INSIGHT AND EXECUTIVE FUNCTION: INVESTIGATING THE ROLE OF DYNAMIC ASSESSMENT

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By

MEGHAN E. MURPHY

B.A., Hendrix College, 2005

M.A., University of Missouri-Kansas City, 2009

Kansas City, Missouri
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INSIGHT AND EXECUTIVE FUNCTION: INVESTIGATING THE ROLE OF DYNAMIC ASSESSMENT

Meghan E. Murphy, Candidate for the Doctor of Philosophy Degree

University of Missouri-Kansas City, 2013

ABSTRACT

The aim of this dissertation was to investigate the relationship among clinical insight, cognitive insight, and executive functioning (EF), as measured by both a dynamic and standard format. Thirty-six participants with schizophrenia/schizoaffective disorder completed assessments of cognitive insight, clinical insight, and EF. The EF measure of the Wisconsin Card Sorting Test was completed in both a standard and dynamic format. Results indicated small effect size correlations between clinical insight and standard EF assessments, but the directions of these correlations were contrary to much of the previous research. Additional small to moderate correlations were found between cognitive insight and a dynamic EF measure. Other findings suggested that persons with better clinical insight reported greater cognitive difficulties. Findings suggest several implications: EF is likely related to insight, lack of insight is not homogenous in this population, the constructs measured by standard assessments are not equivalent to the constructs of dynamic assessments, and clinical and cognitive insight are related, yet independent constructs. Future research directions are discussed.

Approval Page

The faculty listed below, appointed by the Dean of the College of Arts and Sciences have examined a dissertation titled “Insight and Executive Function: Investigating the Role of Dynamic Assessment” presented by Meghan E. Murphy, candidate for the Doctor of Philosophy degree, and certify that in their opinion it is worthy of acceptance.

Supervisory Committee

Melisa V. Rempfer, Ph.D., Committee Chair
UMKC - Department of Psychology

Diane Filion, Ph.D.
UMKC - Department of Psychology

Jennifer Lundgren, Ph.D.
UMKC - Department of Psychology

Joan McDowd, Ph.D.
UMKC - Department of Psychology

Tamera Murdock, Ph.D.
UMKC - Department of Psychology

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DEDICATION

This dissertation is dedicated to my family. Without their support, none of this would have been possible. I also dedicate this work to the participants of this study and all persons living with serious mental illnesses. Thank you for showing me true courage, strength, tenacity, and hope.

CHAPTER 1

OVERVIEW

A common symptom of schizophrenia is a lack of insight into one's symptoms, need for treatment, and consequences of the disorder (Amador, Strauss, Yale, & Gorman, 1991; Amador et al., 1994; David, 1990). Although first conceptualized as uni-dimensional, insight is currently viewed as a multidimensional construct that is related to numerous clinical outcomes, such as medication noncompliance (Amador et al., 1993; Buchanan, 1992; Smith et al., 1999), impaired global functioning (Pyne, Bean, & Sullivan, 2001), poorer work performance (Erickson, Nematollah, & Lysaker, 2011), and poorer prognosis and treatment outcomes (Schwartz, Cohen, & Grubaugh, 1997).

Several theoretical models of insight have garnered support, including theories suggesting lack of insight is related to symptoms, theory of mind, and neuropsychological difficulties (Osatuke, Ciesla, Kasckow, Zisook, & Mohamed, 2008). Currently, there is considerable interest in the idea that insight difficulties are associated with the neurocognitive difficulties that are found in the majority of persons with schizophrenia (Brazo et al., 2002; Fioravanti, Carlone, Vitale, Cinti, & Clare, 2005; Heinrichs & Zakzanis, 1998). In particular, researchers have focused on investigating the relationship between insight and difficulties with executive function (EF; Aleman, Agrawal, Morgan, & David, 2006; Drake & Lewis, 2003; Lysaker, Bell, Bryson, & Kaplan, 1998). Although this theory has received considerable support, some of the findings continue to be mixed (Cooke, Peters, Kuipers, & Kumari, 2005; Osatuke et al., 2008). One proposed reason for this is that current EF measures (e.g., the WCST) are too simplistic (Koren et al. 2004) to assess a multi-faceted construct like EF. Thus, it is proposed by the current author that more ecologically valid

measures of EF, or measures that better approximate and predict a person's ability to function in a real-world environment, could improve the strength of insight predictions.

Proposed constructs that may influence the EF and insight relationship include learning potential, or a person's capacity for learning (Green, Kern, Braff, & Mintz, 2000; Pruß, Wiedl, & Waldorf, 2012), and metacognition (Koren et al., 2004). One research group explored the relationship between insight and a metacognitive EF task and found it predicted a significantly greater variance in insight than did the standard neuropsychological measures (Koren et al., 2004), but there are no published studies investigating the role of learning potential, executive functioning, and insight.

One strategy for assessing a person's "learning potential" is dynamic assessment (e.g., Wiedl, 1999). Dynamic assessments are modified versions of traditional neuropsychological assessments that include learning trials in which the participant is given feedback and assistance to better their performance on the measures (Wiedl). Much like the "real world," it is up to the participant how they utilize the feedback on subsequent trials of the neuropsychological measure. Among other things, dynamic assessments have been advanced as a method for better capturing the cognitive demands relevant to real world functional outcomes (e.g., Green et al., 2000; Hake, Hamera, & Rempfer, 2007) and perhaps the self-monitoring involved in establishing accurate insight. Thus, dynamic assessment may be a more sensitive method of capturing the relationship between EF and insight.

Another advancement in insight literature has been the recent interest in investigating another dimension of insight, insight into cognitive difficulties. A recent cognitive insight measure assesses cognitive insight by grounding the questionnaire in everyday tasks and scenarios with which people may struggle (Stip, Caron, Renaud, Pampoulova, & Lecomte,

2003). Several studies have found significant correlations among these measures and objective neuropsychology measures (Donohue et al., 2009; Hake et al., 2007; Stip et al.), but the relationship between clinical insight and cognitive insight remains unclear (Donohue et al., 2009; Lecardeur et al., 2009; Medalia & Thysen, 2010).

One commonality between these three constructs of clinical insight, cognitive insight, and EF, is the critical role they may have in prognosis, recovery, and responsiveness to treatments (Aleman et al., 2006; Breier, Schreiber, Dyer, & Pickar, 1991; Green, 1996; Green, Kern, & Heaton, 2004; Medalia & Thysen, 2010; Wiedl, 1999). Thus, it is important that researchers investigate the relationships among these variables to better determine both how they influence each other and how they can be influenced by rehabilitation therapies. Therefore, the purpose of this dissertation is to explore the relationship among EF as measured by a dynamic assessment and clinical insight, with the prediction that dynamic assessments of EF will be better predictors of insight than the standard EF assessments. In addition, the relationship among dynamic assessment, clinical insight, and cognitive insight in persons with schizophrenia will also be explored.

CHAPTER 2

LITERATURE REVIEW

Schizophrenia and Insight

Schizophrenia has been described as a psychotic disorder associated with a constellation of symptoms. A common symptom is a lack of insight into one's symptoms, need for treatment, and consequences of the disorder (Amador et al., 1991; Amador et al., 1994; David, 1990). When first introduced in the literature, insight was conceptualized as a one-dimensional construct, with persons being either aware or unaware of their mental health diagnosis (Lewis, 1934). The last two decades have marked a dramatic increase in research on insight in persons with schizophrenia (Osatuke et al., 2008), and what was once understood as a one-dimensional construct has since expanded to a multidimensional construct. Although there are varying ideas on the facets of insight, one meta-analysis defined it as having five factors: awareness of having a mental disorder, awareness of the social consequences of having this disorder, awareness of the need for treatment, and awareness of and attribution of symptoms of the disorder (Mintz, Dobson, & Romney, 2003).

As the conceptualization of insight developed, research steadily increased on the construct. A recent review of insight research reported the range of persons with schizophrenia with poor insight to be 11% to 89% of the samples (Cooke et al., 2005). This large variability could be due to the various scales used and the threshold points chosen in these studies. In an overview on insight, Amador (2006), a key insight researcher, suggests the more reliable estimate is that approximately half of all persons with schizophrenia exhibit lack of insight into their disorder. In one of his studies including more than 200 persons with schizophrenia, Amador et al. (1994) found over 30% of their sample of persons with

schizophrenia were unaware, while approximately 25% were moderately unaware of their disorder. Although the occurrence of poor insight varies in research, the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision (*DSM*-IV-TR) states "A majority of individuals with schizophrenia lack insight regarding the fact that they have a psychotic illness" (pg. 304).

Clinical Significance of Insight

Insight has become a variable of interest due to both its common occurrence and its relationship with other key outcomes. According to Amador (2006) insight "has a major impact on the course of the illness, and causes both partial and complete noncompliance." Intuitively, this makes sense: as a person who does not believe they have a mental illness will likely not be willing to seek and comply with treatment for this disputed mental illness (Lincoln, Lüllmann, & Rief, 2007). Research has also supported more specific correlates of lack of insight; including medication noncompliance (Amador et al., 1993; Bartkó, Herceg, & Zádor, 1988; Buchanan, 1992; David, Buchanan, Reed, & Almeida, 1992; Fenton, Blyler, & Heinssen, 1997; Smith et al., 1999), impaired global functioning (Pyne et al., 2001), poorer prognosis and treatment outcomes (Schwartz et al., 1997), greater involuntary hospitalizations (David et al., 1992), difficulties with vocational performance (Lysaker & Bell, 1994; Lysaker & Bell, 1995; Lysaker, Bryson, & Bell, 2002), difficulties with social functioning (Dickerson, Boronow, Ringel, & Parente, 1997; Lysaker et al., 1998; Smith et al., 1999), and more severe psychopathology (Mintz et al., 2003; Wiffen, Rabinowitz, Lex, & David, 2010).

Although intact insight is associated with more positive treatment outcomes, better prognosis, and stronger social skills, it has also been associated with less favorable outcomes,

including increased suicide attempts (Karow et al., 2008), increased suicidality (Barrett et al., 2010), increased depressive symptoms (Kruck et al., 2009; Lincoln et al., 2007; Mintz et al., 2003; Mohamed et al., 2009; Wiffen et al., 2010) decreased hope (Hasson-Ohayon, Kravetz, Meir, & Rozencwaig, 2009), and lower quality of life (e.g., Hasson-Ohayon et al., 2009; Karow et al., 2008; Valiente, Provencio, Espinosa, Chaves, & Fuentenebro, 2011; Wiffen et al.). In a study including nearly 1,500 people with schizophrenia, improvements in insight were associated with several outcomes: decreased symptoms, improved community functioning, improved quality of life, increased medication compliance, and increased levels of depression (Mohamed et al., 2009). In short, insight, whether intact or impaired, clearly has clinical significance for both a person with schizophrenia and his/her treatment team. In addition, improvements in insight are associated with generally positive outcomes, making it a target for treatment interventions (Turkington, Kingdon, & Turner, 2002; Rathod, Kingdon, Smith, & Turkington, 2005). Therefore, it has been an important variable of interest over the last few decades of schizophrenia research.

Theoretical Models of Insight

Although researchers seem to agree on the overall clinical significance of insight, there are continued disputes concerning its etiology. With the evolution of insight research, etiological theories have also evolved. In early research, some scientists proposed lack of insight as a means of avoiding the noxious side effects of antipsychotic medications or of avoiding taking medications altogether, with some individuals with schizophrenia preferring psychosis over “drug-induced normalcy” (p. 1443, Van Putten, Crumpton, & Yale, 1976; Lysaker & Bell, 1994). Another early theory was that lack of insight was a coping strategy that assists persons to feel more “normal” as they resume their life post-diagnosis

(McGlashan, Levy, & Carpenter, 1975). Over time, these theories were largely abandoned, as newer models on insight grew out of empirical research.

Currently, there are various theoretical models on insight in persons with schizophrenia. In a recent review by Osatuke and colleagues (2008), the authors covered nine theories on insight. The nine theories included the conceptualization of lack of insight as a positive symptom, negative symptom, disorganized symptom, neurological or neuropsychological difficulty, difficulty with theory of mind or metacognition, a neuroanatomical deficit, a psychological defense to aid in coping with the diagnosis, a combination of several of the theories, or a simple difference in perspective from clinicians due to social, cultural, or interpersonal factors. Although numerous theoretical models have been proposed to explain insight, a select few have received the majority of empirical attention and support. From the current author's perspective, the theoretical models of insight as a symptom, a theory of mind deficit, and a neuropsychological deficit stand out as both the most prominent and the most researched in the field and as reviewed below.

Lack of Insight as a Symptom of Schizophrenia. One of the earliest theories of insight to gain support was the idea that it is a positive symptom. Specifically, it has been described as a "delusion of health," such that contrary to the overwhelming evidence that an individual is having abnormal experiences that interfere with his or her daily life, the person maintains a delusion that they are healthy and thus denies the presence of a mental illness (Van Putten et al., 1976). In reviewing this theory, Osatuke et al. (2008) provide only one study that explicitly supports this theory. In this study, Collins, Remington, Coulter, and Birkett (1997) found a significant relationship between positive symptoms and insight, in the absence of a similar relationship between insight and negative symptoms and

neuropsychological assessments. A recent meta-analysis by Mintz et al. (2003) found a significant effect size of -.25 when 22 studies investigating positive symptoms and insight were combined, meaning that as positive symptoms increased, insight decreased. However, this meta-analysis suggests that positive symptoms account for a mere 6.3% of the variance in insight. Thus, the authors concluded that although this represents a statistically significant amount of variance, it is not likely that it represents a clinically significant amount of the variance in insight. In their review, Osatuke et al. (2008) conclude that there is neither enough evidence to support nor refute the theory of lack of insight as a delusion/positive symptom.

Similarly, others have conceptualized lack of insight as a negative symptom of schizophrenia. Negative symptoms are viewed as symptoms that demonstrate a lack of adaptive abilities, such as affective flattening or lack of interest and motivation. Some theorists suggest that lack of insight is merely a "mental withdrawal" (Osatuke et al., 2008) from trying to understand one's own experience and illness. As with the positive symptoms, the meta-analysis by Mintz et al. (2003) found that with 20 studies, the combined effect size for negative symptoms was significant (-0.23); as negative symptoms increased, overall insight decreased. Much like with positive symptoms, this explains 5.2% of the variance in insight, but is not likely to hold practical significance.

The third symptomatology theory purports lack of insight as a part of the disorganized symptom cluster. Disorganized symptoms consist of disordered thinking, speech and behaviors, confusion, disorientation, and memory problems. In this theory, researchers argue that accurate insight requires a complex assessment of the self and others. It also involves cross-temporal comparisons of current and past functioning and comparisons

of self-functioning to that of others. In short, this process requires a complex process of abstract thought, which is often described as a deficit in persons with schizophrenia (Corrigan & Green, 1993; *DSM-IV*, 1994; Silver et al., 2007). Thus, theorists suggest the cognitive disorganization associated with schizophrenia inhibits a person from gaining full insight into their disorder. However, the existing evidence (Dickerson et al., 1997; McCabe, Quayle, Beirne, & Anne Duane, 2002; Monteiro, Silva, & Louzã, 2008) is not substantial enough to support this hypothesis (Osatuke et al., 2008).

In research on the symptom model, McCabe et al. (2002) found symptoms accounted for nearly a quarter of the variance in insight. The symptom related dimensions of delusions, apathy, and bizarre behavior accounted for a significant amount of the variance explained in insight. Similarly, other researchers (Amador et al., 1994; Dickerson et al., 1997) found that delusions, difficulties with abstract thinking, disorganized thoughts, and disorganized behaviors were significantly correlated with insight, but both failed to find significant correlations between insight and negative symptoms. Much like Dickerson et al. (1997) and Amador et al. (1994), McCabe and colleagues found that although the negative symptoms of avolition were a significant predictor of insight, its contribution was relatively weak; thus, they concluded “negative symptoms are not consistently related to insight” (McCabe et al., p. 523). Further evidence against the symptomatology model of insight was reported in a longitudinal study by Smith, Hull, and Santos (1998), in which the authors found no consistent correlations among insight and positive or negative symptoms; the disorganized symptom cluster demonstrated only moderate correlations to insight. Similarly, another longitudinal study by Cuesta, Peralta, and Zarzuela (2000) found insight to be relatively independent from symptoms. Thus, the evidence suggests that at times, such as during acute

psychosis, symptoms and insight may be related, but in general, this relationship does not appear to be a clinically significant predictor of insight.

Criticism of the Symptom Theory of Insight. In addition to these symptom models lacking sufficient support, the current author contends that previous researchers' definitions of disorganized symptoms distinctly overlap with other researchers' definitions of neuropsychological symptoms, such that investigators may be measuring the same or similar constructs. For example, many operationally define disorganized symptoms as including difficulties with abstract thought, and several neuropsychological assessments measure one's abstract thinking abilities. Therefore, it is suggested that the disorganization theory may be partially supported, but mostly due to its close relation to the neuropsychological theory of insight, which will be covered in subsequent sections.

Monteiro and colleagues also supported this notion in their 2008 publication. Initially, regression analyses revealed symptoms as more significant predictors of insight than neuropsychological difficulties. However, once each symptom construct was investigated independently, the disorganized symptom factor was the only one that remained significant. The authors suggested that this factor is closely related to cognition, and subsequently, insight may be related to cognition. Although they did not observe any significant relationships between overall cognition and insight, there were several significant correlations between constructs of insight and EF, as measured by the Wisconsin Card Sorting Test (WCST).

Mintz et al. (2003) suggest that one possible reason for the lack of support for these symptomatology theories of insight is that the relationship among symptoms and insight may be curvilinear as opposed to linear. The authors propose that as symptoms become more

severe, it is more difficult for the person to completely deny a mental illness, while the moderately symptomatic person may have trouble with insight, and the mildly symptomatic person may have good insight. Although a curvilinear model has been supported in other theories of insight (e.g., insight and neurocognitive difficulties, Startup, 1996), this curvilinear model has not been supported in the symptomatology theory (Mintz et al.). One limitation of testing this theory is that the investigation would need to be a large, independent study that enables significant findings even though there are small effect sizes associated with insight and symptomatology.

Another plausible reason for the lack of definitive support for a single symptomatology theory of insight is that perhaps the correlates of insight are not that simple. When first conceptualized, insight was thought of as a dichotomous variable, but with more research, it was clear that insight was a multi-faceted construct. Therefore, it seems reasonable that the etiology of insight also be multidimensional. This idea will be revisited throughout this document, but it is important to question whether it is reasonable to believe that one factor alone would explain the majority of variance in insight.

In reviewing past literature, this multifaceted model is supported by the many findings on the correlates of insight. For instance, Dickerson et al. (1997) found that delusions and difficulties with abstract thinking, among other variables, significantly predicted level of insight. These findings support both the positive and disorganized symptomatology theories of insight etiology. However, it is worth noting the methods of this study were somewhat simplistic in that they used single items from the Positive and Negative Syndrome Scale to assess several variables, including insight, delusions, and abstract thinking. This is especially problematic for the insight construct, because it is not likely that a

single item can capture this multi-dimensional construct. Similar to the Dickerson et al. study, Amador and colleagues (1994) found significant correlations among insight and delusions, disorganized thoughts, and disorganized behaviors. In contrast to the previous study, Amador et al. used a semi-structured interview (Scale to Assess Unawareness of Mental Disorder; SUMD) to assess insight in a multidimensional way. Both studies (Dickerson et al., 1997; Amador et al., 1994) failed to find significant correlations between insight and negative symptoms, which is further evidence against the negative symptom etiology of lack of insight.

Interestingly, although their results moderately supported a symptomatological model of insight, Amador and colleagues (1994) concluded that their study supported the neuropsychological model of insight. This conclusion was based on their finding that across several diagnostic groups (persons with schizophrenia, schizoaffective, bipolar disorder, or major depression with psychotic features), the persons with schizophrenia were significantly more likely to have difficulties with insight. Although not clearly stated, the authors seem to suggest that since persons with schizophrenia are more likely to have neuropsychological difficulties, as compared to other diagnostic groups, the higher occurrences of insight difficulties in persons with schizophrenia is more likely related to neuropsychological difficulties than to symptoms. These conclusions seem to minimize the results reported, while emphasizing the authors' theoretical leanings on insight.

Lack of Insight as Impairments in Theory of Mind (ToM). In another theory of lack of insight, researchers have suggested that persons with schizophrenia may have difficulties with Theory of Mind (ToM; Osatuke et al., 2008), which then leads to difficulties with insight. ToM is defined as the ability to understand the mental states, emotional states,

beliefs, and intentions of both the self and others (Premack & Woodruff, 1978). Although this construct has been primarily researched in persons with autism, there is research suggesting persons with schizophrenia may also experience difficulties with ToM during both the acute psychotic and stable phases of schizophrenia (Bora, Sehitoglu, Aslier, Atabay, & Veznedaroglu, 2007).

