Know Thyself: Tracing Insight Along the Psychosis Spectrum

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BY

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Dedication

This work is dedicated to the memory of my grandmother, Zella Loew Mervis, whose long life taught me that there are many ways to be. It is also dedicated to the memory of my friend Ani Fiordimondo, whose short life taught me that some moments simply are and there is not always a why.

Abstract

The studies presented here examine three domains of insight along the psychosis spectrum. The first domain is clinical insight, which is the awareness of a mental illness, its impacts, and the need to ameliorate those impacts. The second is cognitive insight, which is understanding thought processes as fallible. The third is introspective accuracy. which refers to domain-specific self-assessment. The first study investigates introspective accuracy for substance use in the context of a year of treatment for people with first episodes of psychosis. The second study uses geometric dimension reduction to examine cognitive and clinical insight together and their relationship to forms of cognition in people with prolonged psychosis. Finally, the third study uses probabilistic dimension reduction as a tool for exploratory translational research on psychotic-like experiences, cannabis use, and insight in the general population.

Results for insight across all three studies indicated one paradoxical effect, one effect for a form of cognition, and a mixed finding. The first study found a paradoxical effect for IA, such that those who had poor IA that were overconfident had greater symptom remission midway through treatment for an FEP. The second study presented here found that the combination of poorer clinical and cognitive insight accompanied poorer metacognition, whereas better clinical insight accompanied better metacognition regardless of cognitive insight. The third study had mixed results that show poorer insight sometimes accompanies greater symptoms, which is consistent with the findings of our review even though it did not cover general population samples. Overall, all three studies presented here add to the existing evidence for positive, paradoxical, and mixed findings

for the relationships between insight and other constructs of clinical interest. Finally, future directions in terms of conceptual and treatment implications are discussed.

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INTRODUCTION: TRACING INSIGHT ALONG THE PSYCHOSIS SPECTRUM

The following dissertation consists of a manuscript introduction and three empirical chapters that are independently accepted or submitted for publication. For that reason, the reader is oriented to the structure of this work. These chapters cover several dominant operationalizations of insight. More specifically, they are *clinical insight* (Lincoln et al., 2007; P. H. Lysaker, Hamm, et al., 2018), *cognitive insight* (Beck et al., 2004; Riggs et al., 2012), and *introspective accuracy (IA)* (Harvey & Pinkham, 2015; Nisbett & Wilson, 1977; J. Silberstein & Harvey, 2019). The introductory review, ***An update on clinical insight, cognitive insight, and introspective accuracy in schizophrenia-spectrum disorders: symptoms, cognition, and treatment***, is the first chapter of this dissertation and offers an overview of recent literature on these forms of insight.

The second chapter of this dissertation is a published study on IA, ***Introspective accuracy for substance use across a year of treatment for first episode psychosis*** (Mervis, Fischer et al., 2021). Specifically, this study focused on the individual's self-appraisal of substance use. This study describes an operationalization of IA in the context of a NAVIGATE coordinated specialty care program (Meyer et al., 2015; Mueser et al., 2015) for first episodes of psychosis.

The third chapter of this dissertation is a published study on clinical and cognitive insight, ***Co-occurring deficits in clinical and cognitive insight in prolonged schizophrenia-spectrum disorders: Relationship to metacognitive deficits*** (Mervis, Bonfils et al., 2021). This study focused on theoretically informed and empirically derived clustering based on covariance in clinical and cognitive insight. These groups were

characterized along forms of cognition that are addressed in the introductory review: social cognition, metacognition, and executive function.

The fourth chapter of this dissertation, ***Greater psychotic-like experiences accompany cannabis use in people with lower cognitive insight: A latent profile analysis***, is an original manuscript. This study was conducted in a large online sample of adults and created exploratory latent profiles of cannabis use and cognitive insight. These profiles were characterized across domains of psychotic-like experiences, a dimensional construct usable in the general population (Krueger & MacDonald, 2005; Strauss, 1969; van Os et al., 2000).

The fifth chapter addresses similarities among the findings in the three empirical chapters and places them within the context of the introductory review. Novel conclusions and then conceptual issues are briefly discussed. Following this, there is an extensive empirical appendix, ***Studying conspiracist beliefs and motivation to follow coronavirus (COVID-19) precautions without measuring behavior: Lessons learned***. This appendix describes pilot data and lessons learned related to an emerging program of research on conspiracist beliefs and their relationship to motivation and cognitive insight during the coronavirus pandemic.

All chapters that are published and under review are attributed to multiple authors. As such, all chapters begin with a note describing the role of the candidate as primary author and supporting co-authors.

CHAPTER 1: REVIEW ON CLINICAL INSIGHT, COGNITIVE INSIGHT, AND INTROSPECTIVE ACCURACY IN SCHIZOPHRENIA-SPECTRUM DISORDERS: SYMPTOMS, COGNITION, AND TREATMENT

Foreword:

Joshua E. Mervis: Conceptualization, Methodology, Investigation, Original Draft, Review & Editing, Project Administration.

Jenifer L. Vohs: Reviewing & Editing.

Paul H. Lysaker: Conceptualization, Reviewing & Editing, Supervision.

Abstract

Poor insight, or unawareness of morbid changes in cognition, emotional states, or behavior, is commonly observed among people with schizophrenia. Poor insight represents a persistent barrier to wellness because it interferes with treatment and self-direction. Paradoxically, good insight may also be a barrier to wellness when awareness of these changes leads to depression or self-stigma.

This paper builds upon this previous work by exploring these issues in schizophrenia separately as they have appeared in published research over the last three years in three different kinds of insight: clinical, cognition and introspective accuracy. Specifically, studies are reviewed that address: negative effects of poor insight, the paradoxical effects of good insight, correlates with other forms of cognition, and emerging treatments.

The evidence continues to offer a nuanced picture of the complex effects of good insight in schizophrenia. Incremental improvements were also found in the development of novel integrative treatment approaches. This work also highlights the intricacy of the concept of insight, as well as conceptual work that distinguishes the points of convergence and divergence of these forms of insight.

1.1 Introduction

Poor insight has been broadly observed in individuals with schizophrenia-spectrum disorders and is widely accepted to have a complex relationship to health. In a recent systematic review (Lysaker, Pattison, et al., 2018) and earlier reviews (Belvederi Murri et al., 2015; Palmer et al., 2015; Vohs et al., 2016), Lysaker and colleagues describe straightforward links between poor insight and elements of treatment engagement like poor antipsychotic medication adherence and therapeutic alliance. The authors also note the paradoxical effects of insight, where good insight is associated with better outcomes for symptoms and community functioning, but also can lead to depression, demoralization, poor quality of life, and increased stigma. While much is known about insight in people with schizophrenia spectrum disorders, research in this area continues to boom with over 60 articles since 2018, including 7 new meta-analyses, underscoring a need for ongoing consolidation of findings. In this scoping review, we review the published literature from 2018-2020, including original research articles and letters to editors.

We provide an emphasis on positive and negative psychosocial and cognitive correlates of good insight, as well as treatment efficacy. Here, we focused on three areas. The first of these is clinical insight, which involves awareness of the presence and effects of mental illness as well as need for treatment (Lysaker, Pattison, et al., 2018). In this review, studies measuring clinical insight used both clinician-rated and self-report measures described in an earlier systematic review (Lincoln et al., 2007). The second is cognitive insight, which involves awareness of ones thoughts and their potential fallibility and is often separated into self-reflectivity and self-certainty with the former being more and the latter being less adaptive (Beck et al., 2004). In this review, all studies measuring

cognitive insight used self-report, specifically the Beck Cognitive Insight Scale (Beck et al., 2004). The third domain is introspective accuracy (IA) (Nisbett & Wilson, 1977), which indexes a person's subjective assessment of their abilities against an objective rater. In other words, introspective accuracy is insight into specific abilities like functioning or cognition, but is not necessarily a global trait (Gilleen et al., 2011). While clinical and cognitive insight are more engrained domains of insight, introspective accuracy is an increasingly used construct in schizophrenia research (Pinkham, Klein, et al., 2018; Silberstein & Harvey, 2019; Springfield & Pinkham, 2020) that warrants attention.

The findings in the reviewed studies will be reported as: 1) positive correlates of good insight, 2) paradoxical correlates of good insight, 3) associations with other types of cognition, such as neurocognition, social cognition, and metacognition, and 4) treatments that can improve insight. Following our review of the literature, we provide an expert commentary. In support of acknowledging personhood above "patient" labels, we use the term person or people when referring to individuals with schizophrenia spectrum disorders. Where relevant, we use other terms denoting illness course, such as high-risk or first episodes of psychosis.

1.2 Positive correlates of good insight

1.2.1 Clinical Insight

One of the most consistent findings for good insight across recent research is that insight is linked to better function through medication adherence. In people with stable illness, Garcia-Cabeza et al (2018a) found the effect of clinical insight on disability was partially mediated by poor adherence. Over three years, people with first episodes of

psychosis with greater clinical insight and medication adherence had lower cannabis use and depression (Elowe et al., 2020). In another analysis, Kim et al (2020) examined archival data on medication adherence and grouped people by severity of insight impairments. This analysis found that over a year and a half, individuals with moderate to severe insight impairment had earlier nonadherence (< 80% monthly dose), even when adjusting for illness severity, substance use, attitudes towards medication, cognitive functioning, hostility, and depression. Overall, these studies are consistent with meta-analyses on medication adherence, finding rates around 70% of individuals below the 80% threshold, and poor insight is associated with greater nonadherence (Czobor et al., 2015; Yaegashi et al., 2020).

Regarding symptom severity, good clinical insight is consistently associated with a less severe illness both cross-sectionally and longitudinally, within and outside of treatment contexts. Across several studies, better clinical insight predicted less severe symptoms (Marucci et al., 2019; Ozzoude et al., 2019; Tiryaki et al., 2018), as well as less prior hospitalizations and psychotic episodes (Tariku et al., 2019). In people with both early and prolonged illness, people with better insight had less severe positive symptoms, but more severe negative symptoms, with a later age of onset (Atoui et al., 2018). This may suggest that insight is associated with illness onset, underscoring a need for early intervention. With longitudinal data, changes in disorganization over time were also reported to predict increases in clinical insight over three years, perhaps due to changes in cognitive functioning (Hasson-Ohayon et al., 2020). Phahladria et al (2019) reported lower baseline symptom severity was associated with better self-reported insight in the two years after first episodes of psychosis, while Cohen et al (2019) found more stable insight was

associated with fuller affect, better cognition, younger age, and higher education over four years in prolonged illness. Individuals with self-reported early psychosis responded to a prompt on an online forum and ~41% reported self-realization as a pathway to gaining insight, and greater insight was associated with help-seeking behavior in a study by Spikol and Murphy (2019). This finding is consistent with past work showing poor insight is associated with longer duration of untreated psychosis (Drake et al., 2000).

Two recent meta-analyses examined links to poor clinical insight. One meta-analysis of 19 studies of over 3,000 people found that the prevalence of poor insight is around ~43%, most commonly in inpatients, acute phases, males, younger people, and shorter duration of illness (Li et al., 2020). Another meta-analysis of 123 studies and almost 15,000 people found that poor clinical insight was associated with reality distortion, disorganization, and negative symptoms (Subotnik et al., 2020). Thus, not only is poor clinical insight associated with worse symptoms in recent studies, but this pattern also holds across the broad body of research in this area.

1.2.2 Cognitive Insight

As noted above, self-reflection and self-certainty are the two subdomains of cognitive insight, with the former involving awareness of one's thoughts and the latter indicating a lesser ability to doubt one's thoughts. An overall assessment of cognitive insight can be produced by adjusting the former for the latter and creating a single composite index (Beck et al., 2004). Recent studies using these subdomains and the composite index have found stronger relationships with negative and depressive symptoms than positive or overall symptoms, regardless of illness stage or severity. In people with

treatment-resistant symptoms, Kamble et al (2020) found cognitive insight was better in those with more negative than positive symptoms. In a first episode sample, Liu et al (2020) found those with more severe depressive symptoms had higher self-certainty and more dysregulation. Relatedly, Garcia-Mieres et al (2020) found higher levels of self-reflectivity accompanied lower distress associated with depressive symptoms in an adult sample. Turning towards individuals with at risk mental states, a meta-analysis of 5 studies compared 303 people with at risk states to 376 controls in terms of cognitive insight and found that at risk individuals differed from controls only in terms of self-certainty, reflecting isolated impairment in cognitive insight (Dondé et al., 2020). These studies illustrate how there is often elevated self-certainty associated with worse negative and depressive symptoms, but not positive symptoms.

Concerning the individual domains of cognitive insight, self-certainty continues to show deleterious effects in functioning, while the ways in which people benefit from stronger self-reflection and overall cognitive insight continue to emerge. With regard to functional capacity, lower self-certainty has been found to be associated with better functioning in both people living in the community and in institutions (Pinho et al., 2020). In terms of quality of life, another study found that better quality of life was associated with better cognitive insight and self-reflection (Rathee et al., 2018).

1.2.3 Introspective Accuracy

Several studies suggest that individuals who are better able to appraise their ability to function in the world might learn from errors and revise their approach and improve social functioning. With social cognitive IA, Silberstein et al (2018) found that good IA

predicted less functional impairment even when adjusting for social performance and competence, as well as negative symptoms. Other work similarly found people who exhibited overconfidence in social cognitive tasks had worse functioning (Pinkham, Harvey, et al., 2018b). With neurocognitive IA, a study by Olsson and colleagues (2019) found differences in functional impairment emerged showing those good IA were less impaired than those with poor IA, consistent with prior work (Gould et al., 2015).

One study by Nishida and colleagues (Nishida et al., 2018) incorporated two forms of IA related to functioning: deviations between person and caregiver, as well as person and clinician. When using the definition of IA with the caregiver's perspective, better cognitive insight predicted more accurate or negatively biased IA, such that people underestimated themselves. Additionally, using the clinician's perspective, better social cognition predicted more accurate IA or underestimation. This suggests the vantagepoint of the objective rater can create divergent relationships with other clinical constructs. More evidence for the similarity of good IA and underestimation emerged in work by Kaneko and Okamura (2019), which found better overall life skill ratings in people with accurate and underestimated assessments of their cognitive functioning. In this case, over estimators had the poorest communication and sense of responsibility. Adding to this pattern, another study found that people who were under estimators had the best learning potential, then accurate estimators, finally followed by over estimators (Harris & Rempfer, 2020). These studies highlight the consistently poor outcome associated with overestimation and similarities between good IA and underestimation across several studies. However, one study suggests that while underestimation might be more similar to accurate assessment in clinical populations, this is not true of work in healthy populations, highlighting the value

of dimensional studies. In that study of controls, those that underestimated their social competence were higher in schizotypy, but those who were lower in schizotypy overestimated their competence, reflecting poor IA in both cases (Springfield & Pinkham, 2020).

1.3 Paradoxical correlates of good insight

1.3.1 Clinical Insight

While there are straightforward relationships between good insight and positive outcomes, there is substantial literature reflecting how good insight can also have paradoxical sequelae. More specifically, the insight paradox is a term used to describe issues of clinical import that come about through this pathway. This paradox is commonly observed in research with people with schizophrenia spectrum disorders (Belvederi Murri et al., 2015, 2016; Buchman-Wildbaum et al., 2020; Davis et al., 2020; Lysaker, Pattison, et al., 2018; Palmer et al., 2015). Intuitively, a person who is more aware of the psychiatric challenges they are going through might experience confusion when integrating these struggles into a broader picture of their life (Lysaker, Kukla, et al., 2020; Lysaker, Minor, et al., 2020).

Recent research has continued to highlight how good insight can be entangled with stigma. Two studies found higher clinical insight contributed to self-stigma (Buchman-Wildbaum et al., 2020; Chuang et al., 2019), and another found that it lead to low self-esteem and depression, and thereby low quality of life (Lien et al., 2018). Beyond a direct relationship, the negative impact that stigma has on the relationship between clinical insight and quality of life has also emerged in a longitudinal study lasting a year (Chio et al., 2018).

In this study, those with higher stigma at 6 months had better clinical insight and were less satisfied with their lives at baseline. Relatedly, among those with low stigma at 12 months, those with better baseline clinical and cognitive insight also had better baseline life satisfaction. Evidence of their unique contributions to outcome have emerged as well. In one study, greater cognitive but not clinical insight was positively associated with greater stigma but not resistance to stigma (Grover, Sahoo, Chakrabarti, et al., 2018). While this finding is not consistent with the other findings for clinical insight, this demonstrates that clinical and cognitive insight can show divergent and in part paradoxical relationships with stigma, underscoring the utility of studying both.

Turning to maladaptive behaviors and aggression in particular, recent work suggests that different elements of aggression can show separate patterns of behavior at the interplay of insight and depression. Schandrin et al (2019) found that after adjusting for depression, people with better clinical insight were twice as likely to show hostility as those with poor insight, but after adjusting for depression, this effect was no longer significant. Separately, with adjustment for depression, those with better clinical insight were more likely to show anger and physical aggressiveness. This study, though, stands in contrast to a meta-analysis showing that better clinical and cognitive insight is associated with less aggressiveness and hostility in people with schizophrenia (Reinharth et al., 2014).

The paradoxical relationship between good clinical insight and the development of depressive symptoms appears to be complex (Belvederi Murri et al., 2015, 2016). Overall, these studies reflect that when clinical insight is good, depression is often elevated, and quality of life appears lower. At the same time, a moderating effect of other symptoms that magnify or attenuate the relationship between clinical insight and symptoms, stigma, and

quality of life has been commonly reported. For example, clinical insight was found by Santarelli et al (2019) to enhance the strength of the relationship between negative symptoms, as well as depression, with self-appraisal of cognitive deficits. Painting a broader picture, a meta-analysis of 20 studies and almost 1,200 people found that greater clinical insight was associated with reduced quality of life, with symptom severity moderating the association between insight and quality of life (Davis et al., 2020). When people had more severe symptoms, this meta-analysis found the relationship between insight and quality of life was attenuated. Consistent with this work, Arraras et al (2019) found that better clinical insight accompanied poorer quality of life. There was also no direct relationship between insight and depression as observed elsewhere (Konsztowicz & Lepage, 2019). However, in the latter study, the relationship between clinical insight and depression changed from a small negative effect to a small positive one at higher levels of identifying as having a mental illness, independent of illness duration. This relationship was also independent of positive symptoms, consistent with other findings showing.

From a different point of view, Tariku et al (2019) found good clinical insight was directly associated with later age of onset of psychosis and more depression. A health system medical record review of over 2,000 people with first episodes of psychosis employed a supervised machine learning algorithm that was trained to recognize and categorize insight in clinical records as good or poor (Ramu et al., 2019). A little over half of the people had good insight, and higher scores were associated with more depression. Finally, looking at clinical insight and suicidality over three years, (Ayesa-Arriola et al., 2018) found suicide attempts were more likely to occur close to when a person was rated with poor clinical insight, or had a change in insight, especially worsening insight.

1.3.2 Cognitive Insight

Among the most deleterious effects of cognitive insight are negative ideas about the self and risk for suicide. For example, better cognitive insight accompanied a greater lack of self-compassion and greater self-judgment in a study by Hochheiser et al (2020). Higher cognitive insight overall and self-reflection is associated with a history of active suicidal ideation (Villa et al., 2018) and more recent suicide attempts (Ozturk et al., 2018). These findings suggest a pattern of better cognitive insight and self-directed violence in people with schizophrenia, consistent with prior literature (Verma et al., 2016).

1.3.3 Introspective Accuracy

Several studies found that poor IA or overestimation of abilities is associated with positive outcomes. In a study including several domains of functioning, individuals with poor functioning who overestimated their abilities were compared to those with accurate estimation of impairment (Olsson et al., 2019). Surprisingly, those with accurate estimation had poorer functioning. The authors conclude that overestimation on the part of those with schizophrenia influenced clinician ratings, but it is possible that overestimation comes across as confidence. Two studies suggest a paradoxical relationship between IA and depression, as found in past work (Harvey et al., 2017; Siu et al., 2015). Harvey and colleagues (2019) also found a negative effect of IA, such that those with accurate self-appraisals of everyday functioning were more socially avoidant. In this study, individuals with higher rates of depression underestimated their functional capacity, whereas those with lower rates of depression overestimated. Other work showed that individuals with

schizophrenia who had the poorest IA for social cognition had the least depression (Jones et al., 2020).

