MOMENTARY ASSESSMENT OF ABERRANT SALIENCE, ANOMALOUS SELF-
DISTURBANCES, AND PSYCHOTIC-LIKE EXPERIENCES

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Abstract

In the interest of improving early identification and intervention for psychosis-spectrum symptoms, researchers have identified early subjective changes in perception and experience that precede psychotic-like experiences, including aberrant salience and self-disturbances. Aberrant salience is the misattribution of significance to neutral stimuli and may be linked to atypical dopamine transmission. Self-disturbances include changes in the experience of the self, which may affect the top-down processing of new information, resulting in experiences or thoughts that are inconsistent with the individual’s external context, yet feel internally consistent. The interaction of these phenomena may result in positive psychosis-spectrum symptoms, ranging from innocuous psychotic-like experiences in the general population to hallucinations or delusions found in psychotic disorders. The present study examined the momentary dynamics of aberrant salience, self-disturbances, and psychotic-like experiences as they occurred in the daily lives of undergraduates in order to test four primary aims: (1) examine the ecological validity of existing measures, (2) examine autoregressive relationships to observe the state-versus-trait dynamics of these phenomena, (3) measure cross-lagged relationships between the precursory mechanisms and psychotic-like experiences to test Granger causality, and (4) examine the moderating role of self-concept clarity. The results provided support for the use of these measures to examine within-subject fluctuations, show evidence that carryover effects occur across time points, and show preliminary supportive evidence of Granger causality.
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Introduction

Psychosis is characterized by a multi-dimensional cluster of symptoms, typically organized into positive (e.g. perceptual abnormalities and delusional thinking), negative (e.g. anhedonia, amotivation, and flat affect), and disorganized symptoms (e.g. disorganized speech and odd behaviors) (van Os & Reininghaus, 2016). Traditionally conceptualized as a dichotomous phenomenon (i.e. the psychotic state as a complete “break” from reality), many researchers and clinicians now consider psychosis to be on a continuum (Guloksuz & van Os, 2018). Symptoms can range from highly distressing experiences that impair insight to infrequent experiences considered within cultural norms. More intense symptoms occur in chronic psychotic disorders such as schizophrenia or schizoaffective disorder, in the context of mood disorders such as bipolar or major depressive disorder, and in response to substance use (Guloksuz & van Os, 2018). Subtler symptoms can occur in varying degrees across a wide range of contexts (Fusar-Poli et al., 2013).

Although less common than anxiety or depression symptoms, psychosis-spectrum symptoms are more prevalent than commonly thought. An international meta-analysis estimated a prevalence rate of 8% for subthreshold psychotic experiences, 4% for clinically significant psychotic symptoms, and 3% for psychotic disorders (van Os et al., 2009). Higher rates have been found among adolescents, with reports of psychotic-like experiences ranging from 13-17% (Fonseca Pedrero & Dèbbané, 2017). Similarly, one study found that the majority of college students endorsed at least one psychotic-like experience in their lifetime, but most did not experience them frequently (Cicero et al., 2014), nor report corresponding distress (Loewy et al., 2007). Psychotic-like experiences are even more common among individuals who are already seeking mental health services, with one study reporting that 98.6% of a sample of nonpsychotic
help-seeking youth ages 15-24 reported at least one subthreshold positive psychotic symptom occurring “sometimes” in their lifetime (Yung et al., 2006). Additionally, culturally-normative magical thinking (such as beliefs in ghosts, aliens, or superstitions) is common in 25-30% of adults, and may structurally relate to delusional processes in psychosis, obsessive-compulsive disorder, or eating disorders (Berenbaum et al., 2009).

Associated with increased occurrence of psychotic-like experiences, schizotypy refers to a multidimensional latent trait that may be phenotypically expressed as magical thinking, social anhedonia, or cognitive slippage. Schizotypy is thought to reflect genetic vulnerability for developing psychosis (Barrantes-Vidal et al., 2015; Meehl, 1962). Within schizotypy research, there are two common frameworks for measurement – quasi-dimensional, in which schizotypy is seen as a latent vulnerability for schizophrenia that is expressed in about 10% of the population, and fully dimensional, in which its expression is thought to be normally distributed in the general population (Mason, 2014). Proponents of the quasi-dimensional approach point to the fact that higher levels of schizotypy are often found in relatives of individuals with psychosis (Meehl, 1962) and may indicate increased risk for future development of psychotic disorders (Chapman et al., 1994; Kwapil et al., 2013). Alternatively, this vulnerability may be normally distributed across the population, arising from polygenic, personality, and environmental variations, similar to trait anxiety (Claridge & Beech, 1995). The fully dimensional model is supported by the evidence that schizotypy may be associated with healthy individual differences, including increased creativity and openness, and is not always indicative of poor outcomes (Mohr & Claridge, 2015).

Recent research supports the idea that psychotic symptoms, schizotypy, and personality traits such as low extraversion share common underlying dimensions (Cicero et al., 2019), and
new measures of schizotypy have eliminated cut-scores (Kwapil et al., 2018), supporting the fully dimensional conceptualization of schizotypy. Measuring schizotypy in the general population removes confounds such as the effects of anti-psychotic medication, loss of insight, and functional impairment associated with psychotic disorders while still allowing for examination of mechanisms involved in unusual belief and experience formation (Barrantes-Vidal et al., 2015). It may also capture unique facets of premorbid signs of psychosis, particularly important as the field has adopted an early intervention focus.

Although the precise etiological pathways of schizotypy and psychosis remain unclear and likely involve a variety of polygenic and environmental risk factors (Howes & Kapur, 2009; Murray et al., 2017), researchers have proposed social-cognitive mechanisms that potentially underlie the unusual thoughts and experiences associated with the development of positive symptoms (Broyd et al., 2017; Cicero et al., 2013; Freeman, 2007; Garety et al., 2001; Howes & Murray, 2014; Kapur, 2003). Common to most of these models are two key components: (1) aberrant salience, the misassignment of significance to neutral stimuli, and (2) impaired self-processing, which may include fluctuations in self-concept clarity or the occurrence of anomalous self-experiences.

Psychotic-like experiences are thought to evolve from initial perceptions, derived from either external experiences or internal sensations (bottom-up processing) before they are molded to be consistent with our prior knowledge (top-down processing) (Freeman et al., 2004; Hohwy, 2004). In the context of psychosis, a key phenomenon thought to underlie the identification of this sensory information is known as aberrant salience, which describes feelings of significance towards a neutral stimulus (Kapur, 2003). Like psychotic-like experiences, aberrant salience can be measured in healthy individuals, indicating that it occurs to varying degrees in the general
population (Boehme et al., 2015; Chun et al., 2019; Cicero et al., 2010; Raballo et al., 2019).

Aberrant salience represents a cognitive construct that links phenomenological reports of the early signs of psychosis, such as sharpened senses or an urgent drive to understand the world (Bowers, 1968; Moller & Husby, 2000), with dysregulated dopamine transmission (Boehme et al., 2015; Howes & Kapur, 2009).

Dopamine is a neurotransmitter associated with the prediction of significant events – it is involved in the assignment of value, or salience, to stimuli we encounter, driving motivation and behaviors to seek reward or avoid punishment. This function is known as incentive salience, which contributes the “wanting” or motivational aspect to reward learning, as opposed to the sensory-based “liking” aspect, or the “learning” of relationships between conditioned and unconditioned stimuli (Berridge, 2007; Berridge & Robinson, 1998). The link between the phenomenon of incentive salience and dopamine is supported by research using animal models. When rats are given chemical lesions to dopaminergic pathways, they continue to produce normal reactions to rewarding (such as a sweet taste) and aversive (such as a bitter taste) stimuli, indicating their ability to evaluate the value of stimuli remains intact (Berridge & Robinson, 1998). However, despite this ability to retain the “liking” aspect, (and they can even “learn” new hedonic associations), they lack the “wanting” aspect of reward – they do not act (e.g. voluntarily eat the food) (Berridge & Robinson, 1998). In another study, rats given amphetamines (augmenting dopaminergic activity) showed increased motivation to avoid less salient aversive stimuli, but did not differ from controls in response to highly salient stimuli (Li et al., 2008).

Dopamine has long been a key factor in etiological theories of psychosis, in part due to the discovery of anti-psychotic medications, which act on D3 striatal dopamine receptors, and effectively reduce positive symptoms (Seeman et al., 1976). By blocking dopamine receptors,
these medications are thought to work by reducing the occurrence of aberrant salience, allowing
the patient to cognitively reframe their unusual experiences, essentially deconstructing the
conviction a patient may hold about their hallucinations and delusions (Kapur, 2003). Additional
evidence supporting the dopamine hypothesis of psychosis comes from studies on the effects of
methamphetamine, which increases dopaminergic activity. Prior laboratory research suggests
administration can produce acute paranoia and hallucinations in humans (McKetin, 2018).
Further, this result can vary across individuals who have varying degrees of psychosis-proneness.
In people with schizotypal personality disorder, exposure to amphetamines produces decreased
availability of dopamine receptors compared to healthy controls, indicating increased
dopaminergic activity (Abi-Dargham et al., 2004). Imaging studies have further supported the
relationship between dopamine and psychosis, observing increased presynaptic dopamine
synthesis capacity in individuals with acute psychosis (Howes & Kapur, 2009), individuals at
clinical high-risk for psychosis (Howes et al., 2011), and family members of individuals with
psychosis (Huttunen et al., 2008). Aberrant salience may also be involved in producing the
negative symptoms of psychosis by decreasing the ability to detect relevant motivational stimuli
among all the erroneously identified stimuli; there is too much noise to detect the actual
rewarding signals (Roiser et al., 2009).