Even though the mechanisms through which ToM may influence insight are unclear, researchers have proposed several theories. One theory is that ToM difficulties may make it more likely for persons to misattribute their symptoms to others, which then may make them more likely for people with schizophrenia to believe they do not have a mental illness. Another theory is that deficits in ToM could make it more likely to experience difficulties when self-evaluating, and this skill is critical in attaining insight (Bora et al., 2007). Several studies support the role of ToM in insight, but the ToM measures have been relatively inconsistent and unstandardized. For example, much of the ToM research has used qualitative data, like participant narratives, to support this theory. These characteristics make it difficult to come to a conclusion about the role of ToM in insight, but the development of newer measures assessing metacognition, like the Beck Cognitive Insight Scale, may contribute to a more consistent assessment of ToM and insight (Osatuke et al., 2008).

Lack of Insight as a Neuropsychological Deficit. The neuropsychological model is a relatively recent theory that has garnered a significant amount of both empirical attention and support. In this theory, insight is viewed as having a neurological basis. This theoretical model appears to have begun with a 1991 article by Amador and colleagues, in which the authors suggested similarities between the neurological disorder anosognosia and lack of insight in persons with schizophrenia. Anosognosia is the unawareness of a neurological

disorder, despite clear evidence suggesting otherwise (Silver, McAllister, & Yudofsky, 2005). It is often seen in persons who experience a stroke and subsequent paralysis of their limbs. For instance, the person acts as if the limb is not paralyzed and when questioned or confronted about the paralysis, the person is indifferent, insists they can move it, or even deny that it is their limb (Amador et al., 1991). Although there are several theories on anosognosia, Amador and colleagues insist on one definite precursor to anosognosia, direct injury to the brain. Thus, they proposed the neuropsychological model of insight. In their review of the anosognosia literature, Amador et al. briefly summarize the theories of anosognosia to either attribute it to specific or diffuse damage to the brain.

The frontal lobes have been one of the specific brain areas associated with anosognosia. Amador et al. (1991) summarize previous work which has noted that one similarity across several unawareness deficits is that the person has an inability to self-monitor and self-correct, which leads to a deficit in awareness. Anosognosia has not been consistently linked with damage to a single brain region, but the frontal and parietal lobes are often indicated as areas of dysfunction in several anosognosia cases (Conson, Ranieri, de Falco, Grossi, & de Falco, 2008; Vuilleumier, 2004).

Empirical Evidence of the Neuropsychological Model. Initially, research into the neuropsychological model of insight investigated the relationship between insight and general cognitive difficulties, but the overall results did not strongly support the connection between insight and general cognition. One meta-analysis reported a small, significant mean weighted effect size ($r = 0.17$) for the relationship between insight and cognitive measures (Aleman et al., 2006). When investigating only the WCST and insight, these authors found a significant effect size of $r = 0.23$, while mean effect sizes for IQ and memory were not

significant. The authors suggests this as further evidence that in people with psychotic disorders, lack of insight may be related to EF, as opposed to overall cognitive difficulties. However, when these authors limited their analyses to studies including only persons with schizophrenia, the results shifted. In these analyses, the insight-cognition relationship was significant but the relationship between memory and insight was in the medium range (r = 0.28) while the relationship between EF and insight was in the small range (r = 0.19). One potential confound of this meta-analysis is that it included several studies that used a single item to assess insight, but as a multidimensional construct, it is questionable whether a single item can validly assess insight.

Although the initial investigations exploring general cognitive abilities and insight were mixed (Osatuke et al., 2008), the results became more encouraging when specific abilities were examined. In particular, there is growing evidence of a relationship between insight and neuropsychological tests of the frontal lobe (Drake & Lewis, 2003; Lysaker et al., 1998; Osatuke et al., 2008). Researchers have focused on EF which is purported to reflect frontal lobe functions. EF, as defined by Lezak, Howieson, and Loring (2004), includes four factors: "(1) volition, (2) planning, (3) purposive action, and (4) effective performance" (p. 611), which enables a person to successfully complete behaviors that are independent, purposeful, and self-serving. Numerous researchers have consistently reported that the majority of people with schizophrenia experience difficulties with EF (Brazo et al., 2002; Fioravanti et al., 2005; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003), but the link between EF and insight has been less consistent (Cooke et al., 2005; Osatuke et al., 2008).

Conceptually, the construct of EF maps very well onto some theories of insight. Markova and Berrios (1995) proposed several basic processes of insight, including detecting an abstract experience, comparing it to past experiences and templates, and judging it as either usual or unusual according to this comparison. In addition, others have described insight as an inability to self-monitor and self-correct (Amador et al., 1991). Similarly, EF has been described as "the ability to respond in an adaptive manner to novel situations" (pg. 611) and involves the "capacities for self-determination, self-direction, and self-control and regulation" (*Neuropsychological Assessment,* Lezak, 2004, pg. 181). Thus, if the majority of persons with schizophrenia have EF difficulties (Brazo et al., 2002; Fioravanti et al., 2005; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003), it is likely they would have difficulties in using these cognitive skills---of comparing, evaluating, and judging their functioning and experiences against past experiences and the experiences of others--- to establish accurate insight. Although this theory has received substantial empirical support, the results remain mixed (Cooke et al., 2005; Osatuke et al., 2008). Potential reasons for the inconsistencies will be reviewed throughout the document, but one important concern in this body of research is that EF is used as an umbrella term encompassing many complex cognitive processes. In response to this critique, researchers have taken various approaches to refine further the conceptualization of EF, and this refinement will be discussed throughout the remainder of the document.

The Role of EF

EF Impairment and Schizophrenia. Researchers have established that many persons with schizophrenia exhibit difficulties with cognitive skills, especially those involving EF. This section will further define EF and review the empirical support for EF

difficulties in persons with schizophrenia. The *DSM-IV* (1994) states that people with schizophrenia frequently experience difficulties with goal oriented behavior often leading to problems performing activities of daily living; such behaviors are commonly referred to as executive functions or executive abilities. According to Lezak et al. (2004), difficulties with EFs are exhibited in a more global manner than specific cognitive difficulties, meaning they affect many or all facets of a person's behavior. In addition, EFs are somewhat independent of other cognitive functions; for example, an individual may have cognitive difficulties in areas other than EF and still be productive in their daily life (Lezak et al.).

Traditionally, EF has been defined in this broad, unified manner, but recently, some researchers have argued that EF should be conceptualized in a more fractionated model that accounts for the many specific components of EF as opposed to using the umbrella term (Clark, Warman, & Lysaker, 2010; Savla et al., 2012). In this EF fractionation model, researchers have used exploratory factor analyses to reveal potential components of EF, with some of the components including response inhibition, set shifting, working memory, planning, problem solving, attention, abstraction, deductive reasoning, and mental flexibility (Clark et al., 2010; Homack et al., 2005; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000; Savla et al., 2012).

In one such study, Savla et al. (2012) used exploratory factor analysis to investigate factors of an EF battery in persons with schizophrenia and found two factors: cognitive flexibility and abstraction. The cognitive flexibility factor was defined as the ability to "coordinate attention," multi-task, and adjust strategies according to demands. This factor consisted of timed tests, such as a trail making test, color-word inhibition test, and a verbal fluency test. The abstraction factor, defined as the ability to determine latent relationships

and perform accordingly, consisted of primarily non-timed tasks, including a sorting task similar to the WCST. Although these two constructs were significantly correlated with each other, they had different patterns of correlation with other variables. For instance, abstraction was significantly positively correlated with years of education and functional capacity, but was negatively correlated to duration of illness. In contrast, cognitive flexibility was significantly negatively correlated with positive and depressive symptoms. Although Savla and colleagues did not use the WCST, they suggest the task uses both abstraction and cognitive flexibility, and critique the field for typically only using one variable, total correct, to examine WCST performance. In contrast, they suggest that by using additional variables, such as perseverative errors and conceptual level responses, researchers may be able to differentiate these overlapping constructs.

Regardless of the conceptualization of EF, most researchers would agree that the majority of people with schizophrenia experience difficulties with EF components (Brazo et al., 2002; Fioravanti et al., 2005; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003). One of the most commonly used assessments of EF is the WCST (Kongs, Thompson, Iverson, & Heaton, 2000), and it will be an important variable in the present study. In this measure, the examinee is asked to sort a deck of cards according to four stimulus cards. The cards can be matched according to three sorting criteria: color, shape, or number. After each trial or sort, the examiner tells the participant whether they are right or wrong. After the participant successfully matches a certain number of cards consecutively, the sorting rule changes.

Heinrichs and Zakzanis (1998) reviewed 43 studies that used the WCST as a measure of EF in people with schizophrenia and found the majority (69%) of the participants with

schizophrenia scored below the group medians on EF. In a more recent meta-analysis by Reichenberg and Harvey (2007), the authors concluded that persons with schizophrenia demonstrated severe EF impairments, as measured by the WCST. In a cross-sectional study, Stratta et al. (2003) also found that nearly two-thirds of participants with schizophrenia exhibited cognitive difficulties on the WCST, and that these difficulties appeared to be stable across groups with varying illness durations.

Although most researchers conceptualize the WCST as a general EF assessment, some have suggested it assesses more specific EF constructs, such as set shifting, abstraction, problem solving, perseveration, mental flexibility, and response maintenance (Greve et al., 2005; Polgár et al., 2010; Savla et al., 2012). In a recent study, Polgár et al. (2010) investigated the factor structure of the WCST in persons with psychotic disorders and identified two-factors. Factor 1 included the following variables, correct responses, conceptual responses, categories completed, perseverative responses, and perseverative errors. It was conceptualized as the ability to determine the correct sorting category and to switch sorting categories when needed and has been consistently found in other, larger studies (Greve, Ingram, & Bianchini, 1998; Greve, Stickle, Love, Bianchini, & Stanford, 2005). This factor, often termed as flexibility and set-shifting, was the primary focus of EF in this study.

The second factor in the Polgár and colleagues (2010) study consisted of non-perseverative errors. If a person scored high on factor two, then they were demonstrating ineffective problem solving skills, such as shifting back and forth between sorting categories. Polgár et al. hypothesized that these individuals may be testing too many hypothesis, but the

current author proposes that this failure to maintain set could also represent difficulties in short term memory, concentration, or attention.

Even with this recent research, the exact components of the WCST in schizophrenia remain relatively unknown for several reasons. First, most of the as the factor structures have been explored in non-clinical or mixed diagnoses populations (Greve et al., 2005; Polgár et al., 2010; Savla et al., 2012). Second, the factor loadings appear unstable or inconsistent both across and within studies (Greve et al., 2005). Although it would be ideal to have a more specific conceptualization of EF, the research is not in agreement as to what that would include. Therefore, in response to this limitation, this document will refer to EF in more general terms, but specific domains of EF will be mentioned when appropriate to the variables or construct of interest. In addition, this study will attempt to parse out the domains of EF by investigating numerous WCST variables, as suggested by Savla et al. (2012), and using dynamic assessment, which will be discussed later.

The Relationship between Insight and EF. As previously stated, the link between EF and insight is unclear (Cooke et al., 2005; Osatuke et al., 2008). Much like in the general EF literature, in the insight literature most researchers used the WCST to examine EF and insight (Cooke et al.). It has been noted that two reviews on insight (Cooke et al.; Osatuke et al.) concluded that the relationship between insight and EF is inconsistent, with some researchers finding significant relationships and some not. In the studies finding significant correlations, researchers report that poorer insight is associated with poorer WCST performance. The inconsistent findings could be due to many factors, including varying severity of samples (outpatient vs. inpatient), inconsistent use of an insight measure, and the possibility that the proposed relationship between insight and EF as measured by the standard

WCST is too simplistic (Koren et al., 2004). This section will briefly review the current literature on insight and EF and explore what factors may be contributing to the inconsistent findings.

A current review of the literature revealed 27 studies investigating the relationship between insight and EF, as measured by the WCST. Of these 27 studies, 15 found significant relationships between insight and WCST, with poor insight being associated with poorer performance on the WCST (Chen, Kwok, Chen, & Kwong, 2001; Larøi et al., 2000; Lysaker & Bell, 1994; Lysaker et al., 1998; Lysaker, Bryson, Lancaster, Evans, & Bell, 2002; Marks, Fastenau, Lysaker, & Bond, 2000; Monteiro et al. 2008; Mysore et al., 2007; Rossell, Coakes, Shapleske, Woodruff, & David, 2003; Simon, De Hert, Wampers, Peuskens, & van Winkel, 2009; Smith, Hull, Israel, & Willson, 2000; Voruganti, Heslegrave, & Awad, 1997; Yen et al., 2009; Young, Davila, & Sher, 1993; Young et al., 1998).

The remaining 12 studies reported no significant relationship between insight and WCST (Arduini et al., 2003; Collins et al., 1997; Cuesta, Peralta, Caro, & de Leon, 1995; Cuesta, Peralta, Zarzuela, & Zandio, 2006; Dickerson et al., 1997; Freudenreich, Deckersbach, & Goff, 2004; Goldberg, Green-Paden, Lehman, & Gold, 2001; Lysaker, France, Hunter, & Davis, 2005; McEvoy et al., 1996; Nakano, Terao, Iwata, Hasako, & Nakamura 2004; Pruß et al., 2012; Sanz, Constable, Lopez-Ibor, Kemp, & David, 1998; Simon, Berger, Giacomini, Ferrero, & Mohr, 2006). Several methodological shortcomings were noticed in reviewing these studies. One common limitation was the use of a mixed diagnostic sample (Arduini et al., 2003; Cuesta et al., 1995; Cuesta et al., 2006; Goldberg et al., 2001). This is concerning, as one meta-analysis has suggested that the relationship between cognitive factors and insight is different in people with psychotic disorders than in

people with other disorders, like Bipolar disorder (Aleman et al., 2006). In addition, several of the studies used questionable insight measures, like a single item for the evaluation of insight (Dickerson et al., 1997; Goldberg et al., 2001). The validity of a single item to capture a multidimensional construct is questionable. In another study (Cuesta et al., 1995), the researchers used an insight measure that is not widely accepted. Other confounds included the use of a computerized WCST (Simon et al., 2006), which may alter the validity of the task in this population, or using predominately male samples (Freudenreich et al. 2004; Lysaker et al., 2005; Nakano et al. 2004).

One previously discussed reason for the inconsistent relationship between insight and EF is that it may be a curvilinear relationship (Startup, 1996). In this theory, Startup suggests that persons with fairly intact EF are more likely to have either intact or poor insight, because they have the cognitive abilities to either accurately assess their insight or the abilities and motivation to deny their illness. Startup completed a small study to investigate this theory and found that by using a multiple regression to predict cognition, insight was able to predict 56% of the variance in cognition in a quadratic model, but the linear model predicted a non-significant amount of the variance. Although Startup's theory is referenced in most research on insight and EF, it has neither been thoroughly replicated. In addition, there is limited indirect or direct evidence to support the motivation theory, which proposes that people deceive themselves of their mental illness to protect their self-concept; therefore, this curvilinear hypothesis is intriguing but not thoroughly supported.

Another potential reason for the mixed findings is that perhaps the measures used to assess the key variables, insight and EF, are too simple. This hypothesis is clearly supported when reviewing the pattern of findings in studies investigating insight and EF. Of the 15

studies reporting significant relationships between the WCST and insight, eight used a multi-dimensional, semi-structured interview to assess insight (SUMD). In contrast, only five of the 13 non-significant studies used this same scale, while many of the rest used a single question to assess insight. It appears that in assessing insight, researchers who used a more sensitive measure, like the SUMD, were more likely to find significant results, as opposed to studies using single-item measures. While researchers have used more sensitive measures for assessing insight, few have tried the same in assessing EF. Perhaps one issue in investigating the relationship between insight and EF is that our assessment of EF is not sensitive enough (Murphy, 2010). This idea was also advanced by Pruß and colleagues (2012) when their study found that the standard WCST did not significantly predict insight. The call for EF refinement will be revisited throughout this document.

A further limitation and potential contributor to these mixed findings on the relationship between insight and EF is that researchers tend to view EF as a unified construct as opposed to a multidimensional process consisting of many components (Clark et al., 2010; Donohue et al., 2006; Savla et al., 2012). Proponents of this theory suggest that EF as traditionally conceptualized is too broad a term. In contrast, they argue that EF is a fractionated system that needs to be analyzed using its independent components, such as response inhibition, set shifting, working memory, planning, problem solving, abstraction, concept formation, deductive reasoning, and sustained attention (e.g., Homack et al., 2005; Miyake et al., 2000; Polgár et al. 2010; Savla et al., 2012). As previously discussed, this idea has been investigated through factor analyses, and this study will attempt to address it by including a dynamic assessment of EF, clarifying conceptual language, and investigating multiple WCST variables.

Insight, Metacognition, and EF. In nearly all of the studies comparing insight and WCST performance, researchers have used the standard version of the WCST. The one exception is a study by Koren et al. (2004) in which the authors used a metacognitive version of the WCST. Koren et al. suggested the current models of insight research were too simplistic, in that they failed to take into account the metacognitive functioning which may mediate the relationship between insight and neuropsychological performance on EF tasks. Metacognition is defined as the ability to evaluate, distinguish, and monitor one's cognitive abilities with the goal of controlling one's behavior according to this evaluation (Koren, Seidman, Goldsmith, & Harvey, 2006; Koren et al., 2004). In their adaptation of the WCST, Koren et al. (2004) asked participants to both rate their confidence in correctness of sort and also choose which sorts counted towards their total score. This modification changes the WCST from a forced response task to a task that allows the participant to both monitor and control their responses according to their own evaluation of how they are performing on the task (Koren et al., 2004).

In brief, Koren and colleagues (2004) found no significant correlations between the insight measure (SUMD) and the standard WCST, but did find several significant correlations between insight and variables of their metacognitive WCST. In addition, regression models using the standard WCST predicted a small amount of insight variance (10-19% of variance), while the metacognitive version predicted a moderate to high amount (36-56% of variance), and together the standard and metacognitive versions predicted 66% of the variance in clinical insight and 52% of the variance in awareness of current symptoms. Thus, the authors argue that the metacognitive version of the WCST may improve its predictive power regarding insight.

Although this finding is both striking and unique, it has not been replicated in any published studies. In addition, the Koren et al. (2004) sample was small (n = 30) and included only persons experiencing their first episode of schizophrenia psychosis. Koren et al. also obtained their sample from a hospital in Israel. Although the authors of the SUMD suggest its cross-cultural validity as a measure of insight (Amador et al., 1994), others argue that the conceptualization of mental illness, and thus insight, may differ across cultures (Agrawal, Bhat, & Kuruvilla, 1994). For these reasons, the Koren et al. research on metacognition and insight must be considered carefully, and further research is needed to support their findings that metacognitive measures of EF are more predictive of insight than standard measures of EF.

Another possible limitation of the Koren et al. study (2004) is that the authors used a single administration of the WCST for both the standard and metacognitive assessment of EF. In their WCST administration, the participants were asked after each sort to rate their level of confidence in correctness and asked if they wanted to include the sort in their total. The participants were monetarily rewarded for each correct "chosen" sort, and money was removed for every incorrect "chosen" sort. The researchers considered the standard WCST to be the participants first 64 sorts within this modified task. Koren and colleagues contended that the sample's standard WCST performance was not affected by these modifications, as their sample's performance was comparable to other studies in the literature. However, they did not provide any specific or statistical comparisons between their sample's performance of the "standard," yet modified, task and other studies' samples. Therefore, it is presumptuous to assume that the validity of the WCST was unchanged by their modifications to the WCST.

"Fine tuning" of EF Assessments. Earlier, it was noted that one critique of the inconsistent findings in the relationship between insight and EF is that current EF measurement (i.e., the WCST) is too simplistic (Koren et al., 2004). This is not the first time the WCST and other neuropsychological measures have been criticized as overly simplistic assessments of dynamic cognitive constructs. Researchers interested in functional outcomes and cognitive functioning in persons with schizophrenia have been disappointed with the established relationship between these two variables, with meta-analyses revealing that between 20 to 60 percent of the variance in functional outcomes can be explained by neurocognition (Green et al., 2000). Although this is a significant proportion of variance, it has been suggested that perhaps a "fine-tuning" of neurocognitive tests is necessary to achieve even more accurate predictions of functional outcome (Green et al., p. 130; Fioravanti et al., 2005). In addition, and as discussed earlier, recent critiques have also called for a "fine-tuning" in the conceptualization of EF as many view the construct to be a broad, umbrella term (e.g., Clark et al., 2010; Greve et al., Savla et al., 2012).

In pushing for a fine-tuning of neuropsychological measures, several have questioned the ecological validity of standard neuropsychological measures, or the task's ability to best approximate one's performance in a real life setting (Burgess, Alderman, Evans, Emslie, & Wilson, 1998; Burgess et al., 2006). For example, and as Koren and colleagues suggest (2004), the WCST is a forced response task, in which no matter how certain or uncertain the participant is in the correctness of their response, they are forced to respond regardless. In contrast, many real world situations would allow a person to ask for assistance or to refrain from choosing. Thus, the standard WCST may not be the best approach for assessing a person's real-world potential. Although these assessments typically demonstrate statistically

significant predictive power, researchers have suggested that there may be other factors that are mediating the relationship between neurocognition and outcomes. Some proposed mediators include learning potential, or a person's capacity for learning (Green et al., 2000), and metacognition (Koren et al., 2004).