Finally, moving beyond depression and functioning, Raffard and colleagues (2020) found that when people have good IA for neurocognition, they also have more neurocognitive complaints. This could suggest that greater salience of impairment leads to accuracy or at least underestimation, which would have broad applications for pathways to accuracy of self-assessment.

1.4 Associations with other types of cognition

1.4.1 Clinical Insight

Better integrity of all forms of cognition appears associated with better clinical insight. Conceptually, it is likely that better basic information processing ability allows for stronger integration of information about the self and others, as could be inferred from some neuroimaging work (Ćurčić-Blake et al., 2015; van der Meer et al., 2010). Following this line of reasoning, and consistent with past work (Aleman et al., 2006; Fusar-Poli et al., 2017), good insight is associated with better overall neurocognition (Cohen et al., 2019; Leonhardt et al., 2020; Sauvé et al., 2019) and executive functioning (Othman & Lua, 2018a; Raveendranathan et al., 2020) regardless of illness phase.

The literature on neurocognition has been inconsistent, with some studies finding negative and mixed associations with good insight, as well as null findings. Better clinical insight, for example, showed mixed positive and negative associations with subdomains of executive function variables, positive associations with verbal and performance IQ, and positive associations with some but not all subdomains of memory (Khalil et al., 2020).

Elsewhere, greater clinical insight was associated with better subjective, but not objective neurocognitive functioning in one study (Chuang et al., 2019), but neither subjective nor objective neurocognitive functioning in several other studies (Baliga et al., 2020; Daniell et al., 2021; Marucci et al., 2019; Ozzoude et al., 2019). These findings are not entirely surprising, as meta-analyses suggest that even when there are positive correlations between clinical insight and neurocognitive functioning, they are often weak (Aleman et al., 2006; Subotnik et al., 2020).

Concerning social cognition, which can mediate the association between neurocognition and functioning (Addington et al., 2010; Lin et al., 2013; Schmidt et al., 2011), a recent meta-analysis of 123 studies and almost 15,000 people found weak relationships between clinical insight and neurocognition and moderate relationships between social cognition and clinical insight, specifically theory of mind (Subotnik et al., 2020), and both findings are consistent with prior meta-analyses (Aleman et al., 2006; Bora, 2017). In another recent study, controlling for overall cognitive functioning, better social cognition was associated with better clinical insight (Feyer et al., 2020).

Concerning metacognition as broadly defined, one study showed positive associations with clinical insight, while another incorporated measures of clinical insight in a factor analysis targeting metacognition. People with good clinical insight and lower symptoms had better overall metacognition, self-reflectivity, awareness of others, and metacognitive mastery compared to individuals with lower clinical insight and greater negative, positive, and overall symptoms (Lysaker, Gagen, et al., 2019).

1.4.2 Cognitive Insight

There is significant overlap between the findings in clinical insight and cognitive insight in relation to neurocognition, although they are infrequently studied together. Cross-sectionally and longitudinally, better integrity of cognitive insight domains is associated with better neurocognition, even early in illness development. It is possible that basic information processing mechanisms underlying clinical insight and cognitive insight could overlap. One study that addressed both found no association between the two, but better executive function was associated with lower self-certainty, as well as greater self-reflection, and clinical insight (Grover, Sahoo, Nehra, et al., 2018). In terms of cognitive insight, Expósito & Felipe-Castaño (2018) found no significant association between cognitive insight or self-reflection and neurocognitive functioning, but people with lower self-certainty had better verbal comprehension. This is consistent with similar findings for executive functioning in people with at risk mental states (Ohmuro et al., 2018). Across a 24-month course of Recovery-Oriented Cognitive Therapy, baseline cognitive insight has predicted changes in neurocognition, as well as during a separate 6-month no-treatment test-retest study (Bredemeier et al., 2018). Again, as in the case of clinical insight and cognition, other studies contradict these trends. For example, Othman & Lua (2018b) found cognitive insight, self-reflection, and self-certainty were not significantly associated with neurocognitive functioning.

1.4.3 Introspective Accuracy

In terms of domains of cognition, IA is also more limited in literature compared to clinical and cognitive insights, but the patterns are consistent with those seen in the positive correlates of good IA, and reinforce that overconfidence is the most deleterious. Continuing

the negative trend for those with overconfidence, people with schizophrenia had poor social cognitive IA compared to controls, and those with the most overconfidence had the worst performance of either group (Jones et al., 2020). Relatedly, people with poor IA for social cognition had worse performance on a large battery of social cognitive and neurocognitive assessments, which suggests wide generalizability of impairments (Perez et al., 2020). Importantly, when IA was considered along with performance on the task that derived IA, both performance and IA explained similar amounts of variance in performance in assessments in the battery, highlighting that measuring IA does not supplant the use of its measurement source. The finding of the relationships between poor social cognitive IA also extend to neurocognitive IA and performance (Harris & Rempfer, 2020), especially for over estimators (Kaneko & Okamura, 2019), leaving open the possibility of latent dysfunction underlying both. Continuing with the impact of overconfidence, one study highlighted how the self-certainty subdomain of cognitive insight can diverge with a domain-specific measure of certainty like IA for neurocognition. In this case, people with schizophrenia did not differ from controls in IA, but they endorsed greater self-certainty and self-reflection before and after feedback on performance, reflecting overconfidence (Dietrichkeit et al., 2020).

There were null findings for IA related to decision-making, a type of executive function, and overall neurocognition that suggests they can be independent. In one study, there were no differences in IA for choices between individuals with high and low decision-making bias (Klein & Pinkham, 2018). Other work found no differences in neurocognition between the good and poor neurocognitive IA groups (Olsson et al., 2019).

1.5 Treatments That Can Address Insight

1.5.1 Clinical Insight

Given observations that standard treatments do not necessarily address clinical insight (Pijnenborg et al., 2013), a range of unique applications have been developed to address insight. One of these, an emerging treatment called Metacognitive Reflection and Insight Therapy (MERIT) (Lysaker & Klion, 2017) seeks to assist people in developing more integrated and complex ideas about themselves, including the challenges and possibilities that they experience, thereby improving clinical insight. MERIT is a newer therapy, and its evidence base continues to grow. A 6-month randomized controlled trial (RCT) comparing MERIT to treatment as usual (TAU) in 20 people with early psychosis found MERIT had feasible implementation with people with early psychosis and led to significant improvements in insight (Vohs et al., 2018). In a review of recent case work (Lysaker, Gagen, et al., 2018), evidence has also been presented suggesting MERIT can be delivered in a therapeutic milieu, which all together can result in a range of clinical improvements including in clinical insight. A multi-site RCT compared 6 weeks of a social cognitive group intervention or group cognitive training with improvements in clinical insight noted at improved post-treatment and at follow-up 6 months later. (Pijnenborg et al., 2019).

Beyond conventional psychosocial interventions, there are adjunctive approaches to the development of clinical insight. An RCT adding weekly yoga to TAU led to significantly improved clinical insight compared to the TAU condition (Budak & Yilmaz, 2019). Reinforcing the benefits of yoga beyond mere exercise, an RCT adding twice

weekly strength-based exercise to TAU compared to TAU found no effects for clinical insight (Şenormancı et al., 2020).

Of note, consistent with previous observations (Lysaker, Pattison, et al., 2018), the usefulness of psychoeducation continues to be questionable. Although an open label study of a weekly psychoeducation program replicated prior findings for increasing illness related knowledge, clinical insight did not change (Dondé et al., 2019).

1.5.2 Cognitive Insight

Recent studies have incorporated metacognitive, cognitive, or mindfulness-based approaches. In one multi-site study, people with first episode psychosis who received metacognitive training (MCT) (Birulés et al., 2020) had reductions in self-certainty and improvements in cognitive insight, with a larger effect for those with higher IQs. Another study by Salas-Sender et al (2020) used the same intervention, comparing it to psychoeducation. The authors found that women in the MCT program had more improvement in cognitive insight and self-certainty compared to men. In a residential setting for people with prolonged illness, an RCT added MCT to TAU compared to TAU (Simón-Expósito & Felipe-Castaño, 2019). MCT lead to increased self-reflectivity, with better treatment adherence in the MCT group throughout. This study took place in a treatment setting with substantial offerings, so the incremental benefit of MCT is important. In another RCT, MCT with cognitive behavioral therapy was compared to cognitive training (Moritz et al., 2018), with the former showing better improvements in cognitive insight that were not durable follow-up. In another RCT, months of weekly sessions of MERIT were compared to TAU (de Jong, Van Donkersgoed, et al., 2019), and

while both groups had improved self-reflectivity and metacognitive mastery post-treatment, only MERIT showed durable gains at follow-up. A recent meta-analysis of 12 randomized controlled trials with approximately 800 participants focused on MCT and MERIT, with 10 trials of the former and 2 of the latter (Lopez-Morinigo et al., 2020). Findings were strong for MCT, and mixed for MERIT, but both therapies improved cognitive and clinical insight. Most consistently, they increased cognitive insight and self-reflectivity, and decreased self-certainty.

With regard to mindfulness-related treatments, consistent with recent meta-analyses (Jansen et al., 2020; Louise et al., 2018), generally positive effects have been reported. In two different RCTs, twice weekly mindfulness-based psychosocial skills training (MBST) plus medication (Yılmaz & Okanlı, 2018) or once a week MBST (Yüksel & Bahadır-Yılmaz, 2020) were compared to TAU. Both studies found superior improvement in cognitive insight for the MBST conditions. Another RCT found that mindfulness-based psychoeducation in addition to TAU improved cognitive insight above TAU alone (Çetin & Aylaz, 2018), with the caveat of baseline group differences in self-reflection that favored the experimental condition. Finally, in a social cognitive group intervention, clinical insight improved, but cognitive insight did not (Pijnenborg et al., 2019).

1.5.3 Introspective Accuracy

There are currently no psychosocial treatments designed specifically for IA, suggesting a need to evaluate IA within the context of existing treatments in service of future treatment development or implementation. One recent placebo-controlled randomized clinical trial

of oxytocin for IA deficits had null results (Halverson et al., 2019), and is the only treatment study of any kind in the years reviewed here.

1.6 Summary and Conclusion

Consistent with past research, studies reviewed here suggest that people diagnosed with schizophrenia with good clinical insight tend to have better treatment adherence, less severe symptoms, higher levels of neurocognition, social cognition, and metacognition. Continuing the tradition of the insight paradox, good clinical insight among people diagnosed with schizophrenia is also linked to negative outcomes including depression, stigma, aggression, and poorer quality of life. Of note, there is some indication in this work that these issues may be more severe for people in earlier phases of illness and hence early intervention in this regard may be relatively more important.

Considering cognitive insight, a similar pattern as in prior work can be observed. Good cognitive insight is associated with reduced disorganization symptoms, as well as better community functioning and neurocognition. However, it also linked with heightened levels of suicidality. Regarding IA, in general the same pattern holds. As people are more aware of deficits in function or are overly confident, they are prone to higher levels of dysfunction but also less distress overall.

With regards to the link to other forms of cognition, the results of studies were considerably less consistent. There are limited mixed and null findings regarding the link of clinical and cognitive insight with neurocognition. Though relatively few studies have been conducted, better clinical insight remains linked with higher levels of social cognition and metacognition. Studies of the link between cognitive insight and metacognition are not

represented here, but this could be in part because of the range of definitions of metacognition (Green et al., 2019). Cognitive insight may be in some senses an inherently metacognitive process and some researchers use the terms interchangeably. Studies of cognitive insight and social cognition were not identified for inclusion in this review. The link of IA with these variables remains understudied. Higher levels of IA are associated with good community functioning, social cognition, and neurocognition. Poor IA that involves overconfident self-appraisal is the most impairing, except in the case of depression where it has a protective role as per the insight paradox.

There are two potentially novel conclusions that can be drawn from this review. First, in this review there is only one therapy for insight trialed in first episode psychosis (Vohs et al., 2018), where duration of untreated psychosis is critical to outcomes (Perkins et al., 2005), as is medication adherence, which is associated with good insight (Elowe et al., 2020; Perkins et al., 2006). What remains unclear is if there are notable improvements in insight in early psychosis resulting from interventions that are not designed with intent to treat it. If they do improve insight, they could be deployed in situations where clinicians are not trained in insight-targeting treatments, given the utility of improving insight.

Second, several findings in this review suggest that deficits in insight are more than markers of illness severity. For one, the positive and negative effects on good insight, namely the insight paradox, describes a nonlinear relationship. Another point, as illustrated by Davis and colleagues (2020), demonstrates a negative consequence of good insight that attenuates as symptoms increase, again reinforcing a dynamic relationship. Regarding introspective accuracy, there are patterns suggestive of different forms of inaccurate self-assessment having different correlates, some positive and some negative, without respect

to degree of inaccuracy in those cases. Therefore, good insight does not necessarily indicate less severe illness, given consideration of all symptoms.

There are several areas of opportunity for future work, reflecting emerging areas in the current literature. These are: insight into specific clinical constructs, studying insight constructs together, and dimensional measures of psychosis studied in the general population. First, the role of insight into specific comorbidities that compromise function in schizophrenia is an opportunity for future work. This line of inquiry would not focus exclusively on symptoms or more distant outcomes like community functioning, but also other areas of the clinical milieu. As an example, insight into substance use has no specific measures (Raftery et al., 2020) and could be operationalized with IA and assessed alongside cognitive insight, which is impaired in use (Raftery et al., 2019). Current operationalizations of insight into use often use a binary outcome that requires people to acknowledge that they have a problem. One of the flaws in this form of measurement is that it is neither dimensional nor reliable at the construct level (Raftery et al., 2020).

Second, studying measures of insight together could clarify relationships between forms of insight and related clinical constructs, as highlighted in this review. Several studies examined cognitive and clinical insight together regarding stigma, life satisfaction, aggression, and hostility, as well as treatments. Others compared the relationships between IA and cognitive insight with neurocognition and functioning. These works found that clinical insight, cognitive insight, and IA have substantive areas of overlap, but diverge often enough that future work should characterize their covariance. Doing so could identify profiles of symptoms, forms of cognition, or functioning that co-occur. Relatedly, research

could address whether forms of insight like clinical or cognitive insight covary over time in longitudinal designs, especially with using samples at different stages of illness.

Third, research on insight requires larger samples to detect smaller effects, and such samples are less common in clinical settings. For example, two-tailed a priori power calculations at the recommended level of .80 (Cohen, 1992) indicate small (.10), moderate (.30), and large (.50) Pearson correlations are detectable with samples of 782, 84, and 29 individuals, respectively. While not all studies in this review computed correlations, only the meta-analyses approach or exceed the sample sizes required to detect small effects. Translational research in the general population could more readily reach large sample sizes, detect small effects, and could focus on cognitive insight or IA alongside psychotic-like experiences. If there are indeed dimensional changes, IA or cognitive insight might be incorporated in efforts to quantify risk for psychosis. Evaluation of clinical cut points could then serve to identify clinical populations to assist in early detection of illness.

Finally, this work is in service of benefiting individuals suffering from schizophrenia. As indicated in this review, treatments converge on the need to help people use knowledge of themselves and the world to make sense of the changes in their lives. The goal is not just to help them notice changes in symptoms or functioning, but rather to identify possibilities that remain to live a fulfilling life and move towards it. It is important to remember that clinical insight, cognitive insight, and IA represent individuals' perspectives on the world and their experiences but are not who they are as people. As such, the field must adopt a recovery-oriented stance that any change that supports individuals' pursuit of living a valued life is worthwhile change.

CHAPTER 2: INTROSPECTIVE ACCURACY FOR SUBSTANCE USE ACROSS A YEAR OF TREATMENT FOR FIRST EPISODE PSYCHOSIS

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Abstract

Substance use exacerbates psychosis, mania, depression, and poor functioning in people with first episodes of psychosis (FEP) and is associated with poor treatment outcomes, even when it does not reach the level of a formal disorder. Impaired insight and substance use are common issues that may interfere with treatment outcomes among people experiencing FEP, yet both are treatable. Improvements in these domains are associated with better outcomes. Low insight could increase risk for substance use by impairing the ability to self-appraise and assess consequences. Introspective accuracy (IA) is understudied in this area and is one way of considering self-appraisal. This study is an archival review using data collected from NAVIGATE, a coordinated specialty care program treating people with FEP. IA was operationalized as the difference between clinician and client ratings of substance use. We tested whether IA changed over one year of treatment and whether those changes occurred alongside changes in symptoms and illness self-management. No changes in IA were detected in relation to illness self-management. Changes in IA for substance use occurred midway through treatment—individuals with greater symptom remission had more overconfident IA. Prior research on insight has shown a paradox where greater insight accompanies more symptoms. However, past research has also shown a relationship between IA and functional outcomes, like illness self-management, and that overconfidence in one domain can positively bias clinician ratings in another. Our findings suggest either a positive bias for ratings associated with overconfident IA or an insight paradox type effect.

2.1 Introduction

Substance use can impede progress in psychological interventions, and it is important to understand its role in outcomes for mental health treatment of co-occurring substance use (Kay-Lambkin et al., 2011) and schizophrenia (Czobor et al., 2015). Despite this, substance use is treatable in people with serious mental illness (Barrowclough et al., 2001; Daley et al., 1998; Smeerdijk et al., 2012), and is a common treatment target in First Episode Psychosis (FEP) (Addington et al., 2013; Heinssen et al., 2014) even when it does not reach the level of a formal disorder. Understanding constructs related to substance use in the context of treatment could also provide an opportunity to refine treatment approaches in early intervention.

In the context of mental illness, insight is the degree of lucidity towards experiences related to illness (Pick, 1882) and related inferences about oneself (Lewis, 1934). Much like substance use, impairments in insight are of relevance to intervention research in people with psychosis. These impairments can impact treatment in similar ways—poor insight is associated with poor treatment engagement and outcomes (Elowe et al., 2020; Garcia-Cabeza et al., 2018b, 2018a; P. Lysaker et al., 1994; Lysaker, Vohs, Hillis, et al., 2013; Schwartz, 1998). Limited research has shown that treating insight in schizophrenia yields improvements in substance use outcomes (James et al., 2018). Several studies indicate that both subjective and objective improvements in insight are possible within the first two to three years of treatment following a first episode of psychosis (Phahladira et al., 2019; Saeedi et al., 2007; Vohs et al., 2018). Other research in this population indicates these improvements mitigate depression secondary to substance use (Elowe et al., 2020). However, some research suggests an insight paradox, wherein better insight is associated

with worse outcomes. For example, better insight is linked to greater depression (P. H. Lysaker et al., 2007; Ramu et al., 2019; Tariku et al., 2019), but this is inconsistently observed (Arraras et al., 2019; Konsztowicz & Lepage, 2019). Relatedly, increased suicidality and attempts are sometimes (Ozturk et al., 2018; Villa et al., 2018), but not always (Ayesa-Arriola et al., 2018, p.) associated with better insight.

Researchers have noted that the development of insight via the mechanism of self-reflection is a useful target in treatment models for people with schizophrenia and is therefore useful to measure (Lysaker et al., 2011; Lysaker & Dimaggio, 2014; Moritz & Lysaker, 2018). While not specifically investigated as insight around substance use, there appear to be deficits in the self-appraisal of substance use and related consequences in people with FEP. A meta-analysis of psychosis-related outcomes across the lifespan found that younger people were more likely to use some form of substance and have more severe positive symptoms (Large et al., 2014). Approximately 50% of individuals with FEP have or had a substance use disorder, which increases symptom severity and stigma (Brunette et al., 2018). Using cannabis as an example, a meta-analysis of the prevalence of use in people with FEP found that around a third reported any cannabis use (Myles et al., 2016). In contrast to other research (Brunette et al., 2018), the same study also found that use decreased at follow up ten years after the first episode. A large longitudinal study of FEP found that cannabis use increased the overall severity of psychotic symptoms, mania, and depression, as well as low psychosocial functioning (Seddon et al., 2016). Individuals who kept using cannabis over the first year after an initial episode had more severe symptoms and poorer psychosocial outcomes than others in the sample. These findings are in line with other longitudinal population studies and meta-analyses finding cannabis use

associated with more severe outcomes across the illness course, regardless of reaching the level of a formal disorder (Degenhardt & Hall, 2006; Henquet et al., 2005; Large et al., 2011; Semple et al., 2005; van Os et al., 2002). Others found the same association for substance use broadly (Large et al., 2014). Illustrating all of the above, individuals with FEP who continued using cannabis past the first year of treatment had poorer insight and treatment outcomes over the total three years of treatment (Elowe et al., 2020).

