, obsessive-compulsive disorder [OCD], panic, and agoraphobia), depression, deliberate self-harm, fluctuations in mood (bipolar), hallucinations/delusions (psychosis), post-traumatic stress disorder symptoms, substance abuse, conduct problems, emerging personality disorder, attention-deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), history of abuse/neglect, peer relationship problems, persistent family relationship problems, and current educational problems. All items were coded to indicate presence/absence of that problem, except for educational difficulties where the sum of two items rating severity of attendance and attainment problems on a 3-point scale was used.

Procedure

Participants completed the paranoia questionnaire alongside the routinely administered RCADS and SDQ. Clinicians involved in each participant's care (i.e. care coordinator or psychiatrist) completed a routine measure of current difficulties (i.e. Current View). All three routine measures were completed as part of participant's standard care. Case note diagnoses/presenting problems were obtained from the diagnosis section of participant's electronic records, recent clinical assessment/review letters, and discussion with care coordinators. The study involved an optional follow-up where the self-report questionnaires were repeated after at least 3 months for a subsample of participants who were contactable and agreed to do so. Follow-up questionnaires were completed at the clinic or online via a Qualtrics survey.

Statistical analysis

All analyses were conducted in R, version 3.6.1 (R Core Team, 2013). For each questionnaire, missing values were imputed using predictive mean matching for individuals with missing data for less than 20% of items. As the Current View items were examined individually as distinct variables, missing values were not imputed.

Prevalence. Paranoia prevalence was assessed with mean scores, item endorsement defined as a score of 2+ (i.e. 'couple of times' in past 2 weeks), and the proportion scoring above validated B-CAP thresholds (Bird et al., 2020). Paranoia scores were compared between genders using a *t*-test and the correlation between paranoia and age was examined.

Prevalence rates of paranoia in this sample were presented alongside previously reported mean scores and item endorsements on the B-CAP from a representative dataset of 801 adolescents aged 11–15 years (mean age=13.3, standard deviation [SD]=1.16, girls=410, boys=382, other gender=9) from a secondary school in the United Kingdom (Bird et al., 2019). Here, we report the proportion of adolescents from this school cohort who scored above recently validated B-CAP score ranges (Bird et al., 2020) to enable direct comparison with the clinical sample.

Clinical associations. The bivariate relationships between paranoia and the presence of clinician-rated difficulties were assessed using a series of linear regressions. We did not correct for non-normality in the residuals as linear regression models without normally distributed errors produce valid estimates in large samples (Schmidt and Finan, 2018). For eight variables, however, weighted least squares (WLS) regression was used to account for heteroscedasticity in the residuals (Romano and Wolf, 2017). Standardised beta (β) estimates are presented with 95% confidence intervals (CIs).

Network analysis was used to estimate the unique patterns of association between paranoia, self-report psychological problems, and the clinician-rated presence of two distinct symptoms with clinical relevance to paranoia:

deliberate self-harm and post-traumatic stress. In a network model, individual variables are represented by *nodes*, and pairs of nodes may be connected by an *edge* that indicates the presence of an association after conditioning on all other variables (Borsboom and Cramer, 2013). Consequently, the lack of an edge between two variables indicates an absence of a relationship once all other variables are known.

Due to the mixture of continuous and binary variables in our data, we estimated a Mixed Graphical Model (MGM) using the package 'mgm' (Haslbeck and Waldorp, 2020). Missing data was handled using listwise deletion, resulting in a sample of 218 participants with complete data on all 13 variables. To overcome potential sampling variation and limit the estimation of spurious edges, we used a regularisation technique with the Least Absolute Shrinkage and Selection Operator (LASSO; Tibshirani, 1996). The LASSO regularisation employs a penalty by limiting the sum of the partial correlation coefficients, leading to a shrinking of estimates with some becoming exactly zero (Epskamp and Fried, 2018). The degree of regularisation is controlled by the tuning parameter λ, selected using the extended Bayesian information criterion (EBIC). The EBIC hyperparameter is set between 0 and 0.5 to determine the extent to which a parsimonious model is preferred (Foygel and Drton, 2010), with higher values producing more cautious estimations. We used an EBIC hyperparameter of 0.3. Node predictability was also estimated to show the extent to which each node is predicted by its neighbouring nodes (i.e. those it shares an edge with); this represents the proportion of variance explained (R^2) for continuous variables and the proportion of correct classification (CC_{total}), or accuracy, for binary variables (Haslbeck and Waldorp, 2020). We also calculated the normalised accuracy (nCC) for binary variables which break down the CC_{total} to represent the additional contribution of connected nodes beyond what can be trivially predicted from the marginal intercept model (CC_{marg}) (Haslbeck and Waldorp, 2018).

Once estimated, the unique relations among the variables were visualised using the package 'qgraph' (Epskamp et al., 2012) in a weighted network model where the thickness and saturation of the edge colour represents the size of the relationship. Blue edges represent positive conditional dependence associations while red edges represent negative associations. The node predictability values are visualised by a shaded ring around each node. For the binary variables, these rings are split to represent the accuracy of the intercept model and the additional contribution of connected nodes. No minimum edge weight was set in the visualisation. The network layout was determined by the Fruchterman and Reingold (1991) algorithm, positioning the most strongly connected nodes in the centre. In a separate graph, the shortest paths between paranoia and every other variable were computed to highlight potential mediation pathways in the network. Calculated using Dijkstra's (1959) algorithm, the shortest path represents the fastest route to get from one node to another, taking the strength of edge weights along different possible routes into account. Edges not required for the shortest paths are suppressed, allowing a clear visualisation of the direct and indirect pathways between selected variables.

For all edges, 95% CIs were constructed using a non-parametric bootstrap with 1000 iterations in the package 'bootnet' (Epskamp et al., 2018). The bootstrap difference test was used to compare edge weights. Due to the regularisation, edge weights are biased towards zero and thus CIs cannot be interpreted as a significance test against zero (Epskamp et al., 2018).

Paranoia persistence. Follow-up data were collected for paranoia and the two other self-report measures in a subgroup of participants. Change in paranoia over time was examined using the effect size (ES) formula = M_{pre}-M_{post}/SD_{pre} and a Wilcoxon signed-rank test. Individual change in paranoia was examined using the reliable change index (RCI; Jacobson and Truax, 1991) where an RCI of ±1.96 indicates significant change. For the RCI calculation, the B-CAP Cronbach's α of 0.94 from the current sample was used. To examine the relationship between paranoia persistence and symptoms over time, participants were split into a persistent/increasing paranoia group (≥23 at both times, or ≥23 at either time point with non-significant RCI) and a low/transient paranoia group (≤22 at both times, or significant decreases to ≤22 at follow-up). Using the package 'lme4' (Bates et al., 2015), linear mixed-effects models were conducted for each symptom domain with fixed effects for paranoia group, time, and a group by time interaction, and a random effect for participants.