One response to this idea has been the previously discussed research of Koren and colleagues, who suggest the metacognitive version of the WCST as a more ecologically valid measure (Koren et al., 2006). These researchers suggest the metacognitive WCST better approximates and predicts a person's ability to function in a real-world environment, and hence, it may be both more ecologically valid and more predictive of insight (Koren et al., 2006). As previously discussed, their findings support this idea in that the metacognitive WCST was significantly correlated to insight, while the standard WCST was not. In addition, regression analyses revealed that the metacognitive WCST predicted a moderate to high amount of the variance in insight; in contrast, the standard WCST predicted a small amount of insight variance (Koren et al., 2004).

Another method of "fine-tuning" includes the development of dynamic assessment, which attempts to assess learning potential, or the modifiability of a person's cognitive abilities (Wiedl, 1999; Wiedl, Wienöbst, Schöttke, Green, & Nuechterlein, 2001). Researchers theorize that through dynamic assessment they may be able to assess a person's "learning ability, cognitive modifiability, and rehabilitation potential" (Wiedl et al., 2001, p. 687). In addition, the dynamic approach more closely resembles real world functioning, because the individual is able to interact with and learn from the environment and adapt their performance accordingly (Murphy, 2009). As noted previously, the WCST is a commonly

used measure of EF; as such, this task has also been used frequently in dynamic assessment research.

In a dynamic protocol developed by Wiedl (1999), the WCST is administered in three trials within one session; trial one and three are static trials in which the test is administered according to the standard protocol. Trial two consists of a learning trial, in which the researcher provides the participant with detailed feedback for each response, as a method of coaching the participant through the task. Wiedl proposed three learner categories (learners, non-learners, and high performers) according to the modifiability of the participants' performance. These learner categories have been correlated with functional outcomes, with learners and high performers performing better in problem solving scenarios (Wiedl, 1999), benefiting more from skills training (Rempfer, Brown, & Hamera, 2011), and having better social functioning (Woonings, Appelo, Kluiter, Sloof, and van den Bosch, 2000). This approach was among the most stable and valid approaches of indexing learning potential in a test-retest review of the dynamic WCST (WCST-d; Weingartz, Wiedl, & Watzke, 2008), but researchers have expressed concern with its reduction of statistical power due to it being a categorical variable (Fiszdon & Johannesen, 2010).

Due to these concerns, other researchers have proposed additional, non-categorical methods of calculating learner indices. One such method, as proposed by Sergi et al. (2005), is a gain ratio score. In this method, the score is determined according to the ratio of actual gain over maximum possible gain. Much like the categorical approach, there are several critiques to the Sergi gain approach. First, this method assumes that learning is a linear process. Second, this approach misconstrues the data for high performers. Specifically, if participants perform near the ceiling then they do not have much room for variability in gain

scores and this can make their gain scores appear similar to those who did not improve or those who improved greatly (Fiszdon & Johannesen, 2010). Another method is the optimized performance method, in which researchers only use the trial three or post-test score. Although this approach does not take into account the amount of learning that occurred, it has demonstrated high stability and validity in test-retest studies on learning potential (Weingartz et al., 2008). This study will also include an additional percent gain approach in which the gain score (block 3-block 1) will be divided by the block 1 score and then multiplied times 100.

Similar to the EF and functional outcomes literature, the literature investigating EF and insight is inconsistent. Although both constructs are believed to be frontal lobe functions, the predictions have been moderate at best. Thus, it is proposed that the strength of insight predictions could be improved by using more sensitive and ecologically valid measures of both insight and EF. As previously discussed, the majority of insight research uses a single item to assess this multi-faceted construct, and this shortcoming may contribute to the lack of significant findings. Therefore, the current author proposes that with the use of more complex and sensitive measures to assess insight, this construct may be more accurately assessed.

As for EF, one critique of the WCST is that it lacks ecological validity because it is a forced response task in which the participant cannot receive any meaningful feedback from their environment (i.e. they are only told if their answer is right or wrong). This is much unlike a real world environment in which a person could ask questions, use additional tools, and solicit more detailed feedback. Previous research has suggested that this limitation of the WCST could explain its lack of predictive power for functional outcomes (Fioravanti et al.,

2005; Green et al., 2000), and modifications, such as the WCST-d, have been developed to improve the ecological validity and sensitivity of the WCST. Although the exact constructs that the WCST-d assesses remain to be clarified, the dynamic modification has been proposed to assess learning ability, cognitive modifiability (Wiedl et al., 2001), complex problem solving (Wiedl et al., 2004), set-shifting, meta-cognition, and perseveration despite feedback. These constructs, which are not as clearly captured by the standard WCST, may play a pivotal role in establishing insight, and thus in the insight-EF relationship.

As theorized, the WCST-d assesses a person's ability to assess their behavior, judge it according to feedback (self-monitoring, metacognition), and adjust it as needed in response to environmental cues (set-shifting, flexibility, and abstraction). The current author proposes that similar skills are needed in order to establish accurate insight. It is theorized that individuals who are able to successfully evaluate their behavior (self-monitoring, metacognition), receive feedback, apply feedback to their conceptualizations and problem solving, shift their cognitive set, and adjust their schemas according to said feedback (set-shifting, flexibility, and abstraction) should be able to do the same with the feedback they receive regarding their mental health. In contrast, individuals who struggle with these cognitive skills would likely perseverate in a cognitive set or belief, regardless of the feedback they receive from the external environment, and these individuals are theorized to have both poor WCST-d performance and poor clinical insight. In other words, persons who are able to learn and adapt on a dynamic EF task will be more likely than non-learners to establish accurate insight because they would be more likely to accept incoming information about their diagnosis and symptoms, apply it to their mental health experience, and use that information to better understand their symptoms and experience.

Insight into Cognitive Symptoms

As previously reviewed, cognitive difficulties are a prominent feature of schizophrenia, and these difficulties have a great impact on treatment and functional outcomes (Brazo et al., 2002; Fioravanti et al., 2005; Green et al., 2000; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003). Thus, many behavioral and pharmacological interventions are developed to target and improve these difficulties. Much like with clinical insight, treatment adherence is expected to be low if the individual does not perceive themselves as having difficulties with cognition. From this logic, researchers have begun to develop measures to assess a person's insight into their neuropsychological symptoms. The amount of research on cognitive insight research has been relatively limited, which may be due to previous research suggesting that persons with serious mental illnesses are not accurate in reporting their cognitive difficulties (Burdick, Endick, & Goldberg, 2005; Moritz et al., 2004; Van den Bosch & Rombouts, 1998). However, there is growing evidence to suggest that not all persons with schizophrenia lack insight into their cognitive difficulties (Bowie et al., 2007; Donohue et al., 2009; Hake et al., 2007; Jovanovski, Zakzanis, Atia, Campbell, & Young, 2007; Lysaker et al., 2002) and that cognitive insight is not as dichotomous as sometimes assumed to be.

In addition, cognitive insight, regardless of accuracy, is still an important variable to assess in this population for several reasons. For example, if a person identifies cognitive difficulties but denies having schizophrenia, then the treatment team can use this as a starting point for treatments, like cognitive remediation therapy or pharmacology, and eventually, the individual may either gain awareness of their disorder or be more open to viewing it as such. If a person denies any cognitive difficulties and neuropsychological assessments suggest

otherwise, then this information could be helpful to predict who may struggle to engage in treatments like cognitive remediation, and these persons could receive individual attention focused on enhancing their adherence to therapy.

When comparing subjective and objective measures of cognition, several studies have found that various psychiatric groups (e.g., persons with anxiety, depression, bipolar disorder, and schizophrenia) are inaccurate at assessing their cognitive abilities (e.g., Burdick et al., 2005; Moritz et al., 2004; Van den Bosch & Rombouts, 1998). One study reported that among psychiatric groups, persons with schizophrenia were the least accurate at estimating their cognitive ability (Moritz et al.). Numerous researchers have also found that subjective and objective measures of cognition are often not correlated in persons with schizophrenia, (Keefe, Poe, Walker, & Harvey, 2006; Medalia & Lim, 2004; Medalia & Thysen, 2010; Moritz et al.; Prouteau et al., 2004; Van den Bosch & Rombouts). However, it should be noted that clinicians' ratings of cognitive impairments in persons with schizophrenia have also been found to be inaccurate as compared to objective neuropsychological measures (Harvey et al., 2001; Medalia & Lim; Medalia & Thysen; Moritz et al.; Sanjuán et al., 2006). Several researchers have identified variables, such as EF, that may predict increased accuracy in subjective reports of cognitive difficulties in persons with schizophrenia (Bowie et al., 2007; Hake et al., 2007; Jovanovski et al., 2007; Lysaker et al., 2002), and this research will be more thoroughly reviewed in subsequent paragraphs.

In contrast to other findings, a number of researchers have found that the subjective cognitive complaints of persons with schizophrenia are correlated to objective neuropsychological measures, especially in the areas of memory, attention, and EF (Donohue et al., 2009; Hake et al., 2007; Stip et al., 2003). Donohue and colleagues (2009) found that

participants with intact clinical insight demonstrated significant correlations between their self-report cognitive difficulties and their cognitive performance. In contrast, the participants with impaired insight did not demonstrate significant correlations. Most noteably, Stip et al. found that when cognitive difficulties were framed within the context of *everyday* activities, using the Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS; Stip et al., 2003), there was a significant correlation between subjective and objective measures of cognitive function in persons with schizophrenia.

The SSTICS is unique from other cognitive awareness scales, like the Dysexecutive Questionnaire and the Beck Cognitive Insight Scale, in that it was developed specifically for persons with schizophrenia, and it focuses on cognitive difficulties that are commonly reported in persons with schizophrenia. Another strength of the SSTICS is that it grounds common cognitive difficulties into everyday tasks, such as difficulty remembering one's grocery list or bus schedule or planning chores and errands for the day.

These strengths of the SSTICS have been supported through research. In one study, the SSTICS demonstrated good convergent validity when compared to another scale assessing subjective cognitive complaints (Frankfurt-Pamplona Subjective Experiences Scale; FPSES; Lecardeur et al., 2009). In addition, when the researchers compared the subjective SSTICS ratings to the clinician rated PANSS cognition items, the two scales were significantly correlated. However, there was not a significant relationship between cognitive insight, as measured by the SSTICS, and clinical insight, as measured by the insight item on the PANSS (Lecardeur et al.). This suggests that cognitive insight and clinical insight may be two relatively independent constructs in persons with schizophrenia. Donohue and colleagues (2009) reported both an independence and overlap of cognitive and clinical insight. In their

study, the majority of participants reported cognitive difficulties, but only those with intact clinical insight demonstrated significant correlations between their cognitive complaints and their objective neuropsychological performance.

Medalia and Thysen (2010) also found clinical insight and cognitive insight to be two independent constructs when they were both measured objectively. In this study, insight into clinical symptoms, as measured by the SUMD, was found to be good, with 70% of their sample having full insight. In contrast, participants exhibited partial insight into their cognitive difficulties, and only 27% exhibited full insight into their cognitive difficulties. Medalia and Thysen also reported no significant relationships between cognitive insight and objective neuropsychological measures. One possible reason for this finding is that the relationship between cognitive insight and neurocognition may not be simple enough to be accurately captured by correlations. Much like clinical insight, other researchers have proposed that insight into cognitive symptoms may differ according to a person's cognitive ability. Specifically, persons with greater cognitive difficulties are more likely to remain unaware of these cognitive difficulties.

In recent research, the level of cognitive impairment has been associated with the accuracy of subjective assessments of cognition (Bowie et al., 2007; Hake et al., 2007; Jovanovski et al., 2007). EF has been identified as a specific aspect of cognitive impairment that may contribute to the accuracy of subjective cognitive complaints; that is, persons with higher levels of EF appear more accurate at evaluating their cognitive difficulties (Hake et al.; Jovanovski et al.; Lysaker et al., 2002; Medalia & Thysen, 2010; Voruganti et al., 2007). These results suggest that lack of insight is not a homogenous characteristic of all persons with schizophrenia. In one study, Hake et al. found that within a dynamic assessment

protocol high scorers and learners reported significantly fewer subjective EF impairments than did the non-learner group. In another study, Voruganti and colleagues found the WCST (total score) to be significantly correlated to cognitive complaints as assessed by the SSTICS (r = -0.68).

Summary and Purpose of Current Study

Overall, the literature reviewed above indicates that lack of insight is a common feature in the majority of persons with schizophrenia (Amador, 2006; Amador et al., 1994; Cooke et al., 2005); in addition, EF difficulties occur at a similar rate (Brazo et al., 2002; Fioravanti et al., 2005; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003). With both insight and EF being identified as frontal lobe functions, researchers developed the neuropsychological model, which proposes that difficulties with insight are related to cognitive difficulties, especially difficulties with EF (Amador et al., 1991). Although this model has emerging evidence to support it, studies investigating the relationship between EF and insight have been relatively mixed (Cooke et al., 2005; Osatuke et al., 2008). The use of dynamic assessment strategies that reflect "learning potential" (e.g., Wiedl, 1999) cognitive modifiability, set-shifting, complex problem solving, and meta-cognition has been advanced as a method for better capturing the cognitive demands relevant to real world functional outcomes (e.g., Green et al., 2000; Hake et al., 2007), and perhaps to establishing accurate insight. Thus, dynamic assessment may be a more sensitive and thorough assessment to capture more of the relationship between EF and insight than traditional neuropsychological measures.

In addition, researchers have recently begun to investigate an additional aspect of insight, insight into cognitive difficulties, by using measures that are grounded in everyday

cognition (Stip et al., 2003). Several studies have found significant correlations among these measures and objective neuropsychology measured (Donohue et al., 2009; Hake et al., 2007; Stip et al.), but the relationship between clinical insight and cognitive insight remains unclear (Donohue et al., 2009; Lecardeur et al., 2009; Medalia & Thysen, 2010). Considering these factors, the overarching purpose of the current study is to investigate the relationship among learning potential, clinical insight, and cognitive insight in persons with schizophrenia.

From this perspective, it is proposed that the WCST-d should be considered when investigating the relationship between insight and EF. The dynamic WCST provides participants the opportunity to both monitor and adjust their performance according to the detailed feedback they receive. This is also similar to proposed theories of insight in which researchers suggest insight involves the ability to strategically compare, evaluate, and judge one's current experiences to past experiences (Markova & Berrios, 1995). Because the WCST-d was designed to capture rehabilitation readiness (Wiedl, 1999) and has been a significant predictor of outcome (Rempfer et al., 2011; Wiedl, 1999; Woonings et al., 2000), it may also be a more ecologically valid measure of EF (Murphy, 2009). In addition, it has been proposed to assess the constructs of learning ability, cognitive modifiability (Wiedl et al., 2001), complex problem solving (Wiedl et al., 2004), set-shifting, meta-cognition, and perseveration despite feedback more so than the standard WCST, and the current author suggests that these cognitive skills are necessary components of establishing insight. Thus, it is hypothesized that the WCST-d will demonstrate a stronger relationship with clinical insight (as measured by the SUMD, Amador et al., 1993) than the standard WCST.

As previously discussed, clinical insight is important for recovery, most notably for working collaboratively with the treatment team and maintaining medication adherence. In

addition, research suggests that cognitive difficulties, which are a prominent feature of schizophrenia (Brazo et al., 2002; Fioravanti et al., 2005; Heinrichs & Zakzanis, 1998; Reichenberg & Harvey, 2007; Stratta et al., 2003), are associated with both insight and functional outcomes, such that persons with greater cognitive difficulties are more likely to have difficulties with insight (Aleman et al., 2006), functional outcomes, and poorer prognosis (Breier et al., 1991; Green, 1996; Green et al., 2004; Wiedl, 1999). Thus, they have both been targets of rehabilitation programs, in the hopes that increasing cognition or insight will lead to improved prognosis.

However, one factor that this model neglects is a person's awareness of their cognitive abilities and difficulties. Cognitive remediation therapy has been proposed as one method of addressing cognitive difficulties, but treatment compliance and motivation are likely to be poor if the person is unaware of their cognitive difficulties or the impact these difficulties have on their daily lives. Thus, insight into cognitive difficulties, much like clinical insight, is an important factor to assess when treating a person with schizophrenia. Currently, research appears mixed as to whether cognitive and clinical insights are related or independent constructs. If cognitive insight is independent from clinical insight, then it may present as an ideal starting point for interventions and rehabilitation therapy, as the individual will be more amenable to working on something that they perceive as a personal difficulty, and perhaps these cognitive remediation therapies may open the door to exploring and establishing greater levels of clinical insight.

Therefore, the first aim of this study is to investigate the relationship between dynamic cognitive assessment (WCST-d) and insight in persons with schizophrenia and schizoaffective disorder. Specifically, it is hypothesized that as a more sensitive measure of

EF the WCST-d will be a stronger predictor of insight, as measured by the SUMD, than the standard WCST. In addition, it is proposed that learner sub-groups determined by the dynamic protocol will demonstrate different insight patterns, with learners and high performers exhibiting more insight than non-learners.

The second aim of the current study is to investigate the relationship between cognitive insight, clinical insight, and EF. First, it is hypothesized that insight into cognitive difficulties will be significantly related to EF performance, in that the better one's EF performance, the fewer cognitive difficulties they will report. In addition, as a more sensitive EF measure, the WCST-d is expected to be more strongly correlated to cognitive insight than the standard WCST. The learner sub-groups determined by the WCST-d will also demonstrate different patterns of cognitive insight, with the high performers and learners reporting fewer cognitive difficulties than the non-learners.

Hypotheses

Aim One: Investigating the Relationships between Clinical Insight and Learning Potential.

Hypothesis One: Predictors of Insight. Although the relationship between insight and EF has been extensively researched, the findings have been relatively inconsistent. These inconsistencies could be due to a number of potential limitations, such as mixed diagnostic samples, use of single-item insight measures, or severity of sampled participants. In addition, researchers have suggested that the current neuropsychological assessments are not sensitive enough, and therefore, do not exhibit strong relationships with real life outcomes (Green et al., 2000). This potential shortcoming of standard neuropsychological assessments could be yet another reason for the inconsistent results regarding insight and EF. One research group

(Koren et al., 2006) responded to this critique by investigating the relationship between insight and a metacognitive version of the WCST. Although their results were both intriguing and encouraging, there are no published replications. In addition, and as reviewed previously, their research has several methodological and practical shortcomings.

Therefore, the current author investigated the relationship between insight, as measured by the SUMD, and EF, as measured by two versions of the WCST, both the standard WCST and the dynamic modification (WCST-d) as developed by Wiedl (1999). By using this assessment protocol, the researcher obtained performance scores for both a standard WCST and a dynamic format to yield an index of learning potential. Because the dynamic format was proposed to be more ecologically valid and assess constructs believed to be related to insight (e.g., learning ability, cognitive modifiability, set-shifting, complex problem solving, and meta-cognition), it was hypothesized that the WCST-d would be more strongly correlated to the SUMD than the standard version.

After investigating the relationship between EF and insight, the next logical progression in this study was to determine how well each EF assessment predicted insight using hierarchical regression. In addition, this research question allowed the author to determine if either EF assessment was a significantly better predictor of insight. Using the same arguments as outlined in hypothesis one, it was expected that both EF assessments would predict a significant amount of insight variance, but the WCST-d would be a significantly better predictor of insight than the standard WCST. In addition, the overall predictive power of both EF assessments was investigated.

> **H1:** Insight, as measured by the SUMD, will be significantly correlated to both the standard and dynamic versions of the WCST. In addition, the WCST-d will be a stronger predictor of insight than the standard WCST.

Hypothesis Two: Insight and Learner Status. As Koren and colleagues suggested (2006), standard neuropsychological measures may be too simplistic to accurately capture the relationship between EF and insight. By using dynamic assessment, in which the participant is provided with learning opportunities, strategies, and detailed feedback, researchers may be better able to mirror the person's response to demands of a natural environment, or dynamic situations allowing persons to interact with and receive help from their surroundings. It was suggested that this modification allows the test to be more sensitive, in that persons who are able to respond and modify their behaviors according to corrective feedback (i.e. learners) are no longer clustered with those individuals who have difficulties modifying their behavior regardless of feedback (i.e. non-learners). In addition, these test modifications may increase the sensitivity of the test to constructs such as learning ability, cognitive modifiability (Wiedl et al., 2001), complex problem solving (Wiedl et al., 2004), set-shifting, meta-cognition, and perseveration despite feedback. The dynamic protocol essentially pulls a portion of poor performers out of this category who are able to perform at a higher level once they have received feedback. In contrast, the standard WCST does not allow for these learners to demonstrate their adaptive abilities, and their standard WCST performance usually falls within the impaired range. However, these persons may be more likely to have intact insight, because as demonstrated in the dynamic protocol, they are able to respond and modify their thoughts and behaviors according to feedback. Thus, it was proposed that perhaps the inconsistent correlations between insight and EF were related to this learner group not being able to demonstrate their real-world ability on the standard WCST.