Researchers have noted that understanding insight in the context of substance use could be important to treatment outcomes, but measuring the construct is a challenge (Raftery et al., 2019). Only one instrument measures insight related to substance use in particular, which is limited to alcohol use and self-report (Raftery et al., 2020). There is no universal measure of a person's self-appraisal of substance use that incorporates more than self-report. One solution lies in how self-appraisal can be operationalized as *introspective accuracy* (IA) (Nisbett & Wilson, 1977), using one's subjective evaluations as comparison to objective ones. Examples of objective anchors include interview, informant, or performance-based measures, with IA representing the magnitude of the difference between subjective and objective ratings.

IA has been recently studied in schizophrenia research to assess targets that are highly relevant to recovery like functioning, social cognition, and neurocognition, generally finding poor IA is associated with poor outcomes (Halverson et al., 2019; Pinkham, Klein, et al., 2018; Silberstein & Harvey, 2019; Springfield & Pinkham, 2020). IA regarding substance use is likely to play a role in functional recovery through understanding one's potential to get well (Harvey & Pinkham, 2015; Silberstein & Harvey, 2019). This in turn could increase and individual's engagement with their treatment

through identifying goals or celebrating accomplishments. However, to date we are unaware of any empirical evidence suggesting that changes are in fact related to recovery outcomes such as symptom remission and self-management of illness. To test this, we used archival data in existing local medical databases for people treated in the NAVIGATE model over one year (Kane et al., 2016; Mueser et al., 2015). We operationalized IA for substance use as the difference between clinician and client ratings of substance use within a treatment setting. We then examined whether we could detect changes in IA over time and whether those changes were related to clinician ratings of symptom remission and illness management.

While this study is exploratory in nature, there are general hypotheses about the clinical milieu. We hypothesized that IA for substance use would change over time along with improvements in measures of recovery. People with stronger recovery ratings would demonstrate better IA through the course of treatment. Because individuals with FEP tend to span a wide age range in early adulthood and age may be a confound, we also controlled for the effect of age in our analysis.

2.2 Methods

This study was approved by the local institutional review board and determined non-human subjects research. Individuals were assessed at three time points using one formal clinician-rated assessment measure and a corresponding client-rated assessment measure. Both measures were given at all timepoints by the individual and their program therapist. Participants were diagnosed by their program therapists, including psychologists, social workers, and marriage and family therapists. Diagnoses were not limited to a primary

diagnosis, so individual had multiple diagnoses in some cases (e.g., schizophreniform and cannabis use disorder). However, we report the primary diagnosis.

2.2.1 Sampling Procedure

We accessed 329 deidentified records of individuals in treatment as part of a NAVIGATE program to treat people with FEP. The NAVIGATE program used admission criteria from the effectiveness study (Kane et al., 2016): age 15-40, as well as a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder, brief psychotic disorder, or unspecified psychotic disorder. Individuals were included in the analysis if they had no more than 3 items missing on the Illness Management and Recovery Scale, which is described below. More specifically, missing data could not all be on the same subscale, and none could be missing for the items used to calculate IA. We found 44 records without missing data over the first twelve months of treatment, and an additional 21 records with missing data and imputed median values. In total, we removed 264 records for incomplete data and retained those with complete data for the baseline, six months, and twelve-month assessments. The characteristics of the final sample (N = 65) are detailed below in Table 1.

2.2.2 Assessments

The Illness Management and Recovery Scales (IMR-Client and IMR-Clinician)

The IMR Client and IMR Clinician Scales are 15-item standardized self-report scales used to measure perceptions of life and treatment goals, psychiatric symptoms, recovery, supporter involvement, and role functioning for the past 90 days (Färdig et al.,

2011; Salyers et al., 2007). The client rating scale is self-reported, and the clinician rating scale is observer reported. Each question is behaviorally anchored and uses a 5-point Likert-type rating, and the items on this scale can be interpreted separately or as an overall total. These behavioral anchors are similar for both clients and clinicians; for example, an item might ask both to separately consider the client's progress in relapse prevention planning in case of symptom exacerbations, to reduce the likelihood that a higher level of care is needed. For clinicians, these ratings refer to the client's response to and understanding of pros and cons of substance use, as well as associated problems. They also refer to developing support structures to prevent use, in addition to risk, social, and emotional management related to use, to prevent use relapse. For clients, these ratings refer to their ability to understand and execute the above behaviors.

In a study of over ten-thousand individuals, the IMR scales showed good internal consistency, criterion validity, and construct validity (Sklar et al., 2012). Factor loadings for items included by Sklar and colleagues had good construct validity in their sample. Rather than use the total score or individual item approach, the current study uses subscales based on these studies that supported a three-factor model of the IMR scales, as this was a better fitting solution compared to a single factor. Factors were Illness Recovery (four items), Illness Management (five items), and Substance Use (two items) subscales, using the item configurations from Sklar and colleagues. The recovery subscale is comprised of the symptom distress, impairment of functioning, relapse of symptoms, and coping items. The illness management subscale is comprised of progress towards personal goals, knowledge, contact with people outside of family, relapse prevention planning, and involvement with self-help activities. The substance use subscale is comprised of the

impairment of functioning through alcohol use and drug use items. For brevity, item wording is not included here, but the IMR scales are available in full in the original validation article (Salyers et al., 2007)

The factor analysis producing these subscales did not retain four items from the original scale because they did not load on any factors: involvement of family and friends in treatment, time in structured roles, psychiatric hospitalizations, and using medication effectively. Since this study tested an operationalization using the constructs of the IMR Scales and is not a test of the scales themselves, the term "illness self-management" refers to the IMR Illness Management subscale, as well as the general construct of managing an illness. Additionally, the term "symptom remission" refers to the IMR Illness Recovery subscale, as well as the general construct of symptom remission.

Introspective Accuracy for Substance Use

In our review of the literature, published operationalizations of insight related to substance use consisted of whether someone "admits" or acknowledges, or agrees with raters that one has problematic use. A conceptual challenge with this is that a binary response variable assumes that the raters are correct without providing a magnitude of disagreement, if present. We subsequently operationalized insight as IA for Substance Use, measured as the difference score between clinician and client ratings of substance on the IMR Scales, using the subscales described above. This is a novel approach for measuring substance use in clients. We used this operationalization because it is common for clinicians to assess substance use with their clients and ask them to assess their own substance use. Given that these are two different vantage points, it is reasonable that there

could be dissonance between the two scores, with clinically meaningful variance potentially reflected in that difference. First, each subscale was calculated by adding and averaging the corresponding individual items. Following this, the deviation score was scaled so that higher values on this item reflected better underestimating of progress, whereas lower scores reflected overestimation. Scores close to zero reflect more "accurate" estimations of insight on the part of those with FEP. While this operationalization inevitably creates challenges in the interpretation of analyses, it preserves the direction of discrepancies, a distinction from using another operationalization that focuses only on the magnitude of the difference, like an absolute value. This operationalization also allowed for a continuous distribution as opposed to characterizing the data in groups reflecting overestimating, underestimating, and accurate estimating. A conceptual strength of our operationalization was that it affords both continuous and qualitatively different interpretations of the data.

2.2.3 Planned Analysis

People with first episode psychosis and their clinicians rated these scales at each measurement time point. IA for substance use, the focus of this study, was calculated based on the operationalizations noted above. Time points were at approximate intervals of baseline, six months, and twelve months, but were coded as a factor since the exact number of weeks between assessment timepoints differed from person to person, and some clients spent time away from the treatment program so did not receive the same "dose" of treatment. All variables were standardized as Z-scores before analysis.

All analysis was conducted in RStudio (RStudio Team, 2020). Separate planned linear mixed effects regressions were as follows: 1) IA for substance use predicted by the interaction of timepoint and illness management, controlling for age, and 2) IA for substance use predicted by the interaction of timepoint and symptom remission, controlling for age. We used the *lme4* library (Bates et al., 2007) to estimate all linear mixed effects models. For these models, a random intercept at the individual participant level was the only random effect included. Timepoint was entered as a categorical fixed-effect predictor (with baseline entered as the reference condition), and illness management. Symptom remission ratings were entered as continuous fixed-effect predictors in their respective models. Each model also contained an interaction term, consisting of timepoint and the continuous predictor of interest.

We used the *parameters* (Lüdecke et al., 2020) library to extract conditional and marginal R^2 (with conditional R^2 analogous to R^2 for standard linear models, and marginal R^2 the estimate of the explanatory power of only the fixed-effects in the model). Standardized parameters were obtained by fitting the model on a standardized version of the dataset. 95% Confidence Intervals (CI) and *p*-values were computed using the Wald approximation.

2.3 Results

The baseline characteristics of variables used in our analysis are shown below in Table 2.

Our hypotheses were that we could detect changes in IA over time and that those changes would be related to changes in recovery, such that people who had stronger

recoveries would have better IA. One of our recovery models addressed whether individuals with better illness management had better IA over time. The illness management model's total explanatory power was moderate (conditional R^2 = 0.23) and the part related to the fixed effects alone (marginal R^2) is 0.08. In terms of main variables of interest, the interaction between timepoint and illness management yielded non-significant tests, both for the change in IA from baseline to 6 month timepoint, (std ß = -0.23, 95% CI [-0.65, 0.18], $t(186) = -1.10$, $p = 0.273$), as well as from baseline to 12 month timepoint, (std ß = -0.20, 95% CI [-0.61, 0.22], $t(186) = -0.93$, $p = 0.355$). See Table 3 for complete model parameter estimates and fit statistics.

Another of our recovery models addressed whether individuals with better symptom remission had better IA over time. The symptom remission model's total explanatory power was substantial (conditional R^2 = 0.28) and the part related to the fixed effects alone (marginal R^2) was 0.10. In terms of main variables of interest, the interaction between timepoint and illness management yielded a significant test for the change in IA from baseline to 6 months on symptom remission (std ß = -0.45, 95% CI [-0.85, -0.06], $t(186) = -2.27$, $p < .05$). The interaction effect for the change in IA from baseline to 12 months on symptom remission was non-significant (std ß = -0.15, 95% CI [-0.55, 0.25], $t(186) = -0.73$, $p = 0.467$). See Table 4 for complete model parameter and fit statistics.

2.4 Discussion

IA for substance use refers to an individual's self-appraisal of their current usage benchmarked against an objective rating of their current usage, in this study's case that of their clinician. The present study's primary aim was to test an operationalization of IA for

substance use and detect changes over time corresponding to illness self-management and symptom remission among people in treatment for FEP. We hypothesized that people with stronger recovery ratings would have better IA over time. Contrary to expectations, we found no effect for fluctuations in IA for substance use related to illness management. That is, over a year of treatment whether an individual improved, declined, or stayed the same with regard to the management of their illness, there was no impact on their IA. We found a mid-treatment interaction for IA for substance use and symptom remission, such that greater symptom remission was related to lower IA at the 6-month assessment.

While this finding was surprising, there are several possible explanations. One explanation for the interaction at 6 months but not 12 months is that people who will respond to treatment have responded by that point, creating variability in scores and a subsequently larger, detectable effect. Another possibility is there that are genuinely negative effects of better IA, as noted in recent work on IA and functioning (Olsson et al., 2019) and subjective neurocognitive complaints (Raffard et al., 2020). As to why better symptom control could accompany poorer IA, evidence suggests that the depressive clinical insight paradox in schizophrenia (Davis et al., 2020; Lysaker et al., 2007; Lysaker, Hamm, et al., 2018; Vohs et al., 2016) applies across domains of IA (Harvey et al., 2017; Jones et al., 2020; Siu et al., 2015). Consistent with the specific findings of the present study, other work showed that individuals who overestimated their abilities (lower values for IA) had the least depression (Harvey et al., 2019).

One of the weaknesses of how we operationalized IA is that we assumed that clinicians' ratings of their client's substance use would be an accurate anchor. It is possible that the lack of an effect for illness management represents a bias created by our

operationalization. However, other work using this operationalization for other domains shows consistent positive associations between better IA and better functioning (Gould et al., 2015; Olsson et al., 2019; Pinkham, Harvey, et al., 2018a; Silberstein et al., 2018), which is similar to illness management as measured here. The question of which particular rater is used as an anchor is also relevant, as past work has found relationships between IA and different variables based on usage of clinician or caregiver ratings (Nishida et al., 2018).

There are limitations to this naturalistic study based on an archival review. First, the design has no blinding, control group, randomization, or standardization of raters. Second, the sample size is small. Third, since there was no control over instruments, none specifically assessed clinical or cognitive insight, which are the most studied insight constructs (Lincoln et al., 2007; Lysaker, Hamm, et al., 2018; Vohs et al., 2016). Additionally, we did not have access to information on raters and thereby could not include it as an additional random effect in our modeling. We also did not have access to high contact informants (e.g., partner, parent), which could have yielded a more robust measure of IA. In fact, research has found different relationships between IA derived from high contact informants and clinicians (Nishida et al., 2018). There was no comprehensive measure of substance use available for analysis to establish convergent validity. Finally, the IA for substance use operationalization used only two items and it is possible that operationalizations using more items could produce different findings.

This study tested an operationalization of a construct downstream from self-reflection and insight—IA. We focused on IA related to substance use and potential changes alongside symptoms over a year of treatment. Although the relationship of IA and

an individual's illness management did not change over time, symptom remission did. Better IA for substance use was associated with greater symptoms, consistent with the insight paradox that past research showed in this population (Davis et al., 2020; Lysaker et al., 2007; Lysaker, Hamm, et al., 2018; Vohs et al., 2016). While this study addressed IA in a treatment context, the only specific treatment for IA tested in recent literature had a null finding and was pharmacological (Halverson et al., 2019), so psychosocial treatments targeting IA should be tested. In clinical practice in this population, feedback on IA could offer an inroad for clinicians to talk more openly with their clients about substance use during treatment. For clinicians, it could serve as a tool to conceptualize stages of change related to comorbid substance use treatment. Finally, in clinical research, the study of IA and substance use outcomes represents an opportunity for measurement-based care in assessing treatment response. Future work could evaluate this in medical databases, including comorbid substance use treatment in broader healthcare systems.

Table 2.1

Demographics and Clinical Characteristics of the Sample (n = 65)

Variable	Mean (SD) or % (N)
Age (Years)	21.22 (4.27), Range: 15-34.75
Sex (Men)	78 (47)
Race	
White	48 (32)
Ethnoracial Minority*	52 (33)
Hispanic/Latinx	32 (21)
Education	
Completed High School/GED	23 (15)
Some High School	26 (17)
Some College	29 (19)
Other	22 (14)
Intake Diagnosis	
Psychotic Disorder†	75 (49)
Primary Diagnosis Missing‡	26 (16)

Note: All measurements depicted above are at baseline. *American Indian and Alaska Native (3%), Asian (2%), Black or African American (26%), Biracial (11%), Other (8%), Unspecified (2%). †Unspecified Psychotic Disorder (N = 21), Schizophrenia (N = 16), Schizoaffective Disorder (N = 4), Schizophreniform (N = 6), Substance Induced Psychotic Disorder (N = 2). ‡Primary Diagnosis Missing (N = 16)

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Table 2.2

Baseline Values for Unstandardized Variables

Variable	Mean (SD)
Introspective Accuracy for Substance Use	-.60 (.95)
Clinician-Rated Illness Management	2.01 (.66)
Clinician-Rated Symptom Remission	2.73 (.61)

Note: Higher scores on the clinician-rated variables and lower scores on the insight variable are more desirable. Subscales are those produced from (Sklar et al., 2012). Subscale scores are an average of items on those scales.

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Table 2.3

Illness Self-Management Mixed Effects Model

Predictors	Introspective Accuracy for Substance Use[1]				
	ß	std. Error	*CI*	Statistic	*p*
Intercept	-0.14	0.18	-0.49 – 0.21	-0.79	x
Age at Intake	-0.04	0.08	-0.19 – 0.12	-0.46	0.645
Illness *Self*-Management	0.28	0.18	-0.07 – 0.63	1.57	0.117
6-month timepoint (vs. baseline)	0.34	0.2	-0.06 – 0.74	1.66	0.098
12-month timepoint (vs. baseline)	0.23	0.22	-0.20 – 0.65	1.06	0.29
Illness *Self*-Management x Timepoint interaction terms					
Illness *Self*-Management:6-month timepoint (vs. baseline)	-0.23	0.21	-0.65 – 0.18	-1.1	0.273
Illness *Self*-Management:12-month timepoint (vs. baseline)	-0.2	0.21	-0.61 – 0.22	-0.93	0.355
Random Effects					
σ^2	0.77				
$\tau_{00\ Individual}$	0.15				
ICC	0.16				
$N_{\ Individual}$	65				
Observations	195				
Marginal R^2 / Conditional R^2	0.075 / 0.226				
AIC	549.707				

Note: AIC = Akaike information criterion; ICC = intraclass correlation coefficient.

[1]Introspective accuracy scores computed as clinician rating minus self-report score

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Table 2.4

Illness Recovery Mixed Effects Model

		Introspective Accuracy for Substance Use[1]			
Predictors	*ß*	*std. Error*	*CI*	*Statistic*	*p*
Intercept	-0.01	0.18	-0.36 – 0.34	-0.08	0.939
Age at Intake	-0.01	0.08	-0.17 – 0.15	-0.11	0.916
Symptom Remission	0.39	0.16	0.08 – 0.70	2.47	**0.014**
6-month timepoint (vs. baseline)	0.25	0.21	-0.16 – 0.65	1.18	0.239
12-month timepoint (vs. baseline)	0.03	0.22	-0.40 – 0.45	0.13	0.899
		Symptom Remission x Timepoint interaction terms			
Symptom Remission:6-month timepoint (vs. baseline)	-0.45	0.2	-0.85 – -0.06	-2.27	**0.023**
Symptom Remission:12-month timepoint (vs. baseline)	-0.15	0.2	-0.55 – 0.25	-0.73	0.467
		Random Effects			
σ^2		0.72			
$\tau_{00\ Individual}$		0.18			
ICC		0.2			
$N_{\ Individual}$		65			
Observations		195			
Marginal R^2 / Conditional R^2		0.101 / 0.281			
AIC		543.706			

Note: AIC = Akaike information criterion; ICC = intraclass correlation coefficient.

[1]Introspective accuracy scores computed as clinician rating minus self-report score.

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CHAPTER 3: CO-OCCURRING DEFICITS IN CLINICAL AND COGNITIVE INSIGHT IN PROLONGED SCHIZOPHRENIA-SPECTRUM DISORDERS: RELATIONSHIP TO METACOGNITIVE DEFICITS

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Abstract

People diagnosed with schizophrenia have been broadly observed to experience deficits in clinical and cognitive insight; however, less is understood about how these deficits are related. One possibility is that these deficits co-occur among people when other deficits in cognition are present, such as in executive function, social cognition, and metacognition, which may either promote the development of both forms of poor insight or allow one to negatively influence the other. To explore this possibility, we conducted a cluster analysis using assessments of clinical and cognitive insight among 95 adults with a schizophrenia spectrum disorder. As predicted, this analysis yielded a group with concurrently poor clinical and cognitive insight (n = 36). Additional groups were found with concurrently good clinical and cognitive insight (n = 28) and poor clinical insight and good cognitive insight (n = 31). Groups were then compared on assessments of executive function, social cognition, and metacognition. The group with concurrently lower levels of cognitive and clinical insight had significantly poorer metacognition relative to the other groups. In particular, they tended to form more fragmented and less integrated ideas about themselves and others. No differences were found for executive function or social cognition. Result may suggest that while clinical and cognitive insight are partially orthogonal phenomena, relatively lower levels of metacognition, or difficulties forming integrated ideas about oneself and others, may be a condition leading to the confluence of lower clinical and cognitive insight. Interventions targeting metacognition may be of particular use for this group.