Results

Participant characteristics

A total of 301 adolescents took part (mean age=15.1, SD=1.75). There was a higher proportion of girls (n=184, 61%) than boys (n=117, 39%) and most were White British (n=240, 80%). Participants included 271 community CAMHS patients (mean age=15.0, SD=1.80, girls=164, boys=107) and 30 inpatients (mean age=16.0, SD=0.81, girls: n=20, boys: n=10). Adolescents were accessing services with a range of problems, although the most common were affective disturbances and neurodevelopmental conditions (Table 1). Seven participants had suspected psychosis and an additional four were noted to experience hallucinations alongside other difficulties. Beyond those who had suspected psychosis, paranoia was recorded as a presenting problem in the clinical records of only one participant.

Table 1. Primary presenting problem(s) for accessing CAMHS as recorded by participant's care team and mean paranoia scores for each problem.

	n	Percentage	Paranoia (SD)
Anxiety/depression	195	65	22.0 (19.8)
Emotion dysregulation, self-harm and suicidality	82	27	27.4 (19.5)
Autism spectrum disorder	79	26	21.4 (21.2)
Attention-deficit hyperactivity disorder	41	14	12.7 (13.2)
Anger/conduct problems	30	10	17.3 (16.7)
Disordered eating	24	8.0	21.2 (18.6)
Trauma	23	7.6	25.5 (19.7)
Sleep problems	20	6.6	21.6 (16.3)
Gender identity issues	8	2.7	19.2 (18.7)
Family relationship issues	8	2.7	17.8 (13.5)
Psychosis	7	2.3	26.1 (23.9)
Substance misuse	7	2.3	23.9 (17.4)
Tic disorders	5	1.7	19.8 (30.1)
Hallucinations[a]	4	1.3	23.8 (22.6)
Paranoia[a]	1	0.3	32.0 (NA)

SD: standard deviation; NA: not applicable; CAMHS: Child and Adolescent Mental Health Services.
[a]Occurring alongside other difficulties in participants without suspected psychosis.

Prevalence

Paranoid thoughts were common in this clinical sample, with item endorsement ranging from 14% to 54% (Table 2). The mean number of suspicions endorsed was 5.85 (SD = 5.17). Out of the 301 patients, 35% had at least mildly elevated paranoia, 15% had at least moderate paranoia, 6% had at least high paranoia, and 3% had severe levels of paranoia (Table 3). As shown in Tables 2 and 3, the rates of paranoia were approximately double those previously reported in a general population sample of adolescents.

Paranoia in the patient sample was significantly higher in girls than boys ($t = 4.08$, $df = 288.2$, $p < 0.001$), with 41% of girls reporting at least mildly elevated levels compared to 24% of boys. There was no relationship between age and paranoia ($r = 0.08$, $p = 0.16$). The 30 inpatients had somewhat higher paranoia scores overall (mean = 27.1, SD = 21.5) than the community patients (mean = 19.2, SD = 17.7), although this was not significant ($t = 1.93$, $df = 33.5$, $p = 0.062$).

Clinical associations

The clinician-rated Current View was completed for 272 participants (mean age = 15.0, SD = 1.77, girls: $n = 166$, boys: $n = 106$, outpatient: $n = 248$, inpatient: $n = 24$). Paranoia did not differ between those with and without Current View ratings ($t = 0.20$, $df = 35.3$, $p = 0.84$). A total of 275 participants completed either the RCADS or the SDQ (mean age = 15.1, SD = 1.75, girls: $n = 171$, boys: $n = 104$, outpatient: $n = 250$, inpatient: $n = 25$). Paranoia was slightly higher in those that completed either measure (mean = 20.3, SD = 18.5) than those who did neither (mean = 15.7, SD = 14.7), although this difference was not significant ($t = 1.60$, $df = 41.5$, $p = 0.12$).

Clinician-rated problems. Bivariate associations between paranoia and the presence of each clinician-rated problem are shown in Table 4. The presence of peer relationship problems had the strongest association with paranoia ($\beta = 0.64$, $p < 0.001$) and explained 11% of the variance in paranoia scores. The second largest association was for self-harm ($\beta = 0.55$, $p < 0.001$) which accounted for 7% of the variance in paranoia. Similar sized medium associations were also observed for post-traumatic stress symptoms ($\beta = 0.54$, $p = 0.001$) and a history of abuse/neglect ($\beta = 0.50$, $p = 0.013$), although only 4% and 2% of the variance in paranoia was explained by these factors, respectively. It was notable that of the 104 patients with at least elevated paranoia, 38 (37%) had clinician-rated trauma (post-traumatic stress or history of abuse/neglect). Depression and social anxiety showed small but significant associations with paranoia that each

Table 2. B-CAP item endorsement in CAMHS sample ($n = 301$) and previously reported weekly rates from the general population ($n = 801$).

	CAMHS							Non-clinical[a]
Item	0	1	2	3	4	5	Weekly+	Weekly+
1. People at school are trying to make me feel unwanted	135	33	68	37	17	11	44%	25%
2. I'm sure people are gossiping about me on social media	120	39	76	31	12	23	47%	21%
3. I am being pushed out of conversations on purpose	124	54	63	28	22	10	41%	22%
4. My friends or partner are ignoring my messages to upset me	177	49	32	21	12	10	25%	10%
5. People are trying to embarrass me in class on purpose	185	39	31	24	9	13	26%	20%
6. People are making sly comments to upset me	118	58	60	36	14	15	42%	16%
7. I think people are lying to me on purpose	93	44	74	47	19	24	54%	30%
8. People say things under their breath to wind me up	143	43	48	33	18	16	38%	24%
9. Nasty tricks are being played on me	216	32	30	14	1	8	18%	8%
10. People are trying to confuse me on purpose	164	40	48	19	15	15	32%	17%
11. Groups of people are planning against me	197	35	31	17	11	10	23%	10%
12. People are collecting my information or photos to use against me	237	21	23	7	4	9	14%	7%
13. I'm sure people are seeking revenge on me	201	36	30	17	8	9	21%	11%
14. I feel like I am being followed or stalked	212	23	26	18	9	13	22%	12%
15. I am scared of what strangers will do to me	124	50	45	35	22	25	42%	32%
16. People will try to kidnap me	193	42	26	22	11	7	22%	14%
17. I could be attacked at any time	132	54	43	21	25	26	38%	23%
18. I feel unsafe around people everywhere I go	149	46	37	20	23	26	35%	19%

CAMHS: Child and Adolescent Mental Health Services; B-CAP: Bird Checklist of Adolescent Paranoia.
[a]Endorsement rates as reported in Bird et al. (2019).

explained 6% of the variance. Small significant associations accounting for only 4% and 2% of the variance in paranoia were observed for educational difficulties and generalised anxiety, respectively. The presence of ADHD symptoms showed a small negative association that explained 2% of the variance in paranoia scores.