The manner in which these unusually significant stimuli are interpreted is key to the
evolution into a psychotic-like experience such as perceptual abnormalities or delusional
thoughts. Humans are thought to innately seek meaning; we construct frameworks to describe
relationships between stimuli, identify inconsistencies, and relate these frameworks to ourselves
and our schemas (Heine et al., 2006). If strange experiences occur only rarely, they are unlikely
to be accommodated into our belief system, due to a process termed doxastic reality testing.
Doxastic reality testing refers to the ability to test experiences for consistency with prior knowledge and beliefs (Gerrans, 2014). When an unusual experience (perhaps driven by aberrant salience) does not fit in with prior beliefs, it is typically rejected as anomalous and quickly forgotten. For example, déjà vu is a common phenomenon, experienced from time to time by 76% of people. Most individuals identify it as an anomalous experience and do not perseverate on its occurrence or form strong beliefs about it (Gerrans, 2014). However, there is speculation that individuals with psychosis may be more likely to believe what they experience, and reach a conclusion more quickly (Freeman et al., 2004; Hohwy, 2004). Further, if these unusual experiences persist, an individual may begin to accumulate these peculiar experiences and seek external explanations about why they continue to occur (Kapur, 2003). The processes by which an explanation is chosen, and how idiosyncratic that selection is, may be impacted by how a person draws information about themselves and the world around them. Thus, it is important to understand the role of self-information processing, and how it may be impaired by the self-disturbances seen in psychosis.

An altered awareness of one’s presence and changes in the first-person view of the world (sometimes referred to as “basic symptoms”) may be some of the earliest and most fundamental signs of psychosis (Moller & Husby, 2000; Nelson et al., 2009; Schultze-Lutter & Theodoridou, 2017), and may even arise in childhood, premorbid to other early signs of psychosis (Brent et al., 2014). Phenomenological studies of individuals with recent-onset psychosis describe weakened experiences of the self (e.g. “[I] almost didn’t know who I was” (Moller & Husby, 2000, p. 228)) combined with an increase in drive to scrutinize one’s inner world (e.g. “I thought understanding myself better would help me with conflicts I felt compelled to resolve” (Bowers, 1968, p.352)) prior to their first episode of psychosis. Impaired self-processing has also been examined in
schizotypy. Research has suggested that higher positive schizotypy in adolescence is associated with more concrete self-reflection, such as drawing from memories of recent experiences (e.g. I am a caring person because I helped my friend clean up their house yesterday), rather than the abstract, implicit, self-processing (e.g. caring for my friends is a stable part of my identity) that is typically developed during adolescence (Debbané et al., 2014; Sebastian et al., 2008), and similar impairments have been found in adolescent offspring of individuals with schizophrenia (Keshavan et al., 2008).

The “self” represents multiple levels of cognitive processes that can generally be grouped into two categories. The minimal self refers to self-agency, consciousness, and embodiment, including the experience of the world from a first-person point of view. The narrative self refers to higher-order constructs such as identity and memories, and how these remain consistent over time to form our self-concepts (Gallagher, 2000). Self-processing deficits linked to psychosis and schizotypy can occur across different domains of selfhood: changes in somatosensation (perception of the body based on internal sensations), anomalous self-experiences (changes in first-person experiences), and fluctuations in self-concept clarity (the ability to maintain a stable self-identity) (Klaunig et al., 2018).

The ipseity-disturbance theory of psychosis highlights the occurrence of anomalous self-experiences, and the ways in which disruptions in the minimal self may affect one’s first-person point of view (Sass & Parnas, 2003). These experiences are thought to be composed of two main mechanisms: hyper-reflexivity and diminished self-affection. Hyper-reflexivity refers to exaggerated self-consciousness; a person may pay excess attention to self-relevant information, leading them to perceive it as external. Simultaneously, people are thought to experience diminished self-affection, or a weakened feeling of presence or existence as a subject. Together,
these experiences result in a reduced “grip” on reality, as the barrier between self and other becomes blurred (Sass & Parnas, 2003). These experiences are typically measured through an unstructured phenomenological interview (Parnas et al., 2005), or more recently through a self-report measure (Cicero et al., 2017).

Disturbances in the minimal self may be linked to observed deficits in “source monitoring” in psychosis. People are typically able to ignore internally produced sensations and their own actions such as movements, thoughts, or speech, because they are inherently predictable; they are products of the same brain that is interpreting them (Fletcher & Frith, 2009). However, there is evidence that individuals with psychosis show disruptions in processing self-relevant information, potentially leading to unpredictable information that may be misinterpreted when attended to (Nelson et al., 2014a). Similarly, individuals high in schizotypy have slower reaction times when asked to recognize their own faces (Platek & Gallup, 2002). It may be difficult for some individuals to pinpoint the source of these internal sensations or to identify information as being relevant to themselves, and an external explanation may be selected erroneously. This idiosyncratic interpretation may only partially fit in with an individual’s cultural milieu, further distancing them from shared reality, and possibly leading to further self-processing impairment (Nelson et al., 2014b).

Prior research has primarily focused on the relationship between aberrant salience and the higher-order trait of self-concept clarity in predicting psychotic-like experiences. Functioning at the narrative self, self-concept clarity refers to the consistency of one’s identity, attributes, and beliefs about oneself across time and context (Campbell, 1990). Previous research found that low self-concept clarity interacts with aberrant salience to predict reports of psychotic-like experiences (Cicero et al., 2013, 2015) such that people with high aberrant salience and low self-
concept clarity have the highest levels of psychotic-like experiences. Moreover, lower self-concept clarity is found in individuals with schizophrenia compared to age-matched healthy adults (Cicero et al., 2016). Low self-concept clarity may augment the search for meaning that occurs with aberrant salience, as individuals with less clear identities may have more difficulty integrating new information with prior knowledge about themselves (Cicero, 2017). A recent study suggested that anomalous self-experiences are correlated with self-concept clarity in individuals with schizophrenia (Klaunig et al., 2018). One possible explanation is that as disruption in the minimal self reoccurs, fluctuations in the coherence of one’s narrative self may be produced, resulting in lower self-concept clarity, but causal research has yet to be conducted (Klaunig et al., 2018).

The process described thus far is depicted in Figure 1. As a person experiences an unusually salient sensation or perception, they attempt to connect it to themselves and their context. If the initial experience is driven by aberrant salience (as opposed to appropriate motivational salience), it may be difficult to pinpoint its significance and meaning. For some, it may be easy to dismiss the occasional odd experience as insignificant, but for others, recurrent aberrant salience combined with low self-concept clarity may drive an increased search for meaning. Disturbances in the self may lead to the creation of idiosyncratic beliefs that are not based in one’s sociocultural context (delusions) or perceptual experiences not occurring in the physical environment (hallucinations), both of which feel internally significant, but are externally inconsistent.
The prior research described here has provided correlational and theoretical insights into the potential mechanisms that produce psychosis-spectrum symptoms. However, most studies collect cross-sectional data about lifetime experiences, so it is unclear how frequently or intensely these experiences occur in daily life. Further, these studies have all been correlational, so we do not know if they cause psychotic-like experiences, or if they stem from shared
etiological mechanisms. One method for providing evidence for causal mechanisms is to examine whether the proposed causal variables temporally occur before the outcome variables, above and beyond any autoregressive effects of the outcome variable (also known as Granger-causality). Intensive longitudinal methods such as experience sampling methodology (ESM) enable analysis of these temporal relationships by collecting data at numerous time points over a relatively short period. ESM also has the added benefit of collecting data outside the lab, in the context of participants’ daily lives, and addresses recall bias by reducing the gap between experience and recall, particularly important for fleeting thoughts and moods (Myin-Germeys et al., 2009). ESM has been used widely in studies of psychopathology, and can help elucidate the dynamics of symptoms, and identify internal mechanisms or external determinants driving them (Myin-Germeys et al., 2018).

It has been hypothesized that unusual experiences occur before belief formation, interacting to produce clinically significant psychotic-spectrum symptoms (Freeman, 2007; Krabbendam et al., 2004). Identifying the specific sequence of mechanisms may be especially important in the context of early identification and intervention, as research has suggested that the order in which symptoms present may affect clinical outcomes. Persistent hallucinations in early adolescence may evolve into delusions and increased negative affect in late adolescence (De Loore et al., 2011), and specific characteristics of hallucinations may increase risk for future development of delusions (Escher et al., 2002). Individuals who develop both hallucinations and delusions are at higher risk of symptom persistence and poorer outcomes (Compton et al., 2012; Smeets et al., 2013). Therefore, it is important to further understand the occurrence and sequence of the precursory mechanisms involved in the formation of these symptoms. The present study aims to observe the occurrence of aberrant salience, self-disturbances, and psychotic-like
experiences as they occur in daily life in order to further understand the temporal relationships between these phenomena.