3.1 Introduction

Clinical insight in psychiatric conditions has traditionally referred to the recognition of morbid changes in a person's life, including the development of psychopathology, loss of function, and/or impairments in mental processes (Pick, 1882). It has been operationalized across a broad literature as involving awareness of the presence and effects of mental illness as well as need for treatment. Recent meta-analyses have shown that poor clinical insight is common in schizophrenia spectrum disorders (Li et al., 2020) and is associated with more severe levels of symptoms and impairments in neurocognition and social cognition (Subotnik et al., 2020). Individual studies found poor insight is associated with less engagement with treatment (Garcia-Cabeza et al., 2018a, 2018b). Paradoxically, when clinical insight is good, depression and demoralization can occur, particularly during episodes that result in stigma or social disadvantage (Belvederi Murri et al., 2016; Lien et al., 2018b; Lysaker, Vohs, Hasson-Ohayon, et al., 2013; Ramu et al., 2019). Further, a recent meta-analysis found that increased clinical insight can lead to reduced quality of life in people diagnosed with schizophrenia (J. Silberstein & Harvey, 2019).

The study of insight in schizophrenia spectrum disorders has expanded in recent years based on findings that such people often struggle to understand and make sense of their life outside of a psychiatric context (Vohs et al., 2016). One such area includes awareness of one's cognition, referred to as cognitive insight (Beck et al., 2004). Cognitive insight is distinct from clinical insight in that it is not concerned with the awareness of a mental illness but instead with attention to and awareness of one's thoughts and thought processes. For example, a person with good cognitive insight would be expected to attend

to their thinking while being aware of its fallibility. However, like clinical insight, cognitive insight is associated with several aspects of psychosocial function and is present early in the illness course (Dondé et al., 2020). Lower cognitive insight has been found to be associated with the presence of delusions in people with schizophrenia and in at-risk groups (Kimhy et al., 2014; Uchida et al., 2014), poor neurocognitive functioning (Bredemeier et al., 2018; Expósito & Felipe-Castaño, 2018; Ohmuro et al., 2018), more severe symptoms during first episodes of psychosis (O'Connor et al., 2017) and beyond (Expósito & Felipe-Castaño, 2018; Kamble et al., 2020; Liu et al., 2020), poor quality of life (Rathee et al., 2018; Sagayadevan et al., 2019), as well as poor community functioning (Expósito & Felipe-Castaño, 2018; Pinho et al., 2020). In contrast, higher levels of cognitive insight have been associated with recent suicide attempts or active ideation (Ozturk et al., 2018; Villa et al., 2018), stigma (Grover, Sahoo, Chakrabarti, et al., 2018), depression (Grover et al., 2017; Misdrahi et al., 2014), a lower sense of personal recovery (Giusti et al., 2015), and reduced quality of life (Kim et al., 2015).

Although the study of different forms of insight has been growing rapidly, it remains unsettled as to if and how cognitive insight and clinical insight are related to one another in schizophrenia spectrum disorders (Lysaker, Pattison, et al., 2018). There are at least two possibilities that have been discussed to date. First, as some studies have suggested, they may be unrelated (Ekinci et al., 2012; Greenberger & Serper, 2010; Grover, Sahoo, Chakrabarti, et al., 2018; Othman & Lua, 2018b). Consistent with this, it has been reported that each may be linked to different underlying disturbances in basic brain processes(Nair et al., 2014). A recent meta-analysis of insight in people with psychosis, for instance, found that clinical insight is not related to a specific brain area, but rather with

diffuse regions, whereas cognitive insight is associated with specific areas related to executive function and memory (Pijnenborg et al., 2020). The authors suggested that cognitive insight could involve the integration of information related to the self and one's subjective experiences, whereas clinical insight might not involve such specific processes. However, a second possibility is that they may be related and overlap substantially with one another. Supporting this, one meta-analysis found a small association between elements of cognitive insight and clinical insight (Nair et al., 2014). Additionally, a recently proposed conceptual framework suggested that greater understanding of one's subjective experience of illness supports understanding others' perceptions of one's illness, which in turn supports growth in insight (Thirioux et al., 2020). This might explain the relatively similar associations between good clinical and cognitive insight and a variety of desirable and undesirable outcomes, such as the associations between lower insight and more severe symptoms, as well as lower treatment adherence. With good insight, common associations are presented with regard to stigma and depression. Ultimately, understanding how cognitive and clinical insight are related to one another is important because mixtures of higher and lower cognitive and clinical insight might require different treatment strategies or the development of different interventions.

A third possibility that has been relatively less explored is that cognitive and clinical insight reflect genuinely unique processes which may commonly, though not necessarily, co-occur (Konsztowicz et al., 2018). In particular, it is possible that under certain circumstances or in the presence of other impairments, deficits in both forms of insight may develop. One such set of variables which may lead to the co-occurrence of lower clinical and cognitive insight are impairments in various kinds of cognition. For example,

it is possible that significant disturbances in other forms of cognition might directly contribute to the development of both forms of poor insight or potentially allow the mutual influence of one form of poor insight upon another.

To date, there are at least three different forms of impaired cognition common in schizophrenia which have been related to poor clinical and cognitive insight separately and which might be related to their confluence. The first of these, executive function, refers to the neurocognitive abilities which allow people to form certain ideas, inhibit others, and shift set as needed (Diamond, 2013). We reasoned that deficits in executive functioning might promote both forms of poor insight or heighten their influence upon another because of the interference of these deficits in the ability to effectively sort and manage information. Social cognition refers to people's abilities to form accurate appraisals of the thoughts, feelings, and intentions of others (Pinkham et al., 2014). Here we reasoned that social cognitive deficits would limit an accurate sense of the thoughts and perceptions of others. This in turn would limit the kinds of input from others that might challenge poor insight or heightened the mutual influence of relative deficits in clinical and cognitive insight upon one another. Finally, metacognition refers to the processes which enable people to notice and integrate information in an ongoing sense of self, others, and one's place in the community(Lysaker, Minor, et al., 2020). Here we reasoned that having a generally more fragmented and less coherent sense of self could not only foster both forms of limited insight but also enable lack of awareness in one form of insight which could weaken the other form of insight.

To investigate this possibility, we performed a cluster analysis on validated measures of clinical and cognitive insight to determine if we could identify groups of

people with schizophrenia spectrum disorders who have higher, lower, and mixed levels of insight. Planned tests included determining whether any resulting groups differed on measures of three forms of cognition linked to insight in schizophrenia spectrum disorders: executive function, social cognition, and metacognition (Béland & Lepage, 2017; Bora, 2017; Bredemeier et al., 2018; Expósito & Felipe-Castaño, 2018; Lysaker, Gagen, et al., 2019; Quee et al., 2011; Subotnik et al., 2020; Xavier et al., 2018). Notably, we used multiple social cognition measures because it is a multidimensional construct (Ludwig et al., 2017; Pinkham, 2014). We reasoned that relatively poor executive functioning might result in the co-occurrence of poor clinical and cognitive insight as it might limit the ability to focus attention and interpret specific experiences related to declining mental health and cognitive processes. We believed that relatively poorer social cognition might similarly lead to co-occurring deficits in clinical and cognitive insight as it may limit the ability to recognize and make use of others' perceptions of one's declining mental health and cognitive processes. Finally, it is possible that with poorer metacognition, deficits in both cognitive and clinical insight might emerge as people struggle to form complex representations of themselves and others. To rule out the possibility that any group differences were a function of global severity of psychopathology, we also explored global symptom severity measures.

We hypothesized that there would be more than two groups that reflected higher and lower insight, with additional groups reflecting mixtures of higher and lower insight in terms of clinical and cognitive insight. Additionally, we predicted that a group with significantly lower levels of both clinical and cognitive insight would have the lowest levels of executive functions, social cognition, and metacognition.

3.2 Method

3.2.1 Participants

Participants were 82 adult men and 13 adult women with diagnoses of schizophrenia (n = 57) or schizoaffective disorder (n = 38) confirmed by the Structured Clinical Interview for DSM-IV (First et al., 1997). Participants were engaged in outpatient treatment at a VA Medical Center (n = 78) or Community Mental Health Center (n = 17). All participants were in a non-acute phase of illness, as defined by no hospitalizations or medication changes in the prior month, but were not in remission, per se. Exclusion criteria were intellectual disability or active substance dependence of any form as defined by DSM-IV.

3.2.2 Assessments

3.2.2.1 Insight

The Beck Cognitive Insight Scale (BCIS) (Beck et al., 2004) is a 15-item continuous self-report questionnaire which assesses cognitive insight. It is comprised of a self-reflectivity subscale and a self-certainty subscale. Scores are summed for subscale totals. A total score can be obtained by subtracting the self-certainty scale score from the self-reflectivity scale score. The BCIS has been widely used in psychosis research (Martin et al., 2010; Warman & Martin, 2006).

The Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987) is a 30-item dimensional assessment of the symptoms of schizophrenia scored by a trained rater. Scores range from 1-7 and a clinical cut point identifies moderate to severe symptoms at

above 4, with anything below that indicating no to mild impairment. For this study, we utilized the Lack of Insight item as an index of clinical insight and the PANSS total score as an overall psychopathology index.

From a measurement perspective, it is important to note that a 15-item self-report measure of cognitive insight and a 1-item interviewer rated measure of clinical insight could impart implications for method variance. However, this approach is common practice in the literature (Grover, Sahoo, Chakrabarti, et al., 2018) and there are no known published psychometric studies suggesting loss of information or introduction of measurement error in relation to it.

3.2.2.2 Executive Function

The Wisconsin Card Sorting Test (WCST) (Heaton & Staff, 1993) measures executive functioning in terms of the flexibility of abstract thinking needed to match test stimuli to one of four key categories based on an unnamed matching principle. For this study, we focused on the raw Number of Categories Correct and Percentile for Perseverative Errors as general executive functioning measures, in line with other research on insight (Bredemeier et al., 2018; Expósito & Felipe-Castaño, 2018; Ohmuro et al., 2018).

3.2.2.3 Social Cognition

The Bell–Lysaker Emotional Recognition Task (BLERT) (Bell et al., 1997; Bryson et al., 1997) assesses a person's identification of affective cues in standardized video segments. Scores range from 0 to 18 and index the number of correct identifications. This

measure was developed in part for use with people with schizophrenia. This test has good test retest validity and internal consistency in people with schizophrenia (Pinkham, Harvey, et al., 2018).

The Reading the Mind in the Eyes Test (Baron-Cohen et al., 2001) uses 36 photographs of someone's eyes. Participants are asked to identify which of four emotion or thought words best describes that expressed by the eyes in a given photograph. Participants may be awarded one point per photograph. This measure is used regularly with people with schizophrenia (McGlade et al., 2008; Shur et al., 2008) and has good test retest validity and internal consistency in this population (Pinkham, Harvey, et al., 2018).

3.2.2.4 Metacognition

The Indiana Psychiatric Illness Interview (IPII) (Lysaker et al., 2002) is a semi-structured interview that extracts samples of a person's thinking about the challenges of their life, focusing on those related to mental illness and psychopathology. The IPII's goal is to gather a detailed and well-rounded narrative of psychiatric challenges within the context of a person's life.

The Metacognition Assessment Scale – Abbreviated (MAS-A) (Lysaker et al., 2005; Lysaker, Kukla, et al., 2019) is a multidimensional scale of metacognitive capacity. It produces a total score and four subscale scores: Self-reflection, or an individual's capacity to recognize that they have autonomous thoughts and subsequently synthesize detailed and nuanced personal narratives of their thoughts and emotions; Awareness of the Other's Mind, or the capacity to integrate the thoughts and emotions that other people in their life experience; Decentration, or the capacity to know that others have perspectives

and motivations which are independent of the participant; and Mastery, or the capacity to use metacognitive knowledge of one's strengths and limitations to effectively cope with psychological challenges. The MAS-A is rated based on narrative transcripts, in this case provided by the IPII, by trained raters. Prior research indicates good-to-excellent interrater reliability (Lysaker & Dimaggio, 2014). This scale has been used predominantly with people with schizophrenia.

3.2.2.5 Procedure

Institutional review boards at each recruitment site approved the study protocol. Participants were recruited from clinics at each site and constitute convenience samples. Participants provided informed consent, were administered the SCID-IV, and then completed the full battery of assessments.

3.2.3 Analyses

Data analysis was conducted in the R environment using RStudio (RStudio Team, 2020). We used the k-medians clustering algorithm to identify homogenous groups in the sample using the cluster library (Maechler et al., 2012). In k-medians clustering, k clusters are first defined by identifying a median-based medoid, and then the data are partitioned into distinct clusters until within-cluster variance is minimized relative to between-cluster variance, thus resulting in maximally discrepant groupings (Leonard & Peter, 1990). Clusters derived using this method are robust to outliers, as medians are less influenced by extreme values than means. K-medians clustering is appropriate when a priori hypotheses exist regarding the number of clusters in a sample and is more suitable for smaller sample

sizes than alternative, model-based techniques (e.g., latent class analysis) (Lazarsfeld & Henry, 1968). Additionally, using this procedure instead of theory-defined groups allows exploratory and empirical detection of participants who demonstrated hypothesized patterns of scores on insight indicators.

Because cluster analysis methods like k-medians assume that a two-cluster solution is viable, we calculated the Caliński-Harabasz index (CH index) (Caliński & Harabasz, 1974) for model comparison. The CH index range is unbound, with higher values indicating the most appropriate number of clusters for the data, and is a measure of relative rather than absolute fit. It is worth noting that because k-medians assumes at least two clusters, the assumed two cluster model is always the most statistically parsimonious.

We submitted the BCIS composite score and the PANSS lack of insight item to cluster analysis for three and four-cluster solutions and then compared the CH index for both solutions. Both insight variables were converted to Z-scores before analysis, with no missing data on the cluster indicators. Because we were interested in nuanced cluster patterns beyond a higher/lower dichotomy, our starting point for cluster analysis was the three and four cluster models and we empirically determined the optimal fitting k value for our data between these two.

Following the identification of the final cluster solution, we conducted Kruskal-Wallis tests on the insight variables with the identified clusters as the group variable to confirm the clusters' conceptual relevance (Kruskal & Wallis, 1952). Kruskal-Wallis tests are one-way comparisons of distribution location differences, more similar to medians than means, and are thus appropriate for our k-medians derived clusters. Another strength of these tests is that they do not hold the assumptions needed for typical analysis of variance,

though a weakness is they can be less sensitive at smaller sample sizes. While some analyses in psychopathology research use covariates, there is an assumption that the covariate and independent variables in such analyses are uncorrelated. While not reported here, both the data in the present study and recent meta-analyses (Subotnik et al., 2020) show that psychotic symptoms, neurocognition, and social cognition are associated with clinical insight, making them unsuitable as covariates.

As such, we conducted Kruskal-Wallis tests to test cluster differences in psychosis symptoms, executive function, metacognition, and social cognition. We followed up all significant main effects with posthoc Dunn tests (Dunn, 1964) to examine pair-wise group differences on a given variable. All main effects and posthoc test p-values were adjusted using Benjamini and Hochberg's false discovery rate correction for multiple comparisons (Benjamini & Hochberg, 1995).

3.3 Results

3.3.1 Participants

The mean age and education for the sample were 49.36 (*SD* = 8.70) and 12.72 (*SD* = 1.79), respectively. The median number of psychiatric hospitalizations was six. Fifty-one participants identified as Black (54%), forty-three identified as White (45%), and one participant identified as Latinx (1%).

3.3.2 Cluster Analysis

The Caliński-Harabasz statistic of 76.48 for three clusters and 54.87 for four clusters indicated that the three-cluster solution was a more parsimonious fit for the data

and was carried forward as our final clustering solution. The three-cluster solution identified groups that we determined to be characterized relative to each other by lower cognitive and clinical insight (labeled L hereafter; n = 36), higher cognitive and clinical insight (H; n = 25), or mixed with lower cognitive and higher clinical insight (M; n = 34).

3.3.3 Group Comparisons

As shown in Table 1, groups significantly differed on all insight scales, which further confirmed that clustering had the expected outcome of maximally discriminating groups based on their insight characteristics. There were large main effects for the BCIS composite score that reflects cognitive insight (H[2] = 61.57, $p. fdr$ < .001), self-reflectivity (H[2] = 30.79, $p. fdr$ < .001) and self-certainty (H[2] = 20.46, $p. fdr$ < .001). L had the lowest cognitive insight and self-reflectivity. H had the lowest self-certainty. There was also a large main effect for the PANSS Lack of Insight item (H[2] = 64.42, $p. fdr$ < .001) with L showing the poorest scores, but not for the PANSS total score (H[2] = 2.13, $p. fdr$ = .421). Figure 1 shows clusters with regard to PANSS Lack of Insight and BCIS composite score.

As can be seen in Table 2, groups did not differ on executive or social cognitive domains. In terms of metacognition, there was a moderate main effect for MAS-A Self-Reflection (H[2] = 11.46, $p. fdr$ = .007), with M and H showing the highest scores. A large main effect for Awareness of the Other's Mind (H[2] = 17.36, $p. fdr$ < .001), as well as moderate main effects for Decentration (H[2] = 8.57, $p. fdr$ = .029) and MAS-A total (H[2] = 13.22, $p. fdr$ = .004) were found. In both cases L showed consistently lower scores. There

was no main effect for Mastery (H[2] = 3.69, $p.\ fdr$ = .268). Figure 2 shows clusters with regard to MAS-A scores.

3.4 Discussion

To better understand the relationship between clinical and cognitive insight in schizophrenia spectrum disorders, this study used cluster analytic methods to determine if we could find dissociable groups with co-occurring deficits in both forms of insight, the absence of either deficit, or a mixture of one but not the other deficit. Analyses found a three-cluster solution was the most quantitatively parsimonious, with two-thirds of the sample fitting into "both higher" or "both lower" insight clusters, and one-third fitting into a "mixed" cluster. Concerning the clinical qualitative meaning of the scores, using tertile reference ranges for cognitive insight and related labeling convention (Penney et al., 2019), L and M had more "moderate" cognitive insight, and H had "high" cognitive insight, meaning that they were in a different category with the most intact insight. In terms of clinical insight, L performed as expected and had a more significant lack of awareness of their mental illness. Using the original clinical cutoff values for clinical insight and related labeling convention (Kay et al., 1987), L and M had more "moderate" impaired clinical insight, and H had more mildly impaired clinical insight, again falling in a different category. It is likely that the lack of severe impairments in clinical insight reflect the outpatient nature of the sample. We then examined whether groups differed on three forms of cognition which might potentially influence the co-occurrence of both deficits: executive function, social cognition and metacognition. As anticipated, we found the group with co-occurring deficits in clinical and cognitive insight had the poorest level of metacognition,

specifically in the areas of self-reflection, awareness of others' minds, and decentration. Of note, these findings were present in the absence of group differences in overall psychopathology. No differences were found for social cognition or executive function.

While the study's cross-sectional nature prevents us from concluding causality, these results bring up several considerations to be tested in future research. One interpretation is that exceptionally lower metacognition is a pathway to a profile in which there is both lower clinical insight and lower cognitive insight. With lower metacognition, people might be unable to integrate information into a holistic experience of the self and so be less able to perceive changes that might occur in self experience. This fragmentation of self-experience may lead to a decreased ability to recognize changes in their lives, notice a loss of meaning or functioning, and integrate this information, thus driving lower clinical and cognitive insight or enabling one to negatively influence the other(Henriksen & Parnas, 2014). This is consistent with recent findings that metacognition may operate as a unique hub connecting multiple facets of cognition and psychopathology in schizophrenia (Hasson-Ohayon et al., 2018; Lysaker, Minor, et al., 2020). Of note, there are alternative interpretations. It is possible that with poor clinical and cognitive insight, metacognition is negatively affected. It is also possible that the observed relationship between variables is the result of other variables that were not measured here. These could include, for example, trauma, stigma, or attachment history. It is also possible that the coupling of both forms of lower insight leads to impaired metacognitive capacity and not the other way around.