Table 3. Mean scores and proportions of CAMHS patients (n = 301) scoring above validated score thresholds compared to previously collected data from the adolescent general population (n = 801; Bird et al., 2019).

	CAMHS			General population		
	All	Girls	Boys	All[a]	Girls	Boys
Mean score (SD)	20.0 (18.2)	23.1 (19.4)	15.0 (14.9)	12.5 (14.0)	15.8 (15.0)	8.2 (10.8)
≤22 (average range)	197 (65%)	108 (59%)	89 (76%)	667 (83%)	314 (77%)	351 (92%)
23+ (mildly elevated+)	104 (35%)	76 (41%)	28 (24%)	134 (17%)	96 (23%)	31 (8%)
40+ (moderate+)	46 (15%)	34 (18%)	12 (10%)	52 (7%)	40 (10%)	8 (2%)
54+ (high+)	18 (6%)	15 (8%)	3 (3%)	16 (2%)	11 (3%)	3 (0.8%)
71+ (severe+)	10 (3%)	9 (5%)	1 (0.9%)	4 (0.5%)	2 (0.5%)	2 (0.5%)

CAMHS: Child and Adolescent Mental Health Services; SD: standard deviation.
[a]In the general population sample, 9/801 participants identified as 'other gender'. These participants were not included in the gender group comparison due to the limited sample size.

There was a small-medium association between the presence of clinician-rated psychosis (hallucinations/delusions) and higher paranoia ($\beta = 0.47$, $p = 0.061$, $R^2 = 0.01$). This was not statistically significant, most likely due to limited power with only 17 patients rated as having these symptoms; notably, nine of these (53%) had at least mildly elevated paranoia. Small associations that were not significant ($p > 0.05$) and each accounted for only 1% of the variance in paranoia were observed for substance abuse, emerging personality disorder, separation anxiety, family relationship problems, panic, conduct problems and OCD (Table 4). The associations between paranoia and agoraphobia, extremes of mood, eating problems, and ASD were of a negligible size ($\beta < 0.20$) and non-significant ($p > 0.05$).

Network analysis. The fully estimated network between paranoia, self-report psychological problems and selected clinician-rated symptoms is shown in Figure 1(a) (see supplement for 95% CIs of all edges). Once the contribution of all other variables was controlled, paranoia demonstrated the largest unique relationship with peer difficulties (edge weight = 0.35, 95% CI = [0.22, 0.47]). Figure 1(a) shows paranoia also had a key role in connecting peer difficulties with the rest of the network, with the paths from peer difficulties to four of the anxiety domains, behavioural problems, self-harm, and post-traumatic stress all occurring via paranoia.

Paranoia also demonstrated direct edges with self-harm (edge weight = 0.17, 95% CI = [−0.05,0.38]), conduct problems (edge weight = 0.17, 95% CI = [0.02, 0.31]), panic (edge weight = 0.14, 95% CI = [−0.01, 0.28]), post-traumatic stress (edge weight = 0.14, 95% CI = [−0.07, 0.36]), obsessive compulsiveness (edge weight = 0.11, 95% CI = [−0.03, 0.26]), and separation anxiety (edge weight = 0.08, 95% CI = [−0.05, 0.21]). The edge with peer difficulties was significantly larger than the edges with conduct problems, panic, obsessive-compulsiveness, and separation anxiety ($p < 0.05$) but not self-harm or post-traumatic stress. None of the other edges with paranoia were significantly different in size ($p > 0.05$; supplementary Table S2). A total of 56% of the variance in paranoia was explained by the direct edges with these seven variables (see supplementary Table S2 for predictability values of all nodes). The absence of edges in Figure 1(a) shows that paranoia was conditionally independent from depression, distress/social impairment, hyperactivity, generalised anxiety, and social anxiety, indicating primarily indirect relationships through other variables in the network.

The shortest paths from paranoia to all other variables in Figure 1(b) shows the direct relationship was the dominant pathway between paranoia and all seven variables for which an edge was present. The shortest path network then shows that the fastest route from paranoia to distress/social impairment was via peer difficulties, indicating a mediating role of peer difficulties in this relationship. Potential mediation pathways are also highlighted from paranoia to hyperactivity via conduct problems, and to depression, generalised anxiety, and social anxiety via panic.

Notably, paranoia was the only variable that both self-harm and post-traumatic stress had a unique association with once all other variables were controlled (Figure 1(a)). The normalised accuracy (i.e. predictability) values suggested the single edge with paranoia accounted for 22% of the remaining accuracy of self-harm beyond what was predicted by the intercept model (nCC = 0.22; $CC_{marg} = 0.51$; $CC_{total} = 0.62$). Conversely, the edge with paranoia did not lead to any increase in accuracy beyond the intercept model for post-traumatic stress (nCC = 0.00; $CC_{marg} = 0.75$; $CC_{total} = 0.75$).

Paranoia persistence

A total of 105 participants (mean age = 15.1, SD = 1.71, girls: n = 75, boys: n = 30) agreed to repeat the questionnaires several

Table 4. Associations between paranoia severity and the presence of clinician-rated problems.