To investigate this idea, it was hypothesized that individuals with better cognitive and learning abilities would have different patterns of insight. More specifically, it was expected

that the learner subgroups formed according to performance on the WCST-d (i.e. high scorers, learners, and non-learners) would differ in their level of insight, with high scorers and learners having higher insight scores than the non-learners. In addition, the relationship between the SUMD and WCST was investigated within each learner group; this served as another method to investigate the relationship between insight and EF as assessed by a dynamic protocol.

> **H2:** The learner subgroups formed by WCST-d performance will exhibit different subjective reports of insight (SUMD). Specifically, the high scorers and learners will exhibit more intact clinical insight (i.e. lower insight scores), while the non-learners will exhibit less intact clinical insight (i.e. higher insight scores).

Aim Two: Investigating Insight into Cognition.

Hypothesis Three: Relationship among Clinical Insight, Cognitive Insight, and EF. Research into the relationships among clinical insight, cognitive insight, and EF is relatively new, and the results appear to be mixed, with some finding these constructs unrelated while others find them related. Using the same logic as in aim one, it was proposed that the WCST-d would serve as a more sensitive measure of EF. Due to this characteristic, it was proposed that the WCST-d would be more strongly correlated to cognitive insight than the standard WCST. In addition, the relationships between clinical insight and cognitive insight were explored.

> **H3:** Cognitive insight, as measured by the SSTICS, will be significantly correlated to both the standard and dynamic versions of the WCST. In addition, the WCST-d will be more strongly correlated to the SSTICS than the standard WCST.

Hypothesis Four: Cognitive Insight and Learner Status. Similar to hypothesis three, this hypothesis explored the group differences in cognitive insight according to the WCST learner groups. In this case, cognitive insight was assessed by a self-report measure. As supported through previous research (Hake et al., 2007; Voruganti et al., 2007), it was

expected that there would be learner group differences in cognitive complaints, such that high performers and learners would report fewer cognitive complaints than non-learners. In addition, the relationship between the SSTICS and WCST was investigated within each learner group; this served as another method to investigate the relationship between cognitive insight and EF as assessed by a dynamic protocol.

> **H4:** The learner subgroups formed by WCST-d performance will exhibit different subjective reports of cognitive difficulties (SSTICS). Specifically, the high scorers and learners will report fewer cognitive difficulties than the non-learners.

Exploratory Analyses

Exploratory Analyses One: Insight, Symptoms, and Cognition. Related exploratory analyses were performed to investigate the relationship between insight, symptoms, and cognition. The research on the role of symptoms in insight is mixed; meta-analyses suggests that symptoms may represent a small, yet statistically significant, component of insight and cognition (i.e., < 6.5%; Mintz et al., 2003; Osatuke et al., 2008), while several longitudinal studies have found no consistent relationship among insight and symptoms (Cuesta et al., 2000; Smith et al., 1998). Similarly, cognitive difficulties are viewed as a stable, characteristic feature of schizophrenia (*DSM*-IV-TR) that is relatively unchanged by symptoms, medication, or illness duration (Braff et al., 1991; Clark et al., 2010; Fioravanti et al., 2005; Gladsjo et al., 2004; Heaton et al., 2001; Heinrichs & Zakzanis, 1998; Holthausen et al., 2007; Wilk et al., 2005).

Generally, researchers have considered cognitive difficulties and insight to be trait-like features of schizophrenia which share a small amount of variance, while symptoms have greater variability. The shared variance among these factors has been disputed in research, and thus, the relationship among these factors was investigated using correlational and

regression analyses when appropriate. It was proposed that symptoms, as measured by the BPRS-E, would only predict a small amount of the variance in insight and EF, as measured by the SUMD and WCST respectively. In addition, the covariance of education with insight and EF was investigated, as some researchers have found it to be a significant predictor of both (Clark et al., 2010; Savla et al., 2012).

Exploratory Analyses Two: Self-Monitoring. In addition, the current author investigated the relationship between insight and accuracy of self-monitoring into neuropsychological performance, or self-monitoring. This variable was assessed in a sub-sample of the participants by asking the individual to evaluate their performance on each trial of the WCST according to how many sorts they believe they got correct. It was proposed that as insight improves, accuracy of self-monitoring would also improve, as demonstrated by a significant positive correlation between insight and accuracy of self-monitoring.

CHAPTER 3

METHODOLOGY

Participants

Thirty-six participants with either schizophrenia or schizoaffective disorder were recruited from an outpatient university affiliated behavioral health treatment center in a Midwest metropolitan area.

Of the 36 participants, 28 met diagnostic criteria for schizophrenia and 8 met criteria for schizoaffective disorder, as confirmed by the Structured Clinical Interview for DSM Disorders (SCID; First, Spitzer, Gibbon, & Williams, 1996). There were no significant differences between diagnostic groups on psychiatric symptoms (BPRS-E), depression (HAM-D), clinical insight (SUMD), cognitive insight (SSTICS), or the standard and dynamic WCST. The mean age was 44.56 years (SD = 9.07). Approximately 33% of the sample was female, and 61% of the sample were African Americans, 22% were Caucasians, 6% were multiracial, 3% were Hispanic, and 8% identified as belonging to another racial group. Further demographic information is presented in Table 1. Table 2 presents demographics within each learner group.

Procedures

Eligible participants were recruited at the behavioral health center where they received treatment through client and case manager meeting announcements and through distribution of flyers to case managers. Once a potential participant completed an interest form flyer, the researchers contacted and screened the participants for eligibility. Potential participants were excluded if they endorsed any of the following: co-morbidities that would affect cognition (e.g., mental retardation), significant physical co-morbidities that could

affect task performance (e.g., deafness), substance abuse within the past 30 days, or gross neurological conditions (e.g., traumatic brain injury, neurological illnesses, and stroke). If eligible and interested, participants were scheduled for the informed consent and testing. All testing occurred in small, private rooms at the Truman Behavioral Health centers. Each session began with informed consent procedures, in which the researcher explained the consent form, obtained a signature from the individual, and provided a copy of the documents. Participants with legal guardians were able to participate if their guardian provided written informed consent. If a participant was unable to provide consent or demonstrated a substantial lack of understanding of the procedures, the participant was reimbursed and testing was discontinued. This occurred for three individuals. On average, the testing required three to five hours of the participant's time. In order to address possible participant fatigue, testing was completed over two separate sessions and participants were encouraged to take as many breaks as needed. Upon completion of the study, participants were given thirty dollars as compensation for their time.

Measures

Demographics. Upon completion of the consent forms, a brief demographics and life satisfaction questionnaire were administered to the participants. After completing the demographics, the researcher administered the remaining symptom interviews, self-report measures, and cognitive measures.

Table 1

Sample Demographics

Characteristic		*N* (%)
Age		44.56 ± 9.07
Gender		
	Female	12 (33%)
	Male	24 (67%)
Ethnicity		
	African American	22 (61%)
	Caucasian	8 (22%)
	Hispanic	1 (3%)
	Multi-racial	2 (6%)
	Other	3 (8%)
Diagnosis		
	Schizophrenia	28 (78%)
	Schizoaffective	8 (22%)
Highest Education		
	< GED/Some HS	7 (19%)
	GED/HS Diploma	16 (44%)
	Post High School, not college	1 (3%)
	Some college	11 (31%)
	College degree	1 (3%)
Marital Status		
	Never married	23 (64%)
	Divorced/Separated	10 (28%)
	Married	2 (6%)
	Common Law	1 (3%)
Living Status		
	Supervised living	13 (36%)
	Independent Living	21 (58%)
	Emergency Shelter	1 (3%)
	Homeless	1 (3%)
Employment		
	Yes	3 (8%)
	No	33 (92%)
Volunteering		
	Yes	15 (42%)
	No	21 (58%)

Table 2
Sample Demographics by Learner Group

Characteristic	*N* (%)	High Performer (10)	Learner (5)	Non-Learner (20)
Age		43.40 ± 9.73	45.00 ±13.15	44.90 ±8.31
Gender				
	Male	7 (70%)	4 (80%)	12 (60%)
	Female	3 (30%)	1 (20%)	8 (40%)
Ethnicity				
	African American	5 (50%)	3 (60%)	13 (65%)
	Caucasian	2 (20%)	2 (40%)	4 (20%)
	Hispanic	0	0	1 (5%)
	Multi-racial	1 (10%)	0	1 (5%)
	Other	2 (20%)	0	1 (5%)
Diagnosis				
	Schizophrenia	7 (70%)	3 (60%)	17 (85%)
	Schizoaffective	3 (30%)	2 (40%)	3 (15%)
Education				
	< GED/Some HS	2 (20%)	3 (60%)	1 (5%)
	GED/HS Diploma	4 (40%)	0	12 (60%)
	> High School, not college	0	0	1 (5%)
	Some college	3 (30%)	2 (40%)	6 (30%)
	College degree	1 (10%)	0	0
Marital Status				
	Never married	7 (70%)	3 (60%)	12 (60%)
	Divorced/Separated	2 (20%)	2 (40%)	6 (30%)
	Married	1 (10%)	0	1 (5%)
	Common Law	0	0	1 (5%)
Living Status				
	Supervised living	3 (30%)	3 (60%)	7 (35%)
	Independent Living	5 (50%)	2 (40%)	13 (65%)
	Emergency Shelter	1 (10%)	0	0
	Homeless	1 (10%)	0	0
Employment				
	Yes	2 (20%)	0	1 (5%)
	No	8 (80%)	5 (100%)	19 (95%)
Volunteering				
	Yes	4 (40%)	3 (60%)	14 (70%)
	No	6 (60%)	2 (40%)	6 (30%)
WCST	Naïve	7 (70%)	3 (60%)	13 (65%)
	Non-Naive	3 (30%)	2 (40%)	7 (35%)

Cognitive Assessments

A cognitive battery was administered that included measures of attention/concentration (d2 Test of Attention; D2), processing speed (The Trail Making Test A; TMT A), working memory (The Trail Making Test B, TMT B; Letter-Number Sequencing from the Wechsler Adult Intelligence Scale-3rd Edition, LNS; Controlled Oral Word Association Test, COWAT), verbal memory (California Verbal Learning Test-Second Edition; CVLT-II), EF (TMT B and WCST-64), pre-morbid IQ (Wide Range Achievement Test-4; WRAT-4), and verbal fluency (COWAT). Means, standard deviations, and ranges for the primary variables of interest are presented in Table 2.

EF: Wisconsin Card Sorting Test. As previously stated, the WCST is a commonly used measure of EF and is perhaps the most widely used measure of EF within people with schizophrenia (Reichenberg & Harvey, 2007). More specifically, research has suggested the WCST assesses components of EF, such as set shifting, abstraction, problem solving, perseveration, mental flexibility, and response maintenance (Greve et al., 2005; Polgár et al., 2010; Savla et al., 2012). The reliability and validity of the 64 card version of the WCST has been established within numerous populations, including people with schizophrenia (Kongs et al., 2000).

This study used the 64 card version of the WCST and the dynamic protocol developed by Wiedl (1999), which was discussed previously. In this protocol, the researcher administered three trials of the WCST in one session. The first and third trials were administered in the standard format; in the second trial the researcher explained the three sorting rules of color, shape, and number, and provided detailed feedback for each correct and incorrect sort (i.e. “That’s correct. You sorted by color and color is the correct sorting

category." or "That's incorrect. We don't sort for color now but for shape or number."). Further, researchers instructed the participant as to when a sorting rule changed.

Using the dynamic protocol, Wiedl (1999) also developed three learner categories (learners, non-learners, and high performers) according to the modifiability of the participants' performance. The algorithm for learner classification was determined by using the internal consistency of the WCST to predict hypothetical parallel test scores using linear regression. The parallel scores were then compared to actual post-test scores. The standard error of this prediction was then used to determine a confidence interval at which substantial change in score is considered to have occurred (Wiedl, 1999). According to this algorithm, participants were classified as learners if they improved by 15 correct sorts from trial 1 to trial 3. Due to ceiling effects, participants were classified as high performers if they achieved 43 or more correct sorts on trials one and three. A non-learner was anybody who did not improve by 15 correct sorts from trial one to three and did not obtain 43 or more correct sorts on any trial. In a longitudinal review of learner status indices, this categorical approach was among the most stable approaches at a 12 month follow-up ($r = .41$, $p < 0.001$; Weingartz et al., 2008). In addition, simple post-test scores have also shown good stability in longitudinal studies (Weingartz et al.).

In addition to the categorical learner status, non-categorical variables for change in performance were evaluated. Specifically, a gain ratio was calculated based on the formula developed by Sergi et al. (2005). This gain ratio was the ratio of actual gain over maximum possible gain [i.e., (Block 3 - Block 1)/58]. The maximum gain score of 58 was determined on a hypothetical perfect performance in which the participant's only incorrect sorts are when the categories change unannounced (i.e., 64 cards – 6 changes in category = 58 total

correct). The researcher also explored a percentage gain score. Percentage gain score was calculated by dividing the total correct gain score (Block 3 – Block 1) by the block 1 total correct. This was then multiplied by 100 to achieve a percentage gain score. The final learning potential variable used in this study was the optimized performance variable, which is the total correct on trial three. Much like the categorical learner index, this variable has demonstrated high stability and validity in longitudinal studies on learning potential (Weingartz et al., 2008).

Other variables of interest for the WCST were total correct and perseverative errors for both the standard (trial 1) and dynamic (trial 3) WCST. Total correct is simply the number of correct sorts out of 64. Perseverative errors are incorrect sorting errors in which the participant sorted according to a previous sorting rule that is no longer being reinforced. This variable has been consistently used in EF and insight research, with 25 of the 28 studies within a meta-analysis using this variable (Cooke et al., 2005).

Estimated Intellectual Achievement: Wide Range Achievement Test. The reading subtest of the Wide Range Achievement Test-4 (WRAT-4; Wilkinson & Robertson, 2006) was used as a proxy for pre-morbid intellectual abilities. Because reading is considered to be a more stable cognitive domain to cognitive decline, this test was proposed as a valid estimate of pre-morbid IQ. It is an ideal assessment for both its ease of administration and brevity, as it takes approximately five to ten minutes to administer. This variable was used descriptively.

Assessments of Insight

Clinical Insight: Scale to Assess Unawareness of Mental Disorder. One of the most widely used insight measures is the Scale to Assess Unawareness of Mental Disorder (SUMD; Amador et al., 1993; Amador et al., 1994). In this study, an abbreviated version of the SUMD, as published by Amador et al. (1994) was used. This version of the clinician administered, semi-structured interview includes the assessment of current awareness of having a mental disorder, effect of medications, social consequences of the disorder, hallucinations, delusions, thought disorder, flat/blunt affect, anhedonia, and asociality (see Appendix A).

For each symptom cluster the participant endorses, the interviewer rates the participant as being "aware," "somewhat Aware/Unaware," or "severely unaware," ranging from one to three respectively. If the participant is not experiencing a symptom cluster then it is rated as not applicable and scored as a zero. On this measure, high scores suggest poorer clinical insight. However, due to the scoring only relevant items, a simple total of the SUMD reflects primarily the amount of symptoms endorsed as opposed to the person's clinical insight. Therefore, this study used three SUMD aggregates: a simple total of items (SUMD-ttl), a total for the first three items (SUMD-3), and an individual SUMD average (SUMD-avg). The SUMD-3 includes three items that are completed by all participants regardless of symptoms. They are conceptualized as basic insight and include awareness of a mental disorder, awareness of consequences of disorder, and awareness of effects of medication. The SUMD-avg is a persons raw total divided by the number of SUMD items completed. This method corrects for artificial inflation in SUMD scores for persons presenting with greater symptoms.

Several reviews have demonstrated good convergent validity for the SUMD, in that it demonstrated significant correlations with other insight measures (Cuesta et al., 2000; Kemp & Lambert, 1995; Lincoln et al., 2007). In contrast, the past awareness factors of the SUMD appear to have small to insignificant correlations with other insight measures (Cuesta et al., 2000). This is worth noting, but it should be considered cautiously, because by definition the past insight factor of the SUMD is measuring a different construct than the comparison measures, which only focus on current insight. The SUMD has demonstrated acceptable reliability with one independent study reporting intraclass correlations ranging from strong (current awareness subscale, $r = 0.90$) to moderate (past attribution, $r = 0.52$).

In one meta-analysis, Aleman, et al. (2006) compared the relationships between cognition factors and four widely used insight measures, the insight item from the PANSS, the Schedule for the Assessment of Insight, the Insight and Treatment Attitude Questionnaire, and the SUMD. Although all four scales were significantly correlated with general cognition, only the SAI and SUMD were significantly correlated with the WCST ($r = 0.14$ and $r = 0.28$, respectively). In addition, the current author's review of insight and the WCST revealed that of the 15 studies reporting significant results, eight used the SUMD, while four of the 12 non-significant studies used other insight scales. Cumulatively, this suggests the SUMD as an ideal multi-dimensional and valid assessment of insight for this study.

Cognitive Insight: Subjective Scale to Investigate Cognition in Schizophrenia. The Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS; Stip et al., 2003) was used to assess subjective cognitive complaints or cognitive insight. This 21-item measure assesses difficulties in the cognitive domains of working memory, long term

memory, attention, language, and praxia (see Appendix B). For each item, the participant indicates the frequency with which they have trouble with everyday cognitive tasks, such as remembering a grocery list, finding words, or coordinating chores and tasks. The measure is based on a Likert-type scale ranging from zero (never) to four (very often). For this study, the total score and the SSTICS subscales of sustained executive function, consciousness of effort, and distractibility were used. One of the strengths of this measure is the accessibility of the language and concepts, as the questions are worded simply and are related to everyday tasks. This characteristic likely makes the measure more valid in a population that has demonstrated difficulties with abstract, but not concrete, thinking. Other strengths of the measure are its brevity and ease of administration.

Insight into Performance: Self-Monitoring Accuracy. Self-monitoring, or the person's ability to accurately assess their performance on a neuropsychological assessment, was an exploratory variable of interest in this study. This variable was assessed in a portion of the participants (N = 12), through a simple question after each trial of the WCST: "You just sorted 64 cards. How many of those 64 sorts do you think you got correct?" For this self-monitoring variable, the participant's estimated correct (X) was subtracted from the actual number of correct responses (Y). This was repeated for all three trials of the test. Then, the absolute value of this difference was summed across the three trials to provide a continuous variable of self-monitoring accuracy, such that lower numbers demonstrate greater accuracy and higher numbers demonstrate poorer accuracy. See formula below.

X = Participant's estimate of number correct

Y = Actual number correct

$Z_{D1,\ 2,\ or\ 3}$ = Inaccuracy for each trial (d1 = trial 1, d2 = trial 2, d3 = trial 3)

I_{SA} = Self-Accuracy Insight; sum of the accuracy of self-monitoring across trials

Step One: $Y - X = Z_D$

Step Two: $|Z_{D1}| + |Z_{D2}| + |Z_{D3}| = I_{SA}$

Assessments of Symptoms

Depression: Hamilton Depression Rating Scale. Depressive symptoms were assessed with the widely used Hamilton Rating Scale for Depression (HAM-D; Hamilton, 1967). The HAM-D contains 23 items, which assess multiple symptoms of depression, including suicidality, sleep disturbances, anxiety, helplessness, inappropriate guilt, and anhedonia.

Symptoms: Brief Psychiatric Rating Scale-Expanded. The Brief Psychiatric Rating Scale-Expanded (BPRS-E; Lukoff, Nuechterlein, & Ventura, 1986) was used to assess current symptomatology. The BPRS-E is a brief, semi-structured clinical interview in which participants are rated on various symptom domains. The Likert-type rating scale ranges from “not present” (0) to “extremely severe” (7). Some items, such as motor retardation, tension, affective flattening, posturing, uncooperativeness, and emotional withdrawal were based on clinical observation. In contrast, ratings of conceptual disorganization, bizarre thought content, anxiety, guilt, depressed mood, hostility, somatic concern, hallucinations, and suspiciousness were rated according to the researcher’s assessment of the participant’s self-report.