There were unexpected findings. Groups did not differ on social cognition or executive function. This may suggest these variables, while potentially related to one or the other form of insight, do not affect whether they co-occur. There were also no group

differences in metacognitive Mastery, which is the ability to conceptualize a psychological problem (e.g., loneliness) and cope with it using self-knowledge. This may suggest that the factors which affect the co-occurrence of lower cognitive and clinical insight have more to do with making sense of one's internal states than the ability to respond to distress. Lastly, while we found a group with mixed lower clinical insight and higher cognitive insight, we did not find the reverse or a group with higher clinical insight and lower cognitive insight. This may suggest that lower cognitive insight is a barrier to higher clinical insight. It is possible that these unexpected findings might be in part due to no group having truly poor cognitive insight with reference to published norms (Penney et al., 2019). However, those reference ranges were formed using tertiles in their sample and are only guides. As with all unexpected findings, replication is needed, and results should be taken as fodder for future research.

There are limitations to this work. The cross-sectional nature of this study precludes concluding the stability of these clusters over time and the stability of relationships to variables between clusters. Future longitudinal study is needed to more carefully explore these relationships. The sample size was relatively modest and a larger sample would allow a more robust characterization of groups through cluster analyses or latent-profile approaches. Limited instruments were used and there are other clinical insight measures that are also conceptually relevant for clustering (Lincoln et al., 2007). While the sample included individuals with schizoaffective disorder, there were no specific measures of depressive or manic symptoms, although stability requirements make the latter unlikely. There were also no comprehensive neurocognitive batteries employed here that were normed for severe mental illness such as the MATRICS Consensus Cognitive Battery

(Kern et al., 2008, 2011; Nuechterlein et al., 2008), which includes domains like verbal memory and sustained attention that are not included in the present study. In addition, there are other domains of social cognition not studied here, such as attribution (Pinkham, Harvey, et al., 2018). We also utilized one assessment of metacognition using a method that examines the integrative function of metacognitive processes. More research is therefore needed with broader instrumentation. Participants were mostly male, likely had longer durations of illness by virtue of age, and all were receiving treatment. Replication is needed in more diverse samples including one with people who refuse treatment.

With replication, results may have clinical implications. If metacognitive capacity affects the confluence of these forms of insight, it may be that treatments that target metacognition in schizophrenia spectrum disorders will have positive effects on insight. To date, one approach, Metacognitive Insight and Reflection Therapy (MERIT) (Lysaker & Klion, 2017), has been found to be acceptable to people with lower insight and linked with meaningful improvements in insight in one randomized controlled trial and multiple case studies (Lysaker, Gagen, et al., 2020; Vohs et al., 2018). By targeting the level at which people are struggling to integrate information, MERIT aims to increase the integration of self-experience, leading to a more coherent sense of self and the struggles one faces. Other metacognitive approaches include metacognitive training (MCT), which aims to address stigma, self-worth, and depression (Moritz & Woodward, 2007). These interventions have been found to be acceptable by patients with schizophrenia spectrum disorders, with MERIT and MCT linked to significant improvements in clinical and cognitive insight (Lopez-Morinigo et al., 2020b; Simón-Expósito & Felipe-Castaño, 2019).

Table 3.1

Background Characteristics, Insight, and Overall Symptoms of Groups Varying on Clinical and Cognitive Insight (n=95)

	L	M	H	H Statistic	P	P Adj.	Eta Sq	Size	Post hoc group comparisons
	Clinical - Cognitive -	Clinical + Cognitive -	Clinical + Cognitive +						Dunn Test (P Adj. < .05)
Rank (Insight)	3	2	1						
Total N	36	31	28						
Age	50.5 (8.90)	52 (5.93)	50 (5.93)	1.47	0.48	0.536	0		
Education	12 (1.48)	12 (0)	12 (1.48)	1.34	0.511	0.536	0		
Diagnosis* (N/% Schizophrenia)	24 (66.7)	16 (51.6)	17 (60.7)	1.58	0.454	0.454	0		
				Insight and Psychopathology					
BCIS Composite Index	6 (2.97)	7 (2.22)	14 (2.97)	61.57	< .001	< .001	0.647	Large	3 > 2, 1
BCIS Self-Reflectivity	21 (3.71)	22 (4.45)	26 (2.97)	30.79	< .001	< .001	0.312	Large	3 > 2, 1
BCIS Self-Certainty	15 (4.45)	15 (2.97)	11 (2.97)	20.46	< .001	< .001	0.201	Large	3 < 2, 1
PANSS Lack of Insight	4 (4.33)	3 (2.79)	3 (2.88)	64.42	< .001	< .001	0.678	Large	1 > 2, 3
PANSS Total Score	81 (14.08)	78 (19.27)	75 (14.82)	2.13	0.345	0.421			

Note: Median (Median Absolute Deviation) depicted. False Discovery Rate correction applied to all p-values for main effects and post hoc comparisons. *Chi-square test.

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Table 3.2

Metacognition, Social Cognition, and Executive Function (n=95)

	L	M	H	H Statistic	P	P Adj.	Eta Sq	Size	Post hoc group comparisons
	Clinical - Cognitive -	Clinical + Cognitive -	Clinical + Cognitive +						Dunn Test (P Adj. < .05)
Rank (Insight)	3	2	1						
Total N	36	31	28						
				Metacognition					
MAS-A Self-Reflection	3.5 (.74)	4.5 (1.48)	4.5 (1.48)	11.46	0.003	0.007	0.102	Moderate	3, 2 > 1
MAS-A Other's Mind	2.5 (.74)	3.5 (.74)	3 (.74)	17.36	< .001	< .001	0.167	Large	1 < 2 (3, 2 > 1 before adj)
MAS-A Decentration	0.5 (.74)	1 (.74)	1 (1.48)	8.57	0.014	0.029	0.071	Moderate	1 < 2
MAS-A Mastery	3 (1.85)	4 (1.48)	4 (1.48)	3.69	0.158	0.268			
MAS-A Total	10 (3.35)	12 (4.08)	13 (4.45)	13.22	< .001	0.004	0.122	Moderate	3, 2 > 1
				Social Cognition					
BLERT Total	12 (2.97)	12 (2.97)	14 (2.97)	6.38	0.041	0.078			
Eyes Test	21.5 (5.93)	20.5 (5.19)	23 (4.45)	3.09	0.213	0.329			
				Executive Function					
WCST Categories Correct	2.5 (2.22)	3 (2.97)	4 (2.97)	2.11	0.348	0.455			
WCST Percent Perseverative Errors	22.5 (17.04)	21 (8.89)	18 (11.86)	1.31	0.519	0.519			

Note: Median (Median Absolute Deviation) depicted. False Discovery Rate correction applied to all p-values for main effects and post hoc comparisons.

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Figure 3.1

Insight Domains by Cluster (Raw Scores)

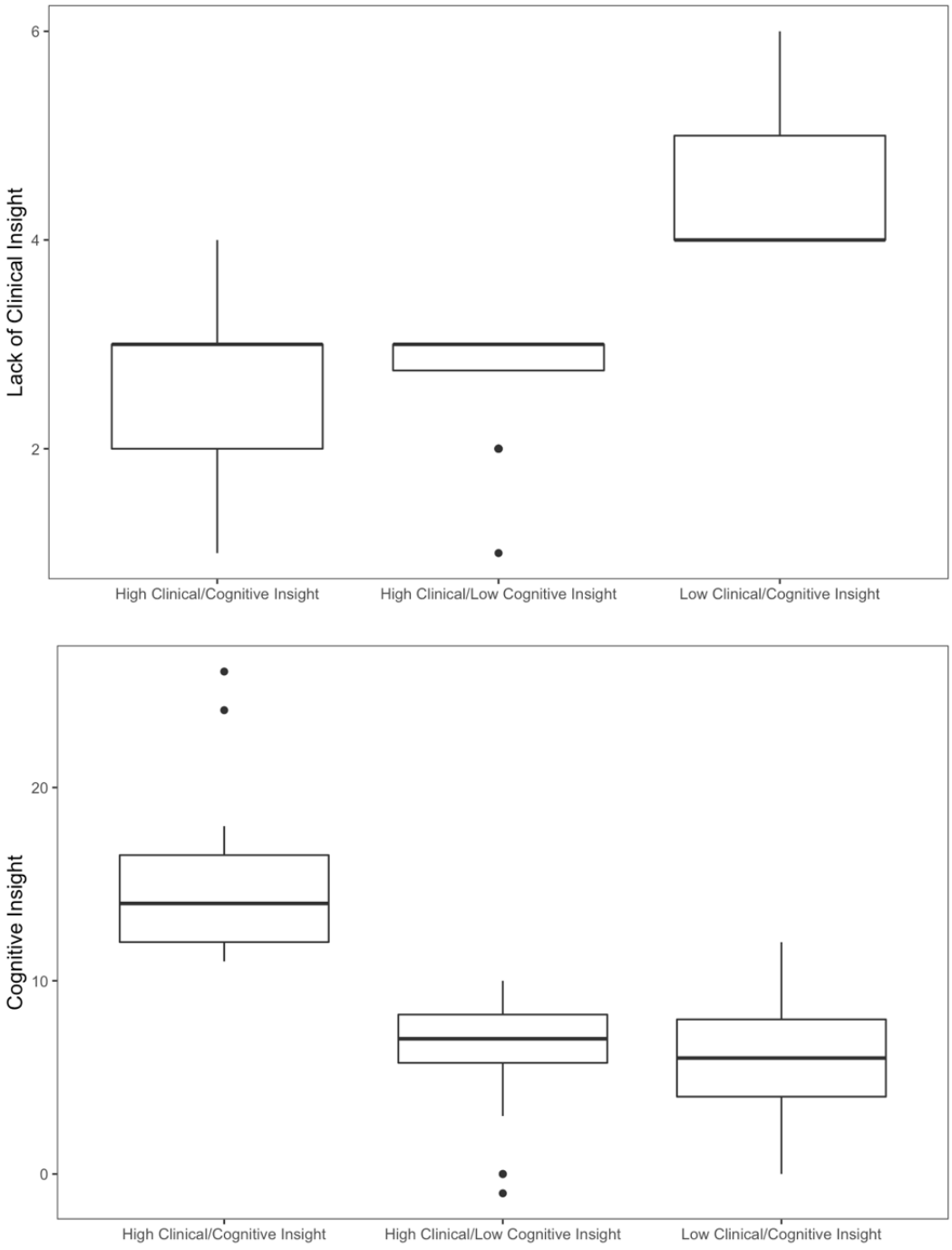

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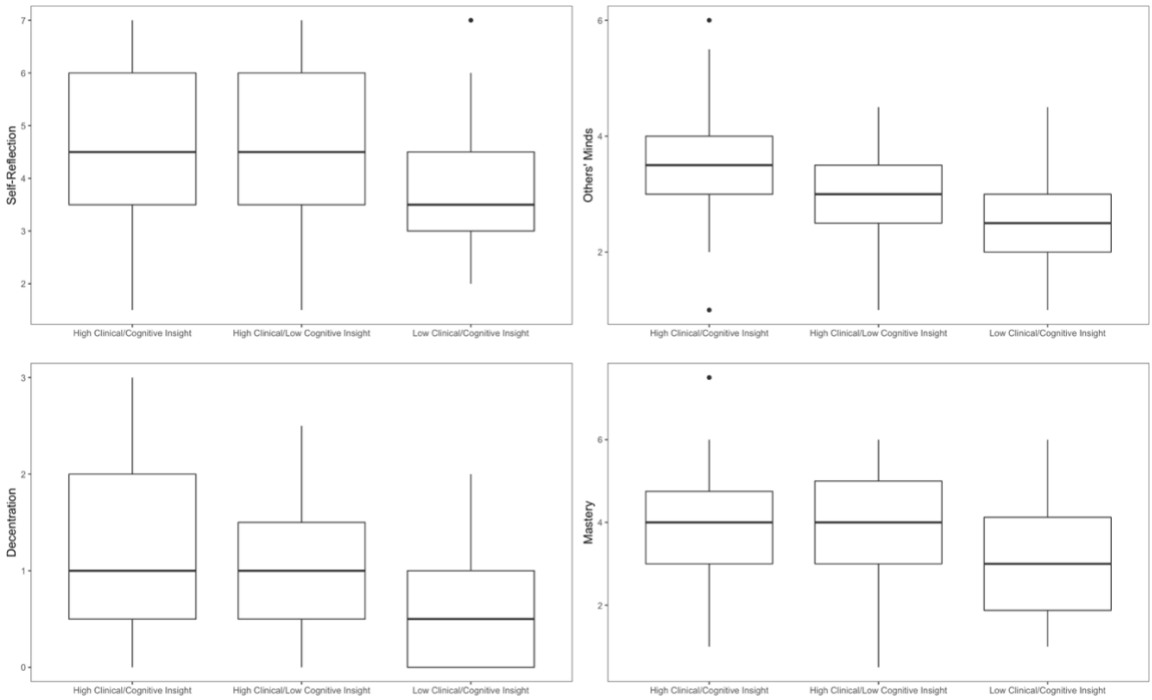
Figure 3.2

Metacognition Subdomains by Cluster (Raw Scores)



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CHAPTER 4: GREATER PSYCHOTIC-LIKE EXPERIENCES ACCOMPANY CANNABIS USE IN PEOPLE WITH LOWER COGNITIVE INSIGHT: A LATENT PROFILE ANALYSIS

Abstract

Cannabis use has been extensively linked with the development of subthreshold psychotic-like experiences. However, less is understood however about what factors are associated with this relationship. Limited research suggests that cognitive insight, which is the extent to which one understands thoughts and beliefs as fallible, might play an underappreciated role. To explore whether cognitive insight may influence or be influenced by the relationship between cannabis use and psychotic-like experiences (PLE), we gathered self-reports of cannabis use, cognitive insight, psychotic-like experiences, and demographic information from 1,301 adults recruited online. Latent profile analyses were first conducted to identify profiles of participants based on patterns of cannabis use and two domains of cognitive insight (self-reflectivity and self-certainty). Kruskal-Wallis tests contrasted profile differences, followed by post-hoc Dunn tests. The profile model that fit the best had three profiles: one with high cannabis use, lower self-reflectivity, and higher self-certainty; one with lower cannabis use, lower self-reflectivity, and higher self-certainty; and one with lower cannabis use, higher self-reflectivity, and lower self-certainty. Kruskal-Wallis tests revealed that those with higher cannabis use, lower self-reflectivity, and higher self-certainty had levels of use consistent with cannabis use disorders and the most psychotic-like experiences. This might suggest that in the face of cannabis use, better cognitive insight does not play a protective role, but rather poor cognitive insight could identify those meriting interventions.

4.1 Introduction

People who use cannabis extensively are three to seven times more likely to develop psychosis (Marconi et al., 2016; Semple et al., 2005; van Os et al., 2021), have a one year earlier onset of psychosis than any other substance users (Large et al., 2011), and show more severe positive symptoms (Large et al., 2014). In adolescents and young adults, lifetime cannabis use is associated with more subthreshold psychotic-like experiences (PLE), especially in the positive symptom domain (Hides et al., 2009; Konings et al., 2008; Ragazzi et al., 2018; Stefanis et al., 2004; van Gastel et al., 2012; Verdoux et al., 2003). This suggests that cannabis use during critical periods of development could cause psychosis, rather than merely reflecting self-medication (Arseneault et al., 2002, 2004). Finally, cannabis use also appears to worsen psychosis in those already experiencing it (Gilman et al., 2018).

There are several ways cannabis could lead to the development or exacerbation of psychosis. One possibility is that genetic polymorphisms, which have been implicated in the development of psychosis, also modulate the impact of the exogenous cannabinoid δ-9-tetrahydrocannabinol (THC) on diffuse brain regions implicated in psychosis (Bhattacharyya et al., 2012; Caspi et al., 2005; Ho et al., 2011; Onwuameze et al., 2013). It is also possible that in addition to indirect epigenetic influences, THC directly affects the function of these brain regions. As an example, THC has a direct and disruptive effect on the endogenous cannabinoid systems, which in turn disrupts maturation of the prefrontal cortex (Bossong & Niesink, 2010; Rubino & Parolaro, 2014).

While biological links between cannabis use and PLE are being investigated, it is less clear whether psychosocial factors might mitigate vulnerability to the psychomimetic

effects of cannabis. One factor that might influence the effects of cannabis use is cognitive insight. A framework proposed by Beck and colleagues (Beck et al., 2004) defines cognitive insight in two constituent parts, self-reflectivity and self-certainty. Self-reflectivity refers to the ability to see thoughts and beliefs as fallible and the belief that one's appraisals might not be as accurate as those of others. Generally, self-reflectivity is a good prognostic indicator. On the other hand, self-certainty refers to the point of view that one's thoughts, and not those of others, are the best representation of reality. Generally, self-certainty is a poor prognostic indicator. This framework allows for a person to be higher or lower on either or both constructs. One mechanism through which cognitive insight could interject is in the causal path from cannabis use to PLE. People who are at risk for psychosis with lower self-reflectivity or higher self-certainty might be less able to understand PLE as a result of cannabis use rather than reality. Such experiences could then remain unchallenged and deter seeking out additional perspectives from others that could ameliorate symptoms, as shown in limited treatment research (James et al., 2018). Other work highlights the possibility that the appraisal of risk for substance use can be greater in people with more PLE, as observed in first episodes of psychosis (Mervis et al., 2021). This could suggest that over time individuals become more aware of the relationship between greater symptoms and use.

A gap in the literature lies at the intersection of substance use, PLE, and insight, which might offer a practical opportunity for intervention. Among individuals with problematic substance use, self-certainty is highest in those with psychotic disorders, reflecting lower insight (Raftery et al., 2019). A clinical trial for substance use reduction found that people who had more years of methamphetamine use had greater self-certainty,

but self-reflectivity and self-certainty did not predict clinical outcomes, suggesting no protective effect (Raftery et al., 2021). Although, that study excluded individuals with psychotic disorders, it might suggest that greater substance use corresponds to lower insight. What remains unknown is whether these relationships are present in the general population, viewed through the lens of PLE. *If there is a relationship between cannabis use, PLE, and aspects of cognitive insight*, different approaches to treating cannabis use may be tailored to levels of cognitive insight. The present study parsed the heterogeneity of cannabis use patterns and cognitive insight domains to characterize those groups according to symptoms of psychosis. The identification of such groups does not establish taxa but rather identifies clinically useful patterns across several variables to facilitate treatment targeting.

We hypothesized that 1) any groups formed on these constructs would differ in cannabis use beyond higher and lower usage insofar as an intermediate group could emerge, and 2) that any group higher in cannabis use would also have lower insight, as indicated by lower self-reflectivity and higher self-certainty, which might underlie appraisal of risks associated with use. If a group higher in cannabis use with poor insight emerged, we hypothesized that 3) they would have the most severe PLE and distress from those experiences.

We chose to use a general population sample for several reasons. One is the ability to gather large samples using dimensional measures of psychosis, which improves construct validity in individuals with and without psychotic disorders in the general population with PLE (Esterberg & Compton, 2009; Krueger & MacDonald, 2005; Linscott & van Os, 2010; Rosenman et al., 2003; van Os et al., 1999). The other benefit of a general

population sample is greater relevance to those at risk of developing psychosis, as such individuals might otherwise be difficult to identify and recruit in sufficiently large numbers. The studies reviewed here indicate that cannabis use is one such stressor for those that have the diathesis, underscoring why insight into use may be important in the prevention of psychotic disorders.