Problem type	Clinician rating				Linear regressions			
	Absent		Present		β	95% CI	p	R^2
	n	Mean	n	Mean				
Social anxiety[a]	79	14.2 (13.7)	189	22.5 (19.4)	**0.45**	[0.23, 0.67]	**<0.001**	**0.06**
Separation anxiety	172	18.5 (17.0)	97	23.1 (20.5)	0.25	[0.00, 0.50]	0.050	0.01
Generalised anxiety	97	16.8 (17.4)	171	21.6 (18.7)	**0.26**	[0.01, 0.51]	**0.042**	**0.02**
OCD	220	20.8 (19.1)	49	17.1 (14.9)	–0.20	[–0.51, 0.11]	0.21	0.01
Panic	187	18.7 (18.2)	84	23.0 (18.7)	0.23	[–0.03, 0.49]	0.078	0.01
Agoraphobia	217	19.6 (18.1)	52	21.8 (19.3)	0.12	[–0.18, 0.43]	0.43	0.00
Depression[a]	75	13.9 (13.2)	197	22.4 (19.5)	**0.46**	[0.25, 0.68]	**<0.001**	**0.06**
Self-harm[a]	143	15.3 (14.3)	129	25.4 (20.8)	**0.55**	[0.31, 0.79]	**<0.001**	**0.07**
Eating problems	222	19.4 (18.6)	50	23.0 (17.3)	0.19	[–0.11, 0.50]	0.21	0.01
Psychosis	254	19.6 (18.1)	17	28.2 (21.6)	0.47	[–0.02, 0.96]	0.061	0.01
Bipolar	246	19.8 (18.6)	26	22.5 (16.4)	0.15	[–0.26, 0.55]	0.48	0.00
PTSD[a]	199	17.7 (16.9)	63	27.5 (20.6)	**0.54**	[0.22, 0.85]	**0.001**	**0.04**
Abuse or neglect[a]	221	18.6 (17.6)	43	27.9 (21.2)	**0.50**	[0.11, 0.89]	**0.013**	**0.02**
Conduct problems	218	19.3 (18.7)	52	23.2 (16.9)	0.22	[–0.09, 0.52]	0.16	0.01
Substance abuse	242	19.4 (18.5)	30	25.4 (16.4)	0.33	[–0.05, 0.71]	0.089	0.01
Emerging PD	208	18.9 (17.8)	62	23.6 (19.5)	0.25	[–0.03, 0.54]	0.080	0.01
Peer difficulties[a]	98	12.5 (13.3)	173	24.2 (19.5)	**0.64**	[0.42, 0.85]	**<0.001**	**0.11**
Family difficulties	111	17.6 (18.4)	157	22.0 (18.3)	0.24	[0.00, 0.48]	0.054	0.01
ADHD[a]	196	21.6 (19.2)	74	15.9 (15.4)	**–0.31**	[–0.55, –0.07]	**0.010**	**0.02**
ASD	172	19.6 (17.6)	93	21.0 (20.2)	0.08	[–0.18, 0.33]	0.56	0.00
Education problems[a]	–	–	–	–	**0.22**	[0.08, 0.36]	**0.002**	**0.04**

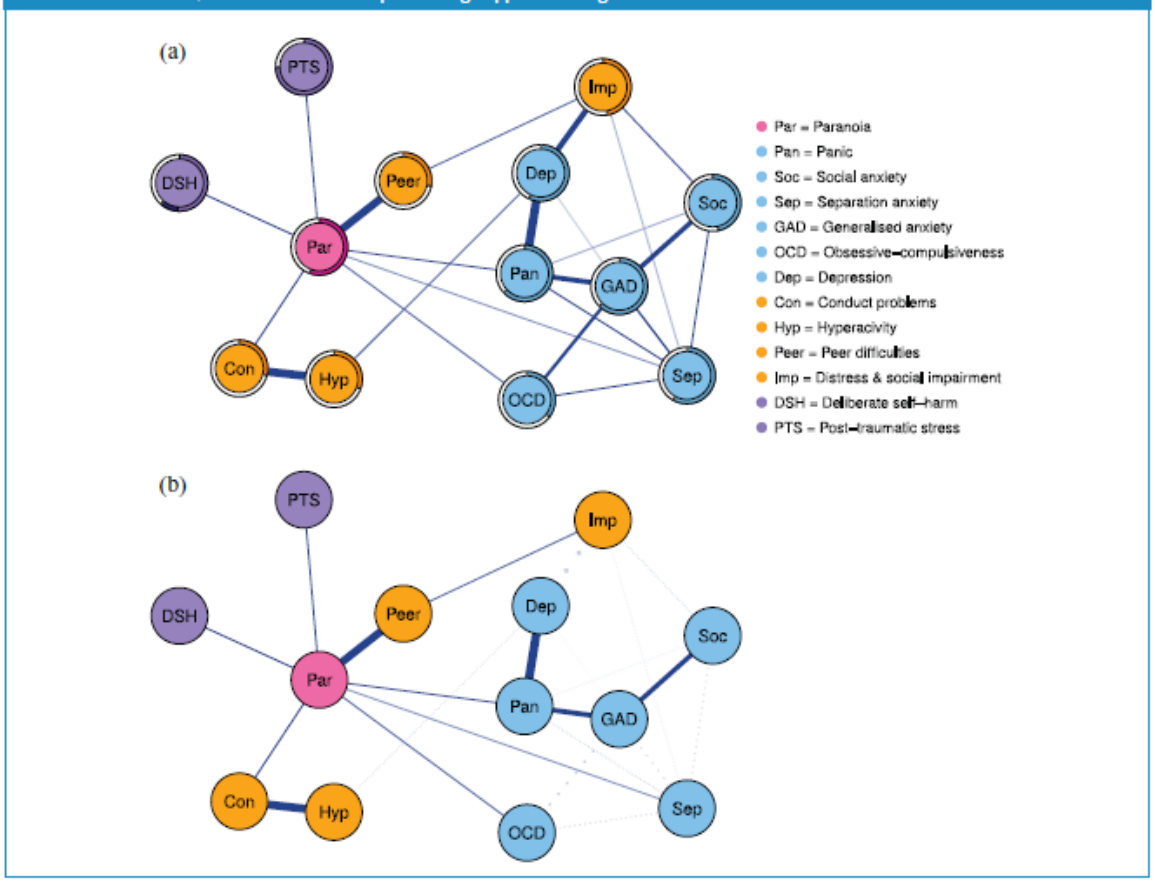
β: standardised beta; CI: confidence interval; OCD: obsessive-compulsive disorder; PTSD: post-traumatic stress disorder; PD: personality disorder; ADHD: attention-deficit hyperactivity disorder; ASD: autism spectrum disorder.
Mean paranoia scores shown with standard deviations in parentheses for those with and without each problem. Significant results highlighted in bold.
[a]Weighted least squares regression used due to heteroscedasticity in residuals.

months later (mean=21.3 weeks, SD=6.52). The difference in baseline paranoia between those with follow-up data (mean=22.6, SD=19.6) and those without (mean=18.6, SD=17.3) was small and not significant ($t=1.78$, $df=190.9$, $p=0.077$).

There was no overall difference in paranoia between baseline (mean=22.6, SD=19.6) and follow-up (mean=23.7, SD=19.4; $V=2296$, $p=0.73$, ES=0.06). On an individual basis, however, 18/105 participants had significant increases (RCI > 1.96) in paranoia and 16/105 had significant decreases (RCI < −1.96). Of the 46 participants with at least mildly elevated baseline paranoia, 30 had consistently elevated or increasing scores, 5 showed significant reductions that remained in the elevated range, and 11 had significant reductions into the average range.