Table 3

Means, Standard Deviations, and Ranges for Primary Variables of Interest

Variable	Mean	±SD	(range)
SUMD- Total	8.71	±3.70	(3-17)
SUMD- 3	4.11	±1.41	(3-8)
Awareness	1.28	±0.57	(1-3)
Consequences	1.50	±0.70	(1-3)
Medication	1.33	±0.63	(1-3)
SUMD- Avg	1.60	±0.48	(1-2.67)
SSTICS Total	32.28	±13.31	(4-54)
Consciousness of Effort	7.31	±3.30	(2-15)
Distractibility	4.92	±2.48	(0-11)
Sustained EF	6.42	±3.50	(0-14)
Memory for Information	5.47	±2.91	(0-12)
WRAT- Reading Subtest	48.58	±11.94	(24-67)
HAM-D	16.34	±10.18	(1.66-36.71)
BPRS-E Total	47.58	±10.75	(31-73)
Positive	13.64	±6.16	(5-31)
Negative	5.64	±2.70	(3-12)
WCST			
Total Correct, Block 1	39.34	±9.40	(16-56)
Perseverative Errors, Block 1	13.37	±6.83	(4-32)
Conc. Level Resp., Block 1	31.37	±13.22	(5-56)
Total Correct, Block 3	45.83	±10.24	(22-59)
Perseverative Errors, Block 3	9.63	±5.71	(3-24)
Conc. Level Resp., Block 3	39.60	±15.62	(6-59)
Gain	6.49	±10.08	(-14-24)
Sergi Gain	.11	±0.17	(-.24-.41)
Percent Gain	21.04	±32.49	(-33.33-92)

Note. SUMD Total= Summed total for all SUMD items, SUMD-3 = Total for first 3 items, SUMD Average = SUMD score divided by number of items completed. SSTICS Total = Sum of SSTICS items, WCST = Wisconsin Card Sorting Test, Block 1 = standard format, Block 3 = dynamic format, Conc. Level Resp. = Conceptual Level Responses,

CHAPTER 4

RESULTS

Data Screening

The data were screened for normality. The WCST perseverative errors variables on both blocks one and three were positively skewed, but this skewness did not meet significance according to the small sample guidelines of a z-score of 2.58 (Field, 2005, p. 72). Therefore, no transformations were performed on the data. No other assumptions were violated. Due to the low sample size, reduced power, and exploratory nature of some of the hypotheses, significance values of $p < .10$ will be explored as trends.

One participant was identified as an outlier on the WCST. This assessment was made based on behavioral observation of questionable effort during testing and statistical analysis of z scores (e.g., perseverative errors on WCST block 1 identified participant as outlier; Field, 2005, p. 76-78). Thus, this participant's WCST data were removed.

Aim One: Insight and Dynamic Assessment

Hypothesis One: Predictors of Insight. In order to investigate the relationship between insight and EF, bivariate correlations were completed between the SUMD and the WCST variables. Specifically, the SUMD variables of interest were total SUMD score (SUMD Total), SUMD basic insight (sum of first three items; SUMD-3), and a SUMD average score (SUMD-Avg; sum of SUMD items for individual, divided by the number of items that individual completed). For the WCST, variables of interest were total correct, perseverative errors, and conceptual level responses on both trials 1 and 3 of the WCST. It was predicted that both the standard (trial 1) and dynamic (trial 3) WCST would be significantly related to the SUMD, and the dynamic WCST variables would exhibit stronger

correlations with insight than would the standard WCST. Table 4 displays the results for the correlations between the SUMD and WCST. In brief, the SUMD was not significantly correlated with any of the WCST variables at $\alpha = .05$ significance level. Further, in order to minimize type II errors for this small, initial study of learning potential and insight, correlations were examined if they reached significance at the more liberal level of $\alpha = .10$. There were several correlations that trended towards significance, including the correlations between the WCST trial 1 conceptual level responses and both the SUMD-Avg, $r = .322$, $p < .10$, and SUMD Total, $r = .297$, $p < .10$, and between the WCST trial 1 total correct and SUMD-Avg, $r = .288$, $p < .10$, and the SUMD Total, $r = .288$, $p < .10$. The direction of these correlations can be interpreted to mean that as clinical insight decreases, correct sorts and conceptual level responses increased on trial one of the WCST.

For the second step of this hypothesis, it was proposed that the WCST-d would be a stronger predictor of insight than the standard WCST. This prediction was tested using hierarchical regression, with the SUMD as the criterion or dependent variable. The standard WCST variable (perseverative errors) was entered first as a predictor, as previous research has suggested it predicts a significant amount of variance in insight. Then, the dynamic WCST variable (perseverative errors) was entered in the next block to determine if it was a significant predictor of insight above and beyond the standard WCST. The R^2 change statistic was investigated to determine whether the changes in the model (i.e. additions of each new predictor) significantly improve the amount of variance predicted. This model was also repeated for the WCST variables of total correct and conceptual level responses. The regression models were not significant. In sum, neither the correlations nor the regressions for hypothesis one reached significance; thus, there was a failure to reject the null hypothesis.

Previous literature (Startup, 1996) has supported a curvilinear relationship between insight and neurocogniton, such that those with low and high insight demonstrated average neurocognitive abilities, while persons with moderate insight had impaired cognition. Following methods detailed by Startup, the WCST-d variables were treated as the dependent variables and insight was treated as the predictor variables. Insight score was entered in the first step, and the square of the insight scores was entered for the second step. This was tested independently for two of the insight variables (SUMD-3 and SUMD-Avg) and WCST variables (i.e., total correct, perseverative errors, and conceptual level responses). There was no evidence of a curvilinear relationship between insight and the WCST.

Table 4

Correlations to SUMD for both Static and Dynamic Versions of the WCST.

Variable	SUMD Total	SUMD-3	SUMD Average
WCST TC, Block 1	.288[+]	.203	.288[+]
WCST PE, Block 1	-.078	-.011	-.069
WCST CR, Block 1	.297[+]	.260	.322[+]
WCST TC, Block 3	.112	.214	.092
WCST PE, Block 3	-.139	-.207	-.112
WCST CR, Block 3	.132	.243	.113
WCST Gain	-.155	.029	-.175
WCST Sergi Gain	-.155	.029	-.175
WCST Percent Gain	-.135	.039	-.109

Note. Intercorrelations for SUMD and WCST variables (n = 35). WCST = Wisconsin Card Sorting Test, TC = Total Correct, PE = Perseverative Errors, CR = Conceptual Level Responses, SUMD-3 = Total for first 3 items, SUMD Average = SUMD score divided by number of items completed.
[+] = Significance at $p < .10$.

Hypothesis Two: Insight and Learner Status. For hypothesis two, it was predicted that insight (SUMD scores) would differ as a function of learner status (high scorers, learners, and non-learners), with high scorers and learners reporting more accurate insight than the non-learners. This was tested using analyses of variance (ANOVA) to analyze group differences on the SUMD between three groups: high scorers, learners, and non-learners. Three separate ANOVAs were completed to compare the learner status groups on each of the SUMD score aggregates. The dependent variables were the SUMD scores (SUMD Total, SUMD-3, SUMD-Avg), while the independent variable was the learner groups.

Ten participants were identified as high performers, 5 were learners, and 20 were non-learners. There was not a significant difference between learner groups on SUMD total insight $F(2, 32) = .804$, $p = .457$. Next, the high performer and learner groups were combined and compared to the non-learners on the SUMD (total insight, average, and basic insight) using an independent samples *t*-test. This resulted in 15 high performers/learners and 20 non-learners. There were no significant differences between the two learner groups on SUMD total, $t(33) = 1.28$, $p = .21$, SUMD-Avg, $t(33) = 1.32$, $p = .20$, or SUMD-3, $t(33) = 1.27$, $p = .21$. Therefore, hypothesis two was not supported; there was not a significant difference between high performers/learners and non-learners in insight. Bivariate correlations were computed to further explore this relationship. The correlations between the SUMD and WCST-d variables were not significant. However, the correlations between the SUMD-Avg and WCST-d gain score were in the expected direction, $r = -.175$, $p = .31$, such that higher gain scores were associated with better clinical insight.

Aim Two: Investigating Insight into Cognition

Hypothesis Three: Relationship among Clinical Insight, Cognitive Insight, and EF. In order to investigate the relationships among clinical insight, cognitive insight, and EF, bivariate correlations were completed. For cognitive insight, the overall score of the SSTICS was used. Additional analyses were also completed using the SSTICS subscales of consciousness of effort, distractibility, and sustained EF (Stip et al., 2003). Clinical insight variables included the SUMD Total, basic insight score (SUMD-3), and the individual average score (SUMD-Avg). For the WCST, total correct, perseverative errors, and conceptual level responses on both the standard and dynamic versions of the WCST were used. It was predicted that both the standard and dynamic WCST would be significantly related to the SSTICS, but the dynamic WCST would be more strongly correlated to cognitive insight than would the standard WCST.

As demonstrated in Table 5, this hypothesis was not supported. There was a significant correlation between WCST-d perseverative errors and the SSTICS subscale of consciousness of effort, $r = -.355$, $p < .05$, meaning that individuals who committed more perseverative errors on trial 3 of the WCST reported fewer problems with memory and multitasking. At the $\alpha = .10$ level, there were several significant correlations. The WCST-d perseverative errors was correlated with both the SSTICS total, $r = -.298$, $p < .10$, and the SSTICS Distractibility scale, $r = -.295$, $p < .10$; persons with greater perseverative errors reported fewer cognitive difficulties. In addition, WCST-d total correct also demonstrated a marginal correlation with the SSTICS subscale of consciousness of effort, $r = .327$, $p < .10$. Persons who reported greater cognitive difficulties also performed a greater number of correct sorts on the WCST-d.

Correlations between the SUMD and SSTICS were also explored. The SUMD-Avg score was significantly correlated with the SSTICS subscale of sustained EF, $r = -.379$, $p < .05$, such that persons who reported greater sustained EF difficulties were rated as having more intact insight. In addition, the correlation between the SUMD-Avg and SSTICS total trended towards significance, $r = -.294$, $p < .10$, such that persons with poorer insight reported fewer cognitive difficulties.

Table 5

Correlations to SSTICS for both Static and Dynamic Versions of the WCST.

Variable	SSTICS Total	SSTICS Consc.	SSTICS Distract.	SSTICS Sust. EF
WCST TC, Block 1	.127	.213	.216	.058
WCST PE, Block 1	-.127	-.170	-.182	-.092
WCST TC, Block 3	.249	.327^{+}	.262	.178
WCST PE, Block 3	-.298^{+}	-.355*	-.295^{+}	-.218
WCST Gain	.134	.133	.064	.126
WCST Sergi Gain	.134	.133	.064	.126
WCST Percent Gain	.045	.055	-.024	.022
SUMD Total	-.002	.204	.022	-.145
SUMD-3	-.267	-.020	-.226	-.317^{+}
SUMD Average	-.294^{+}	-.058	-.250	-.379*

Note. WCST = Wisconsin Card Sorting Test, TC = Total Correct, PE = Perseverative Errors, SUMD-3 = Total for first 3 items, SUMD Average = SUMD score divided by number of items completed, SSTICS Total = Sum of SSTICS items, SSTICS Consc. = SSTICS subscale consciousness of effort, SSTICS Distract. = SSTICS Distractibility, SSTICS Sust. EF = SSTICS subscale of sustained executive function.

* = Significance at $p < .05$. $^{+}$ = Significance at $p < .10$.

Hypothesis Four: Cognitive Insight and Learner Status. Hypothesis four predicted that cognitive insight would differ according to the WCST learner groups, such that high scorers and learners would report fewer cognitive difficulties than the non-learners. This was tested using an analysis of variance (ANOVA) to analyze group differences on the SSTICS between three groups: high scorers, learners, and non-learners. The dependent variable was the SSTICS total score, while the independent variable was the learner groups. SSTICS subscale scores were also explored.

Ten participants were identified as high performers, 5 were learners, and 20 were non-learners. There was not a significant difference between learner groups on SSTICS total insight $F(2, 32) = .67$, $p = .52$. Next, the high performer and learner groups were combined and compared to the non-learners on the SSTICS (total and subscales) using an independent samples *t*-test. This resulted in 15 high performers/learners and 20 non-learners. On average, high performers/learners reported more cognitive difficulties ($M = 35.88$, $SE = 2.76$) than did non-learners ($M = 30.80$, $SE = 3.15$). However, this difference between learner groups was not significant, $t(33) = 1.17$, $p = .25$. In addition, there were no significant differences between learner groups on any of the SSTICS subscales. Thus, hypothesis four was not supported: there was not a significant difference between high performers/learners and non-learners in cognitive insight.

As an extension of the correlational findings between the WCST-d and SSTICS, a mean split was performed on the WCST-d perseverative errors and total correct. Independent *t* tests revealed a significant difference between persons with above average and below average WCST-d perseverative errors on the SSTICS total, $t(33) = 2.05$, $p < .05$, and SSTICS memory for information, $t(33) = 2.63$, $p < .05$. Both differences indicated that

people with fewer perseverative errors on the WCST-d reported more cognitive difficulties than persons with greater perseverative errors. For the mean split of WCST-d total correct, there was a trend towards a significant difference between high and low performers on the SSTICS Memory for information scale, $t(33) = 1.91$, $p < .10$. People who performed better on WCST-d reported more memory difficulties than did persons who performed poorly on the WCST-d.

Exploratory Analyses

Exploratory Analyses One: Insight, Symptoms, and Cognition. Exploratory analyses were performed to investigate the relationship between insight, symptoms, and cognition. Depression, as measured by the HAM-D was not significantly correlated to any of the SUMD insight scores. The HAM-D was significantly correlated with the SSTICS total score, $r = .390$, $p < .05$, such that persons who reported greater depression symptoms also reported greater cognitive difficulties. Further correlations are displayed in Table 6. The HAM-D was not significantly correlated with any of the cognitive variables, including the standard and dynamic WCST variables. In addition, there was no evidence of a curvilinear relationship between the HAM-D and insight (SUMD-3 and SUMD-Avg).

General psychiatric symptoms were assessed using the BPRS-E, which was significantly correlated with the SUMD-Avg, $r = .339$, $p < .05$, suggesting that the more symptoms a person experiences, the less insight they exhibit. The BPRS-E was not significantly correlated to the SUMD-3, which is the sum of the first three SUMD items of awareness of illness, consequences of illness, and effects of medications.

The BPRS-E positive and negative symptom clusters were also investigated. The positive symptoms cluster, which includes grandiosity, hallucinations, suspiciousness,

conceptual disorganization, and unusual thought content (i.e. delusions), exhibited significant correlations with the SUMD and a subscale of the SSTICS. Specifically, positive symptoms were significantly correlated with the SUMD average, $r = .477$, $p < .01$ and the SUMD-3, $r = .387$, $p < .05$. These correlations suggest that the more positive symptoms a person experiences, the less insight they exhibit. The BPRS-E positive scale was also significantly associated with the SSTICS Consciousness of Effort scale, $r = .462$, $p < .01$, suggesting that as positive symptoms increase, so too does a person's report of cognitive difficulties on a subset of SSTICS items. The negative symptoms cluster did not exhibit any significant associations with clinical or cognitive insight.

Unlike previous research (Clark et al., 2010; Savla et al., 2012), years of education was not significantly correlated to insight or EF variables. Pre-morbid estimated IQ, as assessed by the WRAT, was significantly correlated with several WCST variables, including trial 1 perseverative errors, $r = -.352$, $p < .05$, trial 3 total correct, $r = .519$, $p < .01$, and trial 3 perseverative errors, $r = -.501$, $p < .01$, such that higher performance on the WRAT was associated with better performance on the WCST. The WRAT was not significantly correlated to the SUMD nor most SSTICS variables, except for the SSTICS Consciousness of effort, $r = .479$, $p < .01$.

Due to these correlations, an ANOVA was performed to compare the learner groups on the WRAT. There was a trend towards significance, $F(2, 32) = 2.84$, $p = .07$, $\omega = .10$, indicating that as WRAT scores increased, learner status increased. Planned contrasts revealed that high performers had significantly higher WRAT scores (proxy for pre-morbid IQ) than did non-learners, $t(28) = 2.304$, $p < .05$. There were no significant differences between neither learners and non-learners, nor learners and high performers. The WRAT was

the only variable that differed between these two groups. In additional analyses, an independent samples *t*-test compared WRAT scores between those who performed above or below the mean on the WCST-d variables of perseverative errors and total correct. The WRAT was significantly different when participants were split according to the WCST-d total correct, $t(33) = 2.39$, $p < .05$, but not when participants were split according to WCST-d perseverative errors. Participants who performed better on the WCST-d total correct had higher estimated pre-morbid IQ (i.e. WRAT reading scores).

Previous literature has found age (Parellada et al., 2011; Wiffen et al., 2010) and gender (Parellada et al., 2011; Pruß et al., 2012) to be associated with clinical insight in that younger individuals had poorer insight and females demonstrated greater insight than males. Thus, these two demographic variables were explored within the insight and cognitive variables. Age was not significantly correlated with insight or cognitive variables. Independent *t*-tests revealed significant differences between males and females on the SUMD total, $t(34) = -2.09$, $p < .05$, SUMD-Avg, $t(34) = -3.12$, $p < .01$, and SUMD-3, $t(34) = -2.81$, $p < .01$, such that females were rated as having greater clinical insight than males. There were no gender differences on the SSTICS, WCST variables, or symptom variables (BPRS-E and HAM-D).

Table 6

Correlations of Symptoms to SUMD and SSTICS.

Variable	HAM-D Total	BPRS-E Total	BPRS-E Positive	BPRS-E Negative
SUMD-Ttl	.213	.587***	.619***	.157
SUMD-3	-.059	.214	.387*	-.237
SUMD-Avg	-.048	.339*	.477**	-.103
SSTICS Ttl	.390*	.376*	.246	.086
SSTICS Consc.	.192	.478**	.462**	.035
SSTICS Distract.	.363*	.394*	.294^{+}	-.035
SSTICS Sustained EF	.365*	.222	.144	.022
SSTICS Memory	.296^{+}	.325^{+}	.164	.263

Note. WCST = Wisconsin Card Sorting Test, TC = Total Correct, PE = Perseverative Errors, SUMD-3 = Total for first 3 items, SUMD Average = SUMD score divided by number of items completed, SSTICS Total = Sum of SSTICS items, SSTICS Consc. = SSTICS subscale consciousness of effort, SSTICS Distract. = SSTICS Distractibility, SSTICS Sustained EF = SSTICS subscale of sustained executive function, SSTICS Memory = Memory of information.

* = Significance at $p < .05$, ** = Significance at $p < .01$, *** = Significance at $p < .001$. $^{+}$ = Marginal Significance at $p < .10$.

Exploratory Analyses Two: Self-Monitoring. A portion of the participants (n = 12) were asked to complete a self-monitoring task, in which they guessed the number of correct sorts they completed on each WCST trial. To assess accuracy of self-monitoring, each estimate for their total correct was then subtracted from their actual performance. This was repeated on all three WCST trials, and the absolute value of the total correct minus guessed correct was summed. Thus, smaller self-monitoring numbers represented persons who were more accurate in their self-monitoring while larger numbers represented persons who were less accurate. Bivariate correlations were performed to investigate any relationships between self-monitoring accuracy and other variables. It was proposed that as insight improved, so too would accuracy of self-monitoring. This would be demonstrated by a significant positive correlation between insight and accuracy of self-monitoring.

In this sub-sample, self-monitoring accuracy was not significantly correlated with clinical insight (SUMD), cognitive insight (SSTICS), or symptoms (HAM-D and BPRS-E). Thus, the hypothesis was not supported. Self-monitoring accuracy was significantly correlated with concentration performance on the D2 test of attention, $r = -.597$, $p < .05$, such that persons with greater self-monitoring accuracy (lower self-monitoring scores) performed better on an attention task. In addition, there was a significant correlation between self-monitoring accuracy and total correct on both the standard, $r = -.599$, $p < .05$, and dynamic WCST, $r = -.632$, $p < .05$; more accurate self-monitors were significantly more likely to achieve more correct sorts on the WCST for both the standard and dynamic versions.

Additional Analyses: Comparing Intact vs. Poor Insight. In another exploratory analysis, participants were split according to insight into illness and compared across multiple variables. Specifically, a mean-split of the SUMD-Average was used to compare

those with intact versus impaired insight on the WCST. The same method was also used to split participants according to another insight variable aggregate, SUMD-3. For both analyses, there were no significant differences between groups of intact versus impaired insight on the WCST variables. These analyses were also completed for the SSTICS and the SSTICS subscales. For SUMD-Avg, SSTICS Total was significantly different between groups, $t(34) = 2.56$, $p < .05$, meaning that persons with more intact insight reported greater cognitive difficulties. The SSTICS subscales of Sustained EF ($t(34) = 2.63$, $p < .05$) and distractibility ($t(34) = 2.36$, $p < .05$) were also significantly different between persons with impaired versus intact insight. On both subscales, persons with intact insight reported greater cognitive difficulties than persons with more impaired insight.

CHAPTER 5

DISCUSSION

The purpose of the current study was to investigate the relationship between dynamic assessment of EF and clinical and cognitive insight in persons with schizophrenia and schizoaffective disorder. Previous research has established a relationship between clinical insight and EF (e.g., Lysaker et al., 2002; Simon et al., 2009; Yen et al., 2009), but the findings have been mixed (e.g., Cooke et al., 2005; Osatuke et al., 2008). The current author proposed that an EF task of flexibility, set-shifting, and abstraction, the WCST, would be correlated with insight, but a dynamic version of the same task (WCST-d) would be more strongly correlated with insight as it may be a more sensitive measure to the multidimensional relationship between insight and EF. In addition, the study sought to determine if patterns of insight varied according to a person's learner status as determined by the WCST-d (i.e. high performers, learners, and non-learners).