4.2 Methods

4.2.1 Sampling Procedure

This study was approved by the local institutional review board. 1,396 Participants were recruited via Amazon Mechanical Turk ("Mturk") and completed written informed consent procedures online. Mturk has been used extensively to assess psychopathology in relation to variables of interest and past research has found it is well-suited to this type of work (McCredie & Morey, 2019). Participants were required to answer all survey questions and were given several hours to complete the questionnaires. Out of the initial sample, 1,301 participants completed at least 90% of the survey and were included in the analysis procedures described below.

4.2.2 Assessment Procedures

Beck Cognitive Insight Scale (BCIS) was developed to evaluate people's self-reflectiveness and their overconfidence in their interpretations of their experiences (Beck et al., 2004). The instrument is a 15-item self-report questionnaire that uses a 4-point Likert scale, with a self-reflectivity subscale (9 items, alpha= .65) and a self-certainty subscale (6 items, alpha= .64). Alphas observed here are similar or better than those in the

original clinical validation sample (Beck et al., 2004) and are considered sufficient for measures with less than ten items (Cortina, 1993; Holden et al., 1991). A composite index of the BCIS for cognitive insight subtracts the score for self-certainty from self-reflectiveness. The lowest possible score for the composite index is zero, meaning there is no "negative insight" construct built into the scale. The BCIS has been successfully used in psychosis research conducted in the general population (Martin et al., 2010; Warman & Martin, 2006).

Community Assessment of Psychic Experience (CAPE) is a measure of psychotic-like experience used in general population samples and produces stable, reliable, and valid scores, including discriminant validity for subdomains (Konings et al., 2006; Mark & Toulopoulou, 2016; Stefanis et al., 2002; van Os & Delespaul, 2003). Forty-two items cover three PLE domains and related distress using two 4-point Likert scales. There are twenty positive PLE (Alpha = .91) and twenty related distress (Alpha = .94) items; eight depressive PLE (Alpha = .86) and eight related distress items (Alpha = .89); and fourteen negative PLE (Alpha = .89) and eight related distress items (Alpha = .91). All forty-two items are pooled for a total PLE score (Alpha = .94) and related distress (Alpha = .96). One scale indicates frequency and the other distress related to PLE related to each symptom subdomain. Questions on the CAPE have face validity in the context of psychosis, ranging from the more subtle "Do you ever feel as if people seem to drop hints about you or say things with a double meaning?" to the less subtle "Do you ever feel as if electrical devices such as computers can influence the way you think?" Beyond quantification of the primary experience, the CAPE asks about distress caused by these experiences, providing greater breadth to the measure.

Cannabis Use Disorders Identification Test – Revised (CUDIT-R) is a self-report questionnaire with over 90% sensitivity and specificity for cannabis use disorders in clinical samples (Adamson et al., 2010). Eight items on a 5-point Likert scale ask about cannabis use, with exception to one item on a 3-point scale with the same scoring range as the other items (alpha = .88). In the present study, participants indicating that they never use cannabis were not administered the remaining eight items and received scores of zero for all items.

4.2.3 Analysis

Data Processing and Cleaning. We adhered to best-practice guidelines that highlight several techniques to isolate higher-quality participant responses and exclude invalid responses due to computer bots, "insufficient effect," "carelessly invalid responses," and other common issues in online research studies (Curran, 2016). These methods drew heavily on methodological issues noted in research focused on personality and individual differences in the social sciences (Chapman & Chapman, 1983; Costa Jr & McCrae, 2008; Huang et al., 2012; Johnson, 2005; Marjanovic et al., 2014, 2015; Marjanovic & Holden, 2019). From these guidelines, we implemented a time-based cutoff of less than 2 seconds per question. After time-based exclusion, we used the *careless* package in R (Yentes & Wilhelm, 2021) and quantified response invariability suggestive of poor effort and computed within individual inter-item standard deviations to detect random responding. We also implemented a measure of conscientious responding that directs participants to respond in a certain way and an unpublished "infrequency scale" (Chapman & Chapman, 1983), which asks questions that are infrequently endorsed.

All analyses were conducted in RStudio (RStudio Team, 2020). Latent profile analysis (LPA) is a is a form of mixture-modeling for detecting latent subpopulations within a set of continuous variables (Gibson, 1959). It is currently used in behavioral research (Spurk et al., 2020) and the sample size of 1,301 participants is adequate for the detection of up to four profiles based on simulation studies (Tein et al., 2013). The *tidyLPA* package in R (Rosenberg et al., 2019) with *mclust* specification was used for all model fits. Fit was evaluated with Akaike's Information Criterion (AIC) (Akaike, 1998), Approximate Weight of Evidence (AWE) (Banfield & Raftery, 1993), Bayesian Information Criterion (BIC) (Schwarz, 1978), Classification Likelihood Criterion (CLC) (Biernacki & Govaert, 1997), and Kullback Information Criterion (KIC) (Cavanaugh, 1999), using a validated hierarchical decision heuristic (Akogul & Erisoglu, 2017). We note that clusters formed in this way may not reflect natural groupings but provide a means to examine complex patterns of covariance.

Kruskal-Wallis tests (Kruskal & Wallis, 1952) are nonparametric one-way comparisons that quantified profile differences on indicator variables—cannabis use and the subdomains of cognitive insight, self-reflectivity, and self-certainty—between each profile group After this, we characterized the profiles in terms of cognitive insight overall, PLE, and distress related to PLE. Eta-squared effect sizes were interpreted using recent guidelines (Tomczak & Tomczak, 2014), with bootstrapped 95% confidence intervals (n = 1,000) using the bias-corrected and accelerated method (Bca), which resists imbalance and skew (Efron, 1987; Efron & Tibshirani, 1994; Jung et al., 2019). We then used post-hoc Dunn tests (Dunn, 1961, 1964), which investigate pair-wise profile contrasts for variables of interest after significant one-way tests and are conservative regarding Type I errors. All

p-values were false discovery rate adjusted (Benjamini & Hochberg, 1995), which balanced penalization for multiple comparisons against the potential for false-negatives.

4.3 Results

981 Participants remained after 320 were removed for failing validity checks (approximately 25%). Mahalanobis Distance (Mahalanobis, 1936) then identified 35 additional participants for extreme outlying multivariate scores, yielding 946 for the main analysis. Final sample characteristics are shown below in Table 1 and are similar to stable demographics observed on Mturk over 18 months of the COVID-19 pandemic (Moss et al., 2020), but not the United States population on the whole, particularly with people of Latin American descent who are underrepresented in this study (U.S. Census Bureau, 2021).

We considered one through four profile fit solutions along the noted fit criteria and posterior probabilities to determine which solution was the best fit. As shown in Supplemental Table 1, a three-profile solution fit the best (*AIC* = 7457.09, *AWE* = 7662.48, *BIC* = 7525.53, *CLC* = 7430.57, *KIC* = 7474.09). The hypotheses that profiles would emerge with varying amounts of cannabis use and that a higher cannabis use group would have poorer insight was addressed among the profile indicator variables. To empirically name the profiles and examine their relative importance for grouping, we conducted a random forest analysis (Boulesteix et al., 2012). Analysis revealed that cannabis use (Gini = 119.37) and self-certainty (Gini = 119.14) were similarly more influential than self-reflectivity (Gini = 84.51), with a low overall out-of-bag classification error rate of 0.53%. Based on the LPA model estimates and random forest analysis, we found one profile with

lower self-reflectivity, higher certainty, and lower cannabis use (Higher Certainty; H); one profile with lower self-reflectivity, higher certainty, and higher cannabis use (Higher Certainty/Cannabis Use; HC); and one with higher self-reflectivity, lower certainty, and lower cannabis use (Lower Certainty; L). Figure 1 shows the profile centroids and probability distributions across the three detected groups.

There was a small main effect for differences in age (H[2] = 15.88, $p_{fdr} < .001$, $\eta^2 =$ 0.01, 95% Bca CI [0.00-0.03]), such that HC was younger than the other profiles. Analyses for cannabis and insight domains of interest appear in Table 2 along with medians and median absolute deviations.

There was a large main effect for cannabis use, such that the HC Profile had higher use than the other profiles and surpassed the clinical cutoff for probable cannabis use disorders (Adamson et al., 2010). In terms of self-reflectivity, there was a large main effect such that L Profile had the highest scores, followed by the HC and H Profiles, which were significantly different but with similar medians. With regard to self-certainty, there was a large main effect, such that the HC and H Profiles had greater certainty than the L Profile. The cognitive insight composite index showed a large main effect, such that the L Profile had the highest cognitive insight composite scores, followed by the HC Profile, then the H profile, although the latter two had similar scores.

Analyses for PLE and related distress appear in Table 3, along with medians and median absolute deviations, and address the hypothesis that a profile higher in cannabis use would have more PLE and related distress. Figures 1 and 2 show means and standard deviations for PLE subdomains and related distress; when notches in boxes do not overlap it indicates a significant median difference. There were small main effects for Total PLE,

Negative PLE, and Depressive PLE, such that the HC Profile had higher scores than the other profiles. A main effect for Positive PLE found that the HC Profile had the highest scores, followed by the H Profile, then the L Profile, although the differences between the medians for the latter two was minimal. Small main effects for Total PLE Distress and Negative PLE Distress Total reflected the HC Profile's higher scores in these areas compared to the other profiles. There were small main effects for Positive PLE Distress, as well as Depressive PLE Distress, such that the HC and H profiles differed, but likely not enough power for differences with the L Profile.

Since the L and H groups did not differ in PLE and cannabis use, suggesting that insight is not influential, we conducted additional analysis on those variables within the HC group. To better characterize the HC profile with lower self-reflectivity, higher certainty, and higher cannabis use, we conducted exploratory post hoc Spearman's rank coefficient correlations to examine the association between Positive PLE domains and distress with cannabis use. Positive PLE and Positive PLE Distress were weakly correlated with cannabis use. Next, we split the Positive PLE domain into factors derived from meta-analysis of the CAPE and distress related to those factors (Mark & Toulopoulou, 2016). We calculated internal consistencies for Perceptual Anomalies (Alpha = .87) and related distress (Alpha = .88); Delusional Ideations (Alpha = .77) and related distress (Alpha = .85); and Bizarre Experiences (Alpha = .85) and related distress (Alpha = .89). Cannabis use was weakly correlated with Perceptual Anomalies, Delusional Ideations, and Delusional Ideations Distress. Table 4 shows all correlation analyses within the HC group, with insight variables excluded.

4.4 Discussion

The present study aimed to detect patterns of cannabis use and cognitive insight domains co-occurring in a general population sample and characterize resulting groups according to symptoms of psychosis. We had three hypotheses: profiles would emerge with more than just higher and lower cannabis use, groups higher in cannabis use would have lower self-reflectivity and higher self-certainty, as well as the most PLE and distress from those experiences. Against our first hypothesis, the best-fitting profile solution found only higher and lower cannabis use and no intermediate profiles with moderate use. Subsequent analysis found that levels of cannabis use and self-certainty were stronger influences on the grouping than self-reflectivity. The higher cannabis use group had median scores past the clinical cut point for probable cannabis use disorders (Adamson et al., 2010). Partially consistent with our second hypothesis, the profile (HC) with higher cannabis use had lower insight in terms of lower self-reflectivity and higher self-certainty, but there was another profile (H) showing this pattern with lower cannabis use. However, the H profile had lower cannabis use and PLE that was similar to the L profile. This suggests that insight either did not matter for the emergence of PLE, or any effect for self-reflectivity was subsumed by that of cannabis use and self-certainty. Consistent with our third hypothesis, the HC profile had the greatest PLE and related distress across all domains. To better characterize the HC group, we undertook an exploratory analysis and found cannabis use was positively associated with Positive PLE overall and positively associated with specific facets—Perceptual Anomalies, Delusional Ideations, and Delusional Ideations-related Distress.

The between-profile differences between the H and HC profiles related to cannabis use and PLE, and the within-HC profile relationship between cannabis use and Positive

PLE are consistent with prior literature (Hides et al., 2009; Konings et al., 2008; Stefanis et al., 2004; Verdoux et al., 2003). The current study's findings show an association between more PLE and lower cognitive insight, as observed in people with psychotic disorders (Raftery et al., 2019). However, lower cognitive insight on its own was not specific to the HC group, possibly implicating cannabis use in the association with PLE. Regarding other between-profile differences, those with higher cannabis use were younger, possibly explained by increasing openness towards cannabis use (Carliner et al., 2017) and greater problematic use in younger adults (Haug et al., 2017), which could account for use across these profiles better than patterns of insight.

A goal of this study was to use findings to inform treatment applications, which are important because the higher cannabis use group had median CUDIT-R scores consistent with expected scores for people with cannabis use disorders (Adamson et al., 2010). It is possible that among individuals with lower insight, targeting cannabis use could represent a path to reducing symptoms, especially positive symptoms (Large et al., 2014; van Os et al., 2021), based on directionality observed in recent research. In line with past research (Raftery et al., 2021), our findings suggest that targeting cognitive insight itself could improve cannabis use. For this reason, we believe the current study suggests that cannabis use treatment could be more important among those with lower cognitive insight. However, it does not suggest that treating cognitive insight could lead to lower cannabis use.

There are unexpected findings in this study. Against hypothesis, no groups emerged with higher cannabis use and higher cognitive insight, which could be a product of the latent profile analysis. For example, an individual who had higher self-reflectivity, but extreme cannabis use might be misclassified by the latter's influence on profile assignment.

However, the random forest analysis did not support this, finding that cannabis use and self-certainty had equal influence, and that there was overall low misclassification with the LPA indicator variables. Another possibility is that the absence of a group with higher cannabis use and higher cognitive insight could represent underreporting or more desirable responses among individuals with higher cognitive insight in survey research. Another unexpected finding was that groups differed in age, such that the youngest group used the most cannabis and had the most PLE. However, this finding is consistent with other samples showing younger people had greater cannabis use and more PLE, particularly Positive PLE (Ragazzi et al., 2018). The identification and treatment of cannabis use in younger people with PLE could prevent poorer outcomes observed for cannabis users in treatment for first episodes of psychosis (Elowe et al., 2020).

The largest limitation in the present study is that online data collection presents challenges to drawing an inference in the general population because the verification of higher-quality participants is as much an art as it is a science (Curran, 2016). Research supports Mturk studies as generally valid for analysis when response validity indicators are used, as in the present study (Chmielewski & Kucker, 2020). At the same time, note that the population sampled on Mturk appears to have some unexpected psychopathology differences when considered against the general population. For example, a study comparing Mturk participants to a large U.S. census-based normative sample of psychopathology and personality data found that the online participants were generally high quality. However, they showed more significant negative affect and social avoidance than expected (McCredie & Morey, 2019). In support of increased negative affect, a large Mturk study found increased rates of depression, between approximately 1.5 to 3.5 times

that expected in general population samples, and those rates were inflated when analysis did not exclude lower-quality participants (Reichart, 2019). Researchers have also noted the strong potential for Mturk as a way of sampling substance use in the general public, in particular, provided that inclusion and exclusion criteria are well-reported and principled (Mellis & Bickel, 2020; Strickland & Stoops, 2019), as implemented in the present study using contemporary guidelines (Curran, 2016).

This study sought to characterize profiles of cannabis use and cognitive insight to inform treatment of cannabis use in people with PLE because it worsens illness course and may facilitate the development of illness. Specifically, if patterns of cognitive insight and cannabis use covaried, treatments targeting insight could represent an indirect means of targeting self-appraisal of substance use if poorer cognitive insight was associated with greater use. Results showed that while two groups had lower cognitive insight, only those in the profile with median cannabis use reaching the level of a cannabis use disorder had prominent PLE and related distress. This is important because while gold-standard treatments for psychosis struggle to show effects for substance use (Cather et al., 2018), targeting of substance use might minimize risk of PLE in those with lower cognitive insight.

Table 4.1

Demographic Information

Variables	Overall *N = 946*
Age	
Mean (SD)	40.0 (13.1)
Gender Identity	
Female (cis)	516 (54.5%)
Male (cis)	411 (43.4%)
Other Identifying	19 (2%)
Sexual Orientation	
Bisexual	73 (7.7%)
Gay or Lesbian	29 (3.1%)
Other Identifying	28 (2.9%)
Straight or heterosexual	816 (86.3%)
Race	
Asian	85 (9.0%)
Black	80 (8.5%)
Indigenous	6 (0.6%)
Latin American	42 (4.4%)
Middle Eastern	4 (0.4%)
Other Identifying	9 (1.0%)
White	720 (76.1%)
Hispanic/Latinx	67 (7.1%)

Table 4.2

One-Way Profile Comparisons for Cannabis Use and Insight

Variable	Higher *N = 713*	Higher + Cannabis *N = 74*	Lower *N = 159*	H Statistic	η^2	CI	Size	Dunn Test
Cannabis Use	0 (0)	12 (4.45)	0 (0)	404.88	0.43	0.36-0.50	Large	HC > L, H
Self-Reflectivity	11 (2.97)	12 (2.97)	16 (2.97)	222.03	0.23	0.19-0.28	Large	L > HC > H
Self-Certainty	8 (2.97)	8 (1.48)	4 (1.48)	277.6	0.29	0.25-0.34	Large	H, HC > L
Insight Composite	3 (4.45)	4 (4.45)	12 (2.97)	382.12	0.4	0.36-0.44	Large	L > HC > H

Note: 1. All main effect p-values < .0001 and are adjusted for False Discovery Rates. 2. Confidence intervals are bias-corrected and accelerated bootstrap-estimated. 3. Dunn Test p-values < .05, adjusted for False Discovery Rate, 4. For comparisons, profile L refers to Low Self-Certainty, H to Higher Self-Certainty, and HC to Higher Self-Certainty plus Cannabis Use. 5. Medians and (Median Absolute Deviations) reported

Table 4.3

One-Way Profile Comparisons for Psychotic-like Experiences and Related Distress

Variable	Higher N = 713	Higher + Cannabis N = 74	Lower N = 159	H Statistic	η^2	CI	Size	Dunn Test
Total	1.60 (0.32)	1.79 (0.30)	1.62 (0.32)	28.30**	0.03	0.01-0.05	Small	HC > L, H
Positive	1.35 (0.22)	1.55 (0.37)	1.3 (0.22)	27.70**	0.03	0.01-0.05	Small	HC > H > L
Negative	1.79 (0.42)	2.07 (0.42)	1.86 (0.42)	19.22*	0.02	0.01-0.04	Small	HC > L, H
Depressive	1.75 (0.56)	2.13 (0.56)	1.88 (0.56)	22.76**	0.02	0.01-0.04	Small	HC > L, H
Total Distress	1.36 (0.39)	1.52 (0.42)	1.38 (0.39)	10.73**	0.01	> 0-0.02	Small	HC > L, H
Positive Distress	1.15 (0.22)	1.25 (0.30)	1.15 (0.22)	12.61**	0.01	> 0-0.03	Small	HC > H
Negative Distress	1.43 (0.53)	1.64 (0.53)	1.5 (0.53)	10.45**	0.01	> 0-0.03	Small	HC > L, H
Depressive Distress	1.63 (0.74)	1.88 (0.74)	1.75 (0.74)	8.29*	0.01	> 0-0.02	Small	HC > H

*Note: 1. Main effect p-values ** < .0001, * < .001, adjusted for False Discovery Rates. 2. Confidence intervals are bias-corrected and accelerated bootstrap-estimated. 3. Dunn Test p < .05, adjusted for False Discovery Rate, 4. For comparisons, profile L refers to Low Self-Certainty, H to Higher Self-Certainty, and HC to Higher Self-Certainty plus Cannabis Use. 5. Medians and (Median Absolute Deviations) reported*

Table 4.4

Correlations Between Cannabis Use and Psychotic-like Experiences in the High Self-Certainty + Cannabis Profile

Psychotic-like Experiences	Cannabis Use	Positive Facets	Cannabis Use
Positive	**0.24***	Perceptual Anomalies	**0.35****
Positive Distress	**0.24***	Perceptual Anomalies Distress	0.18
Negative	0.14	Delusional Ideations	**0.23***
Negative Distress	0.14	Delusional Ideations Distress	**0.25***
Depressive	0.06	Bizarre Experiences	0.14
Depressive Distress	0.06	Bizarre Distress	0.16

* $p < .05$, ** $p < .01$

Computed correlation used spearman-method with listwise-deletion. P-values adjusted for False Discovery Rate.