Linear mixed-effects models showed that, compared to those with low/transient paranoia ($n=55$), across the two time points, participants with persistent/increasing paranoia ($n=50$) had consistently higher levels of depression (β=0.81, 95% CI=[0.45, 1.18], $p<0.001$), panic (β=0.75, 95% CI=[0.38, 1.12], $p<0.001$), social anxiety (β=0.75, 95% CI=[0.38, 1.11], $p<0.001$), generalised anxiety

Figure 1. (a) Network analysis of paranoia and other symptoms. Edges indicate positive associations and rings represent node predictability based on neighbouring nodes. Pink, blue, and orange rings (i.e. continuous variables) indicate R^2 values. For binary (i.e. purple) variables, the shaded rings represent the proportion of correct classification, split into the accuracy of the intercept model (purple section) and the additional contribution of connected nodes (dark blue section). (b) Shortest paths from paranoia to all other variables, with dashed lines representing suppressed edges.



(β = 0.74, 95% CI = [0.38, 1.10], $p < 0.001$), separation anxiety (β = 0.64, 95% CI = [0.26, 1.02], $p = 0.001$), peer difficulties (β = 0.63, 95% CI = [0.24, 1.01], $p = 0.002$), conduct problems (β = 0.50, 95% CI = [0.11, 0.90], $p = 0.014$), hyperactivity (β = 0.44, 95% CI = [0.04, 0.84], $p = 0.032$), and distress/social impairment (β = 0.62, 95% CI = [0.23, 1.01], $p = 0.0026$), but not OCD (β = 0.22, 95% CI = [−0.18, 0.63], $p = 0.28$).

There were small paranoia group by time interactions at the threshold for significance for generalised anxiety (β = 0.38, 95% CI = [0.02, 0.74], $p = 0.043$) and social anxiety (β = 0.34, 95% CI = [0.00, 0.68], $p = 0.052$), indicating those with persistent paranoia had somewhat less improvement in these symptoms compared to those with low/transient paranoia. Group by time interactions were negligible and non-significant for all other domains ($p > 0.05$; supplementary Table S4).

Discussion

The adolescents attending CAMHS were primarily doing so because they had emotional disorders such as anxiety and depression. This was to be expected. However, paranoia was common in these young patients, with several suspicious thoughts occurring in one-third to one-half of the clinical cohort. Over half of patients regularly thought people were lying to them on purpose, over 40% felt scared of what strangers would do to them, and 35% felt unsafe everywhere around people. Overall, 35% reported at least mildly elevated paranoia and 15% reported at least moderate paranoia. Rates of paranoia were approximately double those observed in adolescents from the general population (Bird et al., 2019). Previous findings that adolescent girls, compared to boys, may be especially likely to report suspicious thinking were replicated (Bird et al., 2019; Ronald

et al., 2014). Although traditionally conceptualised as a symptom of psychotic disorders, paranoia in this adolescent sample primarily occurred alongside common mental health problems and only a minority had suspected psychosis. Although limited in size, the available follow-up data indicated that the paranoia was often persistent. Yet paranoia may well be overlooked: only one participant had the presence of paranoia recorded in their clinical notes.

Paranoid thinking in the adolescent patients was associated with a wide range of clinician-rated problems including anxiety, depression, trauma, self-harm, peer relationship, and educational difficulties. Paranoia in CAMHS patients may therefore be expected to present in the context of emotional problems, adverse life experiences, and impaired social functioning. It may also be particularly common in young people who self-harm: elevated paranoia was present in almost half of patients for whom emotion dysregulation, self-harm, or suicidality was a primary reason for accessing services. Network analysis also showed that once all other variables were controlled, the presence of self-harm was solely associated with paranoia, with this edge contributing to 22% of the predictability of self-harm (beyond the intercept model). This relationship is consistent with findings from the adult literature (Freeman et al., 2019b) and evidence that self-harm is associated with psychotic experiences in general in adolescents (Hielscher et al., 2019; Martin et al., 2015). The co-occurrence of paranoia with so many different psychiatric symptoms could also be an indicator of more severe presentations, with adolescents who report persistent paranoia having greater levels of symptoms and social impairments over time.

Consistent with a cognitive conceptualisation of paranoia as an unfounded threat belief (Freeman, 2016), network analyses showed paranoia had unique associations with anxiety symptoms, especially panic. The network analysis further demonstrated a relationship between paranoia and post-traumatic stress symptoms. Once all other variables were controlled, the presence of post-traumatic stress symptoms was solely related to paranoia. This relationship is consistent with evidence that negative interpersonal experiences contribute to the development of paranoia (Freeman et al., 2013; Shevlin et al., 2015). It is important to emphasise, however, that justified fears of harm in relation to ongoing bullying or abuse is not paranoia (a term that only applies to unfounded ideas). Paranoia in those with adversity occurs when their concerns generalise excessively beyond specific experiences to the point they become clearly unfounded (e.g. when an individual with past bullying develops a persistent concern that people are conspiring to humiliate them and interprets friendliness from others as a trick). Although several mechanisms driving this generalisation are likely, one proposal is that negative experiences lead to learned beliefs about other people (i.e. as threatening) and the self (i.e. as vulnerable) upon which paranoia flourishes (Freeman, 2016). Paranoia can be an understandable protective response to a dangerous world, though this does not mean it is inevitable or that it is without negative consequences. But our findings also show paranoia is certainly not confined to traumatised youth: the trauma variables only accounted for a very small amount of the variance in paranoia and almost two-thirds of patients with paranoia did not have a (clinician-rated) history of trauma.

Arguably one of the most important findings from the study is a close relationship between paranoia and peer relationship difficulties. This association was the strongest of all those assessed from both clinicians and patients, even after controlling for the influence of all other variables in the network. Although the relationship will undoubtedly be bidirectional to a degree, our previous work using a Bayesian approach to causal discovery found adolescent peer difficulties are more likely to be influenced by paranoia than vice versa (Bird et al., 2019). This pathway is plausible, as the ability to trust is necessary for relationships, whereas fear of other people will make it difficult to socialise and make friends. We also found the most common pathway from emotional and behavioural problems to peer difficulties occurred via paranoia, suggesting paranoia may be a common route to impairments in adolescent peer relationships. At an age when peer acceptance is most highly valued (Somerville, 2013), the potential impact on friendships is likely to be a substantial cause of distress for young people. In line with this, peer difficulties were the mediating link connecting paranoia and the overall distress and functional impact of young people's problems.