Previous studies have used ESM to measure schizotypy in daily life. These studies have provided support for relationships between trait schizotypy and expression of psychotic-like experiences, negative affect, and desire for social contact in the daily lives of nonclinical undergraduate students (Barrantes-Vidal et al., 2013; Kwapił et al., 2012). However, few studies to date have examined the specific etiological mechanisms of psychotic-like experiences. Reininghaus et al. (2016) used ESM to survey levels of aberrant salience, stress sensitivity, and psychotic-like experiences in the daily lives of individuals experiencing their first episode of psychosis, clinical high-risk individuals, and healthy controls. They found a stronger association between aberrant salience and psychotic-like experiences in clinical high-risk individuals compared to individuals who already experienced a first episode, indicating that aberrant salience may play a stronger role in unusual belief formation before psychotic symptoms are fully formed (Reininghaus et al., 2016). However, while their measurements were longitudinal, their analyses were cross-sectional, precluding the possibility of examining temporal patterns, and they did not incorporate social-cognitive factors.

The present study aimed to examine the expression of aberrant salience, self-disturbances, and psychotic-like experiences as they occur in daily life in a non-clinical sample of college undergraduate students. The use of intensive longitudinal methods allowed us to address four primary goals. First, we aimed to examine how the expression of these symptoms in daily life relates to lifetime reports of the same symptom and trait measures of schizotypy or self-concept clarity, in order to provide ecological validity to existing measures. Our second, third, and fourth aims involved surveying temporal patterns of these symptoms in order to test
hypotheses about the pathogenesis of psychotic-like experiences. We expected that there would be an autoregressive structure to the data (i.e. consecutive measurements are more correlated than inconsecutive measurements), and that aberrant salience and anomalous self-experiences occur prior to psychotic-like experiences. Lastly, we predicted that self-concept clarity would moderate the relationship between aberrant salience and psychotic-like experiences.

I expected to find support for the following hypotheses: (1) People who report experiences at baseline report higher levels of those experiences in daily life; (1a) More psychotic-like experiences reported throughout the week correlate with higher trait schizotypy (specifically, subscales of perceptual aberration and magical thinking; PerMag), (1b) More psychotic-like experiences reported throughout the week correlate with higher baseline aberrant salience, (1c) More psychotic-like experiences reported throughout the week correlate with higher baseline anomalous self-experiences, (1d) More anomalous self-experiences reported throughout the week correlate with higher baseline anomalous self-experiences, (1e) More anomalous self-experiences reported throughout the week correlate with lower baseline self-concept clarity, (1f) More aberrant salience reported throughout the week correlates with higher baseline aberrant salience; (2) Autoregressive (“inertia”) relationships exist between measured phenomena across timepoints; (2a) Higher aberrant salience at timepoint t-1 correlates with higher aberrant salience at timepoint t, (2b) Higher anomalous self-experiences at timepoint t-1 correlate with higher anomalous self-experiences at timepoint t, (2c) Higher psychotic-like experiences at timepoint t-1 correlate with higher psychotic-like experiences at time t; (3) Precursory mechanisms at time t-1 predict psychotic-like experiences at time t; (3a) Higher aberrant salience at timepoint t-1 correlate with higher psychotic-like experiences at time t, (3b) Higher anomalous self-experiences at timepoint t-1 correlate with higher psychotic-like experiences at time t, (3c) Higher psychotic-like experiences at timepoint t-1 correlate with higher psychotic-like experiences at time t.
experiences at timepoint \( t \); (4) Baseline self-concept clarity moderates the relationship between aberrant salience at timepoint \( t-1 \) and psychotic-like experiences at timepoint \( t \), such that lower self-concept clarity strengthens the relationship between aberrant salience and psychotic-like experiences.

**Methods**

**Participants**

Data were collected from 246 undergraduate students at the University of Hawai‘i Manoa (UHM) between September 2016 – December 2018. Demographics and baseline measures are reported in Table 1.

**Procedure**

Students were recruited through the psychology department and received class credit for participation. Registration took place through Sona-Systems, which facilitates undergraduate research at UHM, and grants credit upon study completion. Participants initially completed a baseline survey online through Qualtrics. Upon completion of this initial study, they had the option to register for the ESM portion for additional class credit. Participants registered for a 15-minute in-person orientation session during which they installed the application (LifeData) on their personal smartphone and received instructions about study completion from a trained research assistant. Participants were offered electronic tablets to use if they did not have access to or feeling comfortable using a personal smartphone, but all participants declined this option.

Once enrolled, participants received notifications on their smartphones six times a day for seven days, prompting them to fill out a survey including 26 questions about aberrant salience, self-disturbances, psychotic-like experiences, mood, and substance use. Notifications were set to occur in random intervals between 10:00 and 22:00, with at least 30 minutes between each
survey, in order to maximize response rate. Additionally, ESM questions were randomized in blocks in order to reduce the effects of habituation to the questionnaires. Participants were encouraged to respond immediately, however, they were allowed 1 hour to respond to the notification in case they were unable to use their phone at that moment.

**Materials**

**Short Form of the Wisconsin Schizotypy Scale.** The Wisconsin Schizotypy Scales (WSS) were originally developed in the 1970s and 1980s as a true-false measurement of various domains of schizotypy: magical ideation, perceptual aberration, social anhedonia, and physical anhedonia. More recently, a short form was created in order to ease administration, and to improve psychometric quality based on item response theory and differential item functioning (Winterstein et al., 2011). Prior research has suggested adequate reliability and validity for use in nonclinical student populations (Gross et al., 2015). The shortened version includes 15 items in each domain. For the purpose of the current study, participants completed the magical ideation, perceptual aberration, and social anhedonia short scales. Participants completed these scales at baseline through Qualtrics. (Appendix A)

**Aberrant Salience Inventory.** The Aberrant Salience Inventory (ASI) is a self-report questionnaire designed to measure lifetime occurrence of aberrant salience in nonclinical samples (Cicero et al., 2010). The full version includes 29 yes/no questions, loading onto a five-factor structure: increased significance, senses sharpened, impending understanding, heightened emotionality, and heightened cognition. Convergent validity has been supported through correlations between the ASI and Perceptual Aberration, Magical Ideation scale, Referential Thinking scale, Tellegen Absorption Scale, Dissociative Process Scale, and Behavioral Activation Scale. Discriminant validity has been supported through a lack of correlation with the
Behavioral Inhibition Scale, and a weak correlation with the Social Anhedonia scale, both of which are typically correlated with psychosis proneness, but would not be expected to relate to aberrant salience specifically (Cicero et al., 2010). The ASI has previously been found to be reliable in both nonclinical and clinical populations. For the current study, participants completed both the full version of the ASI at baseline through Qualtrics, and a shortened version during the ESM portion of the study. To create a short version, one question from each factor was selected based on the highest loading, resulting in five items: (1) Right now, small details that I haven’t noticed before are very important, (2) Right now, my senses feel sharpened, (3) Right now, I feel like I’m going to figure out something big, (4) Right now, my thoughts or feelings are coming very fast, and (5) Right now, the whole world feels like it’s opening up to me. The short version was converted to a 7-point Likert scale, from Not at all to Very much. The ASI is scored by summing responses. (Appendix B)

**Inventory of Psychotic-like Anomalous Self-Experiences.** The Inventory of Psychotic-Like Anomalous Self-Experiences (IPASE) was developed as a self-report measure of self-disturbances (Cicero et al., 2017). The full version includes 57 questions, loading onto a five-factor structure: cognition, self-awareness and presence, consciousness, somatization, and demarcation/transitivism. Questions on the full version are answered using a 5-point Likert scale, from Strongly Disagree to Strongly Agree. Construct validity is supported through strong correlation with the Examination for Anomalous Self-Experiences, an unstructured phenomenological interview that is considered the primary method of measuring these experiences, moderate correlations with psychosis symptom measures, and insignificant correlation with mania scales, a construct that is associate with psychosis but theoretically separate from self-disturbances (Nelson et al., 2018). Participants completed the full version at
baseline on Qualtrics. For the ESM portion, one question from each factor was selected based on the highest loading, resulting in a shortened, 5-item version: (1) Right now, I feel as if my thoughts are not my own, (2) Right now, I fear that I am losing myself, (3) Right now, I can’t tell if I did something or just imagined it, (4) Right now I feel like my body has changed, and (5) Right now I wonder if I truly exist. The ESM version was converted to a 7-point Likert scale, from Not at all to Very much. The IPASE is scored by summing responses. (Appendix C)

**Self-Concept Clarity Scale.** The Self-Concept Clarity scale is a 12-item questionnaire designed to measure the extent to which self-beliefs are stable, consistent, and clearly defined (Campbell, 1990). While scores tend to be highly correlated with self-esteem, this relationship differs across cultures, supporting discriminate validity. The scale showed good internal consistency in samples of undergraduates, and scores may be decreased across various forms of psychopathology (Cicero, 2017). Questions are rated via a 5-point Likert scale (Strongly Disagree – Strongly Agree), with some items reverse coded. Participants completed the scale at baseline on Qualtrics. (Appendix D)

**Psychotic-like Experiences.** Items from (Barrantes-Vidal et al., 2013) were adapted to measure psychotic-like experiences, paranoia, and negative affect in daily life. In the present analyses, only psychotic-like experiences were used as outcome variables. Items to measure psychotic-like experiences included (1) Right now I feel that something or someone is controlling my thoughts or actions, (2) Since the last beep, I have heard or seen things others could not, (3) Right now my thoughts are strange or unusual, and (4) Right now I have difficulty controlling my thoughts. Each item was answered on a 7-point Likert scale slider ranging from “Not at all” to “Very much”. Index scores for psychotic-like experiences were calculated by
taking the mean of the relevant items at each time point. All questions asked during the ESM portion of the study are listed in Appendix E.