Supplemental Table 4.1

Model Fit Statistics for Latent Profiles

Classes	AIC	AWE	BIC	CLC	KIC	Posterior (Min)	Posterior (Max)
1	8360.87	8447.53	8390.2	8350.87	8369.87	1	1
2	8297.35	8443.88	8346.23	8278.59	8310.35	0.75	0.94
3	7457.09	7662.48	7525.53	7430.57	7474.09	0.5	0.96
4	7462.59	7727.55	7550.58	7427.62	7483.59	0.1	0.96

Figure 4.1

Latent Profile Centroids and Probability Distributions

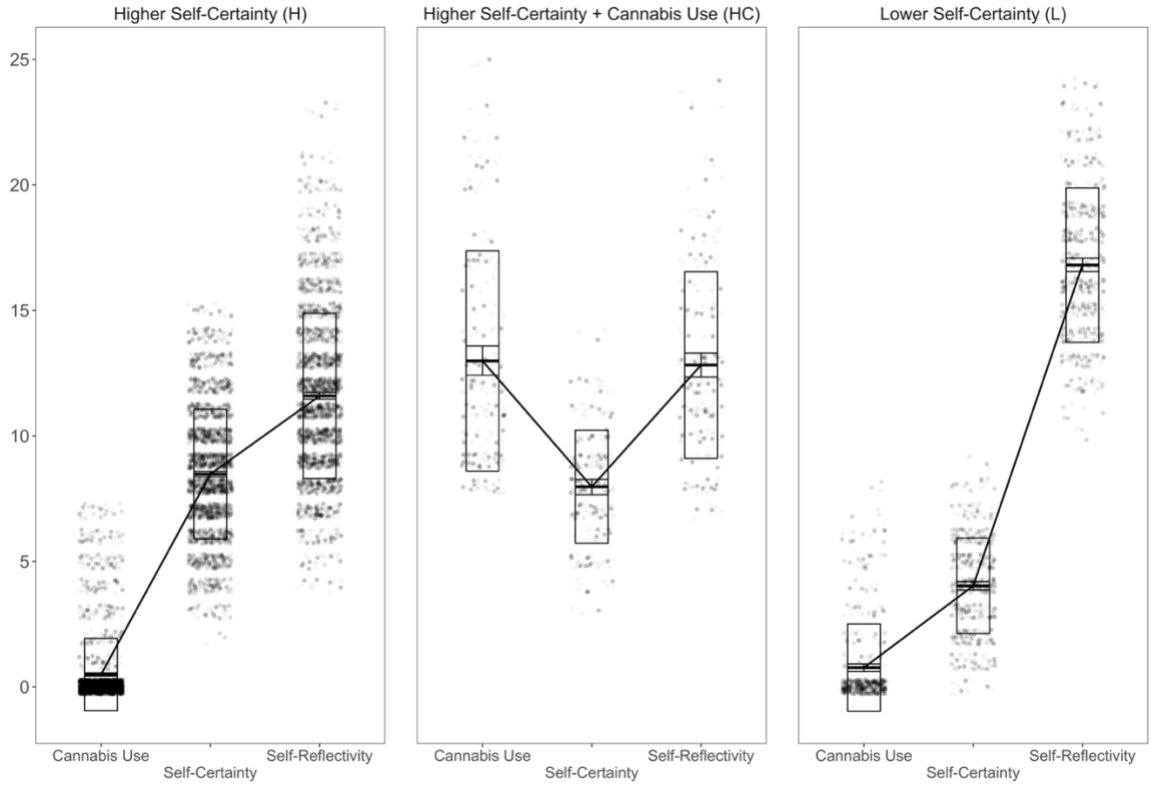


Figure 4.2

Psychotic-like Experience Domains by Latent Profile

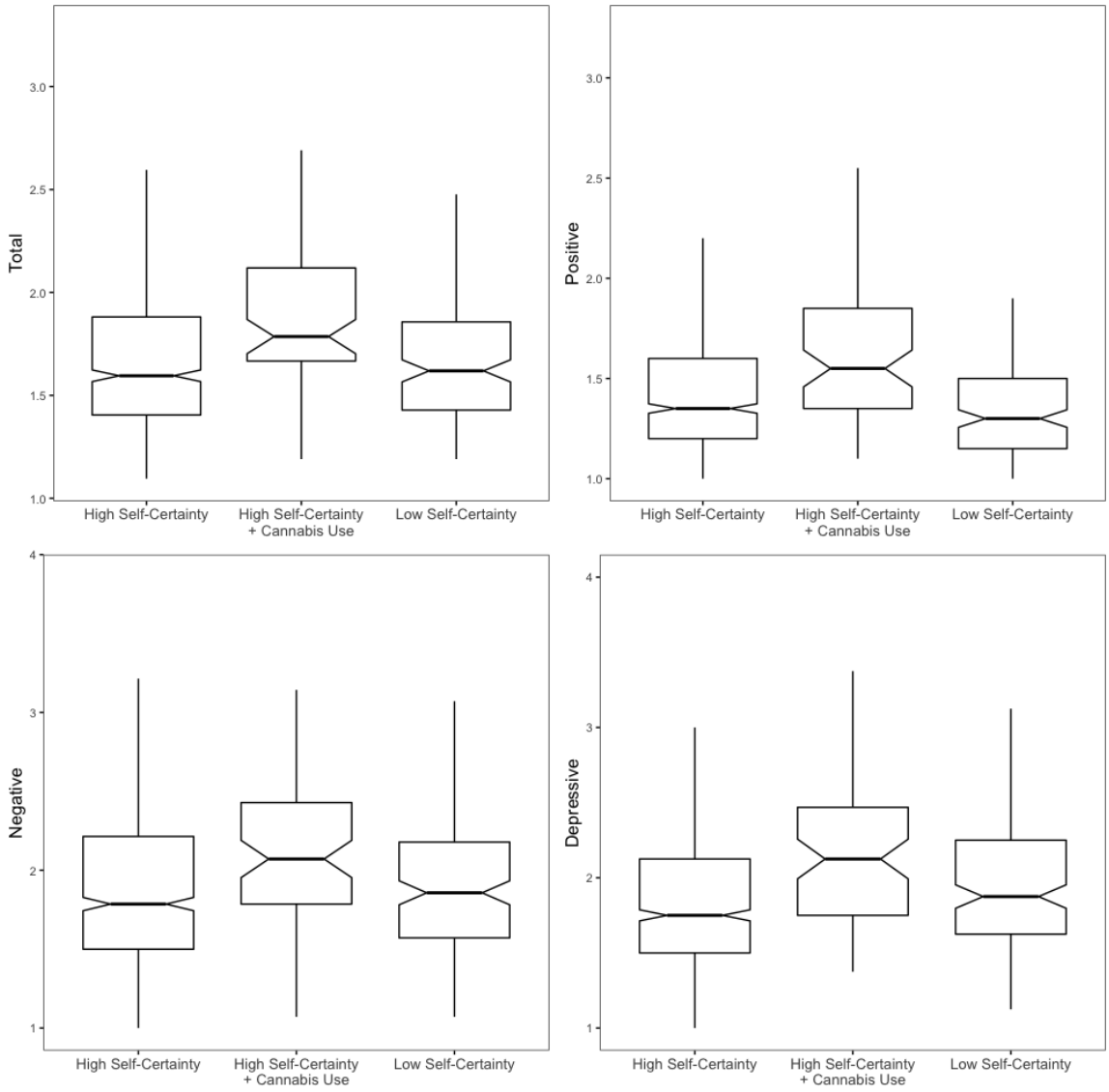
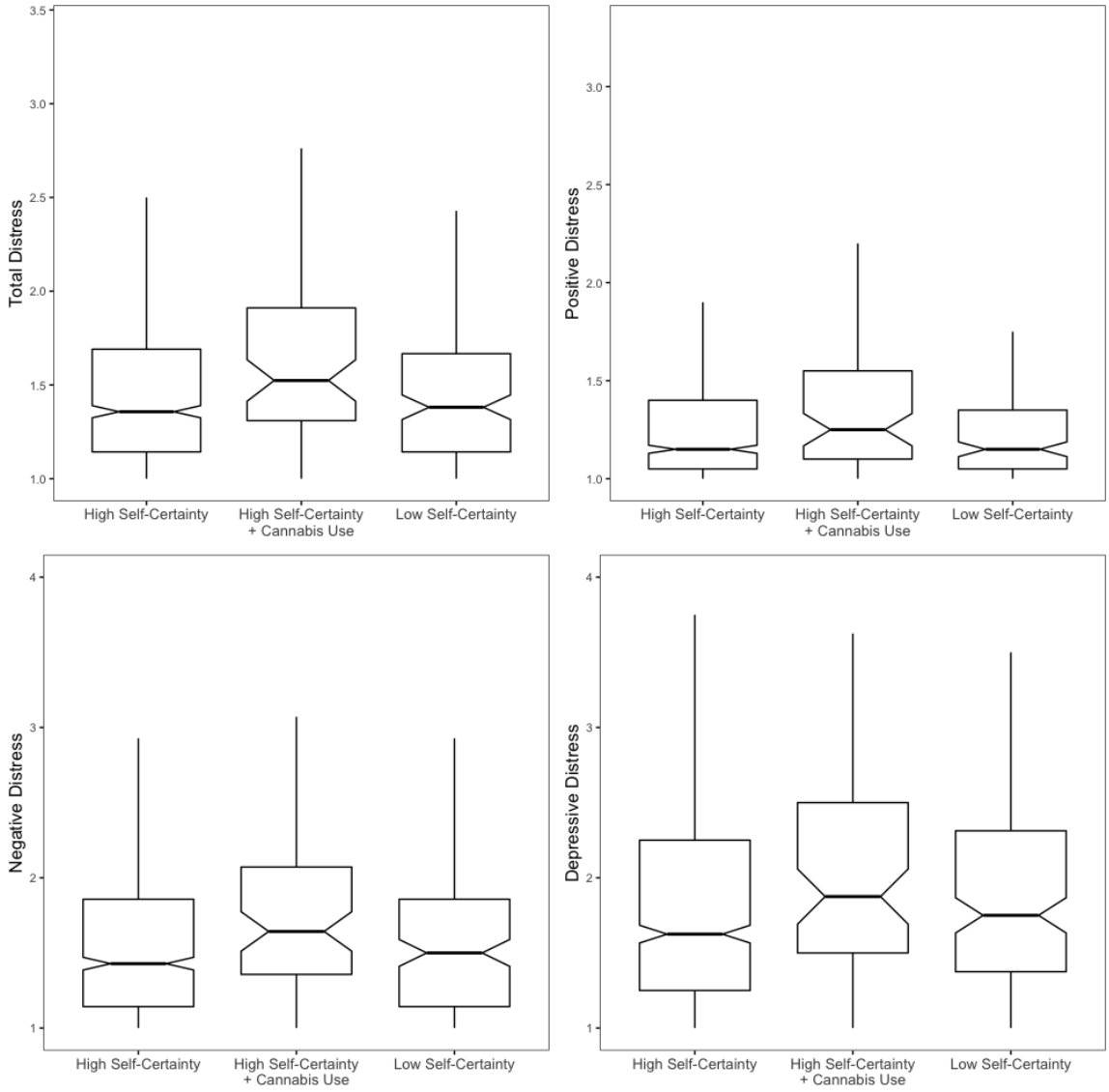


Figure 4.3

Psychotic-like Experience Distress by Latent Profile



CHAPTER 5: GENERAL DISCUSSION

5.1 Interpretive Summary

The introductory review, ***An update on clinical insight, cognitive insight, and introspective accuracy in schizophrenia-spectrum disorders: symptoms, cognition, and treatment,*** provided an overview of the current literature on three forms of insight: *clinical insight* (Lincoln et al., 2007; Lysaker, Hamm, et al., 2018), *cognitive insight* (Beck et al., 2004; Riggs et al., 2012), and *introspective accuracy (IA)* (Harvey & Pinkham, 2015; Nisbett & Wilson, 1977; Silberstein & Harvey, 2019). Briefly, clinical insight is the awareness of a mental illness, its impacts, and the need to ameliorate those impacts. Cognitive insight is centered on thought processes and understanding their fallibility. IA refers to domain-specific self-assessment.

The studies presented here addressed several areas for future research that were proposed in the introduction: insight into specific comorbidities via IA, examination of cognitive and clinical measures of insight together, and translational research on psychotic-like experiences (PLE) in the general population. Consistent with the broader literature, these studies underscore that better insight shows both positive and paradoxical associations with other clinical outcomes (Aleman et al., 2006; Amador & David, 2004; Davis et al., 2020; Lysaker, Pattison, et al., 2018; Riggs et al., 2012; Vohs et al., 2016).

The study on IA, ***Introspective accuracy for substance use across a year of treatment for first episode psychosis*** (Mervis, Fischer et al., 2021), focused on a specific area of the clinical milieu, substance use, and tested the relevance of a related

operationalization of IA. We chose this in response to a gap in the literature: past work noted an absence of measures for insight into substance use (Raftery et al., 2020) despite impairments in those with problematic use (Raftery et al., 2019). We used an approach with relative, rather than absolute, magnitudes that theoretically places the "intact" insight state in the middle of a paradoxical simplex.

We found a paradoxical effect for symptoms and insight—midway through treatment for a first episode of psychosis (FEP), those with greater symptoms had better insight into their substance use. One interpretation for this is that individuals become aware of the problematic nature of use and its magnifying effect on symptoms, as noted in the literature on cannabis (Carney et al., 2017; Elowe et al., 2020; Large et al., 2011; Marconi et al., 2016; Myles et al., 2016). There are also methodology-based interpretations based on the longitudinal treatment context of the study, even though the study itself neither evaluated nor provided treatment. While it is not possible to separate the contextual elements of the study to determine whether time or treatment are separately or jointly influential, it is clear that the paradoxical relationship observed is not trait-like in nature. This might suggest that the treatment of insight is worth pursuing (Lysaker & Dimaggio, 2014). Another interpretation is that a developmental course for insight is possible and that it might fluctuate over the earlier course of psychosis, especially during treatment contexts, and even more so in the context of substance use (Elowe et al., 2020).

With regard to the second area, the study on clinical and cognitive insight, ***Co-occurring deficits in clinical and cognitive insight in prolonged schizophrenia-spectrum disorders: Relationship to metacognitive deficits*** (Mervis, Bonfils et al., 2021), examined

different measures of insight together to better understand their interplay. Several studies have addressed this in regard to stigma and life satisfaction (Grover, Sahoo, Chakrabarti, et al., 2018), aggression and hostility (Reinharth et al., 2014), as well as treatments (Lopez-Morinigo et al., 2020), finding areas of convergence and divergence. Our work expanded on this by using clinical and cognitive insight to construct profiles that could be then characterized in terms of symptoms and forms of cognition. We used a method of dimension reduction that is distance-based and also robust to outliers, which is appropriate for a smaller sample size.

This approach identified three clusters: one group with poor overall insight, another with good overall insight, and one with mixed insight, where individuals had good cognitive insight but poor clinical insight. While overall psychotic symptoms, social cognition, and neurocognition did not differ between groups, the group with overall poor insight had the worst metacognition than the other groups. This could suggest that poor metacognition is a pathway to poor overall insight, or vice versa, which is consistent with the idea that they are tethered as part of some larger framework (Grant, 2001; Klein & Pinkham, 2020; Lysaker, Hamm, et al., 2018; Marucci et al., 2019; Moritz & Lysaker, 2018). Regardless of directionality, treatments that work to improve either form of insight generally target both insight and metacognition (Birulés et al., 2020b; de Jong, Hasson-Ohayon, et al., 2019; Lopez-Morinigo et al., 2020b; Lysaker, Gagen, et al., 2020; Lysaker & Klion, 2017; Moritz & Lysaker, 2018; Moritz & Woodward, 2007; Simón-Expósito & Felipe-Castaño, 2019), but adding a focus on metacognition might provide additional benefit.

The third area was addressed by the study on PLE, ***Greater psychotic-like experiences accompany cannabis use in people with lower cognitive insight: A latent profile analysis***, which was conducted in a large online sample of adults. Specifically, this study focused on a dimensional conceptualization of psychosis and benefited from the strengths of a translational approach (Krueger & MacDonald, 2005; Strauss, 1969; van Os et al., 2000). Doing so allowed use of a probabilistic method of dimension reduction (Gibson, 1959; Pastor et al., 2007; Spurk et al., 2020) with a sample large enough to achieve adequate power (Tein et al., 2013). We sought to understand if insight might play a role in the relationship between cannabis use and PLE, as this could inform treatment if individuals with use and better insight were found to have lower PLE.

This study found that cannabis use was associated with greater PLE among individuals with greater self-certainty, and thereby lower insight. Further, among those with lower insight and higher PLE, median cannabis use surpassed the threshold for categorical diagnosis of a disorder (Adamson et al., 2010). Within that group, greater cannabis use was also associated with greater PLE facets related to delusional ideation and perceptual abnormalities like hallucinations. These findings suggest that among individuals who have greater self-certainty, as seen in individuals with psychosis (Beck et al., 2004; García-Mieres, Usall, et al., 2020; Riggs et al., 2012), those who use cannabis have elevated PLE. As such, they might benefit from adjunctive substance use interventions. Importantly, another group with greater self-certainty and no cannabis use did not have elevated PLE. These results also suggest that cannabis use is the context in which PLE are exacerbated, rather than poor insight.

5.2 Conclusion

Consistent with our introductory review's spread of positive, paradoxical, and mixed effects for insight, the results of the studies presented here also spanned this range. Our results for insight across all three studies indicated one paradoxical effect, one effect for a form of cognition, and a mixed finding. While the review highlighted positive effects of good IA, the first study found a paradoxical effect for IA, such that those who had poor IA that were overconfident had greater symptom remission midway through treatment for an FEP. Our review also found positive associations between better cognitive and clinical insight with better cognition, with the caveat of some inconsistencies. The second study presented here found that the combination of poorer clinical and cognitive insight accompanied poorer metacognition, whereas better clinical insight accompanied better metacognition regardless of cognitive insight. Finally, our review found positive associations between lower symptoms and better insight, albeit with a mixed picture reflecting that this was true for some symptoms and not others. The third study presented here had mixed results that show poorer insight sometimes accompanies greater symptoms, which is consistent with the findings of our review even though it did not cover general population samples. Overall, all three studies presented here add to the existing evidence for positive, paradoxical, and mixed findings for the relationships between insight and other constructs of clinical interest.

Study one expanded upon conclusions drawn from the introductory review with regard to changes in insight over time during treatment. Results showed that improvements in insight were paradoxically related to increases in symptoms in the first six months of

treatment. While this study was not testing the effectiveness of the NAVIGATE treatment, its beneficial impact on symptoms in FEP is well-documented (Kane et al., 2016). There is only one therapy specifically targeting insight that was trialed in FEP, Metacognitive Reflection and Insight Therapy (MERIT) (Lysaker, Gagen, et al., 2020; Lysaker & Klion, 2017). This trial found an opposite pattern, where improvements in insight were related to decreases in symptoms in the first six months of treatment (Vohs et al., 2018). Although the sample in study one was three times its size, both studies used weekly therapy alongside medication and case management. Study one also followed individuals for twelve months, which provided an opportunity to observe that the paradoxical improvement in insight vanished as symptoms improved. Studying the durability of insight improvements in FEP following six months of MERIT could inform treatment approaches. If insight and symptom improvements are maintained after twelve months of MERIT treatment, using it to target insight could be clinically useful. If not, interventions targeting insight could be considered alongside other treatments based on availability and individual preference.

