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Relationship between executive function, attachment style, and psychotic like experiences in typically developing youth

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ABSTRACT

Psychotic like experiences (PLE's) are common in the general population, particularly during adolescence, which has generated interest in how PLE's emerge, and the extent to which they reflect either risk for, or resilience to, psychosis. The "attachment-developmental-cognitive" (ADC) model is one effort to model the effect of risk factors on PLEs. The ADC model proposes attachment insecurity as an early environmental insult that can contribute to altered neurodevelopment, increasing the likelihood of PLE's and psychosis. In particular, early-life attachment disruptions may negatively impact numerous aspects of executive function (EF), including behavioral inhibition and emotion regulation. Yet despite the relationship of disrupted attachment to EF impairments, no studies have examined how these factors may combine to contribute to PLE's in adolescents. Here, we examined the relative contributions of daily-life EF and attachment difficulties (avoidance and anxiety) to PLEs in typically developing youth ($N = 52$; ages 10–21). We found that EF deficits and high attachment insecurity both accounted for a significant proportion of the variance in PLE's, and interacted to predict PLE manifestation. Specifically, positive PLEs were predicted by greater trouble monitoring behavioral impact, less difficulty completing tasks, greater difficulty regulating emotional reactions, greater difficulty controlling impulses and higher attachment anxiety. Negative PLEs were predicted by greater difficulty in alternating attention, transitioning across situations, and regulating emotional reactions as well as higher attachment anxiety. These results are consistent with the ADC model, providing evidence that early-life attachment disruptions may impact behavioral regulation and emotional control, which together may contribute to PLEs.

1. Introduction

Considerable evidence now shows continuity between clinically-significant psychotic symptoms in patient populations and psychotic-like experiences (PLE's) in the general population. PLE's are subsyndromal experiences that approximate the positive and negative symptoms of psychotic disorders (DeRosse and Karlsgodt, 2015; Kaymaz and van Os, 2010). Moreover, although schizophrenia affects only 0.4%–0.7% of the global population (Linscott and van Os, 2010), the median annual prevalence rate for adults who report PLE manifestations is approximately 7.2% (Linscott and van Os, 2013). Prevalence rates of PLEs are substantially higher in late childhood and adolescence, with estimates between 40% and 66% (Laurens et al., 2012; Wigman et al., 2012). Continuity between PLEs and psychotic disorders is supported by 1) an overlap of etiological correlates including lower education, unemployment, and family psychiatric history (Linscott and van Os, 2013), and 2) similarities between the quality and distribution of symptom profiles in patients with psychotic disorders and healthy individuals who report PLEs (Derosse et al., 2014a). Even in the absence of a psychiatric diagnosis PLE's may be associated with variation in cognition (Barnett et al., 2012; Cochrane et al., 2012; Korponay et al., 2014; Mollon et al., 2016) and social function (DeRosse et al., 2017) and may engender emotional distress (Fervaha et al., 2014). Furthermore, PLEs are associated with greater rates of psychotic disorders later in life (Cannon et al., 2002; Chapman et al., 1994; Hanssen et al., 2005; Poulton et al., 2000; Welham et al., 2009). Thus, efforts have been made to understand specific factors that contribute to the development of PLE's,

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including developmental disruptions (Karlsgodt et al., 2009; Weinberger and Marenco, 2003), genetic factors (Linney et al., 2003; Straub et al., 1996), and environmental factors (MacDonald 3rd et al., 2001), as well as to identify potential resilience factors that impede these symptoms from reaching clinical significance.

In addition to genetic or developmental insults, the "attachment-developmental-cognitive" (ADC) model posits that traumatic events and psychosocial stressors that impair attachment may also contribute to vulnerability to psychotic disorders by disrupting neural connectivity and structure formation in the developing brain (Rajkumar, 2014). Attachment theory proposes that child-caregiver emotional bonds form a template for future interpersonal relationships (Bowlby, 1969). Specifically, secure attachment, when the child experiences the primary caregivers as responsive, available and trustworthy, facilitates healthy adult relationships. In contrast, insecure attachment from unreliable or neglectful caregivers, results in difficulties establishing and maintaining relationships in adulthood (Bowlby, 1980). Insecure attachment has been linked to a host of negative outcomes throughout the lifespan, including behavioral difficulties and psychopathology (Hoeve et al., 2012; Lee and Hankin, 2009). Moreover, high rates of insecure attachment, with some estimates of up to 74%, are seen in schizophrenia (Korver-Nieberg et al., 2014; MacBeth et al., 2011).

