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## Associations of suicidality with cognitive ability and cognitive insight in outpatients with Schizophrenia

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### ABSTRACT

**Background:** Previous literature suggests that better cognitive ability and insight are associated with greater lifetime risk of suicide attempts in schizophrenia, counter to the direction of association in the general population. However, the conjoint association between distinct cognitive domains, insight, and suicidality has not been assessed.

**Method:** In a cross-sectional study, 162 adults with schizophrenia or schizoaffective disorder completed cognitive testing via the MATRICS battery, symptom and cognitive insight assessments, along with the Columbia Suicide Severity Rating Scale. We then contrasted participants based on history of suicidality by cognitive domains and insight measures and conducted multivariate analyses.

**Results:** Although a history of any passive ideation was not associated with cognitive ability or insight, verbal learning was positively associated with a greater history of suicidal attempt and prior ideation with a plan and intent. Higher cognitive insight, and the self-reflectiveness subscale insight, was also associated with history of passive or active suicidal ideation. Cognitive insight and cognitive ability were independent from each other, and there were no moderating influences of insight on the effect of cognitive ability on suicide related history. Exploratory analyses revealed that history of planned attempts were associated with greater verbal learning, whereas histories of aborted attempts were associated with poorer reasoning and problem-solving.

**Implications:** Although cross-sectional and retrospective, this study provides support that greater cognitive ability, specifically verbal learning, along with self-reflectiveness, may confer elevated risk for more severe suicidal ideation and behavior in an independent fashion. Interestingly, poorer problem-solving was associated with aborted suicide attempts.

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### 1. Introduction

Approximately 5% of people with schizophrenia die by suicide (Palmer et al., 2005) and up to 40% attempt suicide (Pompili et al., 2007), yet the unique risk factors for suicide in schizophrenia are somewhat unclear (Kasckow et al., 2011). Similar to people without schizophrenia, risk factors include history of suicide attempts, social isolation, depressive symptoms, hopelessness, and substance use (Pompili et al., 2007). However, several studies indicate that greater

premorbid function and cognitive ability are associated with higher rates of suicide attempts (Kim et al., 2003; Nangle et al., 2006), in contrast to the association between lower cognitive function and suicide attempts in the general population (Kosidou et al., 2014). One hypothesis is that greater cognitive ability may be associated with increased insight into illness and cognition, which may lead to distress related to awareness of the disorder and its implications (Cooke et al., 2007). Given the increased attention to suicide in psychotic disorders (Chesney et al., 2014) and to interventions that enhance cognition (Thorsen et al., 2014), further research is needed to understand: a) which cognitive domains are most associated with lifetime history of suicide attempts and ideation, b) whether insight and cognitive function are independent or inter-related correlates of suicide risk, and c) whether these variables are associated with contextual factors in suicide attempt, such as planning or preparation.

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Past research has examined the association of cognitive function with histories of suicidality. For example, Kim et al. (2003) found an association between history of any lifetime suicidality (i.e., thoughts, self-harm acts, plans/threats, or attempts) and better cognitive function on psychomotor speed and attention, verbal working memory, verbal fluency, recall memory, and executive function. Nangle et al. (2006) found greater executive functioning in patients with at least one lifetime suicide attempt, with significantly better performance on attention and verbal fluency. Delaney et al. (2012) found better performance on measures of episodic memory, working memory, and IQ in patients with a history of suicidal ideation or a single attempt (vs. multiple attempts), compared to patients with no past ideation or attempts. Taken together, there is evidence supporting greater rates of suicidal behavior among patients with schizophrenia with better cognitive function, but there is little consistency in which cognitive domains are most associated with past suicidal behavior. One limitation is that standardized measures of suicidality were often not used, particularly ones that systematically address levels of suicidal ideation and the nature and frequency of prior attempts.

One mechanistic hypothesis to explain the association between cognitive functioning and suicidality is that greater cognitive ability may increase cognitive insight, which may influence a patient's ability to initiate and coordinate suicidal behavior (Nangle et al., 2006). Poor clinical insight (e.g., awareness of clinical state) has been associated with impaired cognitive function (Donohoe et al., 2009), while better clinical insight has been associated with a greater likelihood of suicidal behavior in schizophrenia (Crumlish et al., 2005; Massons et al., 2017). However, no studies have examined the potential for an interactive or mediational association of cognitive ability and cognitive insight and suicidality, such as whether insight mediates or moderates the association between cognitive ability and suicidal thinking and behavior. Cognitive insight refers to the patients' capacity to evaluate their atypical experiences and misinterpretations of events (Beck et al., 2004).