Studies two and three expanded upon conclusions drawn from the introductory review with regard to deficits in insight as more than correlates of illness severity. In study two, there were no significant between-group differences in overall psychotic symptoms, despite three different patterns of clinical and cognitive insight. However, differences in metacognition were present and could represent a downstream effect of more subtle differences in neurocognition or social cognition. It is also possible that poor insight might indicate the persistence of symptoms, rather than their absolute severity, as more recently shown with negative symptoms (Raucher-Chéné et al., 2021). In study three, PLE only

accompanied lower insight in the context of cannabis use. Past work in early psychosis suggests that the relationship between lower insight and greater severity of specific symptoms like depression increases in people with FEP and cannabis use (Elowe et al., 2020). Our work also suggests that the addition of cannabis could potentiate an increase in PLE in the general population. This effect could be driven by or amplified through more general risk for psychosis. These studies suggest that interventions should not only target insight when individuals have the most severe psychosis symptom presentation, but also look to the time course or substance use as indicators.

5.3 Conceptual Considerations

A major area of future research that was not addressed is conceptual issues distinguishing the types of insight that are used in these studies from each other. This is part of a larger narrative of what insight really is and how we can best measure and understand it. Most clinical insight instruments have well-fitting single- and multi-factor structures and the construct is well-captured by single item measures (Lincoln et al., 2007). For instance, the co-occurrence of uni- and multi-dimensionality is reflected in Amador and Gorman's (Amador & Gorman, 1998) identification of four basic questions: 1) Is anything wrong? 2) What is wrong? 3) Should we do anything about it? 4) Does it cause problems? Beck and colleagues (Beck et al., 2004) designed the subdomains of cognitive insight as multifaceted, unlike clinical insight. This division raises the question of how these subdomains are distinct from one another. One possibility is that self-reflectivity pertains to a sense of oneself and self-certainty an ability to see the unique and valid perspectives of others. Introspection is a process-oriented action, with accuracy describing

related self-assessments. Within IA, the challenges are both ontological and interpretive, as evidenced by the introductory review: 1) the studies suggest that those who are mildly overconfident, or underestimating are similar to those who are accurate, 2) using absolute magnitudes is agnostic to direction, and 3) using non-absolute magnitudes places the desirable state in the middle of a paradoxical simplex.

Although there are measurement challenges in every instance, in a clinical sense these forms of insight reflect metacognitive processes as much as a clinical status. Ultimately, the studies presented here, along with the broader canon of insight research, serve to advance our understanding of the human experience. In the recovery-oriented treatment of mental illness, this is in service of alleviating human suffering. The clinical utility of insight is then the identification and pursuit of a fulfilling, valued life. Insight therefore is at the core of this simple goal but can also be much more plainly stated: know thyself.

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APPENDIX: STUDYING CONSPIRACIST BELIEFS AND MOTIVATION TO FOLLOW CORONAVIRUS (COVID-19) PRECAUTIONS WITHOUT MEASURING BEHAVIOR: LESSONS LEARNED

Abstract

Conspiracy theories related to the coronavirus (COVID-19) pandemic are manifold and their influence on engagement in precautions related to the virus is increasingly studied. Past research has shown that belief in conspiracy theories is detrimental to engagement with healthcare guidelines related to disease prevention or mitigation. One possible mechanism for this is motivation, which represents a possible target for intervention. It is possible that the development of motivation in this area requires appropriate levels of insight into the situation, both in terms of reflect on the available information and resulting certainty with which a person could act. We examined patterns of covariance between conspiracist beliefs and autonomous motivation to engage in pandemic related health behaviors, and then sought to characterize the resulting groups in terms of cognitive insight. In line with other research, we also tested group differences in delusional ideations, as well as age. Results revealed three groups, one with higher conspiracist beliefs and higher autonomous motivation, one with higher conspiracist beliefs and lower autonomous motivation, and another with lower conspiracist beliefs and higher autonomous motivation. Groups showed minimal differences beyond these variables, with exception to the group with higher conspiracist beliefs and higher autonomous motivation. That group showed the highest self-certainty, self-reflectivity, delusional ideation, and youngest age. However, without information as to their behaviors related to pandemic precautions, it is difficult to draw inference about how this group differs from the other two. Implications for future research and next steps in this program of research are discussed.

6.1. Introduction

Many studies show that conspiracy theories decrease public trust in science and reduce the likelihood of adherence to public health behaviors, creating barriers to mitigating challenges in global health like the COVID-19 pandemic (Allington et al., 2020; Douglas et al., 2015; Freeman et al., 2020; Imhoff & Lamberty, 2020; Jolley & Douglas, 2014; Jovančević & Milićević, 2020; Latkin et al., 2021; Lazarus et al., 2021; Roberts et al., 2005; Romer & Jamieson, 2020; Teovanovic et al., 2020; Uscinski et al., 2020). In public health contexts, meta-analysis (Ng et al., 2012) supports the use of Self-Determination Theory (SDT) (Deci & Ryan, 2000, 2008; Ryan & Deci, 2000b, 2000a), which could inform future interventions (Bavel et al., 2020; Rubinelli & Diviani, 2020) through its emphasis on relative autonomy as a continuum. This continuum adjusts approach motivation for avoidance, and several studies by Sheldon and colleagues underscore the unbiased and efficient nature of measuring relative autonomous motivation (hereafter referred to as "motivation"), which is a strong predictor of health behaviors in relation to oneself and others (Sheldon et al., 2017).

Boosting motivation to follow coronavirus guidelines such as social distancing, hand-washing, and wearing face masks is effective when highlighting the severity of COVID-19 and utility of health behaviors targeting self-efficacy (Kaspar, 2020; Kowalski & Black, 2021). This encourages individuals to reflect on their assumptions about the disease. Beck and colleagues (Beck et al., 2004) described two aspects of this reflective process that they term cognitive insight. These aspects reflect the general degree to which one's evaluations are generally fallible (self-reflectivity) or certain (self-certainty). The two are not mutually

exclusive and are usually studied together in the general population (Van Camp et al., 2017).

To date there are no studies examining the relationship between conspiracy theories and cognitive insight, but several have looked at delusions or delusion proneness in relation to cognitive insight. While delusions tend to be more self-referential than conspiracy theories (Brotherton, 2015), a substantial body of research suggests individuals with delusion proneness are more likely to hold conspiracist beliefs (Barron et al., 2014; Bruder et al., 2013; Dagnall et al., 2015; Darwin et al., 2011; Georgiou et al., 2019; Grzesiak-Feldman & Ejsmont, 2008; Hart & Graether, 2018; Warman & Martin, 2006) and are both more self-reflective and self-certain than those who are not prone to delusions (Warman & Martin, 2006). Therefore, belief in conspiracy theories, while perhaps conceptually related to delusions but referentially distinct, represent a novel area for studying cognitive insight.

Taken together, belief in conspiracy theories impacts motivation for health behaviors, but understanding their co-occurrence in the context of cognitive insight might allow intervention related to health behaviors through the promotion of self-reflectivity. Considering this, the current study proposed the following three descriptive hypotheses focused on beliefs and motivation, without measuring health behaviors outcomes. First, profiling groups of individuals would produce three or more groups with covariance of belief in conspiracy theories and motivation for health behaviors related to COVID-19, rather than two groups that are broadly lower in conspiracy theories belief and higher in motivation, and the opposite pattern. Second, profiles would emerge with individuals stronger in belief in conspiracy theories that are higher and lower on motivation to follow COVID-19 health behaviors and these groups would differ in cognitive insight and its

subdomains. Specifically, the former groups would be higher than the latter in cognitive insight and self-reflectivity, and lower in self-certainty. Finally, based on past literature with conspiracy theories we proposed that profiles higher in conspiracy theories have greater delusional ideations, a kind of psychotic-like experience present in the general population.

6.2 Methods

6.2.1 Sampling Procedure

This study was approved by the local institutional review board. 1,396 Participants were recruited via Amazon Mechanical Turk ("MTurk") in January of 2021 and completed informed consent procedures online. Participants were required to answer all questions and 1,301 completed > 90% of the survey.

6.2.2 Assessment Procedures.

The **Beck Cognitive Insight Scale (BCIS)** was developed to evaluate people's self-reflectiveness and their overconfidence in their interpretations of their experiences (Beck et al., 2004). The instrument uses a 4-point Likert scale, with subscales for self-reflectiveness (9 items; alpha = .66) and self-certainty (6 items; alpha = .65). A composite index for the BCIS is created through subtracting the score for self-certainty from self-reflectiveness, with a minimum score of zero.

The **Generic Conspiracist Beliefs Scale (GCBS)** assessed beliefs about concealed efforts of individuals or governments that cover topics such as viruses, aliens, technologies,

and medicines (Brotherton et al., 2013). This instrument uses a 5-point Likert scale (15 items; alpha = .94) and is the most commonly used assessment of conspiracist beliefs that are not specific to single events (Goreis & Voracek, 2019).

The **Treatment Self-Regulation Questionnaire (TSRQ)** assessed motivation to follow COVID-19 health guidelines. This version of the TSRQ is adapted from prior work on motivation to begin health behaviors in psychosis (Mervis et al., 2017). Consistent with Self Determination Theory (Ryan & Deci, 2000b), someone following guidelines to improve self-worth is exhibiting "autonomous" motivation, whereas someone doing this under pressure from healthcare providers shows "controlled" motivation. The autonomous (6 items; alpha = .87) and controlled motivation (12 items; alpha = .89) subscales are formed from the average of each's items, and the latter is subtracted from the former to produce the Relative Autonomy Index.

Community Assessment of Psychic Experience (CAPE) is a measure of psychotic-like experiences used in general population samples and produces stable, reliable, and valid scores, including discriminant validity for subdomains and facets of subdomains (Konings et al., 2006; Mark & Toulopoulou, 2016; Stefanis et al., 2002; van Os & Delespaul, 2003). One such facet measures delusional ideation (9 items; alpha = .80).

6.2.3 Analysis

We used contemporary methods to ensure only high-quality participant responses were analyzed (Curran, 2016; Yentes & Wilhelm, 2021). In line with recent guidelines on detailed reporting (Mellis & Bickel, 2020; Strickland & Stoops, 2019), we describe these

methods in depth. Specifically, we used response time cutoffs of 2-seconds per item (Huang et al., 2012). Next, we evaluated 1,301 responses for invariability within scales due to flatlining (Costa Jr & McCrae, 2008; Huang et al., 2012; Johnson, 2005), variable/unvaried responding (Marjanovic et al., 2015; Marjanovic & Holden, 2019), effortful responding (Marjanovic et al., 2014), and selection of infrequently endorsed items (Chapman & Chapman, 1983). Beyond response time, participants were excluded for scoring above the 95th percentile for flatlining or infrequently endorsed items, below the 5th percentile for variable/invariable responding, or failing more than one effort check.

All analysis was conducted in RStudio (RStudio Team, 2020) with the *tidyLPA* (Rosenberg et al., 2019), *rstatix* (Kassambara, 2020), and *rosetta* (Gjalt-Jorn, 2021) packages. Latent profile analysis is used in behavioral research with continuous data to and determine individual's likelihood of membership in a specified amount of profiles (Gibson, 1959; Pastor et al., 2007; Spurk et al., 2020). Samples of 1,000 observations have power to detect four profiles (Tein et al., 2013). To select the best model, we used Akogul and Erisoglu's (2017) (Akogul & Erisoglu, 2017) hierarchical approach with Akaike's Information Criterion (AIC) (Akaike, 1998), Approximate Weight of Evidence (AWE) (Banfield & Raftery, 1993), Bayesian Information Criterion (BIC) (Schwarz, 1978), Classification Likelihood Criterion (CLC) (Biernacki & Govaert, 1997), and Kullback Information Criterion (KIC) (Cavanaugh, 1999). Welch's analysis of variance (W-test) (Welch, 1951) compared the means of all profiles per hypotheses, and does not assume homogeneity of variance across profiles, which there was no a priori reason to assume. Simulation studies show W-tests are not prone to the severe bias introduced to the ubiquitous parametric F-test when groups have heterogeneous variance (Delacre et al.,

2019). The Games-Howell test (Games & Howell, 1976) is a two-group comparison that uses Welch's method for degrees of freedom and is also robust to heterogeneity of variance, and provides a consistent false-positive rate when sample sizes are different (Games et al., 1983). All p-values in the present study had false discovery rate adjustments (Benjamini & Hochberg, 1995), which balance penalization for multiple comparisons against the potential for false-negatives.

6.3 Results

After filtering, 366 participants were removed from the analysis, with 935 remaining, meaning approximately 28% of the sample was excluded based on validity measures. Mahalanobis Distance (Mahalanobis, 1936) identified and removed 14 participants for multivariate outliers, yielding 921 participants whose characteristics appear in Table 1.

Profile models were compared on the fit indices noted above. A three-profile solution fit better than other solutions, inconsistent with the hypothesized four-profile solution. Scatterplots of the indicator variables by unnamed profiles appear in Figure 1. Profiles were subsequently named higher motivation and higher belief in conspiracy theories (HAM-HC; n = 417), higher motivation and lower belief in conspiracy theories (HAM-LC; n = 80), and lower motivation and higher belief in conspiracy theories (LAM-HC; n = 424).

With regard to confirming that profiles showed appreciable between group differences on the indicator variables, there was a large significant main effect for

motivation (F(2, 261.01) = 546.83, p < .001, ω^2 = .38, 95% CI [0.33-0.42]). Individuals with LAM-HC (M = 5.4, SD = 1) had lower motivation than those with HAM-HC (M = 9.7, SD = 1.5) and HAM-LC (M = 9.6, SD = 1.6). Belief in conspiracy theories showed a large main effect (F(2, 214.27) = 1213.4, p < .001, ω^2 = .72, 95% CI [0.69-0.74]). Those who had the HAM-LC (M = 28, SD = 6.9) had lower belief in conspiracy theories than others with HAM-HC (M = 52, SD = 7.4) and LAM-HC (M = 51, SD = 8.4).

Regarding the hypotheses for group differences related to insight, there was no effect for cognitive insight (F(2, 222.82) = 0.59, p = .555). There was a small significant main effect for self-reflectivity (F(2, 228.22) = 7.53, p = .001, ω^2 = .01, 95% CI [> 0-0.03]), such that those with HAM-LC (M = 12, SD = 3.8) and LAM-HC (M = 12, SD = 3.5) reported lower self-reflectivity than those with HAM-HC (M = 12, SD = 3.9). There was a small significant main effect for self-certainty (F(2, 224.44) = 15.73, p < .001, ω^2 = .03, 95% CI [0.01-0.06]). Individuals who were with HAM-HC (M = 8.3, SD = 2.9) had higher self-certainty than those with LAM-HC (M = 7.2, SD = 2.9) and HAM-LC (M = 7.2, SD = 3).

Turning to variables with previously documented relationships to conspiracy theories in the literature, age showed a small significant main effect (F(2, 233.09) = 13.14, p < .001, ω^2 = .03, 95% CI [0.01-0.05]). There was a difference between those with HAM-HC (M = 38, SD = 12) and HAM-LC (M = 42, SD = 12), such that the latter was older. However, the group with LAM-HC (M = 40, SD = 13) did not show differences from other groups, likely reflecting a power issue as they are the smallest group. There was a large significant main effect for delusional ideation (F(2, 218.05) = 107.38, p < .001, ω^2 = .19, 95% CI [0.15-0.24]). Those with HAM-HC (M = 1.9, SD = .49) had the most delusional

ideation, followed by those with LAM-HC (M = 1.6, .39), and then those with HAM-LC (M = 1.5, SD = .31).

6.4 Discussion

This study had two main aims. The first aim was to understand the relationship between belief in conspiracy theories in general and motivation for health behaviors related to COVID-19, using dimension reduction as a heuristic to describe probabilistically derived subgroups. A second aim was to look within these groups for differences in cognitive insight and its subdomains of self-reflectivity and self-certainty that might suggest a mechanism for intervention to promote motivation for health behaviors. These aims were explored through three hypotheses. The first hypothesis was that profiling of individuals would produce at least three groups with variable levels of belief in conspiracy theories and motivation for COVID-19 health behaviors, beyond a dichotomous split reflecting the highest and lowest values on both measures. Our analysis was powered to detect up to four groups and we found that a three-group solution fit the best. Large effects for group differences on belief in conspiracy theories and motivation for COVID-19 health behaviors underscore that motivation is a measure of motivation and not behavior, as someone could have high belief in conspiracy theories, high motivation, and low actual adherence to health behaviors in day-to-day life. This is a major limitation of this work that limits interpretability related to one of our main study aims, highlights a flaw in the design in the present study, and indicates that this study must be modified and run again. As such, we tentatively discuss what relationships with motivation might mean without drawing strong inferences.

The second hypothesis of this study was that emerging profiles would meaningfully differ in cognitive insight and its subdomains of self-reflectivity and self-certainty. While there were small effects for greater self-reflectivity in the HAM-HC group, there was also a small effect for greater self-certainty. There were no group differences with cognitive insight. This suggests that individuals with greater belief in conspiracy theories and higher motivation might consider the pandemic guidelines and have high certainty that whatever choices they make are correct. As such, higher motivation could reflect aversion to external control that does not translate to adherence to beneficial health behaviors. Another possibility is that belief in conspiracy theories is present in some individuals, but an aversion to risk motivates them to engagement in health behaviors, consistent with prospect theory (Kahneman & Tversky, 1979).

Third, we proposed that replication of prior findings that individuals with greater belief in conspiracy theories would be younger and have more delusional ideations. Individuals who were HAM-HC were younger than those with HAM-LC. More than other age groups, younger people believe health-related conspiracy theories (Galliford & Furnham, 2017; Hogg et al., 2017; Olansky et al., 2020). Younger people are also less likely to engage in health behaviors related to COVID-19 (Latkin et al., 2021). Belief in conspiracy theories could stem from individual differences in risk assessment (Friedman, 2020), which develops in childhood and increases over time (Fisher, 1998; Miller et al., 1970). This ability requires self-reflection (Olson & Astington, 1993) and thereby insight into inconsistencies in ones thinking (Markman, 1979; Seifert et al., 1995).

Regarding delusional ideation, the group with HAM-HC had the highest scores. This split between the two higher beliefs in conspiracy theories groups echoes the findings for self-

reflectivity and self-certainty, suggesting that greater motivation could be driven by this mixed pattern of insight as well as incidence of delusions. For example, delusions are associated with greater self-reflectivity and self-certainty in the general population (Warman & Martin, 2006), and since delusions are associated with belief in conspiracy theories (Barron et al., 2014; Bruder et al., 2013; Dagnall et al., 2015; Darwin et al., 2011; Georgiou et al., 2019; Grzesiak-Feldman & Ejsmont, 2008; Hart & Graether, 2018), this result is indirectly consistent with existing literature.

While we did address our second study aim through partially replicating past findings on the relationships for age and delusions with belief in conspiracy theories, we did not have the interpretive context that the first aim could provide. We now conclude the present article by highlighting what we will address in the next iteration of this study. Specifically, we plan to ask participants if they are currently, have ever, or will in the future take certain health precautions. We will individually cover wearing of masks, social distancing, quarantining, using hand sanitizer, getting vaccinated, or any other precautions not specified. Additionally, we will ask about a broad change in behavior in relation to the pandemic, using a likert scale. These questions provide appropriate breadth and depth for construct validity (Cronbach & Meehl, 1955). As previously noted, the measurement of motivation on its own without also assessing behavior limits interpretation of why an individual would engage in health behaviors and does not extend to what they do in the real world.

Table 6.1

Demographic Information

	Overall **N=921**
Age	
Mean	39.9
SD	12.9
Gender Identity	
Female	503 (54.6%)
Male	400 (43.4%)
Other	18 (2%)
Sexual Orientation	
Asexual	12 (1.3%)
Bisexual	74 (8.0%)
Gay or Lesbian	27 (2.9%)
Pansexual	13 (1.4%)
Queer	5 (0.5%)
Straight or heterosexual	790 (85.8%)
Race	
Another Group	9 (1.0%)
Asian	74 (8.0%)
Black	76 (8.3%)
Indigenous	5 (0.5%)
Latin American	40 (4.3%)
Middle Eastern	4 (0.4%)
White	713 (77.4%)
Hispanic/Latinx	
No	852 (92.5%)
Yes	69 (7.5%)

Figure 6.1

Correlations Between Indicator Variables Among Unnamed Latent Profiles