Limitations

The study has several limitations. First, the sample was not a fully representative cohort. It was not possible to invite all patients accessing participating services to take part, since services could not be covered by the research team all the time. However, attempts were made to minimise sampling bias by inviting patients to take part regardless of their reason for accessing services or clinical diagnosis. The cohort also included a higher proportion of girls than boys, although this may be representative of CAMHS given the higher rates of common mental health problems in adolescent girls (NHS Digital, 2018). Nevertheless, the pattern of associations between paranoia and other variables could be influenced by gender, and, as a result, the network structure may have biased understanding towards girls. However, there is a lack of clear evidence showing the relationships between paranoia and causal factors differ by gender. Another notable source of sampling bias was the primarily affluent catchment areas for the services included with a local demographic of mostly White British individuals. As experiences such as racism and child adversity are likely to contribute to the development of paranoia (Bentall et al., 2012; Shaikh et al., 2016), clinical levels of paranoia in youth may differ by locality.

A strength of this study was the ability to compare the prevalence of paranoia in CAMHS patients with a representative general population sample of adolescents using the same measure. This was not a perfect comparison, however, as the general population sample were slightly younger than the patients in this study. But as age was not associated with paranoia in either sample, the effect of this difference on the comparison is likely to be minimal. Another limitation was that aside from the B-CAP, our other measures were missing for approximately 10% of participants. This reflected the reality of routine measurement in CAMHS where clinical pressures could prevent clinicians from completing the Current View and patients sometimes left before completing all questionnaires. Notably, as follow-up questionnaires were collected as an optional second stage of the study, only a third of the sample provided longitudinal data. Planned prospective studies examining paranoia in representative clinical samples will be needed to understand fully the relationship over time with other mental health problems.

It must also be acknowledged that a degree of measurement error is likely in self-report measures of paranoia. It is not possible in self-report questionnaires to determine if concerns about intended harm from others are unfounded. However, the B-CAP has shown good construct validity as a measure of unfounded ideation, with evidence that scores are distinct from bullying and are associated with adolescents' ratings that their fears of others are excessive (Bird et al., 2019, 2020). Evidence also shows that, in general, self-report paranoia questionnaires predict genuine paranoid ideation in controlled virtual reality settings (Freeman et al., 2010, 2014). Nevertheless, clinical interview validation of paranoia in young people accessing CAMHS would be beneficial.

Overall, this study highlights paranoia as a common, potentially clinically important, and overlooked problem in young people who are accessing mental health services. Greater awareness by clinicians of paranoia in patients attending CAMHS may be required. The use of validated tools such as the B-CAP may be helpful for clinicians to identify paranoia within young people's broader clinical presentation and monitor change. Targeted intervention for paranoia, suitably adapted for this age group, may then be appropriate to help young people feel safer in their daily lives.

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Author Contributions

J.C.B. led the research design, data collection, data management, statistical analysis, and manuscript preparation. E.C.F., M.K., C.S., A.-L.T., L.C., H.J.S. and A.C.J. contributed to data collection and management. D.F. and F.W. supervised the work and contributed to the design, theoretical interpretation, and writing. All authors contributed to the final version of the manuscript prior to submission.

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Supplemental Material

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Appendix O

Correlation matrix between all network variables (Chapter 5)

Table A7. Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Paranoia	1	0.55	0.46	0.5	0.49	0.44	0.43	0.27	0.21	0.51	0.38	0.28	0.23
2. Panic	0.55	1	0.6	0.64	0.71	0.52	0.7	0.09	0.17	0.23	0.48	0.24	0.15
3. Social anxiety	0.46	0.6	1	0.61	0.66	0.4	0.56	-0.04	0.06	0.28	0.47	0.2	0.08
4. Separation anxiety	0.5	0.64	0.61	1	0.67	0.57	0.52	0.06	0.14	0.33	0.46	0.07	0.13
5. Generalised anxiety	0.49	0.71	0.66	0.67	1	0.59	0.59	0.06	0.15	0.24	0.45	0.21	0.14
6. Obsessive compulsiveness	0.44	0.52	0.4	0.57	0.59	1	0.41	0.13	0.19	0.13	0.31	0.12	0.16
7. Depression	0.43	0.7	0.56	0.52	0.59	0.41	1	0.14	0.33	0.31	0.6	0.31	0.08
8. Conduct problems	0.27	0.09	-0.04	0.06	0.06	0.13	0.14	1	0.52	0.17	0.26	0.11	0.06
9. Hyperactivity	0.21	0.17	0.06	0.14	0.15	0.19	0.33	0.52	1	0.12	0.31	0	0.03
10. Peer difficulties	0.51	0.23	0.28	0.33	0.24	0.13	0.31	0.17	0.12	1	0.37	0.17	0.13
11. Impact (distress/impairment)	0.38	0.48	0.47	0.46	0.45	0.31	0.6	0.26	0.31	0.37	1	0.2	0.09
12. Self-harm	0.28	0.24	0.2	0.07	0.21	0.12	0.31	0.11	0	0.17	0.2	1	0.11
13. Post-traumatic stress	0.23	0.15	0.08	0.13	0.14	0.16	0.08	0.06	0.03	0.13	0.09	0.11	1

Appendix P

Bootstrap difference test (Chapter 5)

Table A8. Bootstrap edge difference test comparing the size of the edges connecting with paranoia.

Node 1	Node 2	Lower CI	Upper CI	$p < 0.05$
Peers	Panic	-0.41	-0.04	TRUE
	Conduct problems	-0.39	0.00	TRUE
	Obsessive compulsiveness	-0.41	-0.05	TRUE
	Social anxiety	-0.43	-0.13	TRUE
	Separation anxiety	-0.41	-0.07	TRUE
	Generalised anxiety	-0.45	-0.19	TRUE
	Self-harm	-0.41	0.03	FALSE
	Post-traumatic stress	-0.43	0.04	FALSE
Panic	Conduct problems	-0.19	0.24	FALSE
	Obsessive compulsiveness	-0.20	0.20	FALSE
	Social anxiety	-0.22	0.12	FALSE
	Separation anxiety	-0.20	0.18	FALSE
	Generalised anxiety	-0.23	0.00	FALSE
	Self-harm	-0.21	0.27	FALSE
	Post-traumatic stress	-0.21	0.26	FALSE
Conduct	OCD	-0.26	0.16	FALSE
	Social anxiety	-0.27	0.07	FALSE
	Separation anxiety	-0.25	0.14	FALSE
	Generalised anxiety	-0.28	0.00	FALSE
	Self-harm	-0.25	0.23	FALSE
	Post-traumatic stress	-0.27	0.21	FALSE
OCD	Social anxiety	-0.23	0.14	FALSE
	Separation anxiety	-0.21	0.20	FALSE
	Generalised anxiety	-0.23	0.00	FALSE
	Self-harm	-0.18	0.28	FALSE
	Post-traumatic stress	-0.20	0.26	FALSE
Social anxiety	Separation anxiety	-0.13	0.21	FALSE
	Generalised anxiety	-0.16	0.00	FALSE
	Self-harm	-0.13	0.31	FALSE
	Post-traumatic stress	-0.15	0.32	FALSE
Separation anxiety	Generalised anxiety	-0.21	0.00	FALSE
	Self-harm	-0.18	0.28	FALSE
	Post-traumatic stress	-0.20	0.29	FALSE
Generalised anxiety	Self-harm	0.00	0.33	FALSE
	Post-traumatic stress	0.00	0.32	FALSE
Self-harm	Post-traumatic stress	-0.29	0.25	FALSE

Appendix Q

Interview schedule (Chapter 6)

General prompts

- Can you tell me a bit more about that?
- How come? / How do you mean? / In what ways?
- What do you think about that?
- What's that like?
- How do you make sense of that?
- Any more examples?