**Analyses**

Data collected in ESM studies are multilevel, with experiences at each timepoint representing Level 1 data, which are nested within subjects representing Level 2. Multilevel modeling is useful when data are structured this way because it allows for examination of Level 2 variables (e.g. person-level variables) without inflating sample size, while still maintaining the fine-grain detail of the intensive longitudinal data at Level 1 (Hox, 2010). Further, it allows for examination of cross-level interactions, such as how subject-level traits correlate to experiences reported throughout the week. Two-level linear mixed modeling was used for Aim 1 analyses.

A relatively recent method known as dynamic structural equation modeling (DSEM) has emerged as a useful analytic method for ESM studies. DSEM represents a combination of multilevel modeling, time-series modeling, structural equation modeling, and time-varying effects modeling (Asparouhov et al., 2018). A key part of DSEM is the decomposition of measured variables into both between-subjects (i.e. how each person’s mean score deviates from the grand mean) and within-subject components (i.e. deviations of each person’s score at time $t$ from that person’s individual mean). To interpret these deviations, it is important to center Level-1 predictors around each subject’s mean score in order to separate the between- and within-subject effects. This is important because we were interested in how individuals deviate from their personal means throughout the week rather than how individuals deviate from each other. For example, an individual with typically low reports of psychotic-like experiences may experience an increase that is meaningful compared to their personal mean but appears average if compared to the group mean. We are interested in these fluctuations because they may reveal
information into individual participant’s momentary changes in experiences, even if relatively small in magnitude. Traditional multilevel models would subject-center scores by calculating the difference between the subject’s overall mean score and observed scores at each timepoint. However, the DSEM module in Mplus version 8 uses latent subject-mean centering, in which an estimated mean is used instead of the observed mean in order to reduce biases, reduce the effect of measurement error, and improve interpretation. By including both latent subject-mean centered and latent subject means, predictors can be fully partitioned into within-subject and between-subject effects for comparison (McNeish & Hamaker, 2019). Time-invariant Level-2 predictors, such as the baseline measure of self-concept clarity, were centered around the grand-mean.

In addition to centering the variables, Mplus also standardizes the variables using within-subject standardization. Unlike typical methods which standardize values across the group, this reflects the number of subject-specific standard deviations that the dependent variable increases when the independent variable increases by one subject-specific standard deviation. These values are then averaged across the group to create a mean within-subject standardized score. As the present study aims are primarily focused on within-subject relationships between variables, this avoids conflating within-subject with between-subject standardization. In a sense, the standardized values can be compared to interpreting a single-subject time-series analysis (Schuurman et al., 2016). To ease interpretation, the unstandardized values are reported in tables and in the text, and within-subject standardized values are reported in the text, as reported in similar studies (Armstrong et al., 2019; Somers et al., 2019).

In the present study, we did not expect growth across the week; rather, we expected the data to reflect a sample of relatively stable processes during one typical week in the lives of our
participants. We expected to find fluctuations within individuals across timepoints, but mean scores should remain stable from the beginning of the week to the end. Although we don’t expect growth over the course of the week, ESM data are usually autocorrelated within subjects; each variable is correlated with itself at proximate timepoints. Our analyses included an autoregressive lag-1 model (AR(1)), which allowed examination of the relationship between the measured phenomena (e.g. psychotic-like experiences) and itself at 1 notification prior. An autoregressive value of 0 would imply a quick recovery between timepoints, while an autoregressive value closer to 1 would imply a stronger carryover effect from one notification to the next. These analyses were used to test the hypotheses in Aims 2 (autoregressive relationships) and 3 (cross-lagged relationships) (Appendix F). For Aim 4, the model was expanded to include both Level-1 (daily life) and Level-2 (baseline) predictors to test for interactions.

Because we are interested in individual differences in how these phenomena are experienced in daily life, we allowed residual variance to vary randomly at level 2. This allowed us to examine the range of variability across our sample; some individuals may have high peaks and low valleys while others remain close to their personal mean. By adding this to the DSEM models, we can test if certain variables (for example, baseline self-concept clarity) predict more unexplained variance.

For computational purposes, the DSEM module in Mplus uses Bayesian estimation. Because of this, there are not null hypotheses tested with p-values as in frequentist statistics. Rather, posterior medians are reported as estimates of parameters, and to determine if an estimate is null, 95% credible intervals for the parameter of interest are reported. Using default priors, if zero falls within the interval, the estimate is null.
Notifications were set to occur at random intervals to maximize response rate, resulting in the duration between notifications varying from 30 minutes to over 12 hours. In order to accurately examine lagged relationships, the data were fit to a time grid of 24 hours, with missing data estimated using a Kalman filter, in which each missing observation is estimated based on previous observations (McNeish & Hamaker, 2019). In DSEM, missing data is estimated using the Markov Chain Monte Carlo (MCMC) algorithm via the Gibbs sampler. The MCMC algorithm organizes all parameters, latent variables, and missing data into blocks, which are updated in a particular sequence with values adjusted based on previous blocks and the whole dataset (Asparouhov et al., 2018). Simulation studies have suggested that DSEM can produce acceptable results with up to 85% missing data (Asparouhov et al., 2018), so a grid of 24 allows us to maintain the fine-grain details of momentary assessment, while accounting for both missed notifications and unequal spacing between notifications. For the occasional situation in which two notifications occurred within the same hour, the mean of both reports was taken to produce one score for that hour.

It is usually important in mixed modeling to evaluate model fit and model comparison statistics. The deviance information criterion (DIC) is often used in Bayesian analyses to compare models in order to make decisions regarding which random effects are necessary to include. However, the large number of parameters in DSEM makes DIC unstable, and thus unreliable. The current consensus is that there is no easy tool to compare models or assess model fit in DSEM, and that researchers should proceed cautiously (Hamaker et al., 2018).

All analyses were completed in Mplus, Version 8.
## Results

Table 1 presents characteristics of the sample, including demographics and baseline levels of measured phenomena.

Table 1.
Sample Demographics and Characteristics (n = 246)

<table>
<thead>
<tr>
<th></th>
<th>Age (M, SD)</th>
<th>19.7 (4.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex (N, %)</strong></td>
<td>Female</td>
<td>141 (57.3%)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>80 (32.5%)</td>
</tr>
<tr>
<td></td>
<td>Missing or Declined to State</td>
<td>25 (10.2%)</td>
</tr>
<tr>
<td><strong>Ethnicity (N, %)</strong></td>
<td>Asian</td>
<td>92 (37.4%)</td>
</tr>
<tr>
<td></td>
<td>Caucasian</td>
<td>42 (17.1%)</td>
</tr>
<tr>
<td></td>
<td>Pacific Islander</td>
<td>47 (19.1%)</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>10 (4.1%)</td>
</tr>
<tr>
<td></td>
<td>Native American</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td></td>
<td>Multiethnic</td>
<td>28 (11.4%)</td>
</tr>
<tr>
<td></td>
<td>Missing or Declined to State</td>
<td>26 (10.6%)</td>
</tr>
<tr>
<td><strong>ESM Survey Completion Rate (M, SD)</strong></td>
<td>69.3% (20.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline PerMag (M, SD)</strong></td>
<td>4.39 (5.34)</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline IPASE (M, SD)</strong></td>
<td>102.78 (44.34)</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline ASI (M, SD)</strong></td>
<td>12.34 (8.34)</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline SCC (M, SD)</strong></td>
<td>35.56 (6.89)</td>
<td></td>
</tr>
</tbody>
</table>

### Aim 1.

Multilevel analyses revealed significant correlations between scores on baseline reports and scores in daily life for each of the measured phenomena. Unstandardized estimates are presented in Table 2.
Table 2.
Baseline Measures Predicting Daily Life Measures