The first hypothesis investigated correlations among clinical insight, the standard WCST, and the WCST-d. The results yielded small to moderate effect size correlations suggesting that better performance on the standard WCST was associated with poorer insight. Although the current literature on clinical insight and the WCST is mixed (e.g., Cooke et al., 2005; Osatuke et al., 2008), most of the published findings report that impaired insight is associated with poorer WCST performance (e.g., Monteiro et al., 2008; Lysaker et al., 2002; Simon et al., 2009). Thus, the current findings were not consistent with current hypotheses or previous literature. There are several potential reasons for these contradictory findings, such as convenience sampling, ceiling effects, and limitations of the insight measure, which are discussed in more detail later. Additionally, the lack of significant

relationships between clinical insight and the WCST-d may suggest that the WCST-d is indeed measuring a different construct than the standard WCST (Wiedl et al., 2001), and this construct may not be related to clinical insight.

In contrast, cognitive insight was found to be significantly correlated with the WCST-d, but contrary to other research (Hake et al., 2007; Lysaker et al., 2002), cognitive insight was not related to the standard WCST. The findings suggest that people who do not respond well to the learning intervention are more likely to demonstrate impaired cognitive insight. It is consistent with the author-proposed theory that insight may be related to the constructs of metacognition, set-shifting, and cognitive flexibility, and the WCST-d may be more thoroughly assessing these constructs than the standard WCST. As such, persons who struggle with these cognitive skills may have greater difficulties accurately evaluating their abilities, and both of these impairments could serve as important intervention targets. Another conclusion based on the WCST findings is that the WCST and WCST-d are not equivalent assessments. The differing patterns of correlations between these two measures and other variables suggest that the WCST-d is indeed assessing different cognitive constructs (e.g., metacognition, learning ability, set-shifting, cognitive flexibility, and problem solving) than the standard WCST (e.g., Wiedl et al., 2004; Rempfer et al., 2006).

Additional analyses investigated the relationships among clinical and cognitive insight. Although previous research has not found significant correlations between clinical and cognitive insight (Lecardeur et al., 2009; Medalia & Thysen, 2010), this study found marginally significant correlations suggesting that suggesting that persons with poorer clinical insight reported fewer cognitive difficulties. In combination with other findings, the

results suggested that persons with poorer clinical insight tended to have both poorer cognitive insight and poorer neuropsychological performance on a dynamic task.

The findings on psychiatric symptoms and clinical insight were consistent with previous literature (Mintz et al., 2003; Wiffen et al. 2010), such that persons with greater psychiatric symptoms demonstrated poorer insight. Much like previous research (Wiffen et al.), positive symptoms were especially related to insight, demonstrating medium to large effect sizes. These findings provide continued support for theories suggesting that positive symptoms contribute to impaired clinical insight.

Interestingly, cognitive insight demonstrated different patterns of association with psychiatric variables, further suggesting that although cognitive and clinical insight are related, they remain independent constructs. For example, analyses suggested that persons with greater positive symptoms were more likely to report greater cognitive difficulties on one subscale than those with fewer positive symptoms. Although this finding is consistent with one study (Gillen et al., 2011), it seems to contradict other analyses and research, which suggest that with greater symptoms, especially neurocognitive symptoms, an individual's cognitive and clinical insight falters. While previous research has suggested that subjective reports by persons with schizophrenia are inaccurate, this does not appear to be a uniform characteristic. Therefore, and as suggested by this study and others (Bowie et al., 2007; Donohue et al., 2009; Hake et al., 2007; Jovanovski et al., 2007; Lysaker et al., 2002; Stip et al. 2003), researchers and clinicians should not disregard the subjective report of persons with schizophrenia as inaccurate. Rather, research should continue to work towards fine-tuning subjective measures in a way that may enhance a person's accuracy.

Overall, these findings suggest that cognitive and clinical insight are related, yet independent constructs, in that they demonstrated different patterns of relationships with other factors, such as EF, learning potential, symptoms, gender, and estimated intellectual abilities. For example, clinical insight was associated with a standard EF assessment, but not with a dynamic EF assessment, while the cognitive insight was only associated with the dynamic EF assessment. The intercorrelations between cognitive and clinical insight and the varying relationships of each with other variables suggests these two constructs share underlying mechanisms while also loading on independent mechanisms; they are simultaneously independent of, yet related to, each other. In addition, and as suggested by Gilleen et al. (2011), the variability in clinical and cognitive insight suggests that insight is not a singular mechanism in persons with schizophrenia. Rather, both may vary somewhat independently within each individual (Donohue et al., 2009; Lecardeur et al., 2009; Medalia & Thysen, 2010).

As another means of investigating learning potential and insight, other hypotheses (i.e. hypotheses two and four) proposed that clinical and cognitive insight would differ according to one's learner status on the WCST-d. It was theorized that those who could adapt their performance on the WCST-d according to feedback (i.e. high performers and learners) would be more aware of their cognitive difficulties and more likely to adapt, set-shift, and adjust their beliefs about their mental health according to feedback. No differences were found in insight between these categorical learner groups, but these analyses likely had reduced statistical power due to the small sample size and uneven learner groups. Thus, additional analyses explored this question using a mean split of WCST-d performance. Only

cognitive insight demonstrated significant group differences, such that people with better WCST-d performance reported greater cognitive difficulties.

These findings could be interpreted in several ways. First, one could grossly conclude that persons with schizophrenia are inaccurate at assessing their cognitive difficulties, which previous research has contended (Keefe et al., 2006; Medalia & Thysen, 2010; Prouteau et al., 2004). However, it could also be interpreted to mean that persons with better EF are more accurate at assessing their cognition than are persons with impaired EF, which has been supported by other researchers (Hake et al., 2007; Jovanovski et al., 2007; Lysaker et al., 2002; Medalia & Thysen, 2010; Voruganti et al., 2007). Interestingly, there were no group differences in cognitive insight when grouping was based on the standard WCST. As previously stated, this further supports that the standard WCST and WCST-d are not equivalent. Second, this suggests that persons who are responsive to learning feedback are more aware of their cognitive difficulties than persons who do not respond to feedback. In addition, it again suggests that inaccuracy in self-report is not a homogenous characteristic of persons with schizophrenia (Hake et al., 2007; Jovanovski et al., 2007; Lysaker et al., 2002; Medalia & Thysen, 2010; Murphy, 2009; Voruganti et al., 2007).

One potential factor related to the null findings when comparing learner groups on clinical and cognitive insight was that this sample contained a small proportion of learners. Within the learning potential research, there is not consensus on the frequency of learner subgroups within samples. Some research has reported that approximately one third of participants are usually identified as learners (e.g., Rempfer, Hamera, Brown, & Bothwell, 2006; Wiedl et al., 2001), while a larger study reported larger portions of learners (Waldorf,

Wiedl, & Schöttke, 2009). In the present sample, the learner group was smaller than anticipated, with 14% of the participants identified as learners.

Another potential issue with the learner comparison analyses was the necessary inclusion of high performers in the analyses. Some dynamic assessment research has suggested removing high performers from learner comparisons, because these participants are neuropsychologically unique in that they are performing within the normal range and are not exhibiting neurocognitive deficits that are present in the majority of persons with schizophrenia (Kurtz & Wexler, 2006; Rempfer et al., 2006; Wiedl et al., 2001). In this study, there were very few learners, and thus, there was not enough statistical power to detect a difference between learners and non-learners once the high performers were removed.

Self-monitoring was also explored in a portion of the sample and was found to be correlated with attention and both the standard and dynamic WCST in that better attention, standard WCST performance, and WCST-d performance were associated with more accurate self-monitoring. Since these analyses were completed in a very small sample, they must be interpreted cautiously, but the magnitude of these correlations was quite large for such a small sample (i.e., large effect sizes). As correlations, the causal nature of these relationships can only be theorized. Therefore, it remains unclear if attention is underlying the correlations between EF and self-monitoring, or if components of self-monitoring are underlying processes occurring in EF, attention, and learning. It is interesting to note that among the intercorrelations of attention, standard WCST, and WCST-d, the WCST-d and attention correlation reaches the largest magnitude of the three (i.e. a large effect size). However, if attention were primarily underlying the learning process then one would expect it to be significantly correlated with the WCST gain variables, and it was not. Another interesting

finding in this area is that the estimated intellectual ability measure, which was significantly correlated with attention and WCST-d, was not significantly correlated with self-monitoring.

This study did provide additional support for previous research suggesting a link between depression and cognitive insight (Gilleen, Greenwood, & David, 2011; Sabbag et al., 2012), such that greater depression was associated with greater cognitive complaints. This is consistent with literature in many different populations, including persons with multiple sclerosis, HIV, traumatic brain injury, substance abuse disorders, and serious mental illness (Bruce & Arnett, 2004; Chamelian & Feinstein, 2006; Horner, Harvey, & Denier, 1999; Lahr, Beblo, & Hartje, 2007; Woods et al., 2007). This finding suggests that depression, or even depressive realism, is likely contributing to the subjective reporting of cognitive difficulties in persons with schizophrenia.

In addition and as previously discussed, it must be considered that perhaps the constructs related to WCST-d performance are not relatable to clinical insight. This study, like some other research, found other variables to be related to insight, such as current psychiatric symptoms (e.g., Mintz et al., 2003; Osatuke et al. 2008), positive symptoms (e.g., Amador et al., 1994; Collins et al., 1997; Dickerson et al., 1997; Mintz et al., 2003), cognitive insight (e.g., Donohue et al., 2009), and gender (e.g., Parellada et al., 2011; Pruß et al., 2012). However, and in contrast to other research (e.g., Kruck et al., 2009; Lincoln et al., 2007; Mintz et al., 2003; Wiffen et al., 2010), clinical insight and depression were not related. Overall, this sample demonstrated expected relationships between clinical insight, demographic variables, and symptoms, but other correlations were in direct contrast to previous work (i.e. clinical insight and WCST relationship). These mixed findings could be due to a number of unknown factors, but some potential limitations are addressed below.

This study had several important limitations. First, the relatively small sample size likely resulted in underpowered analyses. Although the sample size is comparable to numerous published studies on insight (e.g., Gilleen et al., 2011; Jovanovski et al., 2007; Koren et al., 2004; Simon et al., 2009), this limitation significantly reduced the power to find significant results and could have yielded unstable effect size estimates. In addition, several hypotheses involved splitting the sample according to learner status, which further decreased statistical power. Even with this small sample size, there were several significant findings in both correlational and group comparisons. However, these findings should be viewed conservatively due to the power, sample size limitations, and risk of type I error.

The use of a convenience sample was an additional limitation. All of the participants were recruited from a metropolitan community mental health center. This limited the external validity of the results. In addition, this sampling method may have led to limited variability in clinical insight. Because all participants were recruited from an outpatient treatment program, they were enrolled in a treatment program, and thus, endorsing at least some awareness of mental health issues. Furthermore, most participants were active in a recovery-oriented treatment program, which provides services that promote understanding of mental health issues, consequences, medication, and symptom management. When comparing the current sample SUMD scores to a few published means (e.g., Díaz-Marsá, Sánchez, & Rico-Villademoros, 2009; Jovanovski et al., 2007; Marks et al., 2000), this sample was typically rated as having better insight; however, the range of variance on the SUMD between this study and others was small (+1.15 to -0.19). As discussed by Wiffen et al. (2010) this is a common limitation in insight research.

Although this study included many correlates of insight, it was not possible for this study to include all of the potential variables that may contribute to insight. For example, personality traits (e.g., Campos et al., 2011), internal stigma (e.g., Lysaker, Roe, & Yanos, 2007; Pruß et al., 2012), and duration of illness (e.g., Bayard, Capdevielle, Boulenger, & Raffard, 2009) have been proposed as contributing to insight, yet these variables were not assessed in the current study.

In addition, there are several concerns related to the SUMD as a clinical insight measure. First, it must be acknowledged that the SUMD ratings are a subjective opinion of raters, and although researchers were advanced clinical psychology students who completed interrater reliability exercises and brief training, the SUMD still is susceptible to subjective differences between evaluators. Another concern with the SUMD in this and many studies is that these insight ratings are based on a time-limited interaction with the individual. It could be argued that this does not provide enough depth of knowledge about the participant to adequately rate the multi-faceted construct of insight. Also, it could be argued that the nuances of clinical insight are a fluid and ever-changing variable for individuals, and thus, this insight assessment is but a cross-section of a person's clinical insight.

There are also potential limitations on how the SUMD is rated. First, on the SUMD, awareness of specific symptoms is only assessed if a participant endorses that symptom. This could be a concern in participants who are more guarded or paranoid, as they may be more likely to under-report symptoms or even insight, which then affects the SUMD ratings. Also, and as suggested by others (Agrawal et al., 1994), the SUMD relies on memory and recall which is a cognitive construct that is often impaired in persons with schizophrenia. Another concern is the SUMD is scored in a counterintuitive manner, such that *higher* scores

represent poorer insight, while *lower* scores represent more intact insight. This potentially increases the risk of misinterpretation, which was the case in one published study (Larøi et al., 2000). In this example, the authors erroneously interpreted a negative correlation between WCST perseverative errors and SUMD to mean that low insight was associated with low WCST performance, when in fact the correlation suggested that better performance on the WCST was associated with poorer insight, which is what the current study reported.

As pointed out in Johnson (2010), one major limitation of the SUMD is the presence of many different versions of the measure. The various versions of the SUMD lead to both confusion and inconsistency in the scales used for research, making cross-study comparisons challenging. For example, this study used an abbreviated SUMD version (Amador et al., 1994) for several reasons: it focuses only on present awareness as opposed to both past and present awareness, it fit time-limitations of the study, and it was the only published full version of the assessment. However, in this abbreviated version, the Likert-type scale for ratings is collapsed from five to three. This then reduces variability within each item and causes the conflation of awareness ratings (e.g., "somewhat aware/somewhat unaware" are combined in brief SUMD, while it is not in the five point Likert version). Perhaps more significant results would have been found with a broader rating scale that allows more variability.

The present results suggest several avenues of future research. First, dynamic assessment appears to make unique contributions to assessing EF constructs, such as set-shifting, mental flexibility, learning, and metacognition. Dynamic assessments also exhibited different patterns of associations to insight variables than standard EF assessments, further suggesting that dynamic assessments are measuring different constructs than standard

assessments (Hake et al., 2007; Wiedl et al., 2004). In addition, dynamic EF assessments appear to have better predictive power of both cognitive insight and self-monitoring, and therefore could prove useful for evaluating a person's abilities in learning, metacognition, and responsiveness to feedback. Further research should continue refining the proposed constructs assessed by dynamic assessment and should explore the role of dynamic assessment in insight. Related to dynamic assessment, future research should continue to examine the various methods of calculating learning potential. Current research has investigated different aggregates of learning potential (e.g., Fiszdon & Johannesen, 2010; Weingartz et al., 2008), and the null findings between learner groups in this study may suggest that continued refinement of learning potential categorization is needed.

Another future direction related to the present study is the need for refinements in both insight assessments and insight models. As previously discussed, there are numerous concerns with the SUMD as an insight measure, yet it is still one of the more thorough assessments of clinical insight. Throughout this document and numerous publications (Amador et al., 1994; Mintz et al., 2003; Osatuke et al., 2008), insight is described as a complex, multi-dimensional process that appears to evolve throughout a person's experience, yet most of the insight models explored in research are quite simplistic. Therefore, future research should use larger samples to explore more complex models of insight in persons with schizophrenia.

Appendix A

Scale to Assess Unawareness of Mental Disorder-Abridged
(Amador et al., 1994)

Directions: For each symptom item on the Unawareness Scale, it must first be ascertained that the subject has had the symptom during the time period being rated. Using the ratings you made earlier to determine this. Symptom ratings of 3 or higher are required. Circle the relevant items, then inquire as to the patient's awareness of it.

In order to evidence some awareness, the subject does not have to give precise attributions for symptoms. For example, "I hear voices because of the implant the researchers put in my brain" would constitute a "Somewhat Aware/Unaware" response.

In the current episode column, rate the highest level of awareness during the current exacerbation.

Rating Key:
Unk: UNKNOWN- There is inadequate information to assess.
0: NOT APPLICABLE- Item is not relevant
1: AWARE- Subject clearly believes that he or she has a mental disorder.
2: SOMEWHAT AWARE/UNAWARE- Subject is unsure about whether he or she has a mental disorder but can entertain the idea.
3: SEVERELY UNAWARE- Subject believes he or she does not have a mental disorder.

1. **Awareness of mental disorder:** In the most general terms, does the subject believe that he or she has a mental disorder?
2. **Awareness of the consequences of mental disorder:** What is the subject's belief regarding the reason(s) he or she has been unemployed, evicted hospitalized, etc.?
3. **Awareness of the effects of medication:** Does the subject believe that medications have diminished the severity of his or her symptoms (if applicable)?
4. **Awareness of hallucinatory experiences:** Does the subject believe that he or she experiences hallucinations as such? Rate his or her ability to interpret this experience as primarily hallucinatory.
5. **Awareness of delusions:** Does the subject believe that he or she experiences delusions as such, that is, as internally produced erroneous beliefs? Rate his or her awareness of the implausibility of the belief if applicable.
6. **Awareness of thought disorder:** Does the subject believe that his or her communications are disorganized?
7. **Awareness of flat or blunt affect:** Rate the subject's awareness of his or her affect as communicated by his or her expressions, voice, gestures, etc. Do not rate his or her evaluation of his or her mood.
8. **Awareness of anhedonia:** Is the subject aware that his or her behavior reflects an apparent decrease in experiencing pleasure while participating in activities normally associated with such feelings?
9. **Awareness of asociality:** Is the subject aware that he or she shows no interest in social relationships?

Appendix B

Subjective Scale to Investigate Cognition in Schizophrenia
(SSTICS; Stip et al., 2003)

0–Never 1–Rarely 2–Sometimes 3–Often 4–Very Often

1. Have you noticed any difficulty remembering things?

2. Do you have difficulty remembering information that is freshly received *and that must be used immediately*, such as a telephone number, an address, a room number, a bus route number or a doctor's name?

3. Do you have difficulty memorizing things, such as a grocery list or a list of names?

4. Do you have difficulty remembering the names of your medications?

5. Do you ever forget things, such as a date with a friend or a doctor's appointment?

6. Do you forget to take your medication?

7. Do you have difficulty remembering information that you read in the newspapers or hear on TV?

8. Do you have difficulty doing household chores or repairs? For example, do you ever forget how to cook things or what ingredients go into a recipe?

9. Do you have difficulty remembering how to get to the hospital or the outpatient clinic or even to your own place?

10. Do you have difficulty remembering the names of well-known people, such as the Prime Minister of Canada?

11. Do you have difficulty remembering national capitals, important dates in history, names of countries on other continents, or major scientific discoveries?

12. Are you absent-minded or up in the clouds? For example, you lose your train of thought in a
conversation because you are distracted or you have a hard time focusing on what you are reading?

13. Do you have difficulty being on the alert or reacting to unexpected situations? For example, a
fire alarm or a car that rushes by suddenly as you are crossing the street.

14. Do you have difficulty making out what's important when you are presented with different bits of information simultaneously? For example, the name of your medication or your next doctor's appointment while two people are talking about music nearby.

15. Are you unable to do two things at once? For example, memorize an address while making coffee, or count the money in your wallet while the pharmacist explains your medication to you.

16. Do you have trouble focusing your attention on the same thing for more than 20 minutes? For
example, at a conference or a book reading or during a lesson in a classroom.

17. Do you have difficulty planning out your activities as easily as you used to? For example, charting an itinerary for getting someplace, making a budget for the month, preparing meals, or making time for laundry.

18. Do you have difficulty coordinating your movements and actions of everyday life as easily
as you used to? For example, using the telephone, doing some shopping, running errands, preparing meals, doing housework, doing laundry, using transportation, doing home repairs.

19. Do you have difficulty changing your movements, decisions or ways of doing things if you are asked to do so *and you agree*? For example, you agree to do so but it is hard because it is no longer the same.

20. Do you have difficulty finding your words, forming sentences, understanding the meaning of
words, pronouncing words, or naming objects?

21. Do you have difficulty getting dressed or eating? For example, handling buttons, zippers, work tools, scissors, a fork, a key in a lock.