Part 1. Conceptualising trust

"As you know, this interview is about young people's experiences of feeling mistrustful. But to start off with it would be good to think about what trust is as this will be different for different people?"

1. Could you tell me what trust means to you?
   Possible prompts:
   - What does it make you think of?
   - Do any thoughts or pictures come to mind?
   - What does it feel like [to trust someone]?
2. How do you decide that you can trust someone?
   Possible prompts:
   - Any examples of people you trust?
   - What's it like when you do trust?

Part 2. Current experiences of paranoia

"When we last met you started to tell me about some of the times you feel mistrustful and worried about other people"

3. Can you tell me more about the worries you've been having?
   Possible prompts
   - Can you give any examples? [refer to completed paranoia questionnaire if needed]
   - Thoughts / feelings in those moments
   - What happens in those moments / what do you do?
4. What is all of this like in day to day life?
   Possible prompts
   - School / home / when out and about
   - Social media
   - Friendships / relationships?
5. How do [these worries] fit with how you see yourself?
6. What has been the most challenging part of [these worries]?
7. How do [these worries] link with the other problems you come to CAMHS for?
   Possible prompts
   - [Refer to demographic sheet for listed presenting problems]
   - Similar or different? Connected or separate?

Part 3. Changes over time

8. "[Insert summary of paranoid concerns]. Could you tell me about any times the [worries] are better or worse?
   Possible prompts
   - Why is that?
   - What influences how it changes?
   - Why do you think that is?
9. How did these [worries about people] first start?
   Possible prompts
   - Was anything going on at that time?
10. How has it changed over time?

Part 4. Help-seeking

11. Have you spoken to anyone about these experiences?
    If yes: What was this like?
    - Experiences of professionals?
    - What has been helpful / unhelpful?

    If no: Why not?
    - What is it like to keep this to yourself?

Part 5: Ending questions

[Provide a summary of each section and ask if anything else want to add]

- Is there anything we haven't talked about that you think is important to know?
- Do you have any other questions for me?
- Debrief, check-in, and feedback

Appendix R

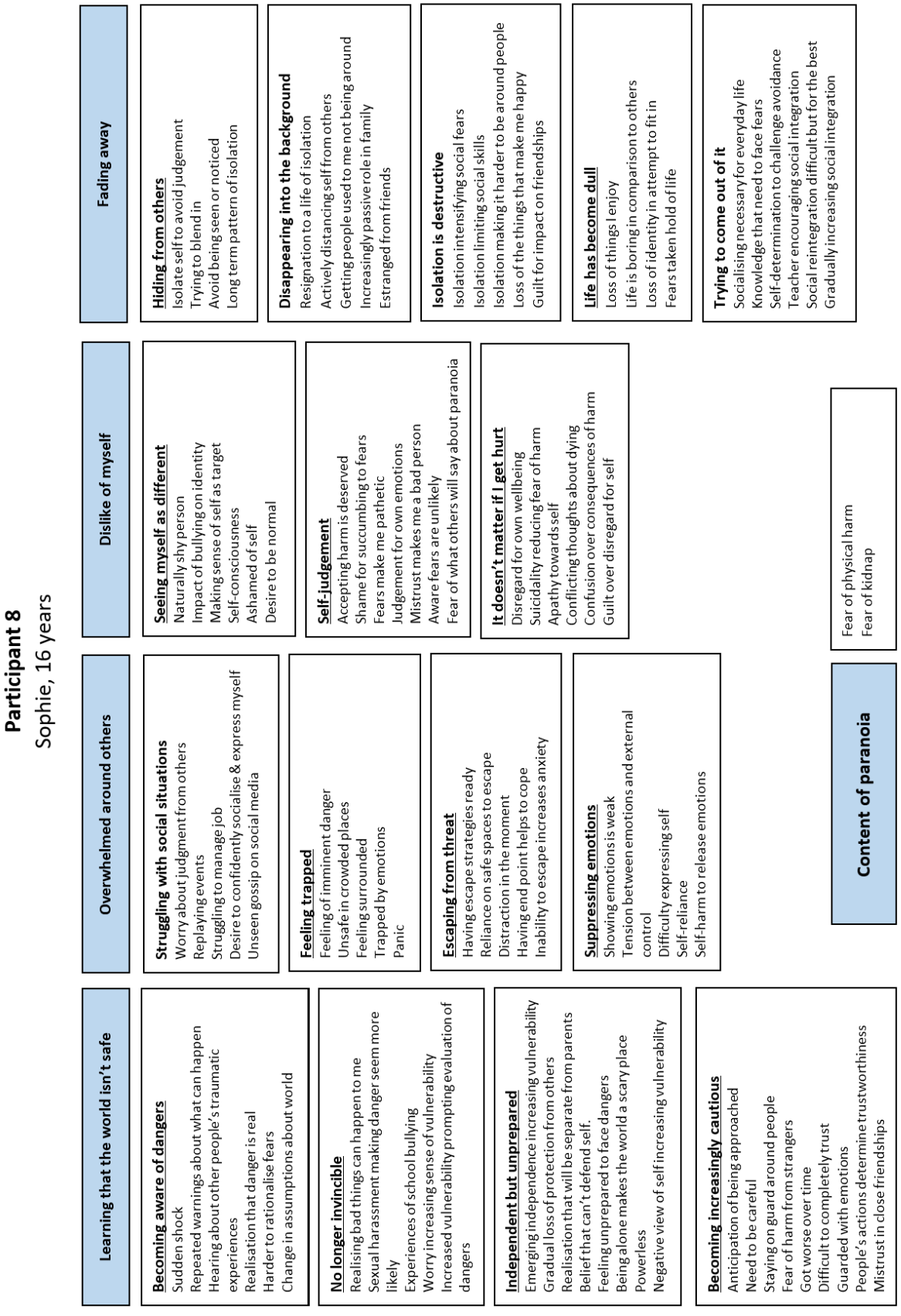
Extract of idiographic analysis (Chapter 6)