<table>
<thead>
<tr>
<th>Aim</th>
<th>Measure</th>
<th>Estimate</th>
<th>Posterior SD</th>
<th>95% Credible Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1a: PLE on PerMag</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLE Intercept</td>
<td>1.105*</td>
<td>0.051</td>
<td>1.006</td>
<td>1.205</td>
</tr>
<tr>
<td>PLE Within-Level Variance</td>
<td>0.246*</td>
<td>0.005</td>
<td>0.237</td>
<td>0.255</td>
</tr>
<tr>
<td>PLE on PerMag</td>
<td>0.063*</td>
<td>0.008</td>
<td>0.048</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1b: PLE on ASI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLE on ASI</td>
<td>0.019*</td>
<td>0.005</td>
<td>0.010</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1c: PLE on IPASE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLE on IPASE</td>
<td>0.006*</td>
<td>0.001</td>
<td>0.004</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1d: IPASE on IPASE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPASE Intercept</td>
<td>3.264*</td>
<td>0.439</td>
<td>2.381</td>
<td>4.112</td>
</tr>
<tr>
<td>IPASE Within-Level Variance</td>
<td>4.113*</td>
<td>0.079</td>
<td>3.961</td>
<td>4.264</td>
</tr>
<tr>
<td>IPASE on IPASE</td>
<td>0.031*</td>
<td>0.004</td>
<td>0.024</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1e: IPASE on SCC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPASE on SCC</td>
<td>-0.090*</td>
<td>0.032</td>
<td>-0.151</td>
<td>-0.025</td>
</tr>
<tr>
<td></td>
<td><strong>Aim 1f: ASI on ASI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASI Intercept</td>
<td>6.292*</td>
<td>0.504</td>
<td>5.312</td>
<td>7.255</td>
</tr>
<tr>
<td>ASI Within-Level Variance</td>
<td>10.187*</td>
<td>0.187</td>
<td>9.822</td>
<td>10.561</td>
</tr>
<tr>
<td>ASI on ASI</td>
<td>0.165*</td>
<td>0.034</td>
<td>0.099</td>
<td>0.233</td>
</tr>
</tbody>
</table>

*significance is based on the Credible Interval (CI) not containing zero

Scores on the magical ideation and perceptual aberration subscales from the WSS were positively correlated with psychotic-like experiences in daily life. Baseline aberrant salience was positively correlated with reports of both aberrant salience and psychotic-like experiences in daily life. Similarly, baseline anomalous self-experiences were positively correlated with both anomalous self-experiences and psychotic-like experiences in daily life. Lastly, self-concept clarity was negatively correlated with reports of anomalous self-experiences in daily life, consistent with our hypotheses.
Aim 2.

Two DSEM models were run to examine both cross-lagged and autoregressive relationships between (1) aberrant salience and psychotic-like experiences (Table 3) and (2) anomalous self-experiences and psychotic-like experiences (Table 4).

As shown in Table 3, the first model revealed a significant autoregressive relationship for aberrant salience at times t and t-1 ($b = 0.364$, 95% CI 0.308 to 0.416; $\beta = 0.372$, 95% CI 0.338 to 0.402) across participants, indicating a non-null carryover effect. The autoregressive term for psychotic-like experiences was not significant, indicating a potential lack of evidence for an overall carryover effect for psychotic-like experiences.

Table 3.

Psychotic-Like Experiences Predicted by Aberrant Salience

<table>
<thead>
<tr>
<th></th>
<th>Effect</th>
<th>Estimate</th>
<th>Posterior SD</th>
<th>95% Credible Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASI</td>
<td>7.815*</td>
<td>0.234</td>
<td>7.361</td>
<td>8.280</td>
</tr>
<tr>
<td>PLE</td>
<td>1.299*</td>
<td>0.032</td>
<td>1.238</td>
<td>1.362</td>
</tr>
<tr>
<td>LogV PLE</td>
<td>-3.581*</td>
<td>0.141</td>
<td>-3.857</td>
<td>-3.304</td>
</tr>
<tr>
<td>LogV ASI</td>
<td>0.595*</td>
<td>0.166</td>
<td>0.268</td>
<td>0.917</td>
</tr>
<tr>
<td>Regression Paths</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASI $\rightarrow$ ASI</td>
<td>0.364*</td>
<td>0.028</td>
<td>0.308</td>
<td>0.416</td>
</tr>
<tr>
<td>PLE $\rightarrow$ PLE</td>
<td>0.059</td>
<td>0.030</td>
<td>0.000</td>
<td>0.116</td>
</tr>
<tr>
<td>ASI $\rightarrow$ PLE</td>
<td>0.032*</td>
<td>0.005</td>
<td>0.023</td>
<td>0.041</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-Person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASI</td>
<td>11.788*</td>
<td>1.377</td>
<td>9.374</td>
<td>14.743</td>
</tr>
<tr>
<td>PLE</td>
<td>0.219*</td>
<td>0.028</td>
<td>0.172</td>
<td>0.281</td>
</tr>
<tr>
<td>LogV PLE</td>
<td>0.101*</td>
<td>0.014</td>
<td>0.077</td>
<td>0.132</td>
</tr>
<tr>
<td>LogV ASI</td>
<td>0.096*</td>
<td>0.012</td>
<td>0.074</td>
<td>0.123</td>
</tr>
<tr>
<td>ASI $\rightarrow$ ASI</td>
<td>0.003*</td>
<td>0.000</td>
<td>0.002</td>
<td>0.004</td>
</tr>
<tr>
<td>PLE $\rightarrow$ PLE</td>
<td>4.591*</td>
<td>0.439</td>
<td>3.836</td>
<td>5.568</td>
</tr>
<tr>
<td>ASI $\rightarrow$ PLE</td>
<td>6.652*</td>
<td>0.622</td>
<td>5.591</td>
<td>8.033</td>
</tr>
</tbody>
</table>

*significance is based on the Credible Interval (CI) not containing zero.
The results of the second model (Table 4) revealed autoregressive effects for both anomalous self-experiences ($b = 0.407$, 95% CI 0.352 to 0.462; $\beta = 0.406$, 95% CI 0.382 to 0.427) and psychotic-like experiences ($b = 0.129$, 95% CI 0.074 to 0.182; $\beta = 0.126$, 95% CI 0.095 to 0.159), indicating non-null carryover effects from one timepoint to the next.

Table 4.

Psychotic-Like Experiences Predicted by Anomalous Self-Experiences

<table>
<thead>
<tr>
<th></th>
<th>Effect</th>
<th>Estimate</th>
<th>Posterior SD</th>
<th>95% Credible Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercepts</td>
<td>IPASE</td>
<td>5.017*</td>
<td>0.004</td>
<td>5.009</td>
</tr>
<tr>
<td></td>
<td>PLE</td>
<td>1.030*</td>
<td>0.013</td>
<td>1.023</td>
</tr>
<tr>
<td></td>
<td>LogV PLE</td>
<td>-3.515*</td>
<td>0.140</td>
<td>-3.789</td>
</tr>
<tr>
<td></td>
<td>LogV IPASE</td>
<td>-1.460*</td>
<td>0.198</td>
<td>-1.844</td>
</tr>
<tr>
<td>Regression Paths</td>
<td>IPASE→IPASE</td>
<td>0.407*</td>
<td>0.028</td>
<td>0.352</td>
</tr>
<tr>
<td></td>
<td>PLE→PLE</td>
<td>0.129*</td>
<td>0.027</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td>IPASE→PLE</td>
<td>0.080*</td>
<td>0.008</td>
<td>0.065</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-Person</td>
<td>IPASE</td>
<td>0.001*</td>
<td>0.000</td>
<td>0.001</td>
</tr>
<tr>
<td>Residual Variances</td>
<td>PLE</td>
<td>0.001*</td>
<td>0.002</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>IPASE→IPASE</td>
<td>0.156*</td>
<td>0.015</td>
<td>0.129</td>
</tr>
<tr>
<td></td>
<td>PLE→PLE</td>
<td>0.094*</td>
<td>0.012</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>IPASE→PLE</td>
<td>0.008*</td>
<td>0.001</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>LogV PLE</td>
<td>4.583*</td>
<td>0.430</td>
<td>3.832</td>
</tr>
<tr>
<td></td>
<td>LogV IPASE</td>
<td>9.633*</td>
<td>0.894</td>
<td>8.105</td>
</tr>
</tbody>
</table>

*significance is based on the Credible Interval (CI) not containing zero

**Aim 3.**

Each of these DSEM models also included cross-lagged relationships to examine if precursory mechanisms occur before psychotic-like experiences, above and beyond any autoregressive effects of psychotic-like experiences. As shown in Table 3, aberrant salience at $t-1$ is significantly correlated with psychotic-like experiences at time $t$ ($b = 0.032$, 95% CI 0.023 to 0.041; $\beta = 0.210$, 95% CI 0.181 to 0.247). Similarly, the results of the second model (Table 4)
demonstrate a significant relationship between anomalous self-experiences at t-1 and psychotic-like experiences at time t (b = 0.080, 95% CI 0.065 to 0.095; β = 0.283, 95% CI 0.259 to 0.306), above the effects of the significant autoregressive relationship for psychotic-like experiences.

**Aim 4.**

We were also interested in whether subject-level self-concept clarity moderated the relationship between aberrant salience and psychotic-like experiences. A third DSEM was run to examine the effect of SCC on each of the coefficients from the original model (Table 5).