Subscales:

Sustained executive function: 16, 17, 18, 19

Memory of information: 7, 9, 10, 11

Consciousness of effort: 1, 3, 15, 20

Daily life: 2, 4, 5, 21

Distractibility: 8, 12, 14

Alertness: 13

Appendix C

Glossary of Terms

Acronym	Meaning
EF	Executive Function; A frontal lobe function, defined by Lezak, Howieson, and Loring (2004) as including four factors: "(1) volition, (2) planning, (3) purposive action, and (4) effective performance" (p. 611), which enables a person to successfully complete behaviors that are independent, purposeful, and self-serving.
WCST	Wisconsin Card Sorting Test; Traditional measure of executive function in which participants match cards according to different sorting rules while receiving minimal feedback on how to sort the cards. More specifically, WCST purported to measure cognitive domains of set-shifting, abstraction, mental flexibility, problem solving, etc.
WCST-d	Dynamic version of Wisconsin Card Sorting Test purported to measure "learning ability, cognitive modifiability, and rehabilitation potential" (Wiedl et al., 2001, p. 687). In this version of the assessment, the participant is given the test three times. In the first trial, the participant is given the standard WCST with minimal feedback. In the second trial, the participant is told more about how to match the cards (i.e., "you can sort by color, shape, or number"). The participant is also provided with detailed feedback after each sort, telling them whether it was right or wrong and why it was right or wrong. Participant is also told when the sorting rule changes. In the third trial, the test returns to the standard format in which the participant receives minimal feedback and instructions (i.e. "right" or "wrong").
High Performer	Learner categorization based on dynamic Wisconsin Card Sorting Test. These individuals consistently perform well on the WCST. They score $\geq$ 43 correct sorts on both trials one and three of the WCST.
Learner	Learner categorization based on dynamic Wisconsin Card Sorting Test. These individuals improve by at least 15 sorts from trials one to three, while also scoring < 43 on trial one.
Non-Learner	Learner categorization based on dynamic Wisconsin Card Sorting Test. These individuals score < 43 on trial one of the WCST, and they either improve by <15 or decline on trial three.
Cognitive Insight	Insight into or awareness of cognitive difficulties. In this study, cognitive insight was based on a person's self-reported cognitive difficulties.
Clinical Insight	Insight into or awareness of having a mental health diagnosis. Insight is viewed as being multi-faceted, in that there is insight into illness, consequences of illness, symptoms, medication, etc. Typically assessed using a clinician rated insight scale.
Metacognition	Cognitive construct simply viewed as thinking about thinking. Purported to include the abilities of monitoring and controlling one's

	behaviors and suggested to be independent of cognitive abilities.
SUMD	Scale to Assess Unawareness of Mental Disorder; Abbreviated version was used in this study. Clinician administered, semi-structured interview that assesses clinical insight in persons with a mental illness. The abbreviated version assesses current awareness of having a mental disorder, effect of medications, social consequences of the disorder, hallucinations, delusions, thought disorder, flat/blunt affect, anhedonia, and asociality. For each cluster, participants are rated as not applicable, "aware," "somewhat aware/unaware," or "severely unaware," with higher scores representing poorer clinical insight.
SUMD-ttl	Total of all completed items on SUMD. Because only the SUMD items relevant to a person's symptoms are scored, this simple total can misconstrue a person's clinical insight.
SUMD-3	Total of the first three items of the SUMD, which are completed by all participants regardless of their symptom reporting. These three items include awareness of having a mental health disorder, effectiveness of medications, and consequences of having a mental health disorder. This composite score is often used in previous literature as the insight score.
SUMD- Avg	SUMD score aggregate which calculates an individual average insight score by dividing the total score by the number of items completed. This method corrects for artificial inflation or deflation of insight scores for persons presenting with greater symptoms or fewer symptoms respectively.
SSTICS	Subjective Scale to Investigate Cognition in Schizophrenia; Twenty-one item questionnaire intended to assess awareness of cognitive difficulties in persons with schizophrenia.
Self-monitoring variable	An author developed variable to grossly assess a person's accuracy in self-monitoring, as it related to the WCST. Specifically, after each trial of the WCST a participant was asked, "You just sorted 64 cards. How many do you think you got correct." The participant's guess for each trial was then subtracted from the actual total correct. This was calculated for all three trials. Then, the absolute value of the three difference scores was summed to yield a single number representative of overall self-monitoring accuracy on the WCST. The scores were such that a high scores represents poor self-monitoring accuracy, while a low score represents better self-monitoring accuracy.
WCST TC	WCST Total Correct. Total correct sorts on WCST. Higher scores suggest better performance.
WCST PE	WCST Perseverative Errors. Errors on WCST in which the person continues to sort based on a previously correct sorting rule. The greater the score, the worse the WCST performance. WCST PE is suggested to assess perseveration and difficulties with task switching.
WCST CR	WCST Conceptual Level Responses. Percentage of correct consecutive sorts that occur in runs of three or more, suggesting that the individual figured out
Gain	Simple gain score on WCST-d, which is calculated by subtracting trial

	one total correct from trial three total correct. This provides the change in performance after the dynamic protocol has been administered.
Sergi Gain	A gain ratio score for the WCST-d that is computed based on a formula developed by Sergi et al. (2005). It is the ratio of actual gain over maximum possible gain [i.e., (Block 3 – Block 1)/58]. The maximum gain score of 58 was determined on a hypothetical perfect performance in which the participant's only incorrect sorts are when the categories change unannounced (i.e., 64 cards – 6 changes in category = 58 total correct).
Percent Gain	Another method of investigating the gain scores on the WCST-d. This score was calculated by dividing the total correct gain score (Block 3 – Block 1) by the block 1 total correct. Then, this number was multiplied by 100 to achieve a percentage gain score.

REFERENCES

Agrawal, S., Bhat, R. S., & Kuruvilla, K. (1994). Validity of the Scale to Assess Unawareness of Mental Disorder. *American Journal of Psychiatry, 151,* 1843.

Aleman, A., Agrawal, N., Morgan, K. D., & David, A. S. (2006). Insight in psychosis and neuropsychological function: Meta-analysis. *The British Journal Of Psychiatry, 189*(3), 204-212. doi:10.1192/bjp.189.3.204

Amador, X. (2006). Poor insight in schizophrenia: Overview and impact on medication compliance. Cnsnewsonline.com

Amador, X. F., Flaum, M., Andreason, N. C., Strauss, D. H., Yale, S. A., Clark, S. C., & Gorman, J. M. (1994). Awareness of illness in schizophrenia and schizoaffective and mood disorders. *Archives of General Psychiatry, 51,* 826-836.

Amador, X. F., Strauss, D. H., Yale, S. A., Flaum, M. M., Endicott, J., & Gorman, J. M. (1993). Assessment of insight in psychosis. *American Journal of Psychiatry, 150,* 873-879.

Amador, X. F., Strauss, D. H., Yale, S. A., & Gorman, J. M. (1991). Awareness of illness in schizophrenia. *Schizophrenia Bulletin, 17,* 113-132.

Arduini, L., Kalyvoka, A., Stratta, P., Rinaldi, O., Daneluzzo, E., & Rossi, A. (2003). Insight and neuropsychological function in patients with schizophrenia and bipolar disorder with psychotic features. *Canadian Journal of Psychiatry, 48,* 338-341.

Barrett, E. A., Sundet, K., Faerden, A., Agartz, I., Bratlien, U., Romm, K., & ... Melle, I. (2010). Suicidality in first episode psychosis is associated with insight and negative beliefs about psychosis. *Schizophrenia Research, 123*(2-3), 257-262. doi:10.1016/j.schres.2010.07.018

Bartkó, G., Herceg, I., & Zádor, G. (1988). Clinical symptomatology and drug compliance in schizophrenic patients. *Acta Psychiatrica Scandinavica, 77,* 74-76.

Bayard, S., Capdevielle, D., Boulenger, J., & Raffard, S. (2009). Dissociating self-reported cognitive complaint from clinical insight in schizophrenia. *European Psychiatry*, *24*(4), 251-258. doi:10.1016/j.eurpsy.2008.12.010

Bora, E., Sehitoglu, G., Aslier, M., Atabay, I., & Veznedaroglu, B. (2007). Theory of mind and unawareness of illness in schizophrenia: Is poor insight a mentalizing deficit? *European Archives of Psychiatry and Clinical Neuroscience, 257,* 104-111.

Bowie, C. R., Twamley, E. W., Anderson, H., Halpern, B., Patterson, T. L., & Harvey, P. D. (2007). Self-assessment of functional status in schizophrenia. *Journal of Psychiatric Research, 41,* 1012-1018.

Braff, D. L., Heaton, R., Kuck, J., Cullum, M., Moranville, J., Grant, I., & Zisook, S. (1991). The generalized pattern of neuropsychological deficits in outpatients with chronic schizophrenia with heterogenous Wisconsin Card Sorting Test results. *Archives of General Psychiatry, 48,* 891-898.

Brazo, P., Marie, R. M., Halbecq, I., Benali, K., Segard, L., Delamillieure, P., Langlois-Thery, S., Van Der Elst, A., Thibaut, F., Petit, M., & Dollfus, S. (2002). Cognitive patterns in subtypes of schizophrenia. *European Psychiatry, 17*(3), 155-162.

Breier, A., Schreiber, J. L., Dyer, J., & Pickar, D. (1991). National institute of mental health longitudinal study of chronic schizophrenia: Prognosis and predictors of outcome. *Archives of General Psychiatry, 48,* 239-246.

Bruce, J. M., & Arnett, P. A. (2004). Self-reported everyday memory and depression in

patients with multiple sclerosis. *Journal of Clinical and Experimental Neuropsychology, 26,* 200-214.

Buchanan, A. (1992). A two-year prospective study of treatment compliance in patients with schizophrenia. *Psychological Medicine, 22,* 787-797.

Burdick, K. E., Endick, C. J., & Goldberg, J.F. (2005). Assessing cognitive deficits in bipolar disorder: Are self-reports valid? *Psychiatry Research, 136,* 43-50.

Burgess, P. W., Alderman, N., Evans, J., Emslie, H., & Wilson, B. A. (1998). The ecological validity of tests of executive function. *Journal of the International Neuropsychological Society, 4,* 547-558.

Burgess, P. W., Alderman, N., Forbes, C., Costello, A., Coates, L. M. A., Dawson, D. R., Anderson, N. D., Gilbert, S. J., Dumontheil, I., & Channon, S. (2006). The case for the development and use of "ecologically valid" measures of executive function in experimental and clinical neuropsychology. *Journal of the International Neuropsychological Society, 12,* 194-209.

Campos, M. S., Garcia-Jalon, E., Gilleen, J. K., David, A. S., Peralta, V., & Cuesta, M. J. (2011). Premorbid personality and insight in first-episode psychosis. *Schizophrenia Bulletin, 37*(1), 52-60. doi:10.1093/schbul/sbq119

Chamelian, L., & Feinstein, A. (2006). The effect of major depression on subjective and objective cognitive deficits in mild to moderate traumatic brain injury. *Journal of Neuropsychiatry and Clinical Neurosciences, 18,* 33-38.

Chen, E. Y., Kwok, C., Chen, R., & Kwong, P. (2001). Insight changes in acute psychotic episodes: A prospective study of Hong Kong Chinese patients. *The Journal of Nervous and Mental Disease, 189,* 24-30.

Clark, L. K., Warman, D., & Lysaker, P. H. (2010). The relationships between schizophrenia symptom dimensions and executive functioning components. *Schizophrenia Research, 124*(1-3), 169-175. doi:10.1016/j.schres.2010.08.004

Collins, A. A., Remington, G. J., Coulter, K., & Birkett, K. (1997). Insight, neurocognitive function and symptom clusters in chronic schizophrenia. *Schizophrenia Research, 27,* 37-44.

Conson, M., Ranieri, F., de Falco, a., Grossi, D., & de Falco, F. A. (2008). Unawareness of 'illnesses': A case of right-sided hemiballism. *Neurological Sciences, 29,* 347-350.

Cooke, M. A., Peters, E. R., Kuipers, E., & Kumari, V. (2005). Disease, deficit or denial? Models of poor insight in psychosis. *Acta Psychiatrica Scandinavica, 112,* 4-17.

Corrigan, P. W., & Green, M. F. (1993). Schizophrenic patients' sensitivity to social cues: the role of abstraction. *The American Journal of Psychiatry, 150,* 589-594.

Cuesta, M. J., Peralta, V., Caro, F., & de Leon, J. (1995). Is poor insight in psychotic disorders associated with poor performance on the Wisconsin Card Sorting Test? *American Journal of Psychiatry, 152,* 1380-1382.

Cuesta, M. J., Peralta, V., & Zarzuela, A. (2000). Reappraising insight in psychosis: Multi-scale longitudinal study. *British Journal of Psychiatry, 177,* 233-240.

Cuesta, M. J., Peralta, V., Zarzuela, A., & Zandio, M. (2006). Insight dimensions and cognitive functions in psychosis: a longitudinal study. *BMC Psychiatry, 6,* 1-10.

David, A. S. (1990). Insight and psychosis. *British Journal of Psychiatry, 156,* 798-808.

David, A., Buchanan, A., Reed, A., & Almeida, O. (1992). The assessment of insight in psychosis. *The British Journal of Psychiatry, 161,* 599-602.

Diagnostic and statistical manual of mental disorders: DSM-IV (4th ed.). (1995).

Washington, DC: American Psychiatric Association.

Díaz-Marsá, M., Sánchez, S., & Rico-Villademoros, F. (2009). Effectiveness and tolerability of oral ziprasidone in psychiatric inpatients with an acute exacerbation of schizophrenia or schizoaffective disorder: A multicenter, prospective, and naturalistic study. *Journal Of Clinical Psychiatry, 70*(4), 509-517. doi:10.4088/JCP.08m04410

Dickerson, F. B., Boronow, J. J., Ringel, N., & Parente, F. (1997). Lack of insight among outpatients with schizophrenia. *Psychiatric Services, 48,* 195-199.

Donohoe, G., Corvin, A., & Robertson, I. H. (2006). Evidence that specific executive functions predict symptom variance among schizophrenia patients with a predominantly negative symptom profile. *Cognitive Neuropsychiatry, 11*(1), 13-32. doi:10.1080/13546800444000155

Donohue, G., Hayden, J., McGlade, N., O'Gráda, C., Burke, T., Barry, S., et al. (2009). Is "clinical" insight the same as "cognitive" insight in schizophrenia? *Journal of the International Neuropsychological Society, 15,* 471-475.

Drake, R. J., & Lewis, S. W. (2003). Insight and neurocognition in schizophrenia. *Schizophrenia Research, 62,* 165-173.

Erickson, M., Nematollah, J., & Lysaker, P. (2011). Insight and negative symptoms as predictors of functioning in a work setting in patients with schizophrenia. *Psychiatry Research, 189,* 161-165.

Fenton, W. S., Blyler, C. R., & Heinssen, R. K. (1997). Determinants of medication compliance in schizophrenia: Empirical and clinical findings. *Schizophrenia Bulletin, 23,* 637-651.

Field, A. (2005). *Discovering Statistics Using SPSS.* Second Edition. London: Sage

Publications.

Fioravanti, M., Carlone, O., Vitale, B., Cinti, M. E., & Clare, L. (2005). A meta-analysis of cognitive deficits in adults with a diagnosis of schizophrenia. *Neuropsychology Review, 15,* 73-95.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1996). *Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version (SCID-CV).* Washington, D.C.: American Psychiatric Press, Inc., 1996.

Fiszdon, J. M., & Johannesen, J. K. (2010). Comparison of computational methods for the evaluation of learning potential in schizophrenia. *Journal of the International Neuropsychological Society, 16,* 613-620.

Freudenreich, O., Deckersbach, T., & Goff, D. C. (2004). Insight into current symptoms of schizophrenia. Association with frontal cortical function and affect. *Acta Psychiatrica Scandinavica, 110,* 14-20.

Gilleen, J., Greenwood, K., & David, A. S. (2011). Domains of awareness in schizophrenia. *Schizophrenia Bulletin, 37,* 61–72. doi:10.1093/schbul/sbq100

Gladsjo, J. A., McAdams, L. A., Palmer, B. W., Moore, D. J., Jeste, D. V., & Heaton, R. K. (2004). A six-factor model of cognition in schizophrenia and related psychotic disorders: Relationships with clinical symptoms and functional capacity. *Schizophrenia Bulletin, 30*(4), 739-754.

Goldberg, R. W., Green-Paden, L., Lehman, A. F., & Gold, J. M. (2001). Correlates of insight in serious mental illness. *The Journal of Nervous and Mental Disease, 189,* 137-145.

Green, M. F. (1996). What are the functional consequences of neurocognitive deficits in

schizophrenia? *American Journal of Psychiatry, 153*(3), 321-330.

Green, M. F., Kern, R. S., Braff, D. L., & Mintz, J. (2000). Neurocognitive deficits and functional outcome in schizophrenia: Are we measuring the "right stuff"? *Schizophrenia Bulletin, 26*(1), 119-136.

Green, M. F., Kern, R. S., & Heaton, R. K. (2004). Longitudinal studies of cognition and functional outcome in schizophrenia: Implications for MATRICS. *Schizophrenia Research, 72,* 41-51.

Greve, K. W., Ingram, F., Bianchini, K. J., (1998). Latent structure of the Wisconsin Card Sorting Test in a clinical sample. *Archives of Clinical Neuropsychology, 13,* 597-609.

Greve, K. W., Stickle, T. R., Love, J. M., Bianchini, K. J., & Stanford, M. S. (2005). Latent structure of the Wisconsin Card Sorting Test: a confirmatory factor analytic study. *Archives Of Clinical Neuropsychology, 20*(3), 355-364. doi:10.1016/j.acn.2004.09.004

Hake, D. L., Hamera, E., & Rempfer, M. (2007). Self-report of cognitive functioning and learning in schizophrenia. *Journal of the American Psychiatric Nurses Association, 20*(10), 1-8.

Hamilton, M. (1967). Development of a rating scale for primary depressive illness. *British Journal of Social Clinical Psychology, 6,* 278-296.

Harvey, P. D., Serper, M. R., White, L., Parrella, M. J., McGurk, S. R., Moriarty, P. J., Bowie, C., Vadhan, N., Friedman, J., & Davis, K. L. (2001). The convergence of neuropsychological testing and clinical ratings of cognitive impairment in patients with schizophrenia. *Comprehensive Psychiatry, 42*(4), 306-313.

Hasson-Ohayon, I., Kravetz, S., Meir, T., & Rozencwaig, S. (2009). Insight into severe

mental illness, hope, and quality of life of persons with schizophrenia and schizoaffective disorders. *Psychiatry Research, 167,* 231-238.

Heaton, R. K., Gladsjo, J. A., Palmer, B. W., Kuck, J., Marcotte, T. D., & Jeste, D. V. (2001). Stability and course of neuropsychological deficits in schizophrenia. *Archives of General Psychiatry, 58*(1), 24-32.

Heinrichs, R. W., & Zakzanis, K. K. (1998). Neurocognitive deficit in schizophrenia: A quantitative review of the evidence. *Neuropsychology, 12,* 426-445.

Holthausen, E. A. E., Wiersma, D., Cahn, W., Kahn, R. S., Dingemans, P. M., Schene, A. H., & van den Bosch, R. J. (2007). Predictive value of cognition for different domains of outcome in recent-onset schizophrenia. *Psychiatry Research, 149,* 71-80.

Homack, S., Lee, D., & Riccio, C. A. (2005). Test Review: Delis-Kaplan Executive Function System. *Journal Of Clinical And Experimental Neuropsychology, 27*(5), 599-609. doi:10.1080/13803390490918444

Horner, M., Harvey, R. T., & Denier, C. A. (1999). Self-report and objective measures of cognitive deficit in patients entering substance abuse treatment. *Psychiatry Research, 86*(2), 155-161. doi:10.1016/S0165-1781(99)00031-1

Johnson, D. (2010). Insight and Judgment. *A Compendium of Psychosocial Measures: Assessment of People with Serious Mental Illnesses in the Community* (pp. 133-144). New York, NY: Springer Publishing Company.

Jovanovski, D., Zakzanis, K. K., Atia, M., Campbell, Z., and Young, D. A. (2007). A comparison between researcher-rated and a self-report method of insight assessment in chronic schizophrenia revisited: A replication study using the SUMD and SAIQ. *The Journal of Nervous and Mental Disease, 195,* 165-169.

Karow, A., Pajonk, F.-G., Reimer, J., Hirdes, F., Osterwald, C., Naber, D., & Moritz, S. (2008). The dilemma of insight into illness in schizophrenia: self- and expert-rated insight and quality of life. *European Archives of Psychiatry and Clinical Neuroscience, 258,* 152-159.

Keefe, R. S. E., Poe, M., Walker, T. M., & Harvey, P. D. (2006) The relationship of the Brief Assessment of Cognition in Schizophrenia (BACS) to functional capacity and real-world functional outcome. *Journal of Clinical and Experimental Neuropsychology, 28*(2), 260-269.

Kemp, R. A., & Lambert, T. J. R. (1995). Insight in schizophrenia and its relationship to psychopathology. *Schizophrenia Research, 18,* 21-28.

Kongs, S. K., Thompson, L. L., Iverson, G. L., & Heaton, R. K. (2000). *Wisconsin Card Sorting Test-64 Card Version Professional Manual*. Lutz, FL: Psychological Assessment Resources, Inc.

Koren, D., Seidman, L. J., Goldsmith, M., & Harvey, P. D. (2006). Real-world cognitive---and metacognitive---dysfunction in schizophrenia: A new approach for measuring (and remediating) more "right stuff." *Schizophrenia Bulletin, 32,* 310-326.