Given the high base rate of suicide in schizophrenia (Pompili et al., 2007), there is a need to refine understanding of associations between cognitive ability, insight, and suicidal thoughts and behavior. In a sample of treated outpatients with schizophrenia, we assessed for cognitive ability, cognitive insight, and history of suicidal ideation and behavior. We hypothesized that greater cognitive ability and insight would be independently associated with higher rates of past suicide attempts. In multivariate models, we examined whether insight mediated the association between cognitive ability and suicidality. We also examined whether cognitive insight moderated these associations (such as by enhancing the association of cognitive ability with suicidality). Lastly, we explored the associations between different domains of cognitive ability and different types of suicide attempts (e.g., planned versus unplanned; aborted).

## 2. Method

### 2.1. Participants

Data from this study included baseline data of an ongoing randomized controlled trial evaluating the effectiveness of different mobile-health augmented interventions in serious mental illnesses. For this study, we included data from 162 adults aged 18 and older who were diagnosed with schizophrenia or schizoaffective disorder. Participants were recruited from the public San Diego County Adult and Older Adult Mental Health System. The clinical trial was designed to be inclusive of users of the mental health system and therefore other exclusion criteria were kept minimal.

To enroll in the clinical trial, participants must have met DSM-IV criteria for schizophrenia or schizoaffective disorder. Participants must have had at least a minimum level of impairment on at least one of the target outcomes, defined as a moderate score ( $\geq 3$ ) on at least one of the BPRS depression, mania, hallucinations, or emotional withdrawal

items. Diagnoses were formed based on a combination of the Mini-International Neuropsychiatric Inventory (MINI; Lecrubier et al., 1997) and medical records obtained with participant consent. Participants needed to be able to read and speak English, willing to sign a release of information for their provider, and provide informed consent, as well as pass the University of California, San Diego Brief Assessment of Capacity to Consent (UBACC) test (Jeste et al., 2007) for decision capacity for research. Participants were excluded if they were currently enrolled in psychotherapy or had received CBT within the past 5 years, had been diagnosed with dementia, had experienced head trauma with loss of consciousness for  $>20$  min, or current participation in a psychosocial/pharmacological clinical trial. This trial was approved by the University of California, San Diego's Human Research Protections Program.

### 2.2. Procedures

During the baseline visit, participants completed cognitive testing, symptom assessments, and suicide history assessments in a research facility or in the community, depending upon their preference. Raters were trained in administering interview-based measures and needed to achieve a 0.90 inter-rater reliability kappa with gold-standard raters in order to administer tests.

### 2.3. Measures

#### 2.3.1. Brief Psychiatric Rating Scale-24

The Brief Psychiatric Rating Scale-24 item expanded version 4.0 (BPRS-24) was used to assess psychopathology symptoms (Ventura et al., 2000). The BPRS-24 assesses 24 psychiatric symptoms including anxiety, depression, mania, delusions/hallucinations, unusual behavior, and suicidality. Presence of symptoms and severity of symptoms are rated on a 1- (not present) to 7- (extremely severe) point Likert scale. Scores range from 24 to 168, with higher scores indicative of greater severity of psychotic symptoms.

#### 2.3.2. Cognitive ability

The MATRICS (Measurement and Treatment Research to Improve Cognition in Schizophrenia) Consensus Cognitive Battery (MCCB) was used to assess cognitive performance (Nuechterlein et al., 2008). The battery consists of 10 tests measuring 7 cognitive and social cognitive domains, but for the present study, only the measures that generated Verbal Learning (Hopkins Verbal Learning Test), Speed of Processing (Trail Making: Test A; Brief Assessment of Cognition in Schizophrenia: Symbol Coding; Category Fluency: Animal Naming), Working Memory (Wechsler Memory Scale Spatial Span; Letter Number Span), and Reasoning and Problem-Solving (Neuropsychological Assessment Battery: Mazes) were administered. The domain scores and composite score were normed for age and education, yielding 4 T-scores and one summary score.

#### 2.3.3. Beck Cognitive Insight Scale

The Beck Cognitive Insight Scale (BCIS) is a 15-item self-report measure that assesses a person's self-reflectiveness and confidence in interpreting experiences, yielding self-reflectiveness and self-certainty subscales (Beck et al., 2004). The self-reflectiveness subscale consists of 9 items measuring patients' objectivity and openness to feedback (e.g., other people can be more objective), and the self-certainty subscale consists of 6 items measuring patients' certainty of their own beliefs and conclusions (e.g. doing something if it feels right). Participants are asked to rate the degree to which they agree with each statement on a 4-point Likert scale ranging from 0- (do not agree at all) to 3- (agree completely).

#### 2.3.4. Columbia Suicide Severity Rating Scale

The Columbia Suicide Severity Rating Scale (C-SSRS) measures suicidal ideation and behavior (Posner et al., 2011). The C-SSRS ideation

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