**Table 5.**

Effects of Self-Concept Clarity on the Lagged Relationship Between Aberrant Salience and Psychotic-Like Experiences

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>Posterior SD</th>
<th>95% Credible Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>μASI on SCC</td>
<td>-0.015*</td>
<td>0.006</td>
<td>-0.027</td>
</tr>
<tr>
<td>μPLE on SCC</td>
<td>-0.098*</td>
<td>0.035</td>
<td>-0.166</td>
</tr>
<tr>
<td>φ1 on SCC</td>
<td>-0.006</td>
<td>0.004</td>
<td>-0.014</td>
</tr>
<tr>
<td>φ2 on SCC</td>
<td>0.001</td>
<td>0.005</td>
<td>-0.008</td>
</tr>
<tr>
<td>φ3 on SCC</td>
<td>-0.001</td>
<td>0.001</td>
<td>-0.003</td>
</tr>
<tr>
<td>ω1 on SCC</td>
<td>-0.074*</td>
<td>0.022</td>
<td>-0.116</td>
</tr>
<tr>
<td>ω2 on SCC</td>
<td>-0.077*</td>
<td>0.026</td>
<td>-0.128</td>
</tr>
</tbody>
</table>

*significance is based on the Credible Interval (CI) not containing zero

As predicted, SCC was negatively associated with both psychotic-like experiences (b = -0.098, 95% CI -0.166 to -0.030) and aberrant salience (b = -0.015, 95% CI -0.027 to -0.002). However, SCC was not found to be a significant moderator of the magnitude of the lagged relationships. This model also revealed an inverse relationship between SCC and residual variance for both psychotic-like experiences (b = -0.074, 95% CI -0.116 to -0.031) and aberrant salience (b = -0.077, 95% CI -0.128 to -0.026), suggesting that individuals with lower SCC
experienced more fluctuations in both aberrant salience and psychotic-like experiences across timepoints.

**Discussion**

Prior research has examined the expression of schizotypy and related phenomena in daily life, providing preliminary insights into the momentary dynamics of emerging unusual thoughts and perceptual experiences (Kwapil et al., 2012; Ludwig et al., 2019; Reininghaus et al., 2016). Additionally, theoretical models and cross-sectional studies have identified aberrant salience and self-disturbances as potential precursory mechanisms of psychotic-like experiences (Cicero et al., 2010, 2015, 2017; Freeman, 2007; Howes & Murray, 2014). However, these phenomena have not been examined in conjunction with psychotic-like experiences using intensive longitudinal methods. To our knowledge, the present study was the first to examine the occurrence of aberrant salience, anomalous self-experiences, and psychotic-like experiences as they occur in the daily lives of young adults. As efforts are underway to refine screening and assessment of psychosis, it is important to understand the nature of how and when these precursory mechanisms occur in order to improve specificity of assessments and allow for earlier identification of risk states. The present study represents an initial effort to explore the temporal patterns of these phenomena in a non-clinical sample.

The first aim examined the ecological validity of existing measures by testing whether baseline scores correlate to daily life scores. The results show that baseline measures do indeed correlate with daily life scores in the predicted directions. This is important to examine because screening efforts often only measure symptoms at one occasion but should reflect what is recent and recurrent for the respondent. Psychotic-like experiences and related phenomena can be subtle and transitory, so baseline measures may not adequately capture their occurrence. Our
results are consistent with previous studies on the expression of schizotypy in daily life (Kwapil et al., 2012), but expand to include aberrant salience and anomalous self-disturbances, potentially even more fleeting experiences.

These findings provide additional supportive evidence for the construct validity of both IPASE and ASI scale scores in young adults. Prior research has provided evidence for both convergent and discriminant validity for the IPASE (Cicero et al., 2017; Nelson et al., 2018), but the measure had not previously been examined for ecological validity. Our findings suggest that the baseline IPASE measure does indeed correlate to an increase in self-disturbances in daily life. However, because self-disturbances are thought to occur across different domains of cognitive processing (Klaunig et al., 2018), it will be important to continue to study the trait-versus-state nature of self-disturbances in psychosis, particularly because the original EASE interview takes a holistic approach to these subtle changes (Nelson et al., 2018). Our results also provide evidence supporting ecological validity for the ASI. While the ASI has consistently converged with measures of positive schizotypy (Chun et al., 2019; Cicero et al., 2010), prior research has revealed mixed evidence for convergent validity between the ASI and other biological or behavioral measures of aberrant salience (Chun et al., 2019; Neumann & Linscott, 2018; Raballo et al., 2019). This may relate to the typically low reliability of behavioral measures, which are often designed to maximize within-subject variability in the context of experimental manipulation, but may not be as suitable for examining between-subject differences compared to self-report measures (Dang et al., 2020). Our finding that baseline ASI scores correlate with daily life scores indicates that self-report ASI may be a useful tool for examining both between-subject and within-subject differences in salience.
The second aim examined the autoregressive or “inertia” relationships between each of the measured variables and themselves at different time points. The first model revealed a significant autoregressive relationship for aberrant salience, indicating that the experience of aberrant salience at an earlier survey increased the reports of aberrant salience at the next survey. The autoregressive relationship for psychotic-like experiences was not significant. This could indicate that psychotic-like experiences are more discrete events compared to schizotypy or aberrant salience. However, in the second model, both anomalous self-experiences and psychotic-like experiences were found to have statistically significant autoregressive relationships.

These mixed results are consistent with the continuing debate about trait-versus-state attributes of psychopathology. Prior research has suggested that psychotic-like experiences are discrete states that are moderated by stable traits such as schizotypy (Kwapil et al., 2012; Rössler et al., 2013), but a network model approach would suggest that states and traits are not necessarily distinct, and that symptoms may dynamically affect each other over time to form a causal network (van Os, 2013). With the latter theory, autoregressive relationships may play an important role in the progression of symptoms. Research in emotion regulation has considered a strong autoregressive relationship to be indicative of regulatory weakness, with a weaker autoregressive relationship indicating a quicker recovery from mood states (Hamaker et al., 2018). Stronger autoregressive relationships are associated with higher trait neuroticism (Suls et al., 1998). Given the potential relationship between schizotypy and neuroticism (Macare et al., 2012) and the role of negative affect or stress on psychotic-like experiences (Kemp et al., 2018; Kline et al., 2012), further research would benefit from examining regulatory factors involved in the autoregressive relationships of psychotic-like experiences.
Analyses for aim three examined cross-lagged effects to observe if precursory mechanisms occurred before psychotic-like experiences. The first model found that increased reports of aberrant salience in one survey were associated with increased reports of psychotic-like experiences at the time of the next survey. Similar results were found with the second model – increased anomalous self-experiences were associated with increased psychotic-like experiences at the next time point, above and beyond the effects of prior psychotic-like experiences. This provides preliminary evidence that aberrant salience and anomalous self-disturbances precede psychotic-like experiences and provides additional evidence that anomalous self-disturbances are distinct phenomena from psychotic-like experiences. However, it will be important to test the reverse hypothesis before causality can be determined (i.e. that the Granger-causal relationship has been fulfilled). Future analyses could compare bidirectional standardized coefficients to provide additional information regarding directional effects, as described in studies using similar methodology (Armstrong et al., 2019; Schuurman et al., 2016).

Lastly, the fourth aim examined the role of baseline self-concept clarity as a moderator of the cross-lagged relationship between aberrant salience and psychotic-like experiences. Although the moderation relationship was not statistically significant, self-concept clarity was shown to be negatively associated with mean psychotic-like experiences and aberrant salience. This is consistent with previous findings that individuals with psychosis-spectrum symptoms have lower self-concept clarity (Cicero et al., 2016), but inconsistent with prior research that suggests an interaction effect between self-concept clarity and aberrant salience (Cicero et al., 2013, 2015). One possible explanation for these mixed results is the differences in selected measurement instruments. Prior studies utilized positive schizotypy as indicators of psychotic-like experiences, while our study asked about specific, momentary occurrences. It is possible that the interaction
between self-concept clarity and aberrant salience produces fluctuations in positive schizotypy, which is thought to be more dimensional. In our college student sample, individuals may not have experienced frequent or intense psychotic-like experiences. Future studies would benefit from measuring schizotypy and self-concept clarity in daily life and expanding the samples to include more individuals who experience psychotic-like experiences in order to further examine this interaction relationship.

Additional analyses revealed that higher self-concept clarity was associated with lower residual variance for each of the outcome variables, indicating that a more stable self-concept may be associated with more stable experiences (i.e. fewer fluctuations) throughout the week. These findings are consistent with prior research in non-clinical samples that link increased self-concept clarity with subjective well-being, and reduced self-concept clarity with daily stressors or negative affect (Ritchie et al., 2011; Schwartz et al., 2011; Sebastian et al., 2008).