Koren, D., Seidman, L. J., Poyurovsky, M., Goldsmith, M., Viksman, P., Zichel, S., & Klein, E. (2004). The neuropsychological basis of insight in first-episode schizophrenia: a pilot metacognitive study. *Schizophrenia Research, 70,* 195-202.

Kruck, C. L., Flashman, L. A., Roth, R. M., Koven, N. S., McAllister, T. W., & Saykin, A. J. (2009). Lack of relationship between psychological denial and unawareness of illness in schizophrenia-spectrum disorders. *Psychiatry Research, 169*(1), 33-38. doi:10.1016/j.psychres.2008.07.010

Kurtz, M. M., & Wexler, B. E. (2006). Differences in performance and learning proficiency on the Wisconsin Card Sorting Test in schizophrenia: Do they reflect distinct neurocognitive subtypes with distinct functional profiles?. *Schizophrenia Research, 81*(2/3), 167-171. doi:10.1016/j.schres.2005.09.003

Lahr, D., Beblo, T., & Hartje, W. (2007). Cognitive performance and subjective complaints before and after remission of major depression. *Cognitive Neuropsychiatry, 12*(1), 25-45.

Larøi, F., et al. (2000). Unawareness of illness in chronic schizophrenia and its relationship to structural brain measures and neuropsychological tests. *Psychiatry Research: Neuroimaging Section, 100,* 49-58.

Lecardeur, L., Briand, C., Prouteau, A., Lalonde, P., Nicole, L., Lesage, A., & Stip, E. (2009). Preserved awareness of their cognitive deficits in patients with schizophrenia: Convergent validity of the SSTICS. *Schizophrenia Research, 107,* 303-306.

Lewis, A. (1934). The psychopathology of insight. *British Journal of Medical Psychology, 14,* 332-348.

Lezak, M. D., Howieson, D. B., & Loring, D. W. (2004). *Neuropsychological Assessment* (4th ed.). New York: Oxford University Press.

Lincoln, T. M., Lüllmann, E., & Rief, W. (2007). Correlates and long-term consequences of poor insight in patients with schizophrenia. A systematic review. *Schizophrenia Bulletin, 33,* 1324-1342.

Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for the expanded BPRS. *Schizophrenia Bulletin, 12,* 594–602.

Lysaker, P. H., & Bell, M. (1994). Insight and cognitive impairment in schizophrenia:

Performance on repeated administrations of the Wisconsin Card Sorting Test. *The Journal of Nervous and Mental Disease, 182,* 656-660.

Lysaker, P., & Bell, M. (1995). Work rehabilitation and improvements in insight in schizophrenia. *Journal of Nervous and Mental Disease, 183,* 103-106.

Lysaker, P. H., Bell, M. D., Bryson, G., & Kaplan, E. (1998). Neurocognitive function and insight in schizophrenia: support for an association with impairments in executive function but not with impairments in global function. *Acta Psychiatrica Scandinavica, 97,* 297-301.

Lysaker, P. H., Bryson, G. J., Lancaster, R. S., Evans, J. D., & Bell, M. D. (2002). Insight in schizophrenia: associations with executive function and coping style. *Schizophrenia Research, 59,* 41-47.

Lysaker, P. H., Bryson, G. J., & Bell, M. D. (2002). Insight and work performance in schizophrenia. *The Journal of Nervous and Mental Disease, 190,* 142-146.

Lysaker, P. H., France, C. M., Hunter, N. L., & Davis, L. W. (2005). Personal narratives of illness in schizophrenia: Associations with neurocognition and symptoms. *Psychiatry, 68,* 140-151.

Lysaker, P. H., Roe, D., & Yanos, P. T. (2007). Toward understanding the insight paradox: Internalized stigma moderates the association between insight and social functioning, hope, and self-esteem among people with schizophrenia spectrum disorders. *Schizophrenia Bulletin, 33,* 192-199.

Markova, I. S., & Berrios, G. E. (1995). Insight in clinical psychiatry: A new model. *The Journal of Nervous and Mental Disease, 183,* 743-751.

Marks, K. A., Fastenau, P. S., Lysaker, P. H., & Bond, G. R. (2000). Self-Appraisal of Illness

Questionnaire (SAIQ): relationship to researcher-rated insight and neuropsychological function in schizophrenia. *Schizophrenia Research, 45,* 203-211.

McCabe, R., Quayle, E., Beirne, A. D., & Anne Duane, M. M. (2002). Insight, global neuropsychological functioning, and symptomatology in chronic schizophrenia. *The Journal of Nervous and Mental Disease, 190,* 519-525.

McEvoy, J. P., Hartman, M., Gottlieb, D., Godwin, S., Apperson, L. J. & Wilson, W. (1996). Common sense, insight, and neuropsychological test performance in schizophrenia patients. *Schizophrenia Bulletin, 22,* 635-641.

McGlashan, T. H., Levy, S. T., & Carpenter, W. T. (1976). Integration and sealing over: Clinically distinct recovery styles from schizophrenia. *Archives of General Psychiatry, 32,* 1269-1272.

Medalia, A., & Lim, R. W. (2004). Self-awareness of cognitive functioning in schizophrenia. *Schizophrenia Research, 71,* 331-338.

Medalia, A., & Thysen, J. (2010). A comparison of insight into clinical symptoms versus insight into neuro-cognitive symptoms in schizophrenia. *Schizophrenia Research, 118,* 134-139.

Mintz, A. R., Dobson, K. S., & Romney, D. M. (2003). Insight in schizophrenia: a meta-analysis. S*chizophrenia Research, 61,* 75-88.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and diversity of executive functions and their contributions to complex 'frontal lobe' tasks: A latent variable analysis. *Cognitive Psychology, 41*(1), 49-100. doi:10.1006/cogp.1999.0734

Mohamed, S., Rosenheck, R., McEvoy, J., Swartz, M., Stroup, S., & Lieberman, J. A.

(2009). Cross-sectional and longitudinal relationships between insight and attitudes toward medication and clinical outcomes in chronic schizophrenia. *Schizophrenia Bulletin, 35,* 336-346.

Monteiro, L. C., Silva, V. A., & Louzã, M. R. (2008). Insight, cognitive dysfunction and symptomatology in schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience, 258,* 402-405.

Moritz, S., Ferahli, S., & Naber, D. (2004). Memory and attention performance in psychiatric patients: Lack of correspondence between clinician-rated and patient-rated functioning with neuropsychological test results. *Journal of the International Neuropsychological Society, 10,* 623-633.

Murphy, M. E. (2009). Everyday executive function in people with schizophrenia: Investigating the dysexecutive questionnaire. Unpublished thesis.

Murphy, M. E. (2010). Insight and executive function: Investigating the role of dynamic assessment. Unpublished dissertation proposal.

Mysore, A., Parks, R. W., Lee, K.-H., Bhaker, R. S., Birkett, P., & Woodruff, P. W. R. (2007). Neurocognitive basis of insight in schizophrenia. *British Journal of Psychiatry, 190,* 529-530.

Nakano, H., Terao, T., Iwata, N., Hasako, R., & Nakamura, J. (2004). Symptomatological and cognitive predictors of insight in chronic schizophrenia. *Psychiatry Research, 127,* 65-72.

Osatuke, K., Ciesla, J., Kasckow, J. W., Zisook, S., & Mohamed, S. (2008). Insight in schizophrenia: a review of etiological models and supporting research. *Comprehensive Psychiatry, 49,* 70-77.

Parellada, M., Boada, L., Fraguas, D., Reig, S., Castro-Fornieles, J., Moreno, D., ... & Arango, C. (2011). Trait and state attributes of insight in first episodes of early-onset schizophrenia and other psychoses: a 2-year longitudinal study. *Schizophrenia Bulletin*, *37*(1), 38-51. doi:10.1093/schbul/sbq109

Polgár, P. P., Réthelyi, J. M., Bálint, S. S., Komlósi, S. S., Czobor, P. P., & Bitter, I. I. (2010). Executive function in deficit schizophrenia: What do the dimensions of the Wisconsin Card Sorting Test tell us?. *Schizophrenia Research*, *122*(1-3), 85-93. doi:10.1016/j.schres.2010.06.007

Premack, D. G., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1,* 515-526.

Prouteau, A., Verdoux, H., Briand, C., Lesage, A., Lalonde, P., Nicole, L., Reinharz, D., & Stip, E. (2004). Self-assessed cognitive dysfunction and objective performance in outpatients with schizophrenia participating in a rehabilitation program. *Schizophrenia Research, 69,* 85-91.

Pruß, L., Wiedl, K., & Waldorf, M. (2012). Stigma as a predictor of insight in schizophrenia. *Psychiatry Research*, *198*(2), 187-193. doi:10.1016/j.psychres.2011.12.012

Pyne, J. M., Bean, D., & Sullivan, G. (2001). Characteristics of patients with schizophrenia who do not believe they are mentally ill. *Journal of Nervous & Mental Disease, 189,* 146-153.

Rathod, S., Kingdon, D., Smith, P., & Turkington, D. (2005). Insight into schizophrenia: the effects of cognitive behavioral therapy on components of insight and association with sociodemographics---data on a previously published randomized controlled trial. *Schizophrenia Research, 74,* 211-219.

Reichenberg, A., & Harvey, P. D. (2007). Neuropsychological impairments in schizophrenia: Integration of performance-based and brain imaging findings. *Psychological Bulletin, 133*(5), 833-858.

Rempfer, M., Brown, C., & Hamera, E. (2011). Learning potential as a predictor of skill acquisition in people with serious mental illness. *Psychiatry Research, 185,* 293-295.

Rempfer, M., Hamera, E., Brown, C., & Bothwell, R. J. (2006). Learning proficiency on the Wisconsin Card Sorting Test in people with serious mental illness: What are the cognitive characteristics of good learners?. *Schizophrenia Research, 87*(1-3), 316-322. doi:10.1016/j.schres.2006.05.012

Rossell, S. L., Coakes, J., Shapleske, J., Woodruff, P. W. R., & David, A. S. (2003). Insight: its relationship with cognitive function, brain volume and symptoms in schizophrenia. *Psychological Medicine, 33,* 111-119.

Sabbag, S., Twamley, E. W., Vella, L., Heaton, R. K., Patterson, T. L., & Harvey, P. D. (2012). Predictors of the accuracy of self assessment of everyday functioning in people with schizophrenia. *Schizophrenia Research, 137*(1-3), 190-195. doi:10.1016/j.schres.2012.02.002

Sanjuán, J., Aguilar, E. J., Olivares, J. M., Ros, S., Montejo, A. L., Mayoral, F., et al. (2006). Subjective perception of cognitive deficit in psychotic patients. *Journal of Nervous and Mental Disease, 194,* 58-60.

Sanz, M., Constable, G., Lopez-Ibor, I., Kemp, R., & David, A. S. (1998). A comparative study of insight scales and their relationship to psychopathological and clinical variables. *Psychological Medicine, 28,* 437-446.

Savla, G. N., Twamley, E. W., Delis, D. C., Roesch, S. C., Jeste, D. V., & Palmer, B. W.

(2012). Dimensions of executive functioning in schizophrenia and their relationship with processing speed. *Schizophrenia bulletin*, *38*(4), 760-768. doi:10.1093/schbul/sbq149

Schwartz, R. C., Cohen, B. N., & Grubaugh, A. (1997). Does insight affect long-term inpatient treatment outcome in chronic schizophrenia? *Comprehensive Psychiatry*, *38*, 283-288.

Sergi, M. J., Kern, R.S., Mintz, J., Green, M. F. (2005). Learning potential and the prediction of work skill acquisition in schizophrenia. *Schizophrenia Bulletin*, *31*, 67–72.

Silver, H., Goodman, C., Bilker, W. B., Knoll, G., Gur, R., & Povar, G. (2007). Suboptimal processing strategy and working-memory impairments predict abstraction deficit in schizophrenia. *Journal of Clinical and Experimental Neuropsychology, 29,* 823-830.

Silver, J. M., McAllister, T. W., & Yudofsky, S. C. (2005). *Textbook of traumatic brain injury.* Arlington, VA: American Psychiatric Publishing.

Simon, A. E., Berger, G. E., Giacomini, V., Ferrero, F., & Mohr, S. (2006). Insight, symptoms and executive functions in schizophrenia. *Cognitive Neuropsychology, 11,* 437-451.

Simon, V., De Hert, M., Wampers, M., Peuskens, J., & van Winkel, R. (2009). The relation between neurocognitive dysfunction and impaired insight in patients with schizophrenia. *European Psychiatry, 24,* 239-243.

Smith, T. E., Hull, J. W., Goodman, M., Hedayat-Harris, A., Willson, D., Israel, L., & Munich, R. (1999). The relative influences of symptoms, insight, and neurocognition on social adjustments in schizophrenia and schizoaffective disorder. *The Journal of Nervous and Mental Disease, 187,* 102-108.

Smith, T. E., Hull, J. W., Israel, L. M., & Willson, D. F. (2000). Insight, symptoms, and neurocognition in schizophrenia and schizoaffective disorder. *Schizophrenia Bulletin, 26,* 193-200.

Smith, T. E., Hull, J. W., & Santos, L. (1998). The relationship between symptoms and insight in schizophrenia: A longitudinal perspective. *Schizophrenia Research, 33,* 63-67.

Startup, M. (1996). Insight and cognitive deficits in schizophrenia: evidence for a curvilinear relationship. *Psychological Medicine, 26,* 1277-1281.

Stip, E., Caron, J., Renaud, S., Pampoulova, T., & Lecomte, Y. (2003). Exploring cognitive complaints in schizophrenia: The subjective scale to investigate cognition in schizophrenia. *Comprehensive Psychiatry, 44,* 331-340.

Stratta, P., Arduini, L., Daneluzzo, E., Rinaldi, O., di Genova, A., & Rossi, A. (2003). Relationship of good and poor Wisconsin Card Sorting Test performance to illness duration in schizophrenia: a Cross-sectional analysis. *Psychiatry Research, 121,* 219-227.

Turkington, D., Kingdon, D., Turner, T. (2002). Effectiveness of a brief cognitive-behavioural therapy interventions in the treatment of schizophrenia. *British Journal of Psychiatry, 180,* 523-527.

Valiente, C., Provencio, M., Espinosa, R., Chaves, C., & Fuentenebro, F. (2011). Predictors of subjective well-being in patients with paranoid symptoms: Is insight necessarily advantageous?. *Psychiatry Research, 189*(2), 190-194. doi:10.1016/j.psychres.2011.02.018

Van den Bosch, R. J., & Rombouts, R. P. (1998). Causal mechanisms of subjective cognitive

dysfunction in schizophrenic and depressed patients. *The Journal of Nervous and Mental Disorders, 186*(6), 364-368.

Van Putten, T., Crumpton, E., & Yale, C. (1976). Drug refusal in schizophrenia and the wish to be crazy. *Archives of General Psychiatry, 33,* 1443-1446.

Voruganti, L. P., Awad, A. G., Parker, G., Forrest, C., Usmani, Y., Fernando, M. L. D., & Senthilal, S. (2007). Cognition, functioning and quality of life in schizophrenia treatment: Results of a one-year randomized controlled trial of olanzapine and quetiapine. *Schizophrenia Research, 96,* 146-155.

Voruganti, L. N. P., Heslegrave, R. J., & Awad, A. G. (1997). Neurocognitive correlates of positive and negative syndromes in schizophrenia. *Canadian Journal of Psychiatry, 42,* 1066-1071.

Vuilleumier, P. (2004). Anosognosia: The neurology of beliefs and uncertainties. *Cortex, 40,* 9-17.

Waldorf, M., Wiedl, K. H., & Schöttke, H. (2009). On the concordance of three reliable change indexes: An analysis applying the Dynamic Wisconsin Card Sorting Test. *Journal Of Cognitive Education And Psychology*, *8*(1), 63-80. doi:10.1891/1945-8959.8.1.63

Weingartz, S., Wiedl, K. H., & Watzke, S. (2008). Dynamic assessment of executive functioning: (How) can we measure change? *Journal of Cognitive Education and Psychology, 7,* 368-387. doi: 10.1891/194589508787724088

Wiedl, K. H. (1999). Cognitive modifiability as a measure of readiness for rehabilitation. *Psychiatric Services, 50*(11), 1411-1419.

Wiedl, K. H., Schöttke, H., Green, M. F., & Nuechterlein, K. H. (2004). Dynamic testing in

schizophrenia: Does training change the construct of a test? *Schizophrenia Bulletin, 30*(4), 703-711.

Wiedl, K. H., Wienöbst, J., Schöttke, H. H., Green, M. F., & Nuechterlein, K. H. (2001). Attentional characteristics of schizophrenia patients differing in learning proficiency on the Wisconsin Card Sorting Test. *Schizophrenia Bulletin, 27*(4), 687-696.

Wiffen, B. R., Rabinowitz, J., Lex, A., & David, A. S. (2010). Correlates, change and 'state or trait' properties of insight in schizophrenia.*Schizophrenia Research, 122*(1-3), 94-103. doi:10.1016/j.schres.2010.03.005

Wilk, C. M., Gold, J. M., McMahon, R. P., Humber, K., Iannone, V. N., & Buchanan, R. W. (2005). No, it is not possible to be schizophrenic yet neuropsychologically normal. *Neuropsychology, 19*(6), 778-786.

Wilkinson, G. S., & Robertson, G. J. (2006). *Wide Range Achievement Test 4 professional manual*. Lutz, FL: Psychological Assessment Resources.

Woods, S. P., Carey, C. L., Moran, L. M., Dawson, M. S., Letendre, S. L., Grant, I., & HIV Neurobehavioral Research Center (HNRC) Group. (2007). Frequency and predictors of self-reported prospective memory complaints in individuals infected with HIV. *Archives of Clinical Neuropsychology, 22*(2), 187-195.

Woonings, F. M. J., Appello, M. T., Kluiter, H., Slooff, C. J., & van den Bosch, R. J. (2002). Learning (potential) and social functioning in persons with schizophrenia. *Schizophrenia Research, 59,* 287-296.

Yen, C.-F., Cheng, C.-P., Huang, C.-F., Ko, C.-H., Yen, J.-Y., Chang, Y.-P., & Chen, C.-S.

(2009). Relationship between psychosocial adjustment and executive function in patients with bipolar disorder and schizophrenia in remission: the mediating and moderating effects of insight. *Bipolar Disorder, 11,* 190-197.

Young, D. A., Davila, R., & Sher, H. (1993). Unawareness of illness and neuropsychological performance in chronic schizophrenia. *Schizophrenia Research, 10,* 117-124.

Young, D. A., Zakzanis, K. K., Bailey, C., Davila, R., Griese, J., Sartory, G., & Thom, A. (1998). Further parameters of insight and neuropsychological deficit in schizophrenia and other chronic mental disease. *The Journal of Nervous and Mental Disease, 186,* 44-50.

VITA

Meghan Elizabeth Murphy was born on April 2, 1983 in Fort Smith, Arkansas. She was educated in both the Catholic and public school systems in Fort Smith, Arkansas, and she graduated from Southside High School in 2001. She attended Hendrix College on an academic scholarship and earned a Bachelor of Arts degree in 2005 with a major in Psychology. She graduated cum laude and received a distinction award in Psychology. She was on the Dean's list during the Fall semester of 2002. Meghan swam and lettered on the Hendrix College swim team during her four years of college attendance and served as the team captain from 2004-2005. She was a seven-time recipient of the Southern Collegiate Athletic Conference (SCAC) Academic Award, which honored SCAC athletes who held a 3.5 GPA during their athletic seasons. In addition to athletics, Meghan held leadership positions in psychology organizations, on student judiciary boards, and as an orientation leader for new students.

In 2006, Meghan was accepted to the Clinical Health Psychology program at the University of Missouri- Kansas City (UMKC), and began the program in August, 2006. She earned her Masters of Arts in Psychology in 2009 with her thesis project entitled "Everyday executive function in people with schizophrenia: Investigating the Dysexecutive Questionnaire." At UMKC, Meghan was involved in research labs investigating serious mental illness, functional outcomes, neurocognition, obesity, and multiple sclerosis. Several of the projects she has developed and assisted in have been presented at national and international research conferences. She has received two UMKC Women's Council awards to fund research projects and travel to present at national research conferences. Meghan has since completed her coursework for a doctorate in clinical psychology and earned a graduate

GPA of 3.96. She has co-authored several manuscripts, including journal articles, several entries for the *Encyclopedia of Clinical Neuropsychology*, and a chapter in the book *Night Eating Syndrome: Definition, Assessment, and Treatment* on night eating and psychiatric disorders. From 2011 to 2012, Meghan completed an APA accredited psychology internship at the Veterans Affairs Western New York Health Care System in Buffalo, New York. Her training there included rotations in primary care, a residential Post Traumatic Stress Disorder unit, and the Psychosocial Rehabilitation and Recovery Center. Meghan is a member of the Anxiety and Depression Association of America.