Early trauma is a significant predictor of insecure attachment (Allen et al., 1996; Styron and Janoff-Bulman, 1997) and the high prevalence of insecure attachment in schizophrenia corresponds to the higher levels of early adversity they experience relative to healthy controls (Cannon et al., 2014; Read et al., 2005). A history of childhood trauma significantly increases psychosis risk (Varese et al., 2012), and the severity and frequency of childhood maltreatment are positively related to hallucinations and delusions (Schenkel et al., 2005). Moreover, the relationship between severity of childhood trauma and severity of psychotic symptoms is the same in healthy individuals assessed for PLE's (DeRosse et al., 2014b). The strong link between insecure attachment and trauma, and their collective effect on symptom expression, provides support for the role of attachment style in the development of PLEs. In fact, insecure attachment has been related to increased PLE's, likelihood of developing maladaptive coping styles (Korver-Nieberg et al., 2014) and has been found to mediate specific childhood adversities and types of psychotic symptoms (Berry et al., 2007; Sitko et al., 2014).

Additionally, insecure attachment may be linked to cognitive impairments that make one vulnerable to the development of PLEs. Individuals with a history of early trauma show neuropsychological impairments (DePrince et al., 2009; Mezzacappa et al., 2001; Perez and Widom, 1994) that mirror those in psychosis patients, specifically in executive functions (e.g. cognitive control, working memory, decision making). (Heaton et al., 2001; Heinrichs and Zakzanis, 1998). Despite evidence that developmental stressors may be risk factors for psychosis by interrupting critical neurodevelopment, the interaction between attachment disruptions, executive functioning and PLE's is unclear. Neuropsychological functioning has been examined in adults who experience PLEs, but little research has been conducted in child or adolescent samples. Adolescence is particularly important stage for executive function development and establishment of social relationships (Blakemore, 2008), as well as a risk period for conversion of subclinical PLEs into clinically significant disorders (Murray and Jones, 2012; Trotman et al., 2013). Thus, the relationship of insecure attachment to PLEs may be especially relevant for this age group.

Our present study aims to understand the relationship between attachment style, executive functioning (EF), and PLE's in a sample of healthy children and adolescents. Continued efforts to understand the etiology of PLE's during this key social, cognitive, and neuropsychological development period are important for creating targeted interventions to prevent the development of serious psychopathology.

2. Experimental materials and methods

2.1. Participants

Our community sample consisted of 52 healthy volunteers aged 10 to 21 (mean = 17.09 ± 2.95) recruited for a longitudinal study via posted flyers, advertisements and referrals from previous study participants. Data utilized for the present analyses was collected at participant's baseline study visit. Our sample was 51.9% female (n = 27) and 61.5% Caucasian (n = 32), 23.1% African-American (n = 12), 5.8% Asian (n = 3), and 9.6% "Other" (n = 5). All participants over age 18 provided written informed consent and minors provided assent alongside parental written consent; the protocol was approved by the Northwell Health Institutional Review Board. Participants were excluded if they had any Axis-I diagnosis, any intellectual disability, any incidence of head injury with loss of consciousness, any medical illnesses that could affect brain functioning, or were taking any medications with known cognitive effects.

2.2. Clinical assessments

2.2.1. Diagnostic interviews

To rule out present and lifetime Axis-I disorders, all participants were administered the Structured Clinical Interview for the DSM-IV, Non-Patient Version (SCID-NP) (First et al., 1997). Participants aged 10–15 were also administered supplemental sections of the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL) to rule out additional child-onset disorders. Assessments were conducted by trained graduate-level raters, with diagnosis confirmed by a consensus of at least two faculty psychologists. Diagnostic interviews were supplemented with family informants whenever possible.

2.2.2. Subclinical psychosis

Subclinical psychosis was assessed using the Community Assessment of Psychic Experiences (CAPE) (Stefanis et al., 2002), a 42-item, self-report questionnaire that measures three dimensions of subclinical psychopathology including positive, negative and depressive symptoms. Because depressive symptoms fell outside the scope of the present study, we only examined the positive (CAPE-p) and negative (CAPE-n) subscales and did not include depressive items in our CAPE total score. The CAPE-p and CAPE-n showed good reliability in the present sample, with Cronbach's alpha estimates of α = 0.84 and 0.85, respectively.

2.2.3. Executive functioning behaviors

EF behaviors were measured using the 80-item self-report form of the Behavior Rating Inventory of Executive Function (BRIEF-SR, (O'Doherty and Nguyen, 2004)). This self-report measure asks participants to rate real-world behaviors that would be adversely affected in childhood and adolescence by EF deficits. The BRIEF-SR contains 8 subscales: 1) Working Memory, 2) Plan/Organize, 3) Organization of Materials, 4) Task Completion, 5) Inhibit, 6) Shift, 7) Emotional Control, and 8) Monitor. All of these scales demonstrated acceptable reliability in this sample, with Cronbach's alpha estimates for all subscales ranging from 0.60-to-0.87 and 0.95 for the BRIEF Total score.

2.2.4. Attachment insecurity

Attachment was assessed using a 20-item measure, the Experiences in Close Relationship Scale – Revised – General Short Form (ECR-R-GSF), which includes two 10-item subscales measuring attachment anxiety and attachment avoidance (Wilkinson, 2011). Attachment insecurity is conceptualized as the degree of difficulty with developing and maintaining a stable sense of intimacy and trust in close relationships, including the degree to which intimate relationships are avoided altogether (attachment avoidance) and the degree to which existing intimate

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