Overall, the results provide insight into the within-subject dynamics of psychotic-like experiences, including the proposed precursory mechanisms of aberrant salience and anomalous self-disturbances. Identifying the dynamics of specific mechanisms of psychotic-like experiences may be particularly important in the context of early intervention efforts. As mentioned previously, efforts to screen for psychosis in adolescent populations have struggled with low specificity (Kline & Schiffman, 2014), potentially due in part to the transdiagnostic nature of risk factors and the heterogeneity of symptom expression. Recent efforts to improve specificity have honed in on the unique subjective changes in early psychosis (i.e. ‘basic symptoms’), which include early changes in perception (e.g. aberrant salience) and the self (e.g. anomalous self-disturbances) (Schultze-Lutter & Theodoridou, 2017). However, studies examining the clinical utility of these early signs have shown mixed results. One study found that combining basic
symptom criteria with the clinical high-risk criteria did not improve predictive accuracy (Hengartner et al., 2017). Although self-report measures such as the IPASE (Cicero et al., 2017) or the Self-Experience Lifetime Frequency scale (SELF) (Heering et al., 2016) have shown to differentiate between individuals with psychosis-spectrum symptoms and individuals without, it is unclear whether they have utility for tracking within-subject changes. The present findings provide preliminary evidence that the IPASE and ASI are suitable for examining within-subject fluctuations, autoregressive relationships, and cross-lagged relationships in a non-clinical sample. Future research should examine the clinical and predictive utility of tracking these phenomena over time and whether including aberrant salience or self-disturbances in conjunction with traditional criteria improves assessment efforts.

The design of this study has many strengths. As previously mentioned, ESM allows for data to be collected intensively over time, which allows for examination of variability over the course of a week. Particularly important for fleeting experiences, ESM reduces the duration of time between experience and report, improving recall bias. Another strength is the use of personal smartphone technology. Young adults are particularly comfortable using smartphones and the ease of survey administration using the Lifedata application allowed for data collection in the context of daily life, with adequate survey completion rates. The data were analyzed using DSEM, a recently developed approach to analyzing within-subject relationships in multilevel time-series data. This approach allowed us to test novel hypotheses regarding carryover effects and lagged relationships without confounding between-subject variance. However, these results should be interpreted cautiously, as this analytical technique is still being developed and currently lacks adequate tests for model fit. An additional consideration, known as the “lag problem”, involves the time scale chosen for this study. The hourly interval allowed us to
examine dynamics across waking hours in a typical week for our participants. However, different conclusions may be drawn if measures were taken weekly, daily, or moment to moment (Hamaker et al., 2018). Given that psychotic-like experiences emerge over the course of adolescent development (potentially developing across years) and may be momentarily sensitive to environmental stressors (potentially developing across seconds or minutes), further studies could examine within-subject changes across larger and/or shorter intervals.

The sample of participants in this study comprised of young adults enrolled in undergraduate psychology courses, which can be viewed as both a strength and a limitation. On one hand, psychotic symptoms frequently emerge during adolescence and young adulthood and schools could play an important role in improving community early identification efforts (Meyer et al., 2019), so examining the occurrence of psychotic-like experiences in college students may have direct implications for risk screening efforts. Additionally, measuring schizotypy in a community sample allows researchers to examine specific facets of psychotic-like experiences without the confounds of disability or anti-psychotic medications. However, because the sample is limited to individuals who are functioning well enough to attend university, it may exclude young adults experiencing higher levels of negative or disorganized schizotypy. Prior research has suggested that negative symptoms may preclude positive symptom formation in at-risk individuals (Carrión et al., 2016), so future studies should examine these phenomena in a broader clinical or at-risk sample.

While psychotic-like experiences have been consistently measured in college student samples with adequate variability, it is unclear how meaningful these experiences are to participants. College students do not typically report distress associated with psychotic-like experiences (Loewy et al., 2007), and report fewer experiences and more stability compared to
at-risk samples (Cicero et al., 2014). If these experiences are occurring at a subthreshold level and causing little to no distress or impairment, they may be under-observed or under-reported. Additionally, the present analyses do not control for substance use or disordered sleep, both of which are associated with psychotic-like experiences and aberrant salience in undergraduate samples (Andorko et al., 2017; Bernardini et al., 2018). It is unclear if the underlying mechanisms of psychotic-like experiences attributed to these external causes are the same as in the context of emerging psychopathology. Continued investigation of these possible additional causal factors in non-clinical samples is warranted in future analyses.

An important next step in this line of research is to identify how aberrant salience and anomalous self-experiences evolve to produce psychotic-like experiences. As mentioned previously, the role of regulatory and affective processes may play an important role in the formation of these experiences. A recent research study used similar cross-lagged methods to identify moderators of the pathway from negative affect to delusion formation in individuals with psychosis. They found that increased awareness of emotions dampened the progression to paranoia, whereas increased rumination strengthened the pathway to paranoia (Ludwig et al., 2019). Similar strategies may be used to examine the progression from aberrant salience or anomalous self-disturbance to a psychotic-like experience, and to examine the role of negative affect or stress. A prior study found evidence that psychotic-like experiences fluctuate in response to minor daily stressors, and that these fluctuations were associated with abnormal dopamine activity (Myin-Germeys et al., 2005). Similarly, aberrant salience has been examined in conjunction with threat anticipation and stress sensitivity (Reininghaus et al., 2016), but the momentary dynamics have yet to be examined. Including relevant measures of distress and
functioning with current measures may help clarify the momentary dynamics of psychotic-like experiences in a clinical context.

Lastly, it may be important to consider the role of individual differences in the formation of psychotic-like experiences. As mentioned previously, the current analyses primarily focus on the within-subject dynamics of the specified phenomena. However, future studies may wish to utilize the unique features of DSEM that allow for examination of between-subject differences in within-subject processes. For instance, one participant may experience a strong cross-lagged relationship between aberrant salience and psychotic-like experiences, while another may experience a stronger effect from anomalous self-disturbances. In our analyses, between-subject variances (i.e. random effects) were consistently significant, indicating the presence of individual differences in each of our variables and lagged relationships of interest. In the context of clinical intervention, idiographic assessment methods may be useful in monitoring the unique within-subject processes that confer risk for psychosis-spectrum syndromes in order to provide intervention that targets specific mechanisms at optimal times.
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Appendix A: Wisconsin Schizotypy Scale – Short Form

Short Form of the Wisconsin Schizotypy Scale – T/F

The Magical Ideation Scale

1. I have felt that there were messages for me in the way things were arranged, like in a store window.
2. I have occasionally had the silly feeling that a TV or radio broadcaster knew I was listening to him.
3. I have noticed sounds on my records that are not there at other times.
4. I have had the momentary feeling that someone’s place has been taken by a look-alike.
5. At times I perform certain little rituals to ward off negative influences.
6. I have sometimes felt that strangers were reading my mind.
7. If reincarnation were true, it would explain some unusual experiences I have had.
8. I have sometimes had the passing thought that strangers are in love with me.
9. The hand motions that strangers make seem to influence me at times.
10. I have sometimes been fearful of stepping on sidewalk cracks.
11. Numbers like 13 and 7 have no special powers.
12. I have had the momentary feeling that I might not be human.
13. I think I could learn to read others’ minds if I wanted to.
14. Horoscopes are right too often for it to be a coincidence.
15. I have worried that people on other planets may be influencing what happens on Earth.

Perceptual Aberration Scale

1. Occasionally it has seemed as if my body had taken on the appearance of another person’s body.
2. I have sometimes felt confused as to whether my body was really my own.
3. I have sometimes had the feeling that my body is decaying inside.
4. Sometimes I have felt that I could not distinguish my body from other objects around me.
5. I have felt that something outside my body was a part of my body.
6. Sometimes I have had feelings that I am united with an object near me.
7. Sometimes I have had a passing thought that some part of my body was rotting away.
8. I have sometimes felt that some part of my body no longer belongs to me.
9. I can remember when it seemed as though one of my limbs took on an unusual shape.
10. I sometimes have to touch myself to make sure I’m still there.
11. I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.
12. I have had the momentary feeling that my body has become misshapen.
13. Sometimes I feel like everything around me is tilting.
14. Parts of my body occasionally seem dead or unreal.
15. At times I have wondered if my body was really my own.

Revised Social Anhedonia Scale
1. Having close friends is not as important as many people say.
2. I never had really close friends in high school.
3. I prefer watching television to going out with other people.
4. Just being with friends can make me feel really good.
5. I’m much too independent to really get involved with other people.
6. I prefer hobbies and leisure activities that do not involve other people.
7. I don’t really feel very close to my friends.
8. People who try to get to know me better usually give up after awhile.
9. Knowing that I have friends who care about me gives me a sense of security.
10. People are usually better off if they stay aloof from emotional involvements with most others.
11. If given the choice, I would much rather be with others than be alone.
12. Although there are things that I enjoy doing by myself, I usually seem to have more fun when I do things with other people.
13. I feel pleased and gratified as I learn more and more about the emotional life of my friends.
14. When things are going really good for my close friends, it makes me feel good too.
15. Making new friends isn’t worth the energy it takes.
Appendix B: Aberrant Salience Inventory

Aberrant Salience Inventory – T/F
1) Do certain trivial things ever suddenly seem especially important or significant to you?
2) Do you sometimes feel like you are on the verge of something really big, but you’re not sure what it is?
3) Do your senses sometimes seem sharpened?
4) Do you ever feel like you are rapidly approaching the height of your intellectual powers?
5) Do you sometimes notice small details that you have not noticed before that seem important?
6) Do you sometimes feel like it is important for you to figure something out, but you’re not sure what it is?
7) Do you ever go through periods where you feel especially religious or mystical?
8) Do you ever have difficulty telling if you are thrilled, frightened, pained, or anxious?
9) Do you ever go through periods of heightened awareness?
10) Do you ever feel the need to make sense of seemingly random situations or occurrences?
11) Do you sometimes feel like you are finding the missing piece to a puzzle?
12) Do you sometimes feel that you can hear with a greater clarity?
13) Do normally trivial observations sometimes take on an ominous significance?
14) Do you go through periods in which songs sometimes seem to have an important meaning for your life?
15) Do you sometimes attribute importance to objects which you normally would not?
16) Do you sometimes feel like you are on the verge of figuring out something really big or important, but you aren’t sure what it is?
17) Has your sense of taste ever seemed more acute?
18) Do you ever feel like the mysteries of the universe are revealing themselves to you?
19) Do you go through periods in which you feel over-stimulated by things or experiences that are normally manageable?
20) Do you often become fascinated by the little things around you?
21) Do your senses ever seem extremely strong or clear?
22) Do you ever feel like a whole world is opening up to you?
23) Do you ever feel that your boundaries between inner and outer sensations have been removed?