Sophie, 16 years		
Initial notes	**Transcript**	**Emergent themes**
Suddenly becoming aware of these dangers, seems more likely now so have to be careful. Interesting ideas about protecting young people through educating about dangers and not inciting fear. As self-confidence reduced, less confident in ability to defend self. Negative view of self increasing sense of vulnerability. Self as weak and unable to protect self. This vulnerability increasing anxiety. As a child feel invincible. Messages of caution from others, including Mum's experience of being attacked. Realisation that if something bad happened she won't be able to protect herself. Change in assumptions about the world Self as vulnerable. Shattered assumptions about self as invincible, realisation that others are vulnerable. Seeing / hearing about bad things happening making her aware of own vulnerability. Not only are these things more likely to happen, but I'm not able to protect myself, no longer invincible.	**Sophie:** Yeah, because I didn't hear much about it when I was a child, when I was started secondary school and it was a lot more... I was introduced to it a lot more than, it was something that I was suddenly aware of and because of this I was sort of like, okay, everyone's telling me I need to be careful, so I need to be really careful because probably its probably something that is going to happen. **Interviewer:** How has it changed over time? **Sophie:** I used to be confident that I'd be able to defend myself, and then I guess I got... when I started feeling less confident about myself, I also was like, well, I'm pathetic, I'm not going to be able to protect myself from anything, so yeah, I got more anxious about what other people could do and say, and stuff like that. **Interviewer:** So it sounds like as you got less confident it felt more... **Sophie**: Yeah, because I'd have, like, people warning me because when you're younger you feel like you can do anything, and I'd feel like, yeah, I can protect myself, and then other people, like my Mum would say, yeah, I felt like that too until I was attacked. I was like, yeah, I could still protect myself, but then it sort of gets in your head and you think, actually, maybe I can't, maybe if that does happen to me I'm going to be trapped, I can't do anything about it. **Interviewer**: So starting to feel a bit more vulnerable? **Sophie:** Mmm, yeah. **Interviewer:** Why do you think that is? **Sophie**: Because we sort of see... when we see these people around us being more vulnerable, we don't like – or I don't – feel as invincible because it becomes a lot more real and a lot less... oh, it's a fantasy, it'll never happen, I can protect myself, I'm a super-hero. But when it happens to people around you, you're like, I never thought that could happen. **Interviewer:** That's become more real. **Sophie:** Yeah. (Continued overleaf…)	Becoming aware of dangers in world. Realising bad things are likely to happen. Need to be careful. Belief that can't protect self. Negative view of self increasing vulnerability. Feeling invincible as a child. Learning that bad things happen to others. Change in assumptions about world. Self as vulnerable. Realisation that not invincible. Realisation that danger is real.

Sophie, 16 years		
Initial notes	**Transcript**	**Emergent themes**
Scary as don't know how to protect myself. Growing up in the world and realising it's not safe. Process of growing up and becoming more independent. Need to face things more independently, won't be able to rely on parents, but don't know how to deal with it yet. Only told that bad things happen, but don't feel prepared to deal with it. Process of growing up and becoming more independent. Huge amount of change and transition in short space of time. Realisation that will be separate from parents and protectors, can't rely on these people anymore. Increased sense of vulnerability prompting evaluation of dangers in the world and how to protect self. "How do I do this?" Sense of uncertainty in how she will be able to manage	**Interviewer**: What's that like, that realisation? **Sophie:** Bit scary because then you don't really know how to protect yourself. You're kind of like... I've got the world to grow into, but it's not something safe. It's something I've got to always be careful of because I'm not going to be able to protect myself. So you kind of like... feel like... it's just a lot more scary because you know that you're growing up and you're going to be facing things a lot more independently and because you've got to do it independently you don't really know how to deal with it, because we're not taught as much how to deal with it, as we are about it. **Interviewer:** So it's kind of, realising you've got to become more independent? **Sophie:** Yeah, and then throughout secondary school it goes quite quickly, so at primary school you're always with your parents; secondary school you start walking to school on your own and stuff like that, and then you've got GCSEs where you've got to do a lot more independent studying and 'A' Levels where you're basically completely independent, and then it's just like... you start... it just goes really quickly how you can go from your Mum making you lunch to figuring out where you're going to move to in a couple of years, and then you've got to realise that you are going to be living independently from your parents and the people who've always protected you before, and you've got to figure out how to protect yourself, and that's when you start thinking more about, okay, so what are the dangers I need to protect myself from, how do I do this?	Growing up in an unsafe world. Emerging independence increasing vulnerability. Feeling unprepared to face dangers. Realisation that can't rely on parents anymore. Increased vulnerability prompting evaluation of dangers. Uncertainty in how to protect self.

Appendix S

Example individual theme structure (Chapter 6)



Appendix T

Participant contribution to each theme (Chapter 6)

Theme	Participant											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Discovering threat & vulnerability												
Losing trust in peers		x		x	x	x	x	x	x	x	x	x
Growing into an unsafe world			x			x		x	x	x		x
Threatening experiences	x	x		x	x			x		x	x	x
Vulnerability to threat	x	x	x	x	x	x	x	x	x	x	x	x
▪ Uncertainty about others	x	x			x	x			x	x	x	x
▪ Self as a target	x	x	x		x		x	x			x	x
▪ Defenseless and alone	x	x	x	x		x	x	x	x	x	x	x
The paranoia experience												
Struggling to trust	x	x		x	x	x	x	x	x	x	x	x
Anticipating threat	x	x	x	x	x	x	x	x	x	x	x	x
Overcome with fear	x	x	x	x	x		x	x		x	x	x
Keeping safe	x	x	x	x	x	x	x	x	x	x	x	x
Making sense of paranoia												
Conflicting logic	x	x	x	x	x	x	x	x	x		x	x
Impact on identity	x	x	x	x	x		x	x	x		x	x
Held back by fear	x	x		x	x	x	x	x	x	x	x	x
Disconnected from friends	x			x	x	x	x	x	x		x	x
Reluctant resignation	x	x	x	x	x	x	x	x	x		x	x
Trying to resist	x	x	x	x		x	x	x	x	x	x	

Note. 1: Katie, 2: Megan, 3: Jack, 4: Ashley, 5: Nathan, 6: Chloe, 7: Emily, 8: Sophie, 9: Holly, 10: Sam, 11: Olivia, 12: Lucy