24) Do you sometimes feel like the world is changing and you are searching for an explanation?

25) Do you ever perceive an overwhelming significance to things that are usually not significant to you?

26) Do you ever have a feeling of inexpressible urgency, and you are not sure what to do?

27) Have you sometimes become interested in people, events, places, or ideas that normally would not make an impression on you?

28) Do your thoughts and perceptions ever come faster than can be assimilated?

29) Do you sometimes notice things that you haven’t noticed before that take on special significance?
Appendix C: Inventory of Psychotic-like Anomalous Self-Experiences

Inventory of Psychotic-like Anomalous Self-Experiences
We are interested in studying the kinds of attitudes and life experience people have. The following questionnaire contains statements about attitudes and life experiences. Please indicate how much you agree or disagree with the following statements on a scale of: 1= Strongly Disagree, 2 = Disagree, 3 = Neither Agree Nor Disagree, 4 = Agree, and 5 = Strongly Agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) I feel like my thoughts are being generated by someone else.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>2) I feel like my current life is not connected with my life in the future.</td>
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<td>3</td>
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<td>3) I sometimes feel like I can see myself from the outside.</td>
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<tr>
<td>4) I feel as though I no longer have an identity.</td>
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<td>2</td>
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<td>5</td>
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<tr>
<td>5) I have had the feeling that I am watching myself from outside my body.</td>
<td>1</td>
<td>2</td>
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<td>6) I have difficulty telling whether I am experiencing something or just imagining it.</td>
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<td>7) I feel like my inner-most identity has disappeared.</td>
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<td>8) I have had the feeling that I am older or younger than I actually am.</td>
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<td>9) I wonder whether or not I truly exist.</td>
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<td>10) I feel as if I have lost contact with myself.</td>
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<td>11) I feel like my body has changed.</td>
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<td>12) When I am reading, I feel like the words are being read by someone else.</td>
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<td>13) I sometimes feel like my legs, arms, or other body parts are not really mine.</td>
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<td>14) I have the experience of being unsure if I have said something out loud or just thought it.</td>
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<td>15) I feel distant from myself.</td>
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<td>16) I sometimes feel like I am unable to control my body parts.</td>
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<td>17) I often feel like I need to agree with other people because I have no point of view.</td>
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<td>18) I feel as if I have totally lost myself.</td>
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<td>19) I often look in the mirror to see if I have changed.</td>
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<tr>
<td>20) I feel as if my thoughts are not my own.</td>
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</tbody>
</table>
21) I try to figure out who I am by looking at things like photos, notes, and diaries.  

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>22) It seems like time is moving faster or slowing than it used to.</td>
<td>1 2 3 4 5</td>
<td></td>
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<td>23) I am living in another world.</td>
<td>1 2 3 4 5</td>
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<td>24) I have electric sensations in my body.</td>
<td>1 2 3 4 5</td>
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<td>25) I feel as if I am not part of this world.</td>
<td>1 2 3 4 5</td>
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<td>26) I fear that I am losing myself.</td>
<td>1 2 3 4 5</td>
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<td>27) I have had feelings of hot or cold throughout my body that are not caused my changes in temperature around me.</td>
<td>1 2 3 4 5</td>
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<td>28) When thinking, I feel as if my thoughts are being written down.</td>
<td>1 2 3 4 5</td>
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<td>29) I feel that I am a stranger to myself.</td>
<td>1 2 3 4 5</td>
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<td>30) I have felt pain from hearing noises.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>31) I feel like time is rushing ahead, slowing down, or standing still.</td>
<td>1 2 3 4 5</td>
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<td>32) I feel as though I no longer have a connection with the world.</td>
<td>1 2 3 4 5</td>
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<td>33) I have felt as if my leg is jerking or my body is rocking when I am in fact not moving.</td>
<td>1 2 3 4 5</td>
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<td>34) I sometimes feel as if I am a ghost.</td>
<td>1 2 3 4 5</td>
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<td>35) I feel that I am not really present in this world.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>36) I have had times when I am unable to control my body.</td>
<td>1 2 3 4 5</td>
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<td>37) When thinking, my thoughts seem so loud that I wonder if other people can hear them.</td>
<td>1 2 3 4 5</td>
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<td>38) I feel that I am not the same person I have always been.</td>
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<td>39) I have had times when I have tried to move but cannot.</td>
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<td>40) I feel that I have an inner void.</td>
<td>1 2 3 4 5</td>
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<td>41) I sometimes cannot remember doing things that I know I have done.</td>
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<td></td>
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<tr>
<td>42) When I think about myself, I feel like I am thinking about a different person.</td>
<td>1 2 3 4 5</td>
<td></td>
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<tr>
<td>43) I have had sudden feelings of weakness in my arms, legs, or other body parts.</td>
<td>1 2 3 4 5</td>
<td></td>
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</tr>
<tr>
<td>44) I feel like there is not a connection between myself and what I am thinking.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>45) I avoid discussions because I have no opinion of my own about things.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neither Agree nor Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>46) I feel as if I am fading out of existence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>47) When I see someone moving, I feel like I am moving, too, even if I am completely still.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>48) I am constantly observing myself, to the point where I have trouble following what’s going on around me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>49) I feel as if my thoughts are repeated or echoed outside of my head.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>50) When I do something, I feel like it is not really me doing it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>51) I feel like I am a passive observer of the world.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>52) My facial expressions, speech, behavior, and gestures are often not in line with what I am thinking or feeling.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>53) I have the confusing feeling that I am somehow changing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>54) I feel as if the barrier between myself and the world has disappeared.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>55) I do not have as strong of feelings as I used to.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>56) When thinking, I can see my thoughts going one in front of the other.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>57) The meaning and significance of my world seems to have changed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix D: Self-Concept Clarity Scale

Self-Concept Clarity Scale – 5-point Likert scale

1. My beliefs about myself often conflict with one another
2. On one day I might have one opinion of myself and on another day I might have a different opinion
3. I spend a lot of time wondering about what kind of person I really am
4. Sometimes I feel that I am not really the person that I appear to be
5. When I think about the kind of person I have been in the past, I’m not sure what I was really like
6. I seldom experience conflict between the different aspects of my personality
7. Sometimes I think I know other people better than I know myself
8. My beliefs about myself seem to change very frequently
9. If I were asked to describe my personality, my description might end up being different from one day to another day
10. Even if I wanted to, I don’t think I would tell someone what I’m really like
11. In general, I have a clear sense of who I am and what I am
12. It is often hard for me to make up my mind about things because I don’t really know what I want
Appendix E: Experience Sampling Questions

ESM Questionnaire administered via smartphone
All questions are answered on a scale of 1 (not at all) to 7 (very much)

1) Right now I feel happy
2) Right now I feel sad
3) Right now I feel anxious/nervous
4) Right now I feel relaxed
5) Right now I feel angry
6) Right now I feel as if my thoughts are not my own
7) Right now I fear that I am losing myself
8) Right now I can’t tell if I did something or just imagined it
9) Right now I feel like my body has changed
10) Right now I wonder whether I truly exist
11) Right now small details that I haven’t noticed before are very important
12) Right now my senses feel sharpened
13) Right now I feel like I’m going to figure out something big
14) Right now my thoughts or feelings are coming very fast
15) Right now the whole world feels like it is opening up to me
16) Right now I feel good about myself
17) Right now I can concentrate well
18) Right now I have difficulty controlling my thoughts
19) Right now I have no thoughts or emotions
20) Right now my thoughts are strange or unusual
21) Right now I feel tired
22) Right now I feel suspicious
23) Right now I feel mistreated
24) Since the last beep, I have heard or seen things others could not
25) Right now I feel that something or someone is controlling my thoughts or actions
26) Since the last beep I consumed: (checkbox, can select more than one)
   a. Food
   b. Caffeine
   c. Medications
   d. Snuff
   e. Cannabis
   f. Alcohol
   g. Cigarettes or E-Cigs
   h. Nothing
Appendix F: Dynamic Structural Equation Models

Figure 2: Model 1 – Aberrant Salience and Psychotic-Like Experiences
Figure 3: Model 2 – Anomalous Self-Experiences and Psychotic-Like Experiences

Latent Decomposition